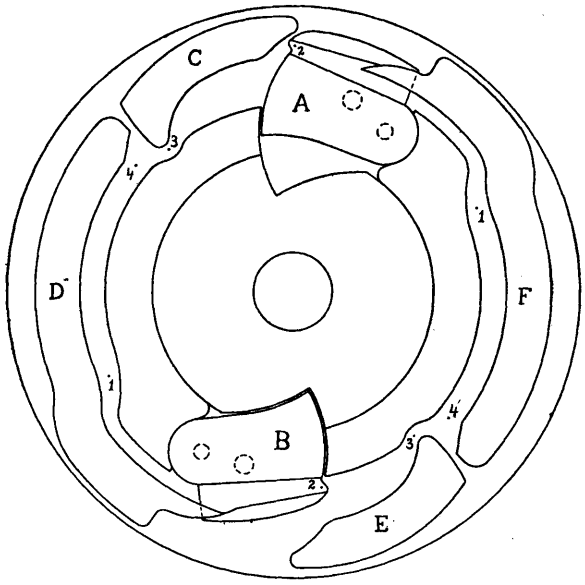
With a single feed machine, one stitch is made for every revolution of the cylinder, whereas with a double feed machine, the needles make two stitches for every revolution of the cylinder. The two yarn carriers are placed opposite to each other on the cam cylinder. The dial plate cam, for operating the dial needles, is simply a condensed form of two cams from a single feed machine, the operating part of the single feed cam remaining unaltered while the part for the needle rest is replaced by another operating part of a single feed cam, although the needle rest is not entirely abandoned, but is greatly reduced.

The groove outline for a two feed dial cam is shown in the accompanying illustration. It will be noticed that there are two movable cams A and B, corresponding in their construction with each other, and which have the same outlines as that used on a single feed machine. Cam A will be used as the welt cam, and cam B as the tuck cam, both cams being operated from the pattern wheel. The points 1 indicate the parts of the cam outline at which the needles are started to open, that is, begin to move outwardly. Points 2 are the portions which open the latches of the needles as they are operated upon, and push the stitches over the latches so that they rest on the needles behind said latches. Points 3 cast the



stitches off of the needles, and thus close the latches of said needles, the yarn carriers having deposited yarn in the hooks of the needles when they were open. From points 4 to 1, the needles are at rest, the operations of the needles being the same as for the single feed, but it will be noticed, as was mentioned, that the needles rest only for a short space as compared to the single feed. The same cam rings C, D, E and F, on the outside of the cam groove, are used to keep the needles in their proper positions, as was explained in connection with the single feed in the article on the Rib Top Machine. With reference to the cylinder or vertical needles, the cylinder cam for operating them is also made to give two stitches in one revolution of the cylinder, or in other words, two single feed cylinder cams are made into one with a slight difference, which is that only one movable cam is provided for making the loose course stitch.

The stitches are made by the cylinder needles in the same relation to the dial stitches as explained in connection with the single feed, that is, the stitches by the cylinder needles are made slightly in advance of those by the dial needles.

In making a sleeve on this machine, a welt is first made, then the plain rib stitch is knitted to make the lower end of the sleeve. After the plain stitch, the tuck stitch is made for the first portion of the upper part of the sleeve and then a looser tuck stitch is put in for the upper portion of the sleeve.

In order to make the different stitches, the positions of the different movable cams must be ascertained. It may be mentioned that the welt cam will be considered as leading the tuck cam in making the stitches.

First, to make the welt, the dial needles must go outwardly only half way for one revolution of the machine, then remain in for two revolutions, so as to lose those stitches, while the cylinder needles are continuing their regular stitch. In accomplishing this, both movable cams must be considered. Considering the welt cam A as making the first stitch, it must move in half way, in order to make the tuck stitch for the welt. The next stitch will be made by the tuck cam B and then the needles must be in, therefore the tuck cam must be entirely in. On the next revolution of the cylinder, the welt cam must also be entirely in, to make up the two lost stitches by the dial needles. The following stitch by the tuck cam will be plain, and so on, both cams making plain work until another style of stitch is needed.

Second, this plain stitch work is made in the same manner as with the single feed, that is, the movable cams are placed outwardly to their farthest positions, in order to have the dial needle latches open with the stitches then resting behind them on the needles, so that said stitches may be cast off at every operation of the needles. The cylinder needles are working plain and continue to work in this manner until the loose tuck stitch portion of the sleeve is required.

Third, the regular tuck stitch is now made, in order to give more elasticity to the sleeve than at the wrist. In order to make this stitch, which is the same as the tuck stitch used in connection with welts, the welt cam continues to make a plain rib stitch while the tuck cam is moved half way in and remains in this position until another style of stitch is required. By following the action of each cam on the dial needles, we see that the welt cam first puts in a plain rib stitch, that is, the needles move out to their farthest position, causing the stitch, or in this case two stitches in each hook, to open the latches and rest behind said latches; at the same time the hooks receive new yarn from the yarn carrier. The two stitches are then cast off at the point 3 following the welt cam in the outline shown in the illustration. The needles are then acted upon by the tuck cam which moves said needles half way out, thus opening the latches for another stitch without removing the first stitch from the hooks. The next revolution of the cylinder causes the welt cam to move the needles entirely outwardly, and consequently the point 3, following said cam, casts off two stitches over the single stitch as placed in the hook of the needle by the yarn carrier. This operation of the needles continues until the desired length has been knitted.

Fourth, the loose tuck stitch is made so as to give more elasticity than the regular tuck stitch. This stitch is made by having the dial needles continue to make the tuck stitch while the movable cam on the cam cylinder causes the cylinder needles to make the long or loose course stitch, said cam being lowered in order to do this. The loose stitch is only

made on every other stitch because only one movable cam is provided on the cam cylinder and two courses are made by the cam outline. This stitch is not always made use of in making a sleeve.

These different portions of the sleeve are automatically made by using a pattern wheel which is the same type as that shown in Fig. 4, in connection with a former article, *i. e.* Brinton's Rib Top Machine (see page 195), the chief difference in the two wheels being, that this wheel is provided with four rows of holes for the pattern screws, while the first only contained three. This pattern wheel in turn operates a bob pin through levers similar to those explained in connection with said Fig. 4, just referred to, and by means of the bob pin, the three different movable cams are operated.

A screw in hole No. 1 of the pattern wheel, raises the bob pin to its highest position, which causes the projection on the cam cylinder, as connected to the movable cylinder cam, to operate said cam and cause the long stitch for the loose tuck work.

A screw in hole No. 2, which puts the bob pin in the next highest position, causes said bob pin to strike a projection on the cam cylinder which operates the tuck cam for making the regular tuck stitch.

A screw in hole No. 3 causes the bob pin to be struck by projections connected to each cam, which puts them all in their normal positions for plain rib knitting.

A screw in hole No. 4 causes the bob pin to be struck by one projection from the welt cam, to make the lost stitch by the dial needles, and by two projections connected to the tuck cam in order to make a lost stitch. In this case one projection is struck slightly ahead of the other.

No screws in any of the holes cause the bob pin to go to its lowest position and be struck by a projection connected to the welt cam, the cam in this instance being moved half way in, in order to make a tuck stitch for the welt.

The order of the different operations explained is governed by the fabric, and has to be arranged so as to make continuous working. (H. Brinton & Co., Philadelphia, Pa.)

BRINTON'S AUTOMATIC RIB SHIRT OR BODY MACHINE.

This machine, as will be seen from its perspective view, as shown in the accompanying illustration, is larger than the machines previously described, containing in this instance eight feeds. The principle of construction and operation of the machine is similar to the Automatic Sleever, just described, that is, two sets of needles are used and tuck and welt cams are used on the dial cap cam. These cams are placed alternately around the dial cap and are equally spaced from each other.

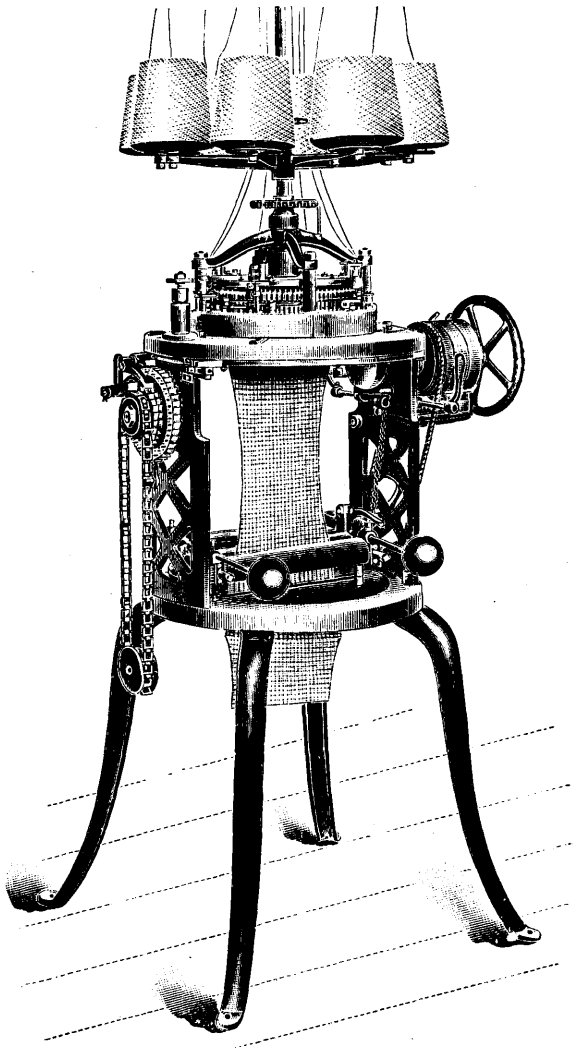
Only two styles of stitches are required to be made in connection with the knitted fabric on this machine, a pattern chain and pattern wheel being used to change from one stitch to the other and back again to the first stitch. For making undershirts, the plain rib stitch is used for the neck, the tuck stitch for the body, and the plain again for the bottom.

It will be seen that, for example, in an eight feed machine eight courses of stitches are made for every revolution of the cam cylinder and consequently eight stitching outlines on the cylinder cam, each complete in itself, *i. e.* containing points 1, 2, 3 and 4 as shown in Fig. 3, as given in connection with Brinton's Rib Top Machine (see page 194) must be provided for the cylinder needles, the same being true also for the dial needles.

To make the plain rib stitch, all of the movable cams on the dial cap cam must be in their farthest positions from the centre of the dial cap.

To make the tuck stitch, every other cam must remain in the outward position while the tuck cams, as placed between them, must be moved half way in. In this manner the tuck stitch is made by the cams as explained in connection with the two feed Automatic Sleever.

In order to make a change from one style of stitch to the other, a raiser is placed on the pattern chain, which, through lever connections explained when treating the rib top machine, sets the pattern wheel in motion, and which in turn operates a lever connected to operate the bob pin, and raise it. This causes a projection from the top of the dial cap to be struck, thus pushing it in. The inner end of the projection is connected to a movable ring which in turn operates levers as are connected to the movable dial cap tuck cams, thus throwing them half way in, the other cams remaining in their same positions.



The pattern wheel continues its revolution until a pin on the opposite side of the wheel from the pattern pins, comes under a lever which raises the reciprocating pawl out of contact with the teeth of said pattern wheel and thus stops it.

When a sufficient length of one style of stitch has been knitted, a raiser on the pattern chain again

starts the pattern wheel in motion, which is pegged properly to give the bob pin the correct movement to change the positions of the tuck cams and thus change the style of stitch.

The needle protector on this machine consists of a loose ring placed on the cam cylinder ring, and having upwardly projecting pins against which pins from the cam cylinder fall after being released by the needle protectors when yarn accumulates between the needles and protector. This action gives motion to the movable ring, causing a pin to strike a projection from the knock off motion, which in turn through levers shifts the belt from the tight to the loose pulley, thus stopping the machine. (H. Brinton & Co., Philadelphia, Pa.)

BRINTON'S FULL AUTOMATIC SEAMLESS KNITTING MACHINE.

The knitting machine is a different type of machine from the rib machines as previously explained, although the principle of knitting remains the same in both types of machines.

A perspective view of this knitting machine is shown in Fig. 1, in which only one set of needles is employed, *i. e.* the cylinder needles, the dial needles, as used in the rib machine, being replaced by sinkers, one sinker taking the place of each dial needle. These sinkers are used to push the stitches away from the needles after they have been cast off by said needles, and also to hold the work down.

This machine is used to complete the knitting of half hose after the tops have been made on the Rib Top Machines, and also to make stockings, in the latter instance requiring no tops from the Rib Top Machine.

In order to knit half hose, the tops are first placed on the cylinder needles, the cylinders carrying the needles being easily removable from the machine so that a top may be placed on one cylinder while another is working. The end of the rib top containing the slack course is placed on the needles, each loop being placed over a cylinder needle. The cylinder is then ready to be placed in the machine, being placed over a binding ring which secures it in the machine. This is known as locking the cylinder and is done by simply pulling a lever up. In order to place the raised needles down into the cylinder cam groove, which were raised in order to allow the needle cylinder to be placed in the machine, a jack cam for pulling down said needles is thrown inwardly so as to act upon them. The needles by thus being lowered, are placed in their working positions and the machine is then ready to start.

The plain stitch is first made by continuous circular knitting in one direction until the heel has to be knitted. The heel is made by giving the cam cylinder a reciprocating motion, that is, one revolution in a right hand direction and then reverse the direction of motion for the next revolution. In this manner only one-half of the needles work, the remaining half being raised out of working position, thus producing the fullness for the heel. The heel is shaped properly by raising a needle out of action from each side of the working needles after every course, until the smallest part or bottom is made, then a needle is added at each end until the heel is finished. After completing the heel, continuous knitting is made until the toe has to be made, the remaining needles having been lowered. The toe is made in the same manner as the heel, and on its completion the machine is automatically stopped, so that the operator may replace the empty cylinder with a new one containing a half hose top.

To make the plain stitch on the machine, the cylinder needles are raised successively by the cylinder cam in order to have the stitch in each hook open the latch and allow new yarn to be put in said hook when the needles descend. The sinkers are also moved in and out during a course by means of a cam groove on the dial cap. The yarn carrier as used in this machine consists of a ring shaped piece situated above the dial cap and having a hole in the side through which the yarn is passed. The ring also acts as a guard for the hooks of the needles which are partially raised when in the resting position. The hole in the yarn carrier is made in the same vertical line with the central point of the centre cam on the cylinder cam and the outward point of the dial cap cam, although this cam is given a little play on either side of the carrier eye. This causes the yarn to be deposited on the sinkers when the needle is up and the sinker is partly out of the way. As the needle comes down, the yarn catches in the hook and is drawn down; at the same time the sinker moves inwardly and pushes the cast off stitch away from the needle. The cylinder cam is made with a needle rest for a little over half of the inner circumference of the cam. The dial cap cam is made to have all of the sinkers in an inward position except a few where the yarn carrier is depositing yarn, and which are in the outward position, that is, the part which pushes the stitch inwardly is in this position. To make the heel, the same plain stitch is

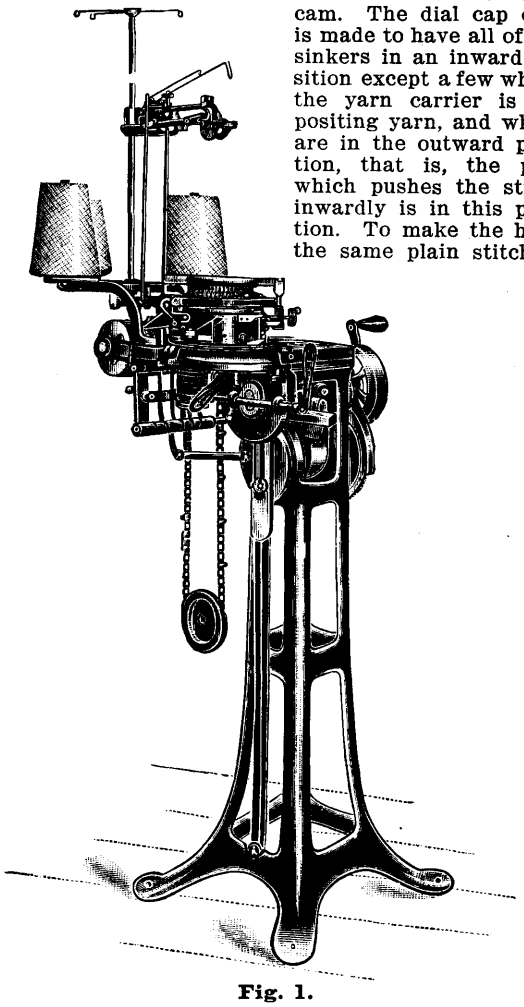


Fig. 1.

made, but only part of the needles are used. A reversing motion for the cam cylinder, as was mentioned, is brought into action in order to give one revolution in one direction and then reverse the motion for one revolution. The cam cylinder is driven from a bevel gear which in turn receives its motion

from either of two sources through a clutch. When the clutch is in contact with a continuously revolving piece, the cam cylinder is revolved in one direction, and when the clutch is in contact with a piece which receives a forward and backward revolution, the cam cylinder is consequently given a similar movement. The continuous revolution is gotten directly from the driving shaft of the machine. The backward and forward motion is gotten through a toothed segment which is given a backward and forward movement through a crank pin as driven from the driving shaft of the machine.

Making the stitch by the cylinder cam requires careful study, so that a development of the cam outline, as given in Fig. 2, will be used to more clearly explain the operation. In order to have only a certain number of needles working for making the heel, it is necessary to raise the others out of the cam groove. These needles which are to remain out of action by being raised, are made with longer butts or shanks than the other needles, the two kinds being known as long and short butt needles respectively. In order to raise them, the jack cam A is brought into action, *i. e.* pushed into the inner circumference of the cylinder cam, so that as it revolves, the long butt needles are pushed up, said needles being held in this raised position by means of a spring placed around the needle cylinder, the short butt needles remaining untouched. The cam cylinder in making

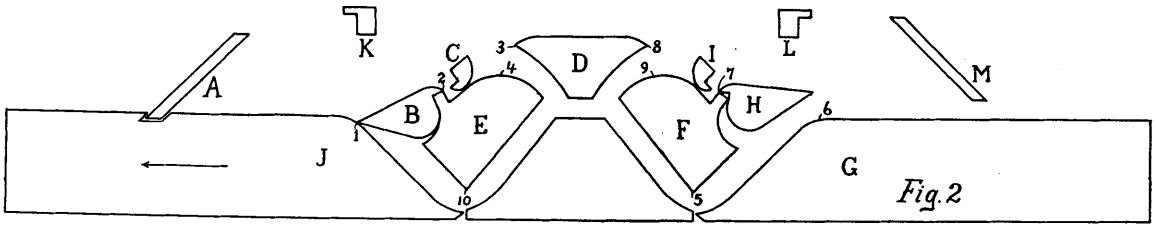


Fig. 2

the backward and forward movements, only operates these short butt needles which are down in working position. For example, the cylinder is revolving in the direction of the arrow, then a needle, after being passed by the point 1 of the needle rest, is moved upwardly by the switch cam B to the point 2, at which point it comes on the small projection of the upper pick C and is raised by it as the cylinder continues to revolve. The projection on the pick C is just large enough to hold one needle. At the point 3, the upper pick comes to the top cam D and the needle is placed in its highest position by said cam, thus raising one needle out of action. After the upper pick C has been moved up, the other needles are acted upon by the stitch cam E and the latches of the needles opened by the point 4. The upper pick C returns to its original position when the needle is off of the projection. When the middle of the top cam D is acting on the needle, yarn is being deposited by the yarn carrier. This cam starts the needle down and enables the under side of stitch cam F to complete this movement, the stitch being cast off the needle, at the point 5. The end cam G then raises the needle up to its resting position at point 6, the switch cam H being easily raised from the under side by the needle, so that it does not interfere with the needles. The point 6 passes all of the working needles and then returns on the backward motion of the cylinder. As the cam goes back in the opposite direction from the first movement, a needle moves up on the switch cam H to the point 7, at which point it comes on a projection of the upper pick I, which is raised as the cam cylinder continues its revolution. At the point 8, the needle is placed in its highest position by the top cam D, thus releasing the upper pick I which descends and rests on top of the shanks of the other needles in the same manner as the upper pick C on the opposite side. In this way a needle from the other side is placed out of action.

The other working needles are acted upon by the stitch cam F, which carries them to their highest positions 9 with the latches open and the stitches resting on the needles below the latches. At the middle of the top cam D, yarn is deposited and as the needles are forced down by the under side of the stitch cam E, they catch the yarn in the hooks for a new stitch. At the point 10, the stitch is cast off, and the end cam J then raises the needle to the resting point 1. In this manner, the stitches are made for the heel, raising a needle at each end, one at a time, for every movement of the cam cylinder. When sufficient needles have been raised out of action for the first portion of the heel, these needles which were placed out of action are brought down again, one at a time, at each end and at each movement of the cam cylinder. This is accomplished by means of the lower picks K and L in connection with the same pieces as used for placing them out of action.

It was mentioned that one needle was replaced into working position at one time, which is true, but it is gotten by replacing two needles at one time and then taking one away. This is necessary, because the upper picks still continue to operate and take one needle up each time.

The lower picks K and L must be released before they can operate on the needles. In the free position, they are situated above the shanks of the inoperative needles, that is, the projections from said picks. When the cam cylinder is moving in the direction of the arrow, the lower pick K comes with its projection over the top of two needle shanks (the size of the projection only allowing two), and as the cylinder continues to revolve, the needles are forced down by the pick into working position. On being released by the needles, the pick K assumes its original position after resting under the shanks until they are passed. As the cylinder returns on its backward movement, the upper pick I takes one of the returned needles back again out of working position, thus leaving the one needle.

On this same backward movement, the lower pick L brings down two needles, one of which is placed back again out of working position by the upper pick C on the next forward movement of the cylinder. These operations continue until the heel is completed, when the clutch is thrown in with the continuously revolving piece and the cylinder consequently given a continuous revolution. At the same time, the lower picks are caught and held until the proper time, during the making of the toe. All of the needles which were out of operation are brought down by the under side of the pull down cam M, which is thrown into the path of the butts of the needles, and the same plain stitch is made as at first.

While making the heel, an extra yarn or splice is run with the regular yarn in order to make that por-

tion of the half hose or stocking stronger and heavier. To allow for this extra yarn, the stitch must be made longer, and to accomplish this, the needle cylinder is raised slightly. This causes the sinkers and needles to be raised, and as the needles go down to the same position as at first, the yarn as laid on the sinkers is drawn down the extra length that the sinkers were raised.

After making the plain part of the foot, the toe is made in the same manner as the heel. On completing the toe, the machine automatically stops off and is ready to have a new cylinder replace the empty one.

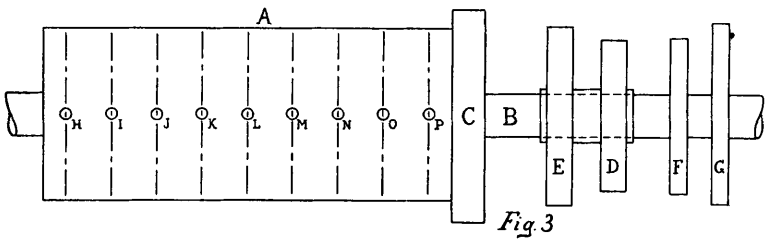


Fig. 3

The method of obtaining these different movements for the several operations as explained, is shown by means of Fig. 3, which is a diagram of a pattern drum as used instead of the regular pattern wheel of the rib machines.

The drum A is a cylindrical piece, mounted on a shaft B and contains nine rows of holes, of these rows some containing more holes than others, extending around the drum, each row being in one plane perpendicular to the axis of the cylinder and equally spaced from each other. These rows are used to fasten the raisers for the pattern to the drum by means of screws. These raisers are of different shape for the different rows, according to the pattern desired. The pattern drum is given rotation by means of a ratchet C on the drum which is operated by a pawl. A regular pattern chain on the sprocket D is used in connection with the pattern drum to give the desired lengths of fabric of the different stitches. This pattern chain sprocket D is revolved by the ratchet E as operated by a pawl. A raiser on the chain pushes a lever up, which causes another lever to come up under the pawl for operating the ratchet C, and raise it out of action. This causes the pattern drum A to remain stationary and allows the yarn carrier to put in the required number of courses of that special stitch. The chain continues to revolve and causes the raiser to move from under the lever mentioned, which movement causes the ratchet to be operated by the pawl and consequently rotate the pattern drum again.

Near the end of the shaft B are placed two cams F and G for shifting the clutch levers, the cam F operating a lever to move the clutch into contact with the reciprocating motion for the cam cylinder. The cam G operates a lever for moving the clutch into contact with the continuously rotating wheel.

Each of the nine rows of holes of the pattern drum A forms a pattern surface with the cams screwed to them, for operating certain mechanisms in the machine.

The pattern surface indicated by row H is used for making a longer stitch while making the heel and toe in order to allow for the splice. This is done by operating a lever which raises the needle cylinder, thus producing the longer stitch as was explained.

Row I is used only when making ladies' hose for the purpose of shaping the stocking. The needle cylinder is raised in order to make a loose stitch which is gradually tightened as the stocking is made, by lowering the needle cylinder.

Row J is used for splicing the heel and toe, the cam placed on it being partly plain surface and partly inclined. The plain surface puts the extra yarn into contact with the regular yarn in order to create friction sufficient to carry it forward. The inclined surface separates the extra yarn from the regular yarn, but does not detach it. This splicing motion is situated above the machine and consists of a trough in which the extra yarn is passed, the end of which trough is provided with a cutting arrangement for this yarn when sufficient has been run. The trough is raised and lowered so that the extra yarn comes in contact with the regular yarn at the proper time and is then withdrawn. Friction and tension devices are also provided for the yarn.

Row K is used to bring the lower picks into action, which is done by moving a projection into the path of a finger situated on the cam cylinder. This action acts through a lever to release the picks so that they are free to work.

Row L is used to put the lower picks out of action by moving a projection into the path of the finger so that it is raised by striking against it.

Row M is used in connection with making the splice by releasing the take-up spring of the feeding mechanism through suitable connections. This allows the yarn to be fed.

Row N is used to stop the machine when the half hose is completed, its use being unnecessary when making ladies' hose as the needle cylinder does not have to be changed.

Row O is used to give a kick off to the drum, that is, the drum is moved an extra distance in order to be in the proper position to give a required movement to the levers which will bring the take-up spring down more quickly.

Row P is used to operate the bob pin through proper levers. The bob pin operates the jack cams for raising and lowering the back half of needles when making the heel and toe of the half hose or stocking. (H. Brinton & Co., Philadelphia, Pa.)

SCOTT & WILLIAMS' RIB FRAME MACHINE, For Making Rib Tops for Men's Half Hose, Rib Legs for Misses' and Children's Hose, Sleeves for Underwear, Leggings, Toques, and Such.

Of the accompanying illustrations, Fig. 1 shows a perspective view of this machine as built either with one or two feeds, in all sizes and gauges from 3 to 6 inches diameter. The smaller sizes are used for children's ribbed hosiery; intermediate sizes for men's half hose and misses' ribbed legs, and sleeves for undergarments; whereas the larger sizes are built for the making of toques and leggings.

Single feed machines are invariably used for making ribbed hosiery, toques and leggings, whereas two feed machines are principally used for the making of sleeves for undergarments, and sometimes for the making of ribbed hosiery legs, particularly where fancy stitches are required.

This machine can be also fitted with lace attachment for fancy hosiery; high splicing attachment for re-inforcing the heels and knees of children's hosiery; or thread changing attachment for the making of toques, leggings and bicycle hose. The machine itself is built after the well known principle adopted by manufacturers for so many years in which the cam ring revolves and the cylinder is stationary.

Fig. 2 represents a side view of a portion of this rib machine showing the card roller for measuring the length of the fabric with the chain for automatically changing the various stitches described as follows:

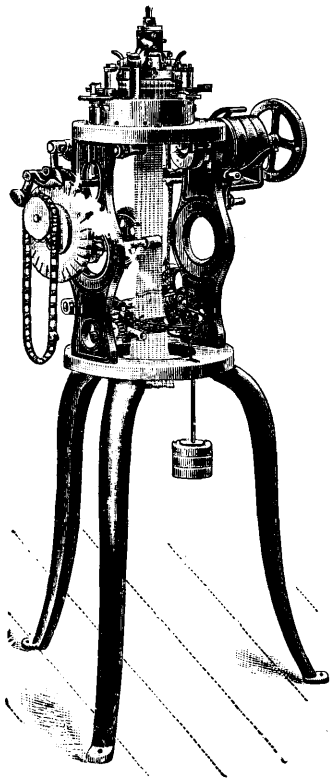


Fig. 1.

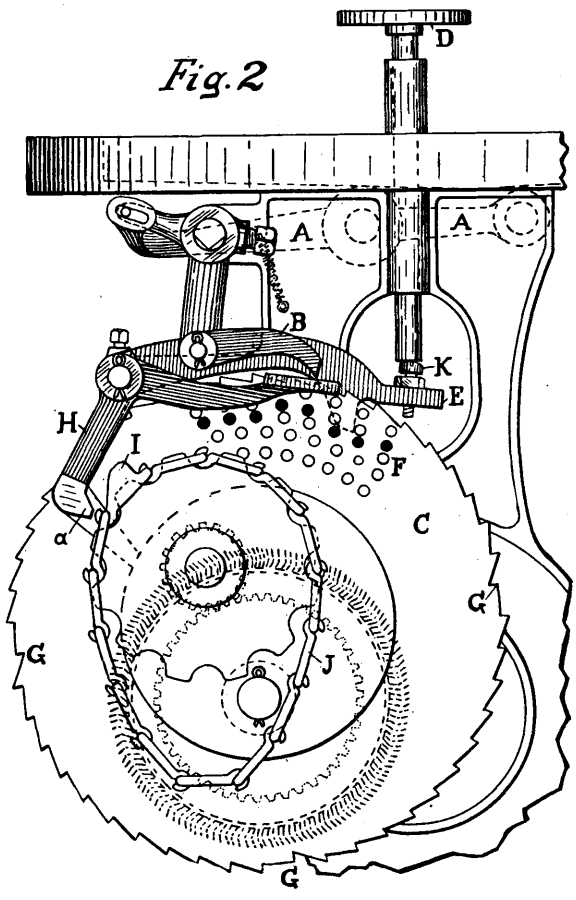
A represents a lever which is actuated by a cam on the bottom of the cam ring. This lever moves the pawl B, which in turn revolves the pattern wheel C which is drilled for small pins or studs of various heights for raising or lowering the disk D, which operates upon the slack course, welt and lace levers.

Lever E receives motion from small pins or studs as placed in the holes F, as are found all around the face of disk C, only a portion of these holes being shown in the illustration. By thus placing a pin in either one or the other of these rows, any design of fabric can be made. Thus for "welting," it would be necessary to place the pins sufficiently high to bring the disk D in alignment with the top or welt levers of the machine, the slack course being made on the third row of pins. The pattern wheel C is divided into an equal number of stops by means of a low tooth, which will stop the wheel as each tooth G is brought under the lever B, which is held out of the path of the low tooth by lever H, until such time as a high link I is brought under lever H, at *a*, which permits lever B to engage with the low tooth in the pattern wheel C, and revolving it throughout any of the patterns (position of pins in wheel) that the wheel may be set to. The length of the fabric is measured by the contact of the fabric with a carded wire roller, which transmits its movements to the chain J, through which the length of the pattern is secured by the addition of the various numbers of links.

For making a regular plain hose, one high link I only is required in the chain, whereas in the event of a fancy pattern or high splicing, it will be necessary to use a series of high links, so that the pattern wheel C can be put in operation at any time a change in pattern is necessary.

Lever E is fitted with an adjusting stud K, so that the height of the disk D can be changed to suit the various heights of the automatic levers of the cam ring. The take-up of this machine is of the well known balanced type so long employed on this class of machinery.

The Splicer. Fig. 3 represents the splicing attachment for the high splicing of the knees and heels of the ribbed legs (enlarged compared to Fig. 2). In this illustration, A represents the main knitting thread as being fed to the machine; B, the extra, or splicing thread, which is usually of a much finer count than the main knitting thread. C represents a bracket fitted to the cam ring for carrying the splicing attachment, and D the splicing lever mounted on the thread guide of the knitting machine. E and F represent levers through which the splicing device is operated by coming in contact with a small disk (D in Fig. 2). This splicing attachment is so arranged that the operator can set the machine for half round splicing at the knee and heel or for all round splicing at the knee with half round splicing at the heel, the disk being so constructed, that by the placing of the pins in the pattern wheel, the setting of the machine for any pattern required can be accomplished with little or no trouble. The splicing thread B is fed to the needles by contact or friction with the main knitting thread A, and can be broken out by the spring lever G, at each half turn through the lever I, which is operated by levers E and F. Lever I performs two functions, one of them being to raise the thread breaking lever G through a small projection H, the other to slacken the thread B, in order to enable the main thread A to carry it to the knitting needles, thus avoiding the yarn being drawn directly from the bobbin until such times as the end



of the splicing thread B has come in actual contact with the needles. This attachment is fixed to the machine in a permanent manner, so that no adjustments are required, being simple in all its movement,

requiring absolutely no attention whatever except through the thumb nuts J, which act upon the spring K, thus breaking the thread through the means of a spring at each half revolution.

For the making of sleeves for undergarments, no special attachments are necessary, except that the two feed machine is required so as to enable the machine to make the shape of the sleeve by the automatic tuck stitch attachment.

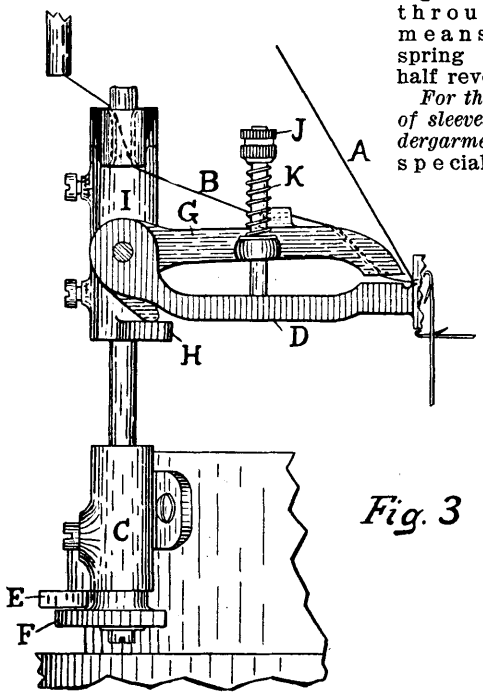


Fig. 3

The striping attachment fitted to this machine for the making of toques, leggings and such is practically a duplication of the splicing attachment as shown in Fig. 3, with the exception that both threads are placed through two levers G, being operated or moved at opposite time, so that as one thread is clamped out, the other is permitted to be fed to the needles.

The production on this machine varies according to the gauge, and the length of the fabric to be knitted. The speed of a machine for the making of ribbed legs should be about 175 revolutions per minute, and the speed for making sleeves without the welt attachment about 220 revolutions per minute. (Scott & Williams, Philadelphia, Pa.)

SCOTT & WILLIAMS' RIB KNITTING MACHINERY

For All Kinds of Underwear, Union Suits and Undervests and Drawers for Men and Women; Sweaters, Tam O'Shanters, etc.

Fig. 1 shows in perspective a regular body machine as built by Scott & Williams, for shaping the garments by what is known as the tuck or royal stitch. This machine is built after the well known type of stationary cylinder and dial, permitting the use of what is known as the balanced take-up, which will be hereafter explained. Fig. 2 shows a side elevation of the machine, giving in detail the automatic mechanism controlled by the knitting of the fabric. Fig. 3 is a sectional view of the sectional cap with its cams for the making of tuck and fancy stitches. Fig. 4 is a plan view of a portion of the cap showing the automatic levers, disk for moving same, and the movable cams, showing the positions of the cams clearing the needles, and the position when tucking on the needles for the making of shaped goods or fancy stitches. Fig. 5 shows a sectional view of the sectional cam ring, with its cylinder, gear ring and bed plate. Fig. 6 shows a side elevation of the section upon which is mounted a complete set of cams for securing the various lengths of loops for the various weights of yarn used.

The general adjustment of a machine of this character is as follows: In order to knit the fabric tighter or slacker, it can be accomplished by two movements, either by depressing or raising the draw down cam C in Fig. 6, or the rais-

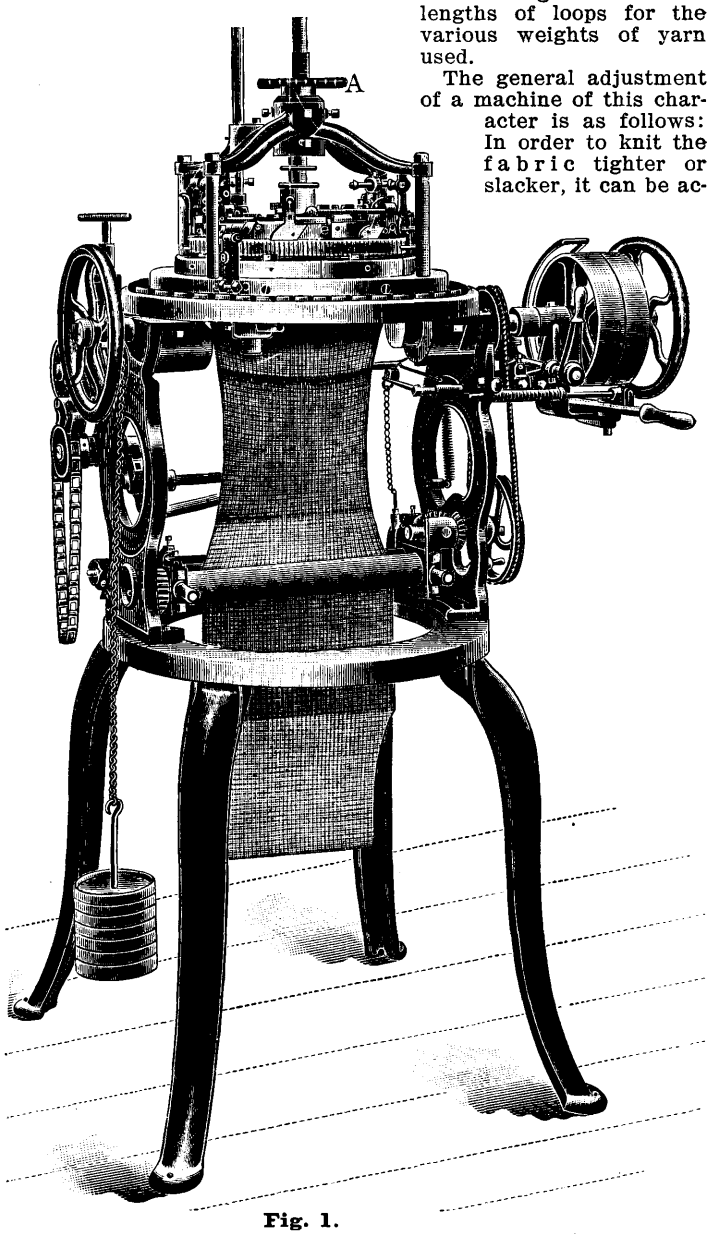


Fig. 1.

ing of the entire spindle B, as shown in said illustration, by the turning of the threaded index wheel A in Fig. 1.

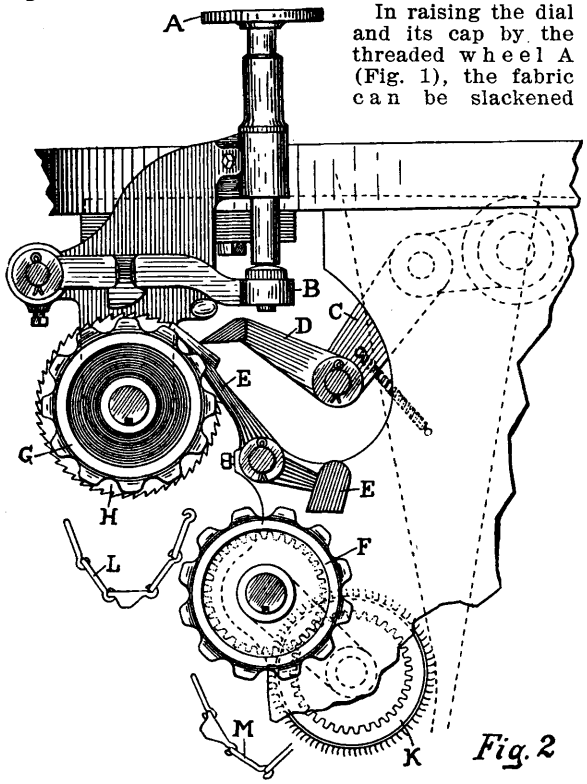


Fig. 2

In raising the dial and its cap by the threaded wheel A (Fig. 1), the fabric can be slackened without disturbing the adjustment of the cam C (see Fig. 6) thus quickly securing any ordinary adjustments that may be required. It is well, however, to see that the dial is not too close to the cylinder so as to permit an easy passage of the fabric, as it is being knit by the needles. If the adjustment required is more than can be conveniently accomplished by the raising or lowering of the dial and its cap, recourse can be had to the adjustment of the the cam C (Fig. 6).

After the adjustments of the various stiffnesses by this cam C it is necessary to ascertain that each one is drawing exactly the same amount of loop, so that the fabric will have a smooth appearance on its face. This can easily be accomplished by marking the yarn a given distance from the needle carrier on each feed. Turn the machine by hand, until the marked places reach the guide, then it will be seen that the cam drawing the longest loop will have the mark much nearer to the guide than the cam drawing the shorter loop. Adjustment thus can be made so accurately that absolutely no difference can exist.

Another important point in this machine is the setting of the cap which operates the dial needles. In a well adjusted machine this should bear a relation to the cam ring which operates the cylinder needles. Care should be taken to see that the cylinder needles draw down in their proper time so that it lands its thread upon the dial needle with the latch open just to the rear of the dial needle rivets. This relation is governed by the circumferential adjustment of the cap of the centre spindle.

The next adjustment to be taken into consideration is the setting of the yarn guide. As this adjustment plays a very important part in the results of the machine, particularly as to menders, the guide should be set sufficiently high to permit the dial needles to pass under without coming in contact with it. The adjustment of the yarn guide should be such as to permit the cylinder needles to close as soon after the guide has passed, as is possible without coming in contact with the guide. The forward end of the yarn guide should be sufficiently long to have the hooks of both sets of needles covered before the latches pass from under the stitch so that it will be impossible for the latches to close before the guide has covered the needles, thus causing drop stitches.

In the event of the machine running off the fabric, through the breaking of the yarn or any other cause, the best thing to do is to introduce the old or previously knit fabric upon the cylinder needles. This is accomplished by placing the fabric underneath the dial with the left hand, and drawing it through between the cylinder and dial by the aid of a needle. The first insertion of the fabric should be done right from one of the sides of cylinder and dial dogs, having it to pass between each, inserting the fabric on the cylinder needles, as close to the edge as possible. A portion of the cylinder needles between each of the feeds is so arranged as to permit the running on of the fabric. After this is accomplished, turn the machine sufficiently far to make another insertion, seeing that the thread guides are re-threaded as each guide comes to the beginning of the running on, repeat this operation until the fabric has been set upon all the cylinder needles, grasp the fabric by hand and place a similar amount of weight upon it, as the machine is turned for each insertion, and the cylinder needles have been fully pressed up, place the other hand on the fabric through the take-up, turn the machine a few revolutions by hand, after which see that all the dial and cylinder latches are open and the machine will be ready for knitting.

The machine is fitted with what is known as a sectional cam ring shown in Fig. 5; A being a sectional view of the cylinder, B a sectional view of the cam ring, C a sectional view of the filling or back

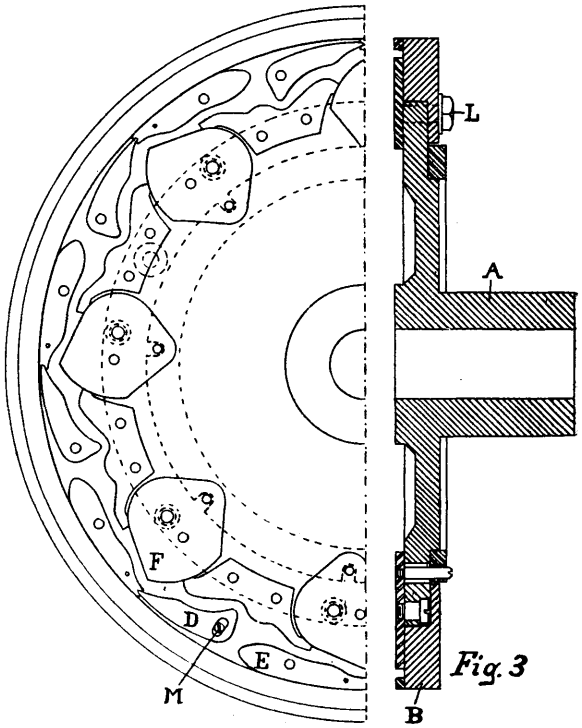


Fig. 3

ring, D a sectional view of the gear ring, F the retaining screw for all of these parts, E a sectional view of the bed plate.

In the event of the taking out of a section, unscrew the retaining screw F. Lift out the filling ring C, draw away from the cylinder the cam ring B, and lift it entirely out of the gear ring. This section has the entire set of cams for one feed mounted thereon, as is shown in Fig. 6. With this device it is possible to uncover the entire length of the cylinder, so that any repairs can be easily made.

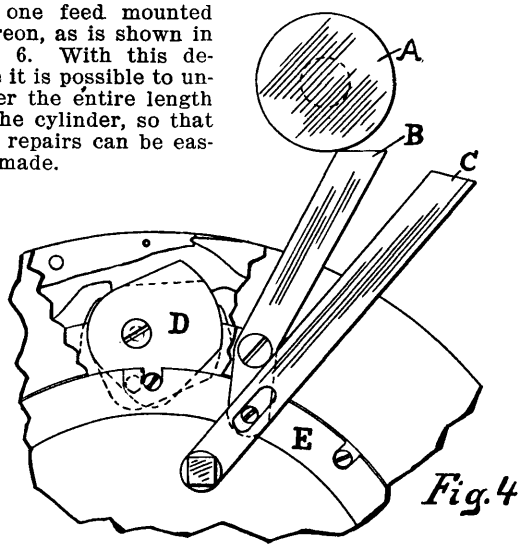


Fig. 4

Fig. 6 shows the adjustment of the draw down cam for the various numbers of stitches. C is the draw down cam, B is the adjusting block upon which the cam is mounted, A the adjusting screw for the various adjustments required.

Fig. 4 is a plan view of the cap, showing one of the automatic tucking cams with the levers and operating disk when changing the levers to the various stitches to be formed. The cam D, shown in this illustration in full lines, is the clearing point, the dotted line is what is known as the tucking point.

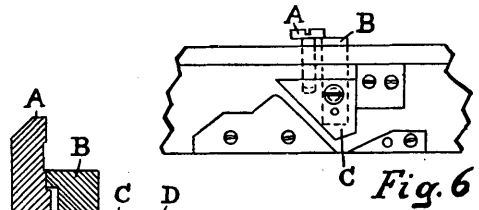


Fig. 6

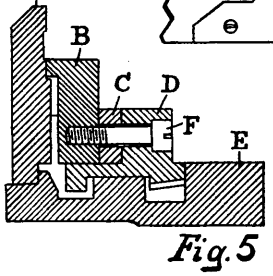


Fig. 5

This cam is controlled by an automatic ring E, which is under control of the levers B and C. The cams are so arranged that by the action of the levers B and C, one or more cams may be automatically placed to a tucking point, thereby forming many of the lace stitches now in use, also the royal stitches for shaping a garment.

Fig. 3 is a plan and sectional view of the cap with the cams mounted thereon. A, being a large hub retaining part of the cams; B, being a removable section upon which are mounted cams D and E. By the taking out of the screw L it is possible to lift the entire outer ring of the cap with their cams mounted thereon clear of the dial, so that any repairs may be made without having to dismantle the machine. The cam D is known as the dial stitch cam, and has an adjusting screw M, for setting this cam to the various lengths that it is desirable to draw. Cam F, the movable or swivel cam, in Fig. 3, was fully explained in connection with details given with reference to Fig. 4.

Fig. 2 is a side elevation of the controlling and measuring mechanisms for the various lengths desired, and also the various stitches to be formed. A in this illustration represents the disk which acts upon the automatic levers for changing the cams to their various positions. B is the lever upon which the chain L acts with its highest link, thereby causing the disk A to change the automatic levers according to the height that they are set. C is a racking lever which racks the rack wheel H, causing the sprocket wheel G upon which the chain L is mounted, to revolve a portion of a revolution or sufficient to pass under the various heights of links desired to produce the various stitches. E is a balanced lever which throws the racking pawl D, into action at three determined times by the chain M as is mounted on the sprocket wheel F. This chain controls the length of the knitting only, and is driven by actual contact with the fabric through the card wheel or drum K, thus insuring every garment being of a proper length. (Scott & Williams, Philadelphia, Pa.)

BRANSON'S 15/16 AUTOMATIC KNITTING MACHINE.

When a knitting machine is spoken of as being a ¾, ⅞, or $\frac{15}{16}$ automatic machine, as the case may be, by that is meant that the production of a half hose or stocking is not completed automatically by said machine, but requires more or less attention from the operator to make the different parts of the stocking, and the more attention that is required on the part of the operator, the less automatic the machine is. This construction ($\frac{15}{16}$ automatic) is advantageous in several ways, since the work required by the operator only takes a few seconds to perform, and the construction of the machine is in almost all cases greatly simplified by eliminating parts required to make the machine full automatic. Besides this, the operator's attention is directed more to the machine than in the full automatic, and any bad work is more readily detected with a consequent saving of waste fabric.

In the $\frac{15}{16}$ automatic machine, the operator has to attend to the machine only twice during the complete knitting of the stocking, that is, at the beginning of the toe and at the beginning of the heel, and three times in connection with half hose. The details of the construction and operation of the machine are best given by means of the accompanying illustrations, of which Fig. 1 is a perspective view of this machine, Fig. 2 is a development of the cam cylinder, showing the pickers in the lowered or needle raising position, Fig. 3 is a development of the cams in a portion of the cam cylinder, showing the picker in the raised or normal position and in which position the raised needles are brought down while knitting the last portion of the heel or toe. Fig. 4 is a detail of one of the needle controlling devices and the turret lever controlling it.

Being a knitting machine, only a set of cylinder needles are used, and a set of sinkers for aiding in casting off the stitches from the needles as the latter are lowered, is used in connection with them. The cam cylinder, carrying the cams for operating the needles, has an upright piece, carrying the yarn carrier ring, attached to it, as seen in Fig. 1. The cam cylinder receives a continuous circular motion for the leg and foot portions of the stocking, and a re-

ciprocating circular motion while making the heel and toe. These two motions are successively given to the cam cylinder by means of a clutch arrangement, which throws one motion out at the same time that the other is thrown in. The continuous circular motion is gotten directly through bevel gears from the shaft to which the driving pulley is attached, while the reciprocating motion is obtained from a continuously rotating gear, having a crank arrangement which oscillates a toothed segment back and forth, the latter being in mesh with a gear which is loose upon the shaft, but may be thrown into working engagement by means of the clutch referred to. The clutch is operated by hand, the lever for this purpose being shown just under the main frame piece at the right side of the illustration, being marked A.

One of the main features of the machine is the pattern arrangement, which includes the means for measuring both the length of the stocking and the size of the foot, and an arrangement controlling the making of the heel and toe. This latter arrangement consists of a cam drum which is secured to a ratchet, in fact two ratchets, although one of the ratchets has the major portion of its periphery made smooth or without teeth. The teeth are properly disposed about the circumference and are used to hasten the rotation of the cam drum at certain points. This hastening is obtained by having the pawl, which engages the teeth, oscillate back and forth over the ratchet for every revolution of the cam cylinder, while the pawl which actuates the regular ratchet, only oscillates back and forth once for every five revolutions, and besides this, the teeth on the former ratchet are coarser than those on the regular ratchet. The cam drum consists of a drum with two projections on its periphery and one cut out place in which a lever falls at the proper time. The teeth on the auxiliary ratchet are made to come under the pawl at the same time that the cam drum produces a movement of any levers, the object of this being to have the movement made quickly and more positively than could be obtained with the slow motion of the regular ratchet. The ratchet is only in motion during the knitting of the heel and toe, it being stopped by having a few teeth cut out of its periphery and thus giving the pawl nothing to work on.

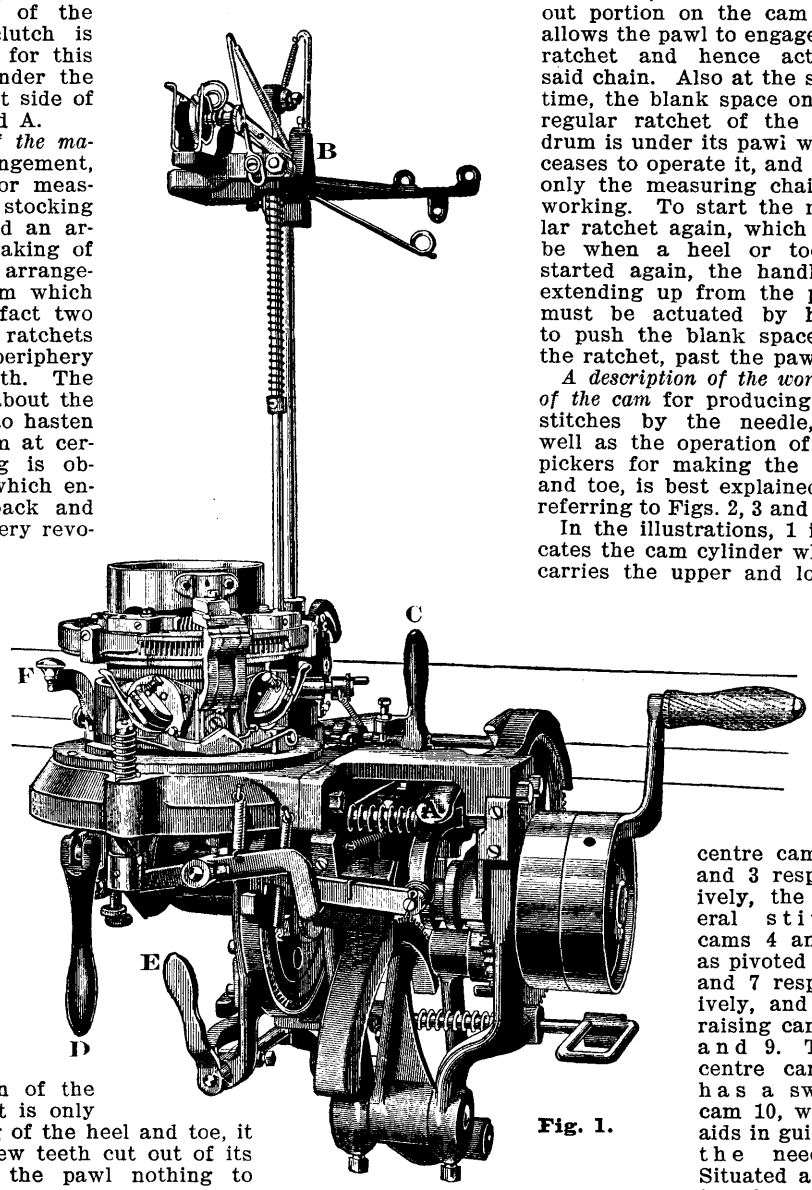


Fig. 1.

Referring to the cam drum again, the first projection on it to act is the one to reverse the position of the pickers on the cam cylinder, at the completion of half of the heel or toe, and thus have the needles brought back into working position, one at a time, as will be explained later. The next projection operates at the completion of the heel and toe, and causes three movements at one time. These movements are to put the needles, which were raised, again into working position by throwing into action the pull down cam for one revolution; to throw the clutch so as to produce continuous circular motion, the levers for this purpose being shown at the front of the machine; and to actuate a scissor arrangement to cut out the extra yarn which is fed while making the heel and toe, this motion being located above the machine at B. At the same time a lever, working on the cam drum and connected from a shaft to the pawl for operating the ratchet of the measuring chain (at the back of the machine—not shown) falls into the cut out portion on the cam and allows the pawl to engage the ratchet and hence actuate said chain. Also at the same time, the blank space on the regular ratchet of the cam drum is under its pawl which ceases to operate it, and thus only the measuring chain is working. To start the regular ratchet again, which will be when a heel or toe is started again, the handle C extending up from the pawl must be actuated by hand to push the blank space on the ratchet, past the pawl.

A description of the working of the cam for producing the stitches by the needle, as well as the operation of the pickers for making the heel and toe, is best explained by referring to Figs. 2, 3 and 4.

In the illustrations, 1 indicates the cam cylinder which carries the upper and lower centre cams 2 and 3 respectively, the lateral stitch cams 4 and 5 as pivoted at 6 and 7 respectively, and the raising cams 8 and 9. The centre cam 2 has a swivel cam 10, which aids in guiding the needles. Situated also in the cam cylinder are the turrets 11 and 12, for carrying the pickers 13 and 14 respectively, said pickers being secured to pivoted arms which are capable of working in the oblique slots of the turrets, *i. e.* the pickers can be moved up and down along the slots. The position of the pickers shown in Fig. 2 are for raising the needles successively out of action while knitting the first portion of the heel or toe, the turrets 11 and

12 carrying said pickers, being held down against the action of a spring by having projections 15 on the plates 16 of the turrets, caught and held by shoulders 17 on spring actuated turret levers 18, the normal tendency of the turrets being to revolve so that the shoulders 19 on the plates 16, will rest against the pins 20, thus placing said turrets in the positions shown in Fig. 3, *i. e.* the position for returning the raised needles, one at a time, into working position while making the last portion of the heel or toe, and also the position which they occupy while continuous circular knitting is being made.

We will follow the movement of the needles while making three portions of the stocking, that is, the leg portion, the first portion of the heel, and the last portion of the heel. Consider first the regular knitting for the leg with the cam cylinder revolving in the direction of the arrow. The pickers will be in the raised position and out of the path of the needles, as shown in Fig. 3. As the cam cylinder revolves, the resting portion of the cam 8 will act on the needles to keep them stationary until the first part of the stitch cam 4 acts upon them which starts to raise them, the highest point 21 in turn raising them to their highest position, with their hooks open to receive new yarn and the previous loops resting on the needles below the latches. As the cam cylinder continues its motion, the needles strike the swivel cam 10 and push it over against the stitch cam 5, thus providing a guide for the needles to the stitch cam 5, which latter, being pivoted, will be moved by the needles to make the groove between the stitch cam 5 and centre cam 3 sufficiently large for the butts to pass in, the guard cam 22 limiting the movement of the stitch cam 5. The point 23 on the stitch cam will cause the stitch to be cast off of the needle, and then the raising cam 9 will raise the needle to the resting position, with the latch of the needle open and the loop resting on it. The tendency of the stitch cams is to assume the positions shown in the illustrations, which positions will be necessary while making the heel and toe. The action of the cams, as just explained, will continue until the heel is ready to be made, and then the turrets have to be turned a quarter of a revolution to put the pickers 13 and 14 in the lowered position, shown in Fig. 2, said turrets being held by the turret levers 18, as previously explained. The cam cylinder will now make the reciprocating movement, and one-half of the needles around the cylinder will have to be raised and remain out of working position during the entire knitting of the heel.

For the sake of a starting point, we will suppose that the reciprocating movement of the cam cylinder is in the direction of the arrow, then as the motion continues, the first part of the stitch cam will come in contact with a needle and raise it until the cut out portion on the left side of the picker 13 comes in contact with the butt of the needle, said cut out portion only being large enough to hold one needle, and as the motion of the cam cylinder continues, the picker has to give way by being carried upwardly in the line of the slot and also has a turning motion about its axis, which places said needle in a position to be acted upon by the top side of the cam 2 and thus place it out of working position. The remainder of the needles follow the regular path, as explained for the regular knitting, since the picker, when it descends after being liberated from the needle, rests on top of the butts of the needles and does not affect their movement. On the backward reciprocation of the cam cylinder, the picker 14 raises a needle out of action in the same manner as the first picker did, the remaining needles following the regular path. This motion continues until the first portion of the heel is made, then the turrets are automatically released by having the turret levers 18 depressed, said turrets being actuated by springs to assume the raised position shown in Fig. 3. Now the needles which were taken up by the picker 13 will be brought down one at a time, by picker 14, and vice versa those needles raised by picker 14 will be brought down by picker 13. The cam cylinder, in moving in the direction of the arrow, will cause the picker 13 to come against the butt of a raised needle on the right hand side and lower it, in turn springing back to its normal position, the needle of course then being the first to receive yarn from the carrier. When the backward reciprocation of the cam cylinder takes place, the picker 14 will bring down a needle, and this motion will continue until all of the needles are down again which had been raised. The half of the needles which were raised at the beginning of the heel are now automatically lowered at the same time that the continuous circular motion is given to the cam cylinder, the extra yarn used in the heel being also cut out at this time. The same action of the cams and pickers takes place when knitting the toe, which explanation need not be repeated here.

The practical operation of the machine is as follows: The needle cylinder is secured in the machine by

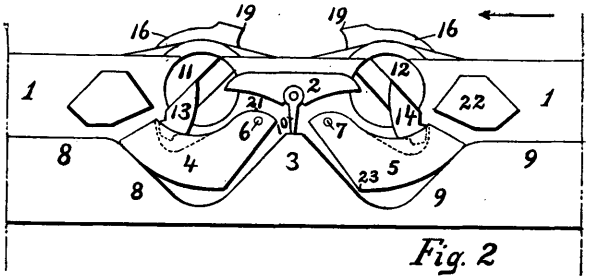


Fig. 2

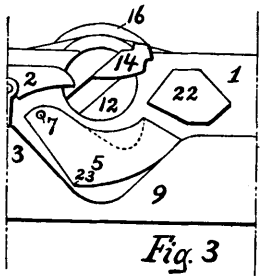


Fig. 3

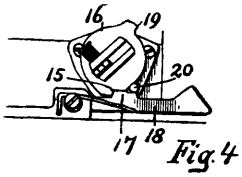


Fig. 4

means of the lever handle D, shown at the left hand side of Fig. 1, which operates the clamping ring to hold the cylinder. The half of the needles which are up are then brought into working position by the pull down cam, and the machine is started by shifting the belt to the fast pulley, this being done by the handle E. The measuring motion, *i. e.* measuring chain, is in motion while the ratchet on the cam drum is idle. This continues until a high link on the chain comes under a lever and raises it, by which the machine is stopped, which means that the leg portion of the stocking or half hose, as the case may be, is completed and the heel is now ready to be made. The stocking is shaped at the ankle by links on the same chain, but working another lever. The operator now raises one-half of the needles out of working position by pressing down on lever F. This lever is connected to the needle lifting ring of the cam cylinder, and consequently when it is operated, the needles resting on it are raised, said ring being immediately lowered by a spring. The lever handle C, as connected to the pawl for operating the regular

ratchet on the cam, is then pulled to get the blank space on said ratchet from under the pawl, so that the latter may operate, and at the same time the pawl for operating the ratchet on the measuring motion is raised out of contact with it, so that only the cam is in motion during the knitting of the heel.

The pickers are then turned down by hand and caught under the levers mentioned, in which position they will raise a needle out of action for every oscillation of the cam cylinder. The extra yarn is pieced in with the regular yarn.

The operator then throws the clutch for producing the reciprocating motion by means of lever A at the same time that she operates the lever E to start the machine. This work requires only a short time and the machine now continues to knit, raising the needle out of action at every reciprocation until the first portion of the heel is made, and then a projection on the cam actuates the turret levers 18 which hold the turrets 11 and 12 down and thus releases them, putting the picks 13 and 14 in position for drawing the needles successively down into working position. At the completion of the heel, the clutch is moved automatically to produce continuous circular motion and at the same time the extra thread is cut out, and the other half of the needles lowered by a pull down cam; the motion of the cam drum is stopped and the rotation of the measuring chain begun. The foot portion of the stocking is now made and on its completion the machine automatically stops. The size of the foot portion can of course be made any length by simply building the chain to suit the requirements. The same operations are now gone through with for the toe, as explained for the heel, it being kept in mind that the heel and toe are made with the cam drum working, while the leg and foot of the stocking are made with the measuring chain working. (Branson Machine Co., Philadelphia, Pa.)

BRANSON'S AUTOMATIC SHIRT MACHINE THREE COLOR STRIPER.

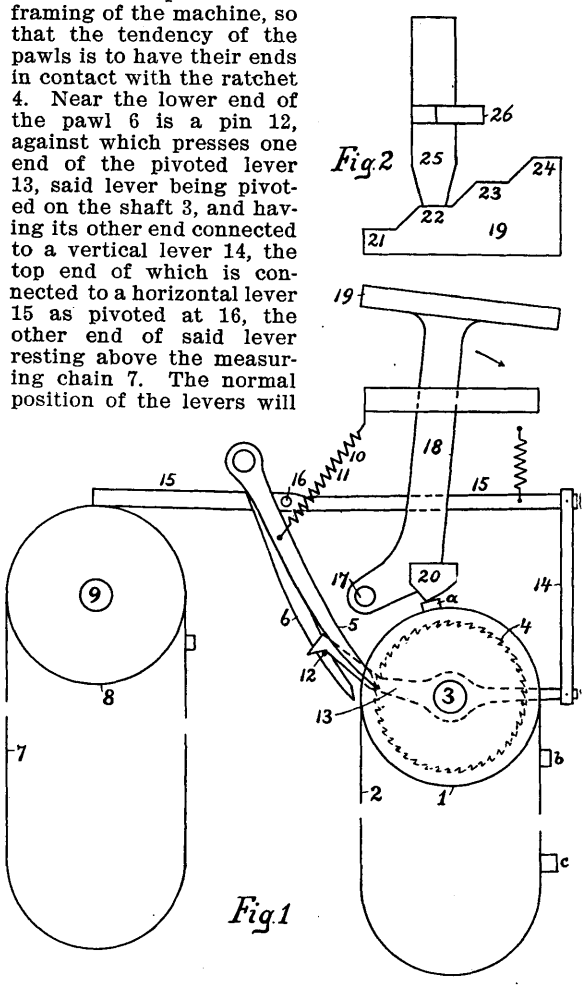
This arrangement is used to produce different colored horizontal stripes in fabrics such as sweaters, bathing suits, skating caps, hosiery, etc., and is attached either to machines of large (shirt) or smaller (stocking) diameter. These knitting machines have the regular set of cylinder needles, but sinkers are not used in connection with them, but instead, the needle cylinder grooves for the needles are so made at the top as to aid in casting off the stitches when the needles go down, a positive take-up motion for the fabric being used to keep the proper tension on the work. The regular cam is used on the cam cylinder, which causes the needles to raise successively to open their latches and slide the loop below them, so as to receive new yarn and then descend below the top of the needle cylinder to cast off the stitches, after which the needles are raised slightly to a resting position, with the loops of yarn resting on the latches, to prevent them from flying about on their pivots and frequently causing stitches to be lost.

The striping arrangement, as attached to the machine, is characterized by its simplicity and positive working, and by its almost unlimited range of patterns which it is capable of producing. It consists principally of two motions, *i. e.* the yarn carrier motion which is attached to the side of the revolving cam cylinder, and the pattern motion to actuate the yarn carrier motion, and which is located on the body portion of the machine.

The details of these two motions, as well as their operation, are best shown by means of the accompanying illustrations, of which Fig. 1 is a side view of the pattern motion, Fig. 2 being a top view of the movable slide and cam, and Fig. 3 is a side view of the yarn carrier motion.

The operation consists in lowering the different yarn carriers of the latter motion into the path of the raised needles, so that the yarn may be caught by them, said carriers being lowered according to the pattern desired, only one carrier being in the lowered position at one time. The yarn carrier arrangement is attached to the cam cylinder, directly in the radial plane from the centre of the cylinder with the highest point of the raising cam, which of course is necessary in order for the yarn to be deposited in the hooks of the needles.

Referring to Fig. 1 for the pattern motion, 1 indicates the sprocket for carrying the pattern chain 2, said sprocket having secured to its shaft 3, a ratchet 4, the teeth of which are wide enough to accommodate two pawls 5 and 6. The object in having two pawls is to allow a measuring chain 7 on the sprocket 8 to be used in connection with the regular color pattern chain, said sprocket 8 being on the same shaft 9 with the measuring fabric roll and hence is driven continuously. Both pawls 5 and 6 are connected to ends of springs 10 and 11 respectively (only one of which can be shown in Fig. 1, one being situated behind the other), the other ends being attached to a part of the framing of the machine, so that the tendency of the pawls is to have their ends in contact with the ratchet 4. Near the lower end of the pawl 6 is a pin 12, against which presses one end of the pivoted lever 13, said lever being pivoted on the shaft 3, and having its other end connected to a vertical lever 14, the top end of which is connected to a horizontal lever 15 as pivoted at 16, the other end of said lever resting above the measuring chain 7. The normal position of the levers will



cause the lever 13 to press the pawl 6 out of contact with the ratchet 4.

Pivoted at 17 on the machine is an upright lever 18

which carries the actuating cam 19 for the yarn carriers, at its top end, the lower end being provided with a piece 20 which is acted upon by the high links of the color pattern chain 2 to actuate the cam 19 at the top. This lever 18 is spring controlled and its normal tendency is to move in the direction of the arrow. The shape of the cam 19 is shown in the top view (Fig. 2) from which it is seen that it is made up of a series of steps 21, 22, 23, and 24 which press against the movable slide 25, according to the links on the pattern chain 2. This movable slide is located on the bed plate of the machine and has a slanting projection 26 on it, which comes under the different vertical pieces 27, 28 and 29 (see Fig. 3) when actuated by the cam 19. These three pieces are carried in a frame 30, which is secured by screws to the side of the cam cylinder, and have attached to their upper ends, the rear ends of the yarn carriers 31, 32 and 33 respectively, the latter being pivoted at 34 with their front ends, made circular with holes 35, 36 and 37 respectively, running through them for guiding the different yarns to the needles. The vertical pieces 27, 28 and 29 have springs attached to them on the rear sides (not shown) the other ends of which are fastened to the lower portion of the pieces 30, and thus they tend always to keep said vertical pieces in their lowest position, or in other words, the yarn carrier guides 35, 36 and 37 above the needles of the cylinder. However, the vertical pieces 27, 28 and 29 are provided with pins 38, 39 and 40 respectively, which, when the vertical pieces are successively raised, are pushed up above a spring controlled plate 41 and rest on its top edge, thus being prevented from falling until the plate 41 is moved outwardly by another pin coming up. When the plate 41 does move out for an instant, the pin which was resting on it is freed and thus allows the spring controlling the vertical piece (either 27, 28 or 29 as the case may be) to drop it down, and hence only one vertical piece is up at one time, or only one guide is down in the path of the needles.

These vertical pieces are raised as they revolve with the cam cylinder by having the projection 26 on the slide 25 come in their paths, said slide, as previously mentioned, being actuated by the cam 19. Three different heights of links on the pattern chain (see *a*, *b* and *c* respectively) are used for the three different colors of yarn. When the step 21 of the cam 19 is in contact with the slide, the projection 26 is said to occupy a "neutral" point as seen in Fig. 3. Step 22 will cause the projection 26 to raise the vertical piece 27 which controls the middle yarn guide 35. Step 23 will cause the projection 26 to raise the vertical piece 28, which controls the yarn guide 36, which is the one in front of the other two, and step 24 will cause the projection 26 to raise the vertical piece 29 which controls the back yarn guide 37. A common link on the chain 2 allows the slide 25 to assume the "neutral" position and the successively higher links put the slide successively under the vertical pieces 27, 28 and 29. The projection 26 is not required to remain under the vertical piece after once raising it, since the latter is supported by means of its pin resting on the edge of the plate 41, and hence only one special link in the chain is required to make a change, the length of fabric knitted by this yarn being governed by the number of common links following the high link, until another size of high link is put in the chain for another color. This of course simplifies building the chain and it is not necessary to keep a large stock of special links on hand.

The pawl 5 is actuated to drive the ratchet 4 so that a link on the chain 2 will come under the piece 20 for every revolution of the cam cylinder and hence one course of one color may be inserted to produce a pin stripe. The number of courses may be increased by simply adding common links after the high link. When large stripes are to be produced or where it is desired to knit the body of the fabric in one color and have a special border, the measuring chain 7 is used in connection with the pattern chain. The measuring chain is always working and when it is desired to make a large stripe a special link with a side projection is put in the pattern chain 2, which, when it comes around, presses the pawl 5 out of contact with the ratchet 4, and hence stops its motion, said ratchet remaining stationary until a high link on the measuring chain 7 comes under the horizontal lever 15, which through the series of levers explained, raises

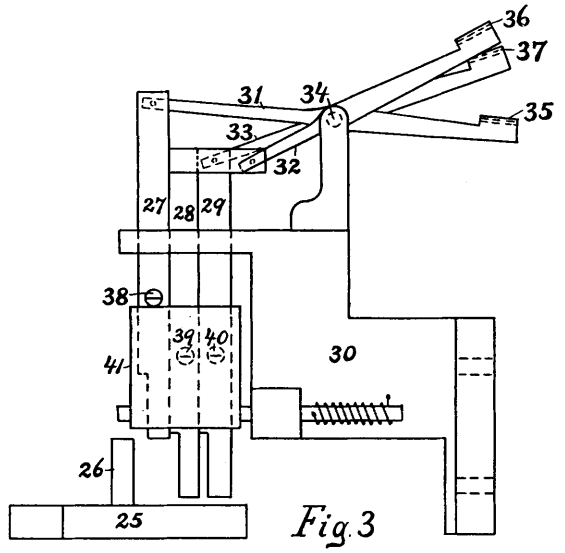


Fig. 3

the arm 13 off of the pin 12 and allows the spring 11 to pull the pawl 6 into contact with the ratchet 4 which starts the latter, thus taking the projection on the chain from under the pawl 5 and allowing it to again engage the ratchet 4. The pawl 6 is thrown out of contact as soon as the link on the chain 7 passes from under the lever 15. When the changes of color are made in the fabric, the yarn is not cut out but simply hangs and is knitted in again when called for, and the loose yarn afterwards has to be trimmed off of the fabric. (Branson Knitting Machine Co., Philadelphia, Pa.)

THE WILDMAN MFG. CO.'S CHAINLESS MEASURING DEVICE.

In this device a pattern wheel or disk takes the place of the pattern chain as used in connection with other automatic knitting machines for producing variations in the pattern of the knit fabric and to which pattern chain an uninterrupted motion is imparted, requiring in turn a long pattern chain. In the Wildman Mfg. Co.'s measuring device, the use of this long pattern chain is overcome, by providing means whereby the pattern wheel or disk may be permitted to remain in a state of rest while no change is to be made in the pattern of the fabric knitted, consequently permitting the use of a small pattern wheel. The same as in machines as using pattern chains, the actuation of the pattern wheel is automatically controlled by the fabric itself.

The device is furnished with a series of plates, representing a measuring value of either 1, 2 or 3 inches, and when consequently the adding or taking away of one of these plates will correspondingly either lengthen or shorten the pattern.

To enable the operator to obtain as fine a measurement as $\frac{1}{32}$ of an inch, either way, the measuring wheel is graduated, the wheel is also grooved its entire circumference, in which are sliding plates, which are arranged to slide backwards or forwards, to lengthen or shorten the pattern to any fraction of an inch. There is also another slotted plate arranged in the device to regulate the amount of courses that may be required between the welt and slack course, this plate, by its movement, putting in one or more courses or taking out one or more.

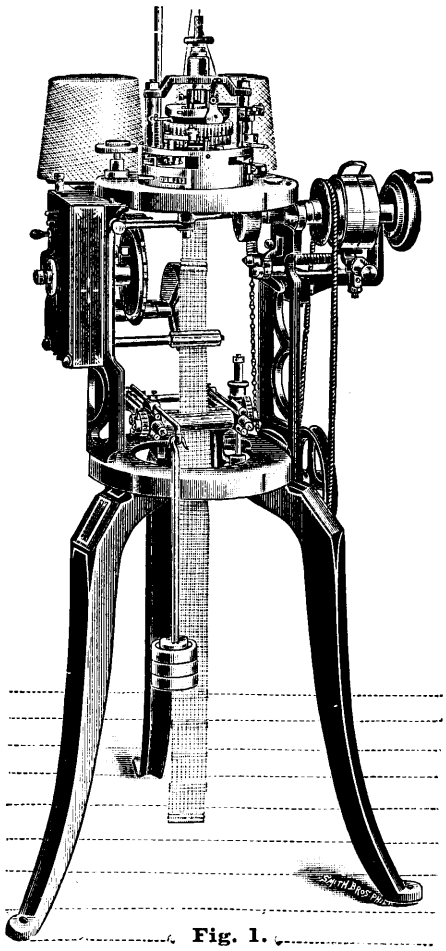


Fig. 1.

Means are also provided for enabling the pattern wheel and the mechanism for operating and controlling it, to be instantly brought to any determined point, as for example into position to commence the making of the pattern.

Of the accompanying illustrations, Fig. 1 is a perspective view of a Wildman Mfg. Co.'s Knitting Machine, showing the measuring device (enclosed in its casing) applied thereto. Fig. 2 is a side elevation of the machine, with parts in section and broken away. Fig. 3 is a face view of the pattern wheel and lever. Fig. 4 is a front view of the enclosing casing of the pattern wheel operating devices. Fig. 5 is an enlarged view of the pattern wheel operating devices as shown in Fig. 2.

A is the framework, and B the head of the machine, in which the movable cams are operated through levers *a*, *b*, actuated by disks S, N, on a shaft *s*, which is raised and lowered by a lever S', controlled by the pattern wheel. The raising or lowering of the shaft *s* changes the positions of the parts S, N, so as to make them actuate the levers *a*, *b*.

C is the take-up for taking up the cloth as it is knitted in the head B, said take-up being operated through a belt or rope from the driving shaft of the machine, as clearly seen from consulting Fig. 1. D is a pattern wheel mounted on a shaft *d* in bearings on the frame A below the base plate A'. This pattern wheel consists of a disk having its periphery provided with projections *d'*, similar to those used in connection with knitting machines, using pattern chains in place of the wheel. The pattern wheel has attached to its outer edge the segments *d'*, which form the operative projections, as shown in detail in Fig. 3. By making these segments detachable they may be easily removed and replaced by others to change the character of the pattern wheel D. E and F are two disks (shown as ratchet wheels), of which the former is the pattern wheel operating the disk or ratchet and the latter is the disk or ratchet for controlling the pattern wheel operating disk or ratchet E. The disk E is carried by the shaft *d* and is provided with ratchet teeth. The disk F, which is of slightly smaller diameter than the disk E, is loosely journaled on the shaft *d* adjacent to the ratchet E, and is also provided with ratchet teeth.

H is a pawl adapted to engage the teeth of both the ratchets E and F. It is pivoted to a slide H' in guides *h* on the frame A of the machine, below the base plate A'. The slide H' is reciprocated by a horizontal lever H^2, pivoted at h^2, below the base plate A', and acting at one end upon the end of the slide H' and at its other end H^3 upon an annular cam H^4, carried by the rotary base plate B' of the knitting head. A spring H^5, between the slide H' and the framework of the machine, returns the slide and maintains the end of the lever H^2 in contact with the cam H^4.

The ratchets E and F are so constructed and operated that the ratchet E will move faster than the ratchet F. The ratchet E is provided with alternate deep and shallow teeth *e'*, e^2, so disposed with reference to the teeth of the ratchet F that when the pawl H engages a deep tooth *e'*, it will also engage a tooth of the ratchet F and will move both ratchets, but when it engages a shallow tooth e^2 it will

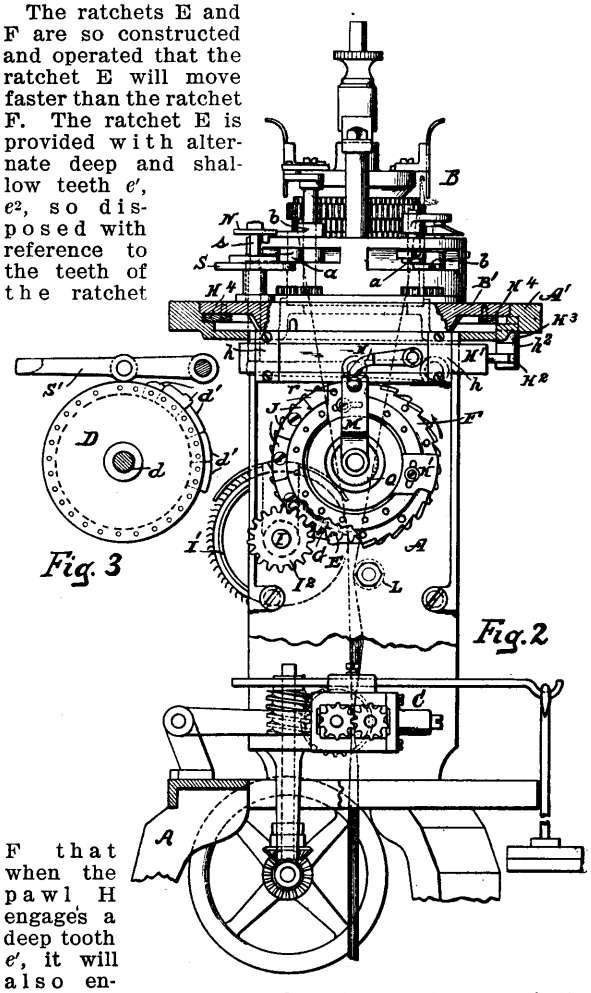


Fig. 3

Fig. 2

not engage the tooth of the ratchet F, and consequently will move the ratchet E only. The pawl H therefore moves the ratchet E twice as fast as it moves the ratchet F. G is a gear wheel, journaled on the shaft *d*, between the fast ratchet E and the loose ratchet F, to the latter of which it is secured so as to rotate therewith.

I′ is a wheel provided with pins or teeth carried by the shaft I, and is adapted to make contact with the cloth as it passes from the knitting head to the take-up. (See dotted lines in Fig. 2.) I^2 is a pinion on the shaft I, engaging the gear wheel G, which is loose on the shaft *d*. As the cloth is knitted and is drawn down by the take-up C, it will rotate the wheel I′ and shaft I, from which, through the pinion I^2 and gear wheel G, the ratchet F will be rotated on the shaft *d*.

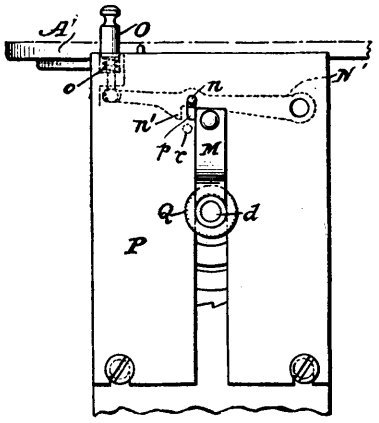


Fig. 4

J is a series of segments, of which one or more may be used, attached to the ratchet F adjacent to the edge, so that their outer faces will be level with the teeth. The pawl H is sufficiently broad that it will make contact with the faces of the segments J, thus preventing it from engaging the teeth of the ratchet F, and consequently while that portion of the ratchet F which is provided with the segments J is under the pawl H, it will not be operated thereby. K is an adjustable segment similar to the segments J, except that it is secured to the ratchet F with provision for circumferential adjustment. The segment K is secured to the ratchet F by a set screw *k*, passing through a curved slot *k′* in the segment, and engaging a threaded socket k^2 in the face of the ratchet F. The segment K is also provided with a flange, engaging an annular groove 1 in the face of the ratchet. By adjusting the segment K it may be made to overlap the last of the segments J to a greater or less extent. K′ is a similar segment, and of which there may be more than two used, if so required, said segments being adjusted apart from each other, as the pattern may require. The ratchet E is provided at one or more points with places where the short ratchet teeth are cut away, as at *e* (see Fig. 5), so as to present short spaces devoid of shallow teeth, and these spaces *e* are notched.

The operation of the pattern mechanism so far as the same has been described is thus: Supposing the parts at starting to be in the positions shown in Fig. 5, with the pawl H resting on the surface of the segment K and upon the flat portion *e* of the ratchet E above the notch therein, the reciprocation of the pawl H will produce no movement in either ratchet F or E, and, not driving the ratchet E, will not rotate the shaft *d* and pattern wheel D, which therefore will remain at rest, with the lever S′, shaft *s*, and disks S, N, in such positions as may be determined by the portion of the pattern wheel which is acting on the lever S′. As the cloth is knitted, and travels down, it acts on the card wheel I′ and rotates the shaft I and through the pinions I^2 and gear wheel G drives the ratchet F. When the segment K passes from under the pawl H, it permits it to drop into engagement with both the notch of the ratchet E, and the teeth of the ratchet F. The pawl H thus continues to rotate both the ratchets E and F, moving the former with every reciprocation and the latter with alternate reciprocations, and turns the pattern wheel until the segment K′ on the ratchet F passes under the pawl and holds it out of engagement with the teeth of the ratchet F, but without disengaging it from the ratchet E, which it continues to rotate, together with the pattern wheel D, until the part *e* comes adjacent to the segment K′. The pawl now ceases to drive the ratchet E and pattern wheel D until the segment K′, which has been moving slowly with the ratchet F under the action of the wheel I′, passes from under the pawl and allows it to drop into engagement with the notch and the teeth of the ratchet E, when it will continue to rotate both ratchets until the first of the segments J passes under it. The segments J now lift the pawl from engagement with ratchet F. Meanwhile the ratchet E and pattern wheel are driven by the pawl H until the portion *e* of the ratchet E is reached, when the rotation of the ratchet E and the pattern wheel D ceases and the ratchet F rotates slowly under the action of the wheel I′ until the segments J and K pass from under the pawl H and allow it to drop into engagement with the notch *e′*, and when the operations described are repeated.

In the construction shown, the segments and pattern wheel are so arranged that the needles will first knit one or more plain courses, will then form a rib, and while the segment K′ is passing, will form a series of plain courses, and finally, while the segments J are passing, will make a long series of tuck courses. This arrangement is for a knitted sleeve

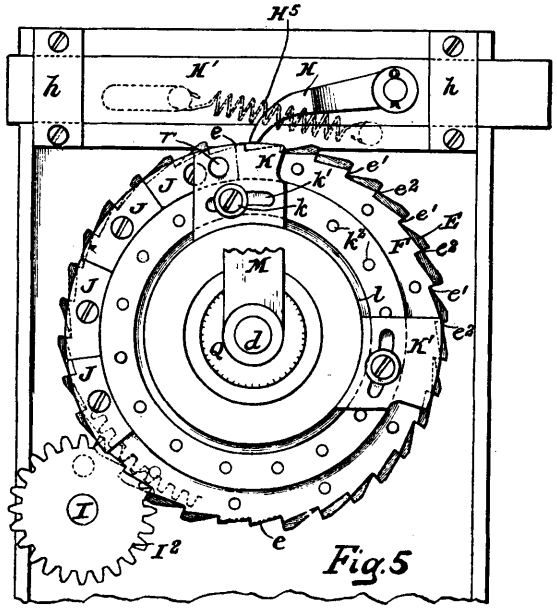


Fig. 5

and cuff, but for other patterns, the parts J, K, K′, may be differently arranged to control the pattern wheel in any way that may be desired, as to make tucks, loose courses, etc.

The segment K′, or both the segments K′ and K may be omitted when the pattern does not require it.

To insure a uniform operation of the wheel I′ by the cloth, a guide L, extending transversely adjacent

to the periphery of the wheel I′ is provided. The pattern wheel D and ratchet E are so located with reference to the handle M that they will be at the starting point of the pattern when the handle is turned into the upright position.

O is a push pin extending through the casing P, which encloses the ratchet mechanism, and is connected with the free end of the lever N′. A spring *o* normally holds the parts raised. By depressing the push pin O, the stop *n* will be brought in position to arrest the indicator handle M, and thus stop the pattern wheel D and ratchet E at the starting point. The stop *n* is shown projecting through a slot *p* in the casing P.

To provide for the adjustment of the ratchet F, its hub is extended and provided with a knurled handle Q, by means of which the ratchet may be turned on the shaft *d*. A stop *r* is carried by the segment K and is adapted to strike a projection or lug *n′* on the lever N′ when the same is lowered. The ratchet F is turned on the shaft *d* until the stop *r* strikes the lug *n′*, and the ratchet is then at the starting point of the pattern. (Wildman Mfg. Co., Norristown, Pa.)

THE WILDMAN MFG. CO.'S SPLICING MECHANISM.

The purpose of splicing, as already before mentioned in connection with the Scott & Williams as well as the Brinton machines, in connection with knitting is to introduce at desired intervals an extra thread, known as a splicing thread, to the regular thread, in order to thus strengthen, *i. e.* re-inforce the knit fabric at such places where said splicing thread is knitted into the fabric.

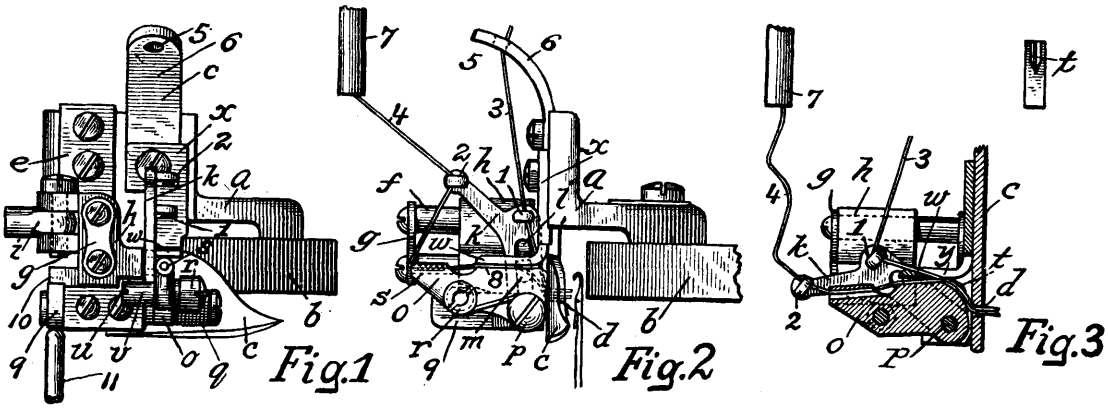


Fig.1 Fig.2 Fig.3

The object of the Wildman splicer is to provide an arrangement by which the loose end of the splicing thread will never be shorter than a length determined upon, as necessary to insure the splicing thread being engaged and carried into the fabric by the main thread when the latter is moved to contact therewith, *i. e.* to have the splicing thread when broken out of the fabric provided with a loose end, which will reach from the clamp at least to a predetermined point toward the needles, which is sufficient to insure contact with the main thread when the latter is moved to engage and carry it to the needles. This feature is accomplished by the action of the cylinder needles forming the loop, which puts greater strain on the thread, at this point, than there is brought to bear at any other point between the clamp and the place where the cylinder needles are drawing the loop. To retain this long end on the splicing thread, insuring it not being worn off by the action of the main thread, the latter is carried out of contact with the splicing thread; therefore insuring certain feeding of the splicing thread, when the clamp is released and the main thread carried in contact with the splicing thread. The parts of the new attachment are also arranged to facilitate threading of the attachment when the thread has been absent. The device is entirely independent of the thread guide, which may be adjusted in precisely the same way as if the machine had no splicer. The latter may be removed by taking out two screws, which will not affect any of the machine adjustments; and when replaced on the machine again, no adjustment is needed, as the parts are made to fit and ready to work. One important advantage in connection with this splicer is that the operator can see the relative position of the thread carrier and the needles as easily with the splicing attachment in place as without it.

Fig. 1 is a front view of the attachment. Fig. 2 is a side view showing it in relation to the cap plate of the knitting head to which it is secured and to the needles. Fig. 3 is a view similar to Fig. 2 with parts omitted and other parts in section, the parts being however shown in a different position.

The attachment is secured by a bracket *a*, secured to the cap *b* to the knitting head. The bracket *a* has screwed thereto the thread guide *c*, provided with the eye *d*, which directs the thread to the needles. Upon the bracket *a*, and to one side of the arm of the thread guide *c*, a supplemental bracket *e* is screwed, which has attached thereto a pair of guide rods *f*, extending parallel with each other, and held together at their outer ends by a plate *g*, secured thereto by screws. Upon these rods, a block *h* is adapted to slide freely, being operated by a rod *i*, and which effects the throwing in or out of the splicing thread.

A sweep arm *k* is pivoted to the lower part of the supplemental bracket *e*, and a slot *l* therein receives the elongated head *m* of a pin, journaled in the block, so that as the block moves outwardly, the sweep arm will be swung downwardly from the position shown in Fig. 2 to that shown in Fig. 3, and a reverse movement of the block will return the sweep arm to the elevated position shown in Fig. 2. The sweep arm carries guide eyes 1 and 2 for the main and splicing threads 3 and 4 respectively. A movable guide and clamping arm *o* for the splicing thread 4, is pivoted upon the same pin *p* which pivotally holds the sweep arm *k*, said clamping arm being under tension of a spring *q*, which is coiled around the pin *p* and has its free end engaging a pin *r* on the clamping arm to press the same upwardly. This clamping arm is provided with a guide opening *s* for the splicing thread and at its inner end with a curved V-shaped channel *t*,

presenting a rounded path or surface adjacent to the main yarn guide eye *d*, and over which the splicing thread passes to be supported at all times thereon. The clamping arm is moved downwardly to release the splicing thread when splicing is to be done by a cam surface *u* on the block *h*, which engages the extension *v* of the pin *r*, carried by the clamping arm, and forces the same downwardly when the block moves outwardly.

Immediately above the clamping arm, a clamping foot *w* is arranged in fixed position to co-operate with the movable clamping arm to clamp and hold the splicing thread when plain or single knitting is to be done. The upwardly extending arm *x* of the clamping foot is screwed to the arm of the thread guide *c*. This foot is slotted at *y* for the passage of the main thread 3, which passes first through the eye 5 of the guide arm 6, which is formed of an extension of the thread guide *c*, thence through the eye 1 of the sweep arm, then through the slotted clamping foot and the V-shaped groove or channel *t* in the clamping arm, and finally through the thread eye *d* to the needles. The splicing thread 4 passes from the guide tube 7 laterally at an inclination to the guide eye 2 of the sweep *k*, and from this point passes through the channel *s* of the clamping arm, and thence between the clamping face or edge 8 of the clamping arm and the clamping foot, and from here it is deflected out of its straight course and extends downwardly over the curved surface of the channel *t*, lying closely against the bottom of the V-shaped groove. From the groove the splicing thread passes through the thread guide or eye *d* to the needles, it lying just below the main yarn.

Fig. 2 represents the positions of the parts when only the main thread 3 is passing to the fabric, the splicing thread 4 being broken and held by the clamping parts, with a stationary loose end supported on the curved surface or groove. It will be noticed that the loose end of the splicing thread extends over a curved surface between the clamping parts and the needles, and thus, as mentioned at the beginning, insures a loose end being left when the splicing thread is broken out, by the pull at the needles, sufficiently long to be caught and carried into the fabric when the main thread 3 is moved so as to contact therewith.

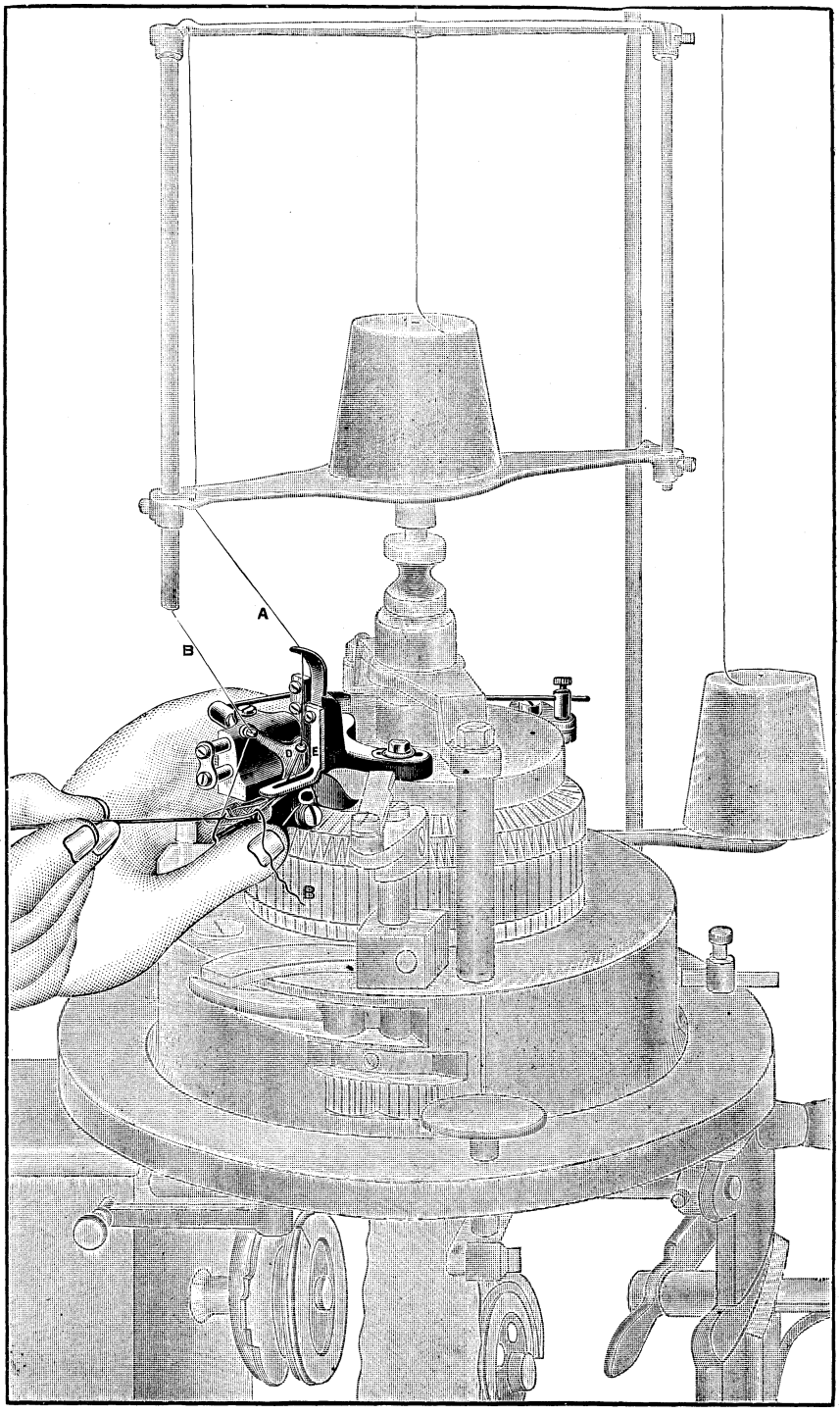


Fig. 4.

To overcome any irregularities in the point of

breaking, when splicing is to be resumed, the block *h* is moved outwardly, thus causing the clamping arm to be depressed by the cam surface and the loose end of the splicing thread 4 released. At the same time the sweep arm carrying the main thread is swung outwardly, and the rapidly moving main thread is thus pressed down upon the splicing thread firmly, see Fig. 3, and owing to the curved or bent course for the threads, the contact will be stronger and more certain by reason of the natural tendency of the main yarn to straighten out between the eyes 1 and *d*. This contact of the main yarn against the splicing yarn takes place first nearest the broken end of the splicing yarn and then gradually increasing the contact surface until sufficient grip on the splicing yarn is secured to carry it to the needles, thus avoiding any liability of the broken end becoming doubled or looped, and thus tending to straighten the broken end, which will then go to the needles without becoming looped or bunched.

When, however, the splicing thread is to be thrown in, the outward movement of the sweep arm to carry the main thread into contact with the loose end of the splicing thread will at once provide a slack portion of the splicing thread by freeing it from lateral pull, and this action takes place at the same time the clamp releases the splicing thread.

In order to provide for the knitting of slack stitches where the splicing thread is thrown into work, a pivoted arm 9 is provided, pivoted to the bracket *e* and operated by a lug 10, carried by the block *h*, said arm 9 bearing upon the pin 11, which connects with the stitch cam.

Directions for Threading the Device. This procedure will be readily understood from Fig. 4, showing the splicer prominently contrasting from the knitting machine proper. Letters of reference in this illustration indicate thus: A (= 3 in Figs. 2 and 3) the main thread; B (= 4 in Figs. 2 and 3) the splicing thread; D (= *k* in Figs. 1, 2 and 3) the sweep arm as pivoted to the lower part of the supplemental bracket of the device, and E (= *x* in Figs. 1 and 2) the upwardly extending arm of the clamping foot.

To thread the main thread, depress the thread clamp and thread the yarn through slot in presser foot, thence through hole in yarn guide in the ordinary manner.

When afterwards required to thread the splicing thread, depress thread clamp with thumb of left hand, as shown in illustration. Take an ordinary cylinder needle in your right hand, and reach with it back under the presser foot and draw the main thread forward between presser foot and thread clamp, and put the loose end of the splicing thread through the loop formed in the main thread when drawing forward, as shown in illustration. After this is done, let go of the main thread with the needle and take hold with the fingers above the yarn guide at point A, and draw the main thread taut. This operation will draw the splicing thread to the proper position. Be sure that in drawing the loop for threading, that the main thread is in the circular groove at the inner end of the thread clamp (see *t* in Fig. 3). (Wildman Mfg. Co., Norristown, Pa.)

THE WILDMAN MFG. CO.'S STOP MOTION
For Knitting Machines using Rotary Bobbins.

In connection with this stop motion the bobbin stand revolves in unison with the revolutions of the machine without supporting the bobbins directly on the revolving parts of said machine, thus preventing objectionable vibrations and increased wear of the revolving parts of the knitting machine, resulting frequently in imperfect knitting and rapid destruction of the working parts. In connection with the new stop motion, a stand or support is used to sustain all the weight of the bobbins, bobbin-stand, stop motion, and connections, and to give greater stability and steadiness to the revolving bobbins, stop motions, and other parts.

Of the accompanying illustrations, Fig. 1 is a side view of a Wildman Mfg. Co.'s knitting head with the stop motion in place. Fig. 2 is an enlarged view, as compared to Fig. 1, of the stop motion head and upper structure. Fig. 3 is a detail front view of the feeler finger, guard and adjacent parts, and Figs. 4 and 5 being detail views relating to the knot catcher.

The same as two bobbins only are shown in connection with Figs. 1 and 2, four feeds with their respective stop motions can be used.

Examining the stop motion more in particular with reference to Fig. 2, we find that the yarn from the bobbin passes first through the thread gauge O, thence through shearing device 1 to feeler finger 2, sweep 3, eye 4, and thence to the needles through the hollow axis of the bobbin stand 5. The thread gauges O, shears 1 and feeler fingers 2, with their guide fingers 6, are all supported from the stop motion head.

The sweeps 3 consist of wires having a semicircular bend at 7, fitting over their pivot pins 8, which extend through the arms 9 of the block 10, secured to the reduced extension 19 of the standard 20.

The sweeps 3 are held in by their bent portions engaging the upper wall of the arms 9. The inner ends of the sweeps engage the hooked ends of the rods 15, which extend down into the stop motion head so that their lower hooked ends may engage detent levers 16, pivoted within the stop motion head at 17, the lower arms of each of said detents engaging normally the shoulder of the movable shear blade which is pivoted at 1^x and is under tension of the spring 11, tending constantly to close the shears 1 and sever the yarn, which tendency is resisted by the detent 16. The rods 15 are held in proper position by the collar 10^x, fixed to the standard, and which collar affords a backing for the rods.

When the sweep 3 is pulled down, owing to the yarn becoming taut, the detent lever 16 will be withdrawn from the movable shear blade, and the same will close under the action of its spring 11. The same result will be accomplished when the thread fails, for then the feeler finger 2, which is pivoted to the stop motion head at 12, will fall and its lower eccentric end 22 will engage the detent lever 16, and throw it out of connection with the movable shear blade. When this shear blade moves, a pin 13 thereon will operate the swinging lever 14, which is pivoted centrally of the casing 27. This lever carries on its under side a pin which will operate a spring pressed detent, pivoted within the casing, whereupon a catch lever 18, pivoted within the casing previously referred to, will be released. This catch lever 18, has a shoulder, adapted to hold pin 21, which extends up through a slot in the bottom of the casing from a tripping lever 23. This tripping lever is pivotally supported on the standard by its hub 24, fitted to turn about the standard 20. The tailpiece 25 of this lever, carries a catch pin 26 rigidly, which extends downwardly therefrom and is normally engaged by a spring pawl 28, pivoted in a slot 29 of the block 30, which is fitted to slide on the standard, and is attached to the hollow stand 31 of a tripping foot 32, having a series of pins 33 extending down through the arms of the bobbin stand. The said stem encircles the standard 20, and it and the tripping foot are thus arranged centrally of the bobbin stand and rotate therewith.

The tripper lever 23, is under tension of a spring 34, encircling the standard 20, one end engaging a

pin 35 of the lever and the other end being held by a collar 36, secured to the standard 20.

It will now be understood that the release of the catch lever 18, as described, when the shears operate will allow the pin 21 and the tripping lever 23 free movement under the action of the tripping spring 34, and the catch 26 will be withdrawn from the pawl 28, thus allowing the tripper foot 32 to fall by gravity to thrust the pins 33 downwardly, said momentum of the tripper foot 32 being increased by means of expansible spring 38, so that in the continued rotation of the bobbin stand, one of these pins will be brought into the path of a finger 39, carried by an arm 40, fixed to a rock shaft 41, journaled at its upper end in the standard 45, and at its lower end in the base plate 42 of the brake device, to which base plate 42, the standard 45 is secured. The rock shaft 41 has fixed thereto an arm 43, which is connected by a link 44 with an arm fixed to the rock shaft 46, extending down through the fixed base ring of the machine. This rock shaft has an arm 47, adapted to engage an incline 48 on the tripper arm 49, which engages the shipper rod 50. The movement of the parts described will release the shipper rod, which under the action of its spring 51 will operate the shipping fork 52. These parts are carried around with the stand as the pins 33 engage said stand, and these pins guide the trip foot and its stem vertically.

For resetting the parts, a handle is provided on the tripper lever at 37, by which it may be turned against the tension of its spring and made to engage the latch lever 18, after which by sliding the tripper foot and its stem vertically, the spring pawl will engage the catch pin 26, and thus hold the tripper foot up ready for another action.

The shears are automatically reset upon the operation of the tripping mechanism.

In order to arrest the machine quickly when the power is thrown off, a friction brake is employed, comprising a brake shoe, adapted when operated to engage the rotary flange of the knitting head, which is carried by a shaft, under tension of a spring, in the base 42, and held inactive by a latch pin, engaged by a catch, secured to the rock shaft 41, so that when this shaft 41 is operated to shift the driving means, the catch lever previously referred to, will release the latch pin previously referred to, and the shaft previously referred to, being free to rotate under the action of its spring, will apply the brake shoe to the rotary base flange.

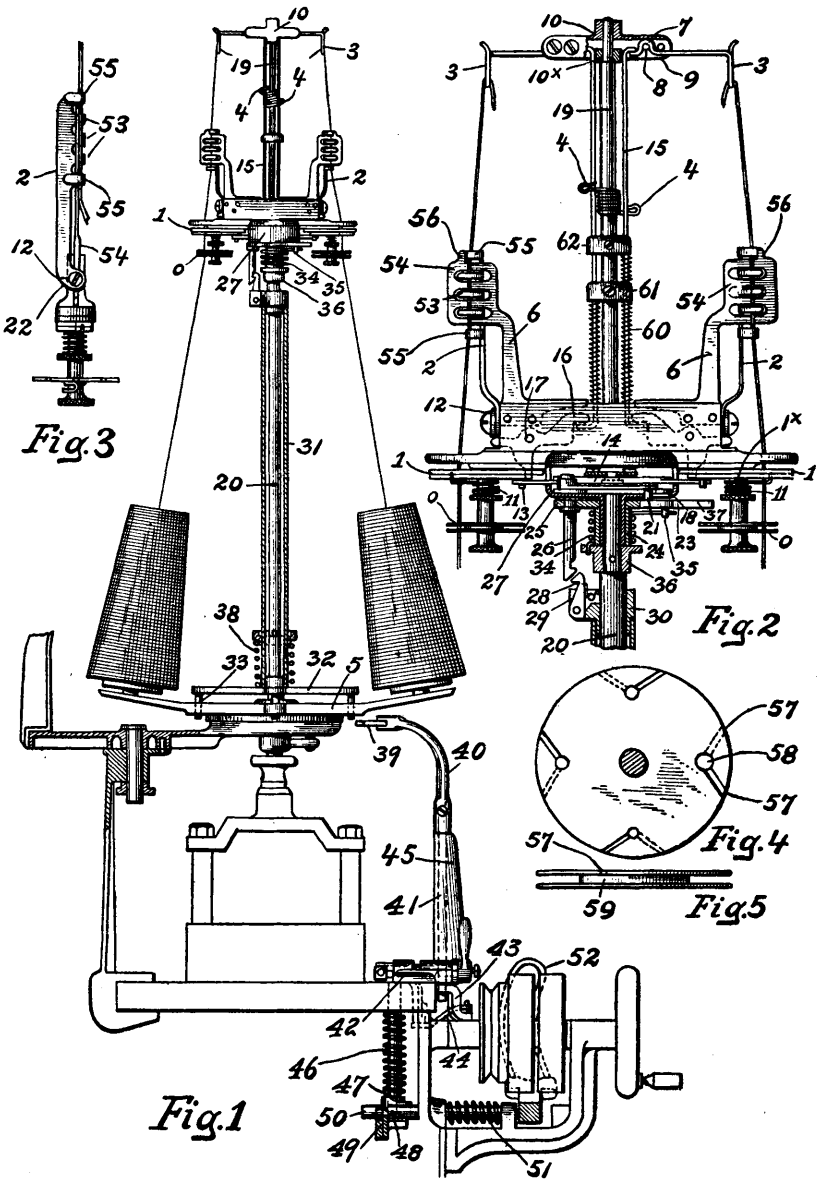


Fig.3

Fig.1

Fig.2

Fig.4

Fig.5

The arm of the stop motion head, directly above the shears 1, is provided with a guide eye, to which a narrow slit extends diagonally, which in turn serves to hold the thread in position between the shear blades.

The feeler fingers 2 fall in a direction opposite to that in which the head rotates, and they therefore operate transversely of the stop motion head. By reason of this there will be no pressure on the yarn due to centrifugal force exerted through the feelers, and the machine can be run at any desired speed, and at the same time the feelers can be made sufficiently heavy to fall quickly when released. The feeler has a plurality of fingers 53, extending in one direction to pass into a plurality of openings formed in the guides or guards 54, and it has an upper and lower finger 55, extending in a direction at right angles to the fingers 53 and at points above and

below the guide. This arrangement permits threading to be readily performed, while preventing the thread from coming out when once inserted.

The feeler finger is pivoted eccentrically, as shown in Fig. 3, and in falling its eccentric portion 22 will operate the detent 16.

The guide arm has a stop 56 for the upper end of the feeler finger to prevent its upper end from springing out, due to centrifugal force.

A knot catcher, as shown enlarged in Figs. 4 and 5, as compared to illustrations Figs. 1 and 2, is also provided to the mechanism, said knot catcher comprising two disks, having slots 57 extending inwardly from the edge and terminating in the eye 58. The disks are placed one over the other with the eyes in line, but with the slot in one inclining in a direction opposite to that in the other. The disks are placed apart by a block or piece 59, which leaves a space between them, and in threading the yarn is passed through one slot, then through the space between the disks, and through the other slot to the eyes.

The rods 15 controlled by the sweeps 3, are pressed by springs 60, and these are independently adjustable by collars 61 and 62, on the extension 19 of the standard 20, the lower collar 61 having an opening through which the spring for the upper collar 62 passes.

The rotary bobbin stand is supported axially over and independent of the knitting head, this feature making it also independent of the spindle, which is part of the knitting head. (Wildman Mfg. Co., Norristown, Pa.)

THE WILDMAN MFG. CO.'S STOP MOTION,
Applied to the Acme Knitting Machines.

The stop motion as explained in the previous article, employed in connection with knitting machines using rotary bobbins, like for example the Wildman Mfg. Co.'s machines, is herewith shown applied to knitting machines, in the operation of which said bobbins do not revolve, *i. e.* remain in a stationary position during the operation of the machine, like for example the Acme knitting machine, such application requiring special devices and arrangement in connection with said stop motion, in order that the same can be associated with the let off mechanism of said make of machines.

Of the accompanying illustrations, Fig. 1 is a plan view, parts being in section, of such portions of an Acme machine (as built by the Mayo Knitting Machine and Needle Co., see pages 218-219) as necessary to be given to show the action of the Wildman Mfg. Co.'s stop motion upon it. Fig. 2 is a side view with parts broken away, and parts being in section, of the knitting machine, showing the stop motion and its application to the knitting machine in perspective. Fig. 3 is a detail view in section, with parts in elevation and parts omitted for the sake of clearness, said view being taken from a point at the right of Fig. 2. Fig. 4 is a view of a detail with reference to Fig. 2.

Before explaining the connection and operation of the stop motion to the knitting machine, it will be advisable to first give a description of the let-off mechanism of the latter, quoting numerals of reference in the illustration, in connection with the explanations given, and of which, 1 indicates the head of the machine, the movable parts of which are driven through gearing 2 from main driving shaft 3, journaled in a bracket 4, shaft 3 carrying fast and loose pulleys 5, 5'. 6 is the belt shifting fork as carried by a block 7, which is slidably mounted on a rod 8, extending out from the frame 9 of the machine. A spring 10 is arranged between the belt shifting block 7 and the frame 9, to keep the former with the fork 6 pressed toward the left, Fig. 1, and thus keep the belt on the loose pulley 5'. The shifting block 7 is guided in its movement by rod 11, extending out from the side of the frame of the machine, and engaging a groove 12 in the top of the block 7.

For operating the belt fork against the pressure of the spring 10, a rock shaft 13 is provided, which is journaled in bearings 14 on the frame of the machine, and has a hand lever 15 for operating it. The shaft 13 at its rear end has an arm 16 projecting inwardly when the parts are in the position shown in the illustrations, having pivotally connected thereto a link 17, the other end of which is pivoted to the belt shipper block 7. The arrangement of these parts is such, that when the rock shaft 13 is turned to move the arm 16 into the position indicated in Fig. 3, said position will be maintained by the parts because the pivot point of 16 will be level with or slightly below the centre of the rock shaft, and the tendency of the spring exerted through link 17 will be to hold the parts locked in this position.

The stop motion, as shown in connection with Figs. 1 and 2, briefly described, comprises head 18 (see 27 in previous article), supported on a standard 19 (see 20 in previous article), said stop motion head containing mechanism controlled by either a feeler finger 20 (see 2 in previous article), or a sweep 21 (see 3 in previous article), so that when either of these devices are operated, caused by the breaking or running out of the thread, the mechanism within the stop motion head, will cause a vertical rock shaft 22 to be operated, the lower end of said rock shaft being journaled in the bracket 23 and carrying a trigger 24, which will release a lever 25, pivoted to said bracket and arranged to be under tension of the spring 26.

The connection of the stop motion thus referred to, and the let off of the machine is thus: The lever 25 previously referred to, is connected by a link 27 to a carrier 28 in the form of a plate arranged to slide at its upper end on the rock shaft 13, and guided at its lower end by a fixed rod 29, held at its front end in a bracket 30, secured to the front of the

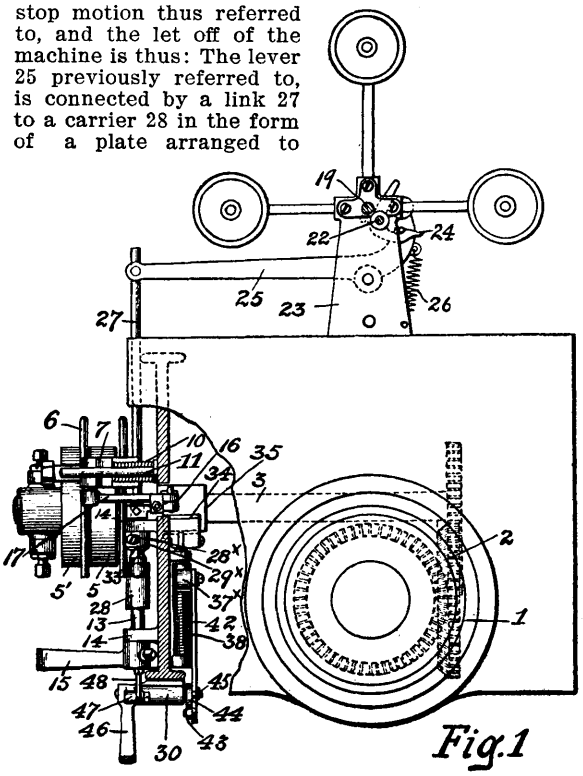


Fig. 1

frame, and at its rear end said guide rod is supported in an ear 30′ of a bracket 31, fixed to the frame of the machine by the bolt 32. This carrier plate 28 has thereon a conical shaped let off pin 33, so arranged that when the carrier plate is moved toward the rear of the machine, when the stop motion proper operates and pulls on the link 27, the let off pin will strike a stud 28x on a collar 29x, fixed on the rock shaft 13 by the said screw, and the rock shaft will be turned through a sufficient arc to carry the point 16 (see Fig. 3 more particularly) above the horizontal plane of the centre of the rock shaft, up to the point 16′, and immediately the spring 10 exerts its force, and thus shifts the belt from the fast pulley to the loose one.

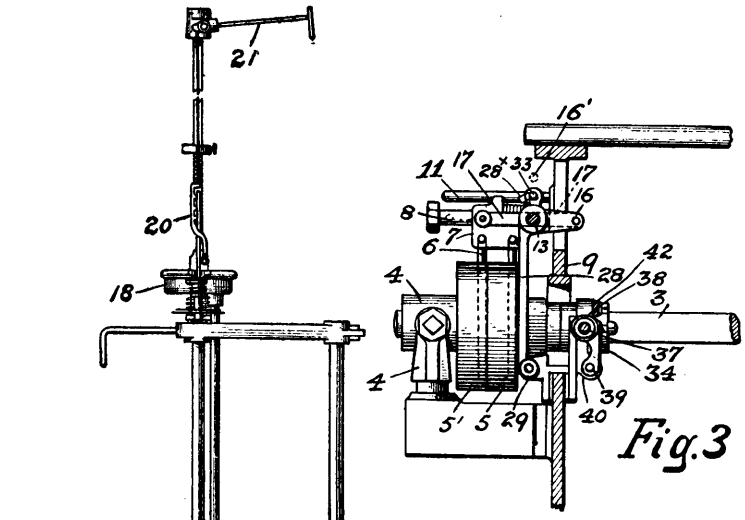


Fig. 3

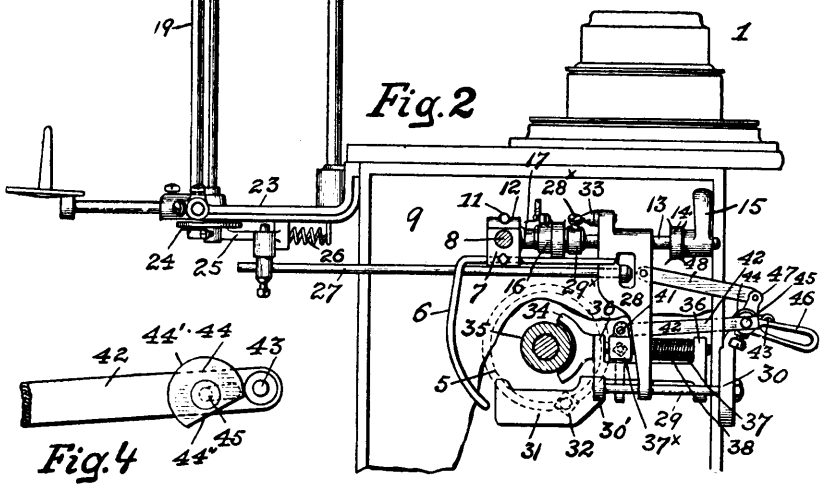


Fig. 2

Fig. 4

A brake to stop the revolution of the machine quickly upon the operation of the stop motion and let-off is also provided, the same comprising a brake shoe 34, adapted to engage a collar 35 on the main drive shaft 3 of the machine, the said brake shoe having its stem 37 guided in ears 36 of the bracket before described. Stem 37 has an arm 37x fixed thereto, and a spring 38 surrounds the shank, and constantly exerts its force, tending to press the brake shoe 34 against collar 35 of the shaft 3. The arm 37x has a sliding connection also with a second guide rod 39, held in ears 40 of the bracket 31. To the arm 37x of the brake stem is pivoted at 41 a link 42, which at its forward end is provided with a roller 43, bearing on a cam 44 on a rock shaft 45, which is journaled in the bracket 30 and has a hand lever 46 fixed thereon. The cam 44 has part of its periphery 44′ concentric with the centre of the shaft 45 and another part 44″ flattened. The hand lever 46 is also provided with an arm 47, which is connected with the carrier 28 by a link 48.

When the knitting machine is running normally, the parts will be in the position shown in the several views, the brake being off and being held off by the roller 43, bearing against the high part of concentric portion 44′ of the cam.

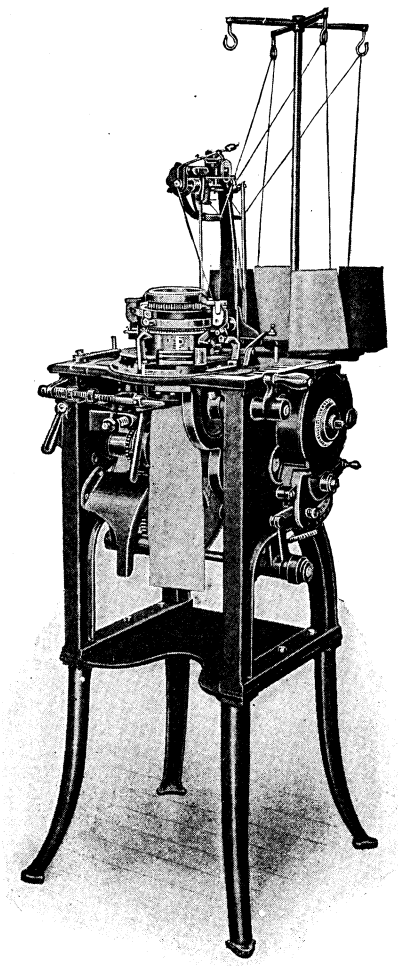
As soon as the stop motion operates, and the link 27 is pulled, the carrier plate 28 is operated, first putting in motion the let off mechanism, and then through link 48 and shaft 45 causing the cam to present its low or flat portion to the roller 43, thus allowing the spring 38 to exert its force, moving the arm 37x and forcing the brake shoe or fork against the brake surface of collar 35, fast on the main drive shaft 3 of the machine. By operating the hand lever 46, both the brake shoe and the carrier 28 are reset into normal position, ready again for automatic operation.

The parts when operated as before described, having rendered the machine inoperative, it will be impossible to start the machine again unless the stop motion is again reset, due to the fact that the let off pin 33 obstructs the movement of the screw 28x until the carrier 28 is moved forward by setting the stop motion. The brake 34 also remains in action against the brake surface of collar 35, fast on the main drive shaft 3 of the machine, until the stop motion is reset, for, as before mentioned, the brake is controlled from the carrier 28, and until the latter is moved forward upon the resetting of the stop motion proper, the brake remains in action. (Wildman Mfg. Co., Norristown, Pa.)

THE ACME KNITTING MACHINE.

The same is shown in its perspective view in the accompanying illustration, and is what is technically known as a fully automatic seamless Hosiery Knitter, its vital parts being the cam cylinder, needle cylinder, and skeleton cylinder. The skeleton cylinder adds greatly to the durability of the needle cylinder and cam cylinder, and permits of a more substantially built machine than could be had otherwise.

The machine is built in one-fourth inch sizes, from 2″ up to 4¼″ diameter, with any number of needles desired up to eighteen to the inch, varying in gauges from twelve to forty-eight. Any of these machines can be readily changed at the mill from one gauge to another, of from one number of needles to another by changing the needle cylinder and a few cams, and from one size to another by changing the whole head. The most practical speed at which the machines are to be run is from 240 to 260 revolutions per minute. The stitch taken by the machine can be varied, and readily changed from long to short, or vice versa. The machine is also supplied with a device for reënforcing heel and toe, the stitch being automatically loosened to accommodate the extra thread in the heel and toe, and again tightened without cutting the fabric, the reenforcing thread being automatically slackened to make sure it is fed into the needles.



The feed movements which control the measuring device of the machine are positive, securing the same number of courses in the same size stocking, raising and lowering always the same number of needles in the heels and toes, so that these parts of the stockings are always uniform.

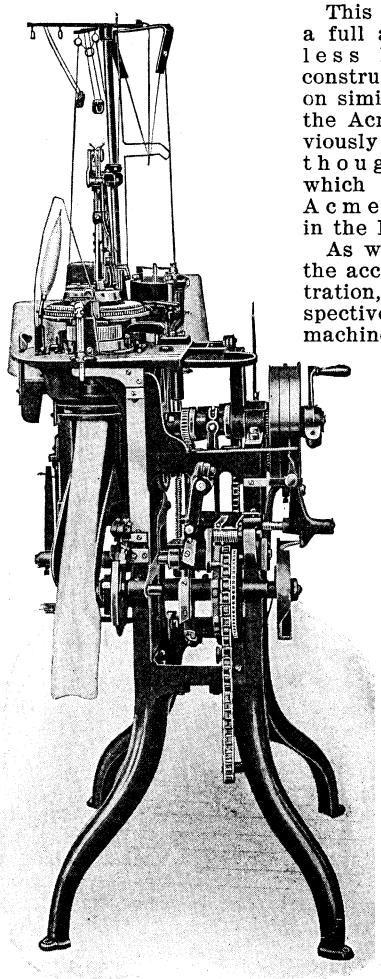
The pattern mechanism or measuring device consists of gears and disks, which are graduated to permit easy and accurate setting.

Besides being built as a plain machine, the Acme can be equipped with double sole, lace, yarn changer and tipper attachment. Also it can be built to make a change of yarn automatically at the heel, so as to make the leg of a stocking of one color, and the foot of another, and at the same time, to reënforce the heel and toe automatically.

The double sole attachment automatically runs an extra thread into the back of the ankle and the bottom of the foot, and the extra thread goes in and out of directly opposite needles, so as to make a perfectly straight line where the reënforcing thread goes in and out on the back of the ankle and bottom of foot. The lace attachment makes a variety of lace stitches down the front of the leg and foot of a stocking. The yarn changing attachment makes a complete change of yarn in the heels and toes automatically, and this same attachment can be arranged to plait a cotton thread with a worsted thread. The tipping attachment is used mostly on small sizes of machines for automatically tipping the heels and toes of children's goods.

The machine is also supplied—if desired—with a stop motion, which automatically stops the machine before making the heel of a stocking, so as to allow a change of yarn by hand to be made, and thus a stocking with the leg in one color and the foot in another color can be produced. Also a stop motion can be put on the machine to stop it before making both the heel and toe, and thus allow a change of yarn for these parts to be made by hand, in these instances however reducing the machine to a partially automatic machine only. The transfer device used, when making any kind of transferred goods is simple, easy and quick to operate, and makes the machine an especially serviceable one for this class of work. (Mayo Knitting Machine & Needle Co., Franklin Falls, N. H.)

THE HEMPHILL KNITTING MACHINE.



This machine is also a full automatic seamless hosiery knitter, constructed practically on similar principles as the Acme machine previously explained, although some parts which appear in the Acme are eliminated in the Hemphill.

As will be seen from the accompanying illustration, which is a perspective view of the machine, chain links are employed for a measuring device instead of the gears and disks, as in the Acme. The construction of the head of the Hemphill does away with the skeleton cylinder found in the Acme, and at the same time the cam cylinder is practically dispensed with,

and the needles and sinkers easy of access. The former can be removed directly from the machine without removing its head, whereas to remove sinker, a coiled wire spring (placed around the outside of the head to keep them in proper place) is simply expanded with the left hand, removing or replacing sinkers at will with the other hand.

This machine also can be equipped with a double sole, yarn changing, or yarn changing and plaiting attachment. Its speed is lessened before changing from circular to reciprocating motion, and again increased after changing from the reciprocating to circular motion. It is equipped with a transfer device for making rapid and perfect transferred work possible. (Mayo Knitting Machine & Needle Co., Franklin Falls, N. H.)

TAYLOR'S STOP MOTION.

This motion is designed to be attached to any make of knitting machine in which the cone, carrying the yarn, does not revolve, the object of the motion being to automatically stop the machine when a thread breaks in its passage to the needles from the cone and also when the thread does not come off of

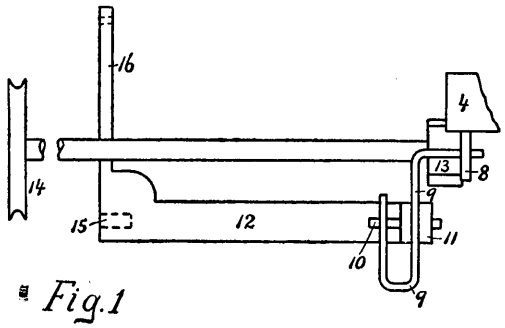


Fig. 1

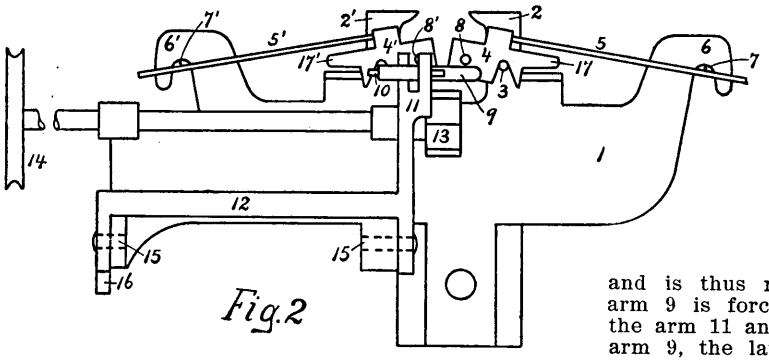


Fig. 2

the cone properly, *i. e.* tangles or is held by knots or lumps being in the yarn. Every stop motion is made to control two threads, independently of each other, and is situated about a yard above the top of the knitting machine, on a stiff rod. The motion consists principally of a special shaped casting, with two detector wires suitably placed on it, which operate a small lever at the proper time to lower it into the path of a revolving ratchet wheel, which in turn pushes it outwardly, thus raising a projection on the same piece, and this motion is transmitted through a chain and lever to the knock off lever on the machine.

The details of the motion are shown in the accompanying illustrations, of which Fig. 1 is a partial top view of the stop motion and Fig. 2 is a back elevation, showing the parts in the position which they occupy when the thread is feeding properly to the needles of the machine. The two detecting arrangements for the stop motion are identical, both acting on the same lever which through its connections stops the machine when either thread breaks, for which reason only one of the detector arrangements will be referred to.

Referring to the illustrations, 1 indicates the casting or main piece of the stop motion, having an upright piece 2 in which is secured a pin 3, extending through it and projecting on both sides so as to act as a pivotal support for casting 4 which has a vertical hole through it, thus allowing it to fit down over the upright piece 2. This casting 4 carries a pair of detector wires 5 which extend past a hook 6 on the casting 1, one wire being on each side of the hook, the thread 7 for knitting passing over said wires and under the hook 6, the casting 4 and wires being so balanced that the tension on the thread is sufficient to keep the wires in the position shown, when running properly. A movable weight is applied to one wire to regulate the balance when necessary. A wire 8 projects outwardly from the casting 4 and extends directly over a pivoted lever 9, the latter being pivoted by a pin 10 in the upright arm 11 of the angle lever 12 and is so balanced that the end situated under the wire 8 is always up when the thread is running properly. Situated just below the lever 9 is the revolving ratchet wheel 13 which is driven through a pulley 14 from a similar pulley on the shaft of the machine by means of a band, said ratchet being the part to actuate the stop motion when a thread breaks.

The angle lever 12 is pivoted to the casting by means of screws 15 and has an arm 16 extending outwardly, to the end of which is attached one end of a chain, the other end being connected to a pivoted lever on the frame of the machine, said lever being in turn connected to the knock off lever of the belt shifter, which by pulling down releases its hold on the shifter and allows a stout spring to move the shifter.

The action of the stop motion is as follows: When a thread 7 breaks, the detector wires 5 are thrown upwardly by the greater weight on the other side of the pivot 3, and the wire 8 moves downwardly, taking the arm 9 with it, which comes in contact with the ratchet wheel 13 and is thus moved outwardly by it. When the arm 9 is forced down, it hits against a part of the arm 11 and thus when the ratchet moves said arm 9, the latter acts as a solid lever with the arm 11, so that the latter is moved outwardly at the same time. This action causes the angle lever 12 to move on its pivots 15 and thus raise the arm 16 of the lever, which movement, through the chain and levers explained, stops the machine. Owing to the manner of balancing the different levers, they will assume their normal positions, when the thread is replaced between the hook 6 and the wire 7.

When the thread is caught by a knot, etc., the tension on said thread will be sufficient to pull the wires 5 down past the end of the hook 6; so that the thread will slide off of said wires and at the same time the pivot of the casting 4 is changed to the point 17 which then makes the action of the motion quicker. The casting 4 may be easily raised off of its pivot and cleaned without trouble. (James Taylor, Philadelphia, Pa.)

RUTH'S STOP MOTION.

The object of the mechanism is to automatically stop the machine with the brake applied, when one or more threads as fed to the machine break during the process of knitting, by shifting the driving belt from the fast to the loose pulley. The construction and operation of the device are best shown by means of the accompanying illustrations, of which Fig. 1 is a side view of part of a knitting machine showing the different parts of the mechanism for the stop motion. Fig. 2 is a portion of the thread guide mechanism, showing the parts in the position they occupy

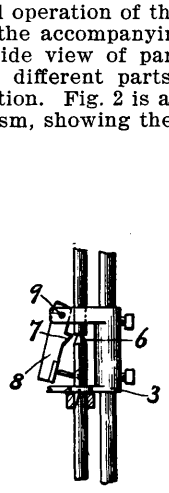


Fig. 2

Fig. 1

Fig. 3

when a thread is absent, *i. e.* the thread having broken. Fig. 3 is a view, partly in section, showing more in detail the manner of keeping the driving belt on the fast pulley. Referring to the illustrations, numeral of reference 1 indicates the frame of the machine, and to which is attached a vertical rod 2, carrying guides 3 and 4. Situated in these guides is a vertically movable rod 5 which has a recess 6 cut into it near the top end, said recess being made in order to allow a projection 7 on the latch 8 to hold said rod 5 up. This latch 8 is pivoted at 9 in the guide 3, and the projection 7 is kept in the recess 6 of the rod 5 by means of a spring 10, pressing against it near its lower end, the pressure on said spring being made adjustable by means of screw 11. A finger 12, through which the thread is passed in threading the machine, is journaled at 13 on the guide 3. This finger 12 is connected by means of a rod to a shorter finger 14 which is in a direct line with the bottom end of latch 8.

In threading the machine the yarn is drawn off of the cone 15 and passed up through a guide 16 on the vertical shaft 2, up and within contact of the finger 12, to the guide 17 at the top of the rod 2. From there the thread is passed, through guide eyes 18 and 19, to the cylinder needles 20 of the machine. The tension of the thread is sufficient, when working properly, to keep the finger 12 in an almost vertical position; but as soon as the thread breaks, the finger 12 will fall, and consequently the shorter finger 13 comes in contact with the lower end of the latch 8 and pushes it outwardly, thus disengaging the projection 7 from the recess 6 on the rod 5, as clearly shown in connection with Fig. 2. This rod, thus being liberated, will of its own weight, fall upon the horizontally positioned end of a trigger 21 and in turn cause the other end of said trigger to disengage with the recessed portion 22 of the lever 23. This lever 23 is pivoted at 24 and has a spring connected to its outer end, which tends to draw it down. The other end of the lever 23 carries a block 26 through which a short rod 27 passes, having a nut 28 on the end extending through said block. This rod 27 is connected at its other end to a lever 29 by means of a pin 30. This lever 29 is pivoted at 31 and has one end extending over the inclined surface 32 of the piece 33. This piece 33 is pivoted at 34 and is provided with a tooth 35 to bear down against the outer end of the brake shoe 36.

When the lever 23 is released by the trigger 21, the rod 27 is pulled forward, in a right hand direction, by this motion and by its connection to the lever 29, causes the outer end of said lever to press the inclined surface of the piece 33 down, thus disengaging the tooth 35 from the outer end of the brake shoe 36, allowing a spring 37 to press the inner end of the brake shoe 36 against the flange 38 of the cam cylinder.

The lever 29 is also made with a recess in its under side to allow a vertical rod 39 to rest in a raised position when the thread is running properly; but when said lever is pulled forward, as explained before, the under side of said lever presses the rod 39 down, and which movement causes a rod 40 as centred at 41 to also be pressed down. This rod 40 carries a piece 42, which fits into a groove 43 (see Fig. 3), on the rod 44 when the machine is running, thus keeping the belt on the tight pulley by means of the shipper lever 45, but as soon as the piece 42 is taken out of the groove 43, a spring (not shown) acts upon the belt fork or shipper lever and which moves the belt from the tight to the loose pulley. Consequently when the lever 40 is pressed down, the piece 42 is disengaged from the groove 43 and the belt shifted, as explained, thus stopping the machine.

It will be understood that the operation of stopping the machine and applying the brake to the cam cylinder 38 are about simultaneous, thus preventing any knitting action of the machine with the thread missing.

When the broken yarn has been repaired, the several parts of the stop motion are returned to their original positions as shown in Fig. 1, after which the belt is shifted from the loose to the fast pulley by means of the rod 46 with its handle 47 thus starting the machine again. When the lever 23 is thus returned to position shown in Fig. 1, it is apparent that the lever 48 is turned upon its fulcrum 49 by reason of the contact between the lever 23 and the stud 50 which projects from the lever 48 and rests upon the lever 23 and operates the brake lever 36 so as to remove the shoe from contact with the flange 38, and when brought into the position shown in Fig. 1 permits the spring 51 to contract and bring the tooth 35 in engagement with the lever 36 so as to retain the latter in position. (Ruth Automatic Knitting Machine Company, York, Pa.)

DUEMLER'S TWO FEED KNITTING MACHINE

For Producing Fancy Effects.

This machine is similar to a single feed knitting machine, except that it has two feeds and extra appliances for producing various designs of knitted fabrics, it being used especially for knitting fancy stockings. The details of the construction and operation of the machine are given in connection with the accompanying illustrations, of which Fig. 1 is a plan view of a portion of a circular knitting machine, showing the principal parts on the cam cylinder. Fig. 2 is a diagrammatic view, illustrating a development of the interior of the cam cylinder and the positions of the parts during the knitting of the foot portion of a stocking. Fig. 3 is an enlarged view of a piece of fabric produced on the machine.

Referring to the illustrations, 1 designates the bed plate, 2 the needle cylinder supported thereby, and 3 the cam cylinder, which is provided with the usual cams, including the oppositely disposed stitch cams 4 and 5 and the raising cams 6 and 7, leading to the resting cam 8. The cam cylinder is also provided with the usual pickers 9, by means of which certain needles are successively moved out of and into action during the reciprocations of the cam cylinder in knitting the heel and toe portions of a stocking.

Two sets of needles 10 and 11 are used, which are alike in every respect, except that the latches of the set 11 are longer than those of the set 10, these needles being arranged in the relation indicated in Fig. 2.

Arranged in the cam cylinder 3, near the raising cam 6, are an additional stitch cam 12 and a raising cam 13, which in conjunction with stitch cam 5 and the raising cam 7, actuate the needles to effect the knitting of two stitches during each revolution of the cam cylinder in the formation of the leg and foot portions of a stocking.

The knitting by the needles 10 is done in the usual manner, while the needles 11 having longer latches will produce a variation from the regular knitting, as will be seen from the following example, the plane where the loops are formed being indicated by the line x—x. Assuming that a white thread 14 is being delivered to the needles through the eye 15 in the yarn carrier 16, at cam 12 and a black thread 17 through the eye 18 at cam 5, then the operation of the machine is as follows: During the knitting of the leg portion of a stocking, the cam 19 is below the resting cam 8, as will be explained later. As the stitch cam 5 passes the needles, the latter are caused

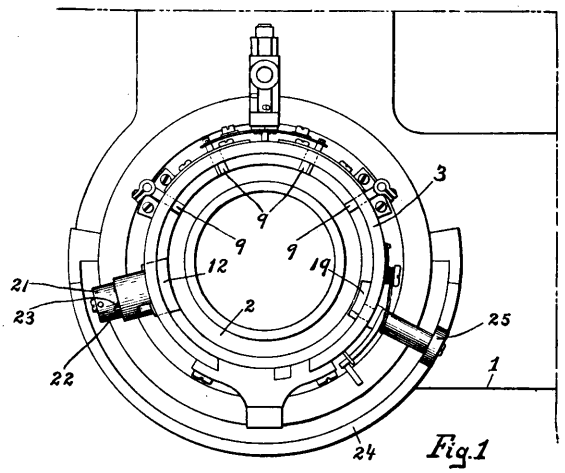


Fig. 1

to engage and knit the black thread 17 into the fabric in the usual manner, and the elevating cam 7 raises the needles to the resting cam 8. At this point the needles are raised, and owing to the length of the latches of needles 10, the black stitch in the hooks is put below the latches thus freeing the latter, as is done in ordinary knitting, while the longer latches of the needles 11 are not freed, but are held by the loop as in a tuck stitch. The needles are next acted upon by the stitch cam 12, where the white thread 14 is delivered to the needles. At this point the needles 10, having their latches free, catch the white thread in the hook and cast off the black stitch in the usual manner, while the needles 11, having their latches engaged by the black loops, merely draw down the black loops and the white thread together without casting off a stitch. These long latched needles 11 now hold both a white and black loop. As the cam cylinder advances in the direction of the arrow, the needles are raised by the cam 20 sufficiently to cause the white and black loops in the hook of the needle 11 to be slid below the latch and thus free it. The cam 5 now meets the needles again, and the latter having all their latches clear of the loops, catch the black thread in the usual manner. The needles 10 will cast

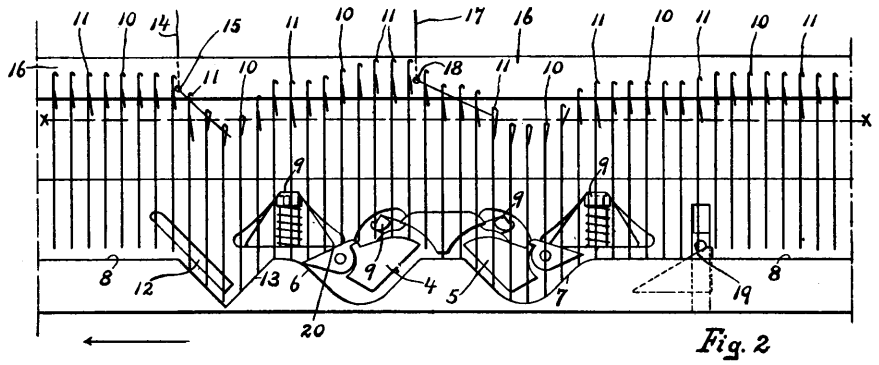


Fig. 2

off the single white thread, while the needles 11 will cast off both white and the previously formed black loop of the threads. Thus it will be seen that the needles 11 do not knit the white thread 14 but knit a

chain of black stitches down the face of the fabric, thereby producing a longitudinal stripe through the fabric at each point where the needles 11 occur, the needles 10 knitting alternate black and white stitches as shown in Fig. 3. After the completion of the leg portion of the stocking, the cam cylinder is reciprocated to knit the heel, the needles being thrown into and out of action in the usual manner. During this operation the black thread is employed, it being desired to continue the longitudinal stripe along the top of the foot portion of the stocking and omit said stripes from the bottom of it. In order to see how this is accomplished, we will refer again to the illustrations. In the first place the cam 12 must be thrown back out of action so as to knit only one stitch for every reciprocation of the cam cylinder, which is done by turning by hand a collar 21, so that its notch 22 will move out of contact with the projection 23 and thus draw the cam 12 back. The concave portion at 13 in the cylinder cam will not now produce any motion to the needles but will simply pass under them in the same way that the resting cam 8 does.

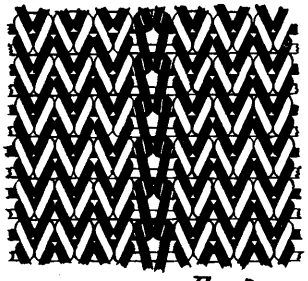


Fig. 3

In order to knit the longitudinal stitch only on top of the stocking foot, one-half of the needles around the cylinder must knit regularly, while the other half must knit in the same way as for the leg portion. To thus knit regularly, one-half of the needles must be raised sufficiently so that the latches of the needles 11 will have the loop slip below its latch at every stitch in the same way as with the needles 10. To raise half of the needles every time the required extra distance without raising the other half of the needles, the cam 19 is provided, which may be raised above the needle rest cam 8 and thus cause all needles with which it comes in contact to be raised higher, as is needed. Said cam 19 is raised by means of a stationary cam 24 upon which rolls a wheel 25, the wheel being on the same stud with the cam 19. It is spring controlled and when leaving the cam 24 with the continued movement of the cylinder, the cam 19 is dropped again below the surface of cam 8 and the longitudinal stripe made in that half of the foot by the needles 11 with the needles 10 always working plain. Since the action of the cam 19 is not needed during the knitting of the leg portions, the cam 24 is lowered out of action by hand when the foot is completed and again into action when required. (H. Brinton & Co., Philadelphia, Pa.)

BRANSON'S MANTLE KNITTING MACHINES.

Branson's Mantle Knitting Machine for Floating Thread Stitch.

The object of this machine is to produce mantles, which are afterwards treated chemically and used in connection with what is generally termed Welsbach lights.

There are several styles of special stitches used in manufacturing these mantles, the one made on this machine being known as the "floating thread" stitch.

The diameter of the cylinder of the machine is quite small, owing to the small size of the mantles required to be made on it. A special stitch is used in knitting these mantles, which requires a special yarn carrier and special needles placed after a certain system between regular needles, otherwise the machine is similar to a knitting machine, that is, a set of cylinder needles is used and a cam cylinder carrying the cam for actuating said needles. Only continuous circular knitting is required, a feature which greatly simplifies the construction and operation of the machine, which is *full automatic*. Two yarns are fed at the same time from separate holes in one yarn carrier, and it is the method of knitting these two yarns into the fabric which produces the "floating thread" stitch. One thread knits into the fabric after the plain knitting stitch and forms the structure, while the other thread floats behind two of the regular stitches and knits in on every third stitch with the first thread.

The method of making the floating thread stitch, as well as a diagram of the stitch itself are given in the accompanying illustrations, of which Fig. 1 is a cross sectional view of the needle cylinder, also showing the yarn carrier as depositing the two separate yarns in the proper needles for producing the stitch. Fig. 2 is a diagram of a portion of the fabric, showing the interlacing of the two yarns. Besides having the yarn carrier provided with two holes for feeding the two yarns, there are two kinds of needles used in the cylinder, two needles of the regular style alternating with one needle of special construction, which is similar to the regular needle, except that its end carrying the latch and hook is bent back slightly, so that when said needles are raised, their hooks will not be in the circle made by the regular needle hooks and hence they can take a yarn which the regular needles cannot take, by passing said yarn in back of the regular needles but in the front of the hooks of the special needles.

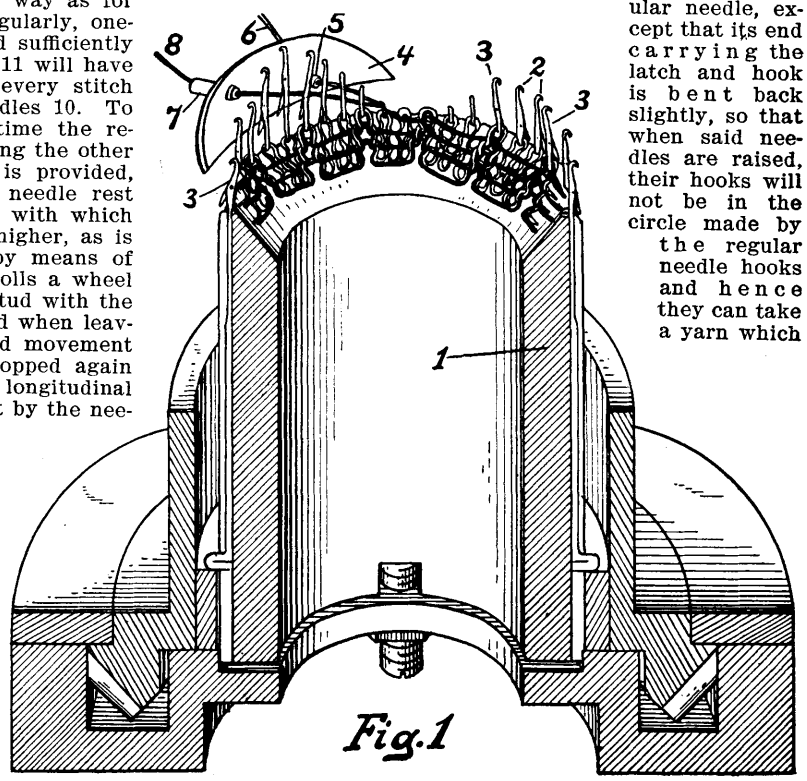


Fig. 1

Referring to the illustrations, 1 indicates the needle cylinder, carrying in its grooves the regular needles 2 and the special or bent needles 3, said needles being placed alternately two of regular and one of special

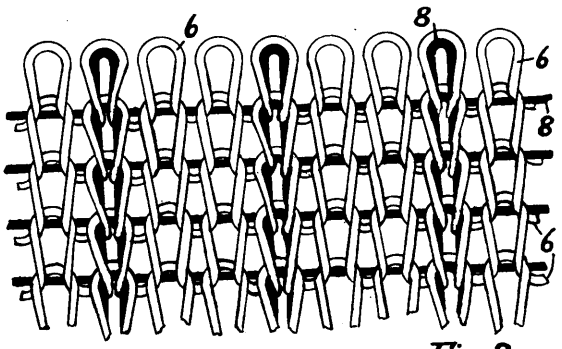


Fig. 2

in the grooves of the needle cylinder. The specially constructed yarn carrier 4 is provided, toward the back end and near the bottom, with a guide hole 5 which deposits the yarn 6 in the hooks of all of the needles. This is readily done, because the hole 5 is far enough behind the highest point of the raising cam and low enough to the needles to enable the special needles to descend far enough to bring their hooks back into the circle with the regular needles and receive yarn before having their latches closed.

Situated near the top and at the front end of the yarn carrier 4 is a guide hole 7 for depositing the floating thread 8 in the hooks of the special needles 3, said hole 7 being sufficiently high and in front of the highest point of the raising cam to enable it to deposit the yarn 8 before the regular needles are raised high enough to prevent the yarn from passing over them. The third or special needle, by being bent back slightly at the top, prevents the yarn from being deposited behind it and hence catches said yarn in its hook. Before the needle is lowered by the stitch cam of the cam cylinder, the yarn 6 is also deposited in its hook, thus having said needle to cast off two loops for every revolution of the cam cylinder. This system of using a floating thread will produce a web, shown by diagram Fig. 2, in which it will be seen that the regular thread 6 is knitted plain, while the floating thread 8 only knits in with every third plain stitch, leaving it to float behind the other two.

Chemical Preparation of the Knit Fabric for Mantles. The web in coming from the machine in the form of a tube, is afterwards cut into lengths from eight to nine inches long and each of these pieces is then folded and sewn at the top with a loop of asbestos thread. They are now ready for the chemical treatment, which consists in immersing said pieces in a solution of nitrate of thorium and cerium, after which they are dried and the cotton burned out. In this way, the nitrates are converted into oxides and the shell is then stiffened and is ready to be packed into boxes for shipment. (Branson Machine Co., Philadelphia, Pa.)

Branson's Mantle Knitting Machine for Lattice Stitch.

This machine produces what is known as the lattice stitch, which is considerably tighter and more substantial than the floating thread stitch and in turn will produce a higher priced mantle. The stitch is made by using two sets of needles on the cylinder and a sufficiently high yarn carrier ring to protect the latches from closing, said ring having two separate yarn carrier eyes, and also two cam grooves, one situated over the other on the cam cylinder. The needles of one set are placed alternately with the other set in the needle cylinder. Each set of needles knits the plain stitch, using its respective yarn, and the small float between two needles of one set is stitched in on the inside or back of the intervening stitch of the other set, and vice versa the float from the intervening set is stitched in on the inside of the needles of the first set, thus producing a web somewhat resembling a lattice and hence the name, "lattice" stitch. The method of making the stitch on the machine is best shown by means of the accompanying illustration Fig. 1 which is a development of the working portion of the cam cylinder, showing also the relative positions of the yarn carrier eyes while Fig 2, as given on page 225, is a diagram of the web produced.

Referring to illustration Fig. 1, 1 indicates a portion of the cam cylinder of the machine, carrying the cams 2, 3, 4, 5, 6 and 7 respectively.

Two separate and distinct cam grooves are used for the two sets of needles, the path of the upper set being indicated by a dotted line 8, and the path of the lower set by the dotted line 9. The cam cylinder moves in the direction of the arrow. When the needles of both sets are in a resting position, the hooks of the upper set rest above those of the lower set, and the yarn carrier eye 10 for the upper set is situated above the hooks of the lower set when in their resting position, thus said yarn carrier can deposit yarn in the hooks of the upper needles when they are raised by cam 5, without touching the lower set of needles, and vice versa, the yarn carrier eye 11 for the lower set is placed low enough as to only deposit yarn in the hooks of the lower needles as raised by the cam 2, the upper set being sufficiently high, to be out of the path, and by the time their hooks descend to the line of the yarn, the loops on said hooks have closed the latches and the floats are not caught. When the hook of the upper needle is at its lowest point, *i. e.* casting off, the float of the other thread passes over said hook, owing to its being pulled over by the take-up and consequently

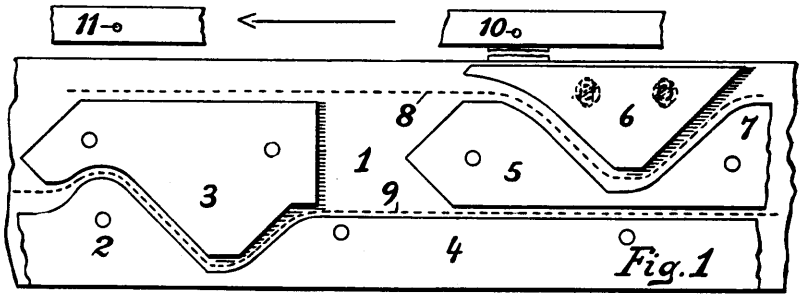


Fig. 1

rests on the inside of the web, together with the loop just cast off, and in this manner is stitched in on the back. In a similar manner the floats of the thread of the upper needles are pulled back of the hooks of the lower needles and are stitched in on the back of the web.

It will be noticed that the cams 5, 6 and 7 for making the stitch by the upper set of needles are placed over the resting cam 4 of the lower cams, and vice versa, the cams 2 and 3 are placed under the part of the upper cam groove where the upper needles are at rest, so that only one set of needles will be working

at the same point on the needle cylinder at one time, the two sets of needles thus not interfering with each

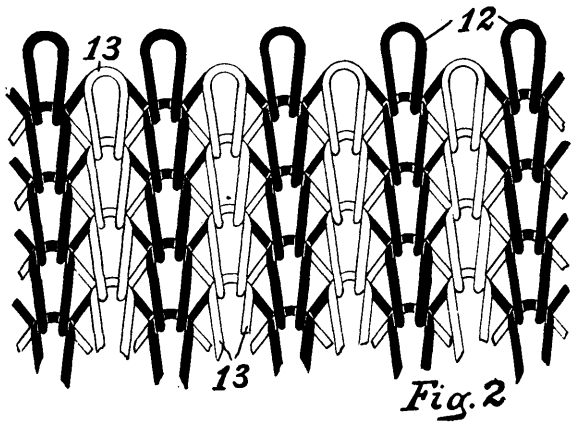


Fig. 2

other. The method of making the stitches by the two cams is similar to the regular plain knit stitch and need not be discussed again.

On examining the diagram Fig. 2, we can readily trace the interlacing of each thread; for instance, take the thread 12, which we will consider as having been knit by the upper set of needles, and it will be seen that it knits after the plain stitch on every other stitch and is caught behind the stitches between them. In the same way, the thread 13 knits plain by the lower set of needles on every other stitch and has its floats caught behind the stitches between them, thus producing the lattice work effect. (Branson Machine Co., Philadalphia, Pa.)

Branson's Mantle Knitting Machine for Honey Comb Stitch.

This machine is another type of mantle knitting machine, and is used to produce a special stitch in the web, known as the "honey comb" stitch. This stitch is somewhat similar to the lattice stitch, as previously explained, and differs from it by having the short floats of one thread stitched in on the back of the stitches of the other thread, and the floats of the other thread stitched in on the face of the first stitches; while in the lattice stitch, the floats of both threads are stitched in on the back. From this it will be seen that the honey comb stitch is related to the rib stitch, and more so for the reason that a set of cylinder needles and a set of dial needles are used in the machine for making it.

Two separate yarns are used, requiring the use of two yarn carriers, one to feed a yarn to the cylinder needles and one to feed a yarn to the dial needles. The needles of the cylinder set work in the spaces between the needles of the dial set in a regular rib machine. While the dial needles are having yarn deposited in their hooks by one yarn carrier, the cylinder needles at that point receive the yarn but do not knit it in, and in the same way, at the point where the cylinder needles are having yarn deposited in their hooks, the dial needles receive the yarn but do not knit it in.

The method of making the stitch may be best explained by means of the accompanying illustrations, and where a diagram of the web is also given.

Fig. 1 is a development of working portions of the cam cylinder, Fig. 2 is a view, taken of the under side of the dial cap, showing the outline of the dial cap cam, and Fig. 3 is a diagram of the web produced on the machine. Referring to the illustrations, 1 indicates the cam cylinder, carrying the cams 2, 3, 4 and 5 respectively. It will be noticed that the cam 2 is cut away at the bottom as compared to the stitch cam 4, the reason for this being to enable said cam to lower the cylinder needles at that point out of the way of the acting dial needles and yet not lower them far enough to cast off a stitch. The cam 4 is used for making the stitch by the cylinder needles in the regular way, the cams 3 and 5 being used to bring the cylinder needles again to their normal position.

The dial cap is indicated by 6, and carries the cams 7, 8, 9 and 10. Situated on the top side of the dial cap 6 are the yarn carriers 11 and 12, placed oppositely from each other on said dial cap. It will also be noticed in connection with the cams 7 and 9 that the inward point of the cam 7 does not extend as far inward as the corresponding point on the cam 9, which has the effect of drawing the dial needles inwardly at the point where the cylinder needles are taking yarn, but not far enough to cast a stitch off. The cam 9 is the regular stitch cam and makes the stitch in the regular way. The cam cylinder and dial plate revolve in the same direction, the arrows used showing said direction, although the arrow for the dial

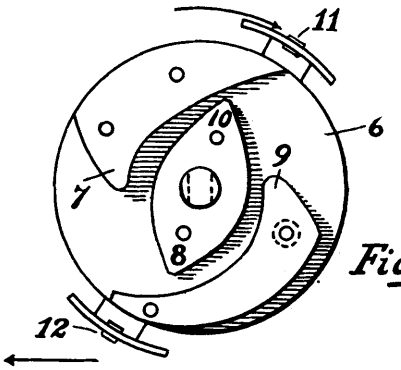


Fig. 2

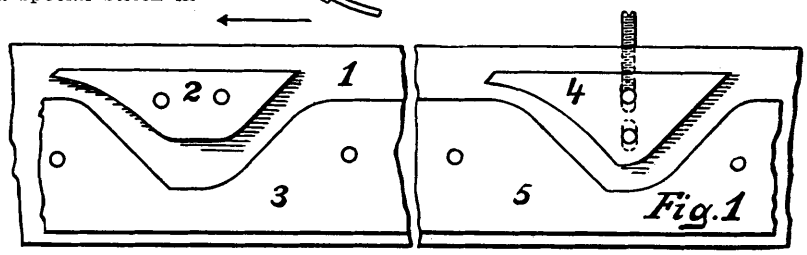


Fig. 1

cap is in the reverse direction to the actual running of the dial, because the latter is shown with its bottom side up, but by turning it over into its running position with the arrow in the same relation

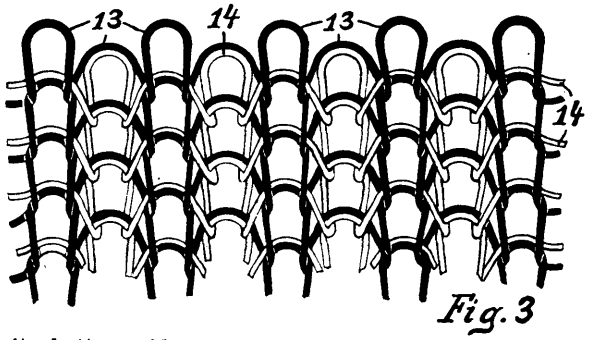


Fig. 3

with it, the direction of the arrow will then correspond to that of the cam cylinder. The dial cap is set in relation to the cam cylinder, so that the inward point on the cam 7 will correspond to the stitch cam 4 on the cam cylinder, and the stitch cam 9 will correspond to the cam 2 on the cam cylinder. In this way, the stitches are made by each set of needles and a web is produced, as shown in Fig. 3, in which the thread 13 is knitted by the cylinder needles and the thread 14 by the dial needles. It will be noticed that the floats of thread 14 are stitched behind the stitches of thread 13, and the floats of thread 13 are stitched in the front of the stitches of thread 14, thus producing the desired web. (Branson Machine Co., Philadelphia, Pa.)

THE "LAMB" FLAT KNITTING MACHINE.

This machine is a type of another style of knitting machine from the circular machines thus far explained, and differs from the latter principally by having its needles set in a straight line rather than in a circle, which construction, of course, demands a different method of feeding the yarn to the needles, that is, the yarn carrier must traverse back and forth across the hooks of the needles instead of in a circle. The machines are made in different lengths of knitting surface, varying from 8 inches to 60 inches, the different sizes being especially adapted for certain kinds of work, as for instance, the smaller size machines are used for knitting mittens, stockings, gloves, etc., while the larger sizes are used for undershirts, cardigan jackets, leggings, sweaters, skating caps, etc. A great variety of knit goods may be made on one of these machines, as will be explained later. The smaller machines are operated by hand power, while the larger ones are driven by belt power except in some cases where hand power is preferred, although the large machines require considerable effort when operated by hand, necessitating the services of a strong man.

A description of the construction and operation of the machine is best given by referring to the accompanying illustrations, of which Fig. 1 is a perspective view of a long Carriage Knitting Machine; Fig. 2 is a perspective view of a knitting machine bed, showing the drop jacks; Fig. 3 is a view, taken of the under side of a portion of the carriage, showing two sets of cams, known as Common Locks or Cams; Fig. 4 is a similar view, showing Automatic Drop Locks; Fig. 5 is a similar view, showing Automatic Tubular Locks; Fig. 6 is a detail view of a common lock, showing the method of actuating the centre cam.

Referring to the illustrations, and especially to Fig. 1, it will be seen that the machine is constructed upon the principle of employing two straight, parallel rows of needles, said rows being sufficiently near to each other to make an unbroken tubular fabric when required; but far enough apart to allow the fabric to pass down between them as it is knitted.

The needles composing the two rows are placed opposite to each other, in grooves in a steel needle bed, the two sides of which slope from each other, somewhat similar to the gable of a house, and are separated at the ridge or centre, where the needles form the stitches. The grooves for the needles of one set are placed so as to come opposite the spaces between the grooves of the other set, so that the needles of each set, if so required by the style of fabric knit, will make alternate stitches in the fabric, in the same manner as in circular rib knitting, and also will not interfere with the working of each other, during knitting. The needles are placed in separate grooves with the latches turned outwardly, and also the butts or shanks of the needles, by which they are operated, projecting upwardly, extending sufficiently above the top of the grooves to be actuated by cams. The carriage of the machine has two surfaces which correspond to the two sides of the needle bed, and which fits down on said bed and is moved back and forth across the bed, either by hand or other power to perform its function in connection with knitting. On each under side of the carriage is an automatic cam—one for each row of needles—for operating the needles in and out in their grooves, the butts or shanks of said needles fitting loosely into the cam grooves. The carriage also carries a yarn guide C for delivering the yarn from the bobbin into the hooks of the needles as they are moved outwardly by the cam. The eye of this yarn guide C is situated over the central point between the two rows of needles and hence makes the stitches by each row of equal length. The yarn in coming from the bobbin, passes through guide eyes at A, then through an eye in the end of a spring wire B, before it finally reaches the yarn guide C. The object of this arrangement is to take up the slack in the yarn when the carriage reverses its motion at each end of the machine, and thus makes a smooth selvage on the fabric.

As the carriage is moved over the needle bed, the needles are moved outwardly by the cams, the latches of said needles being opened by the pieces D, to receive yarn from the yarn carrier C, and are drawn in almost immediately after the yarn is deposited.

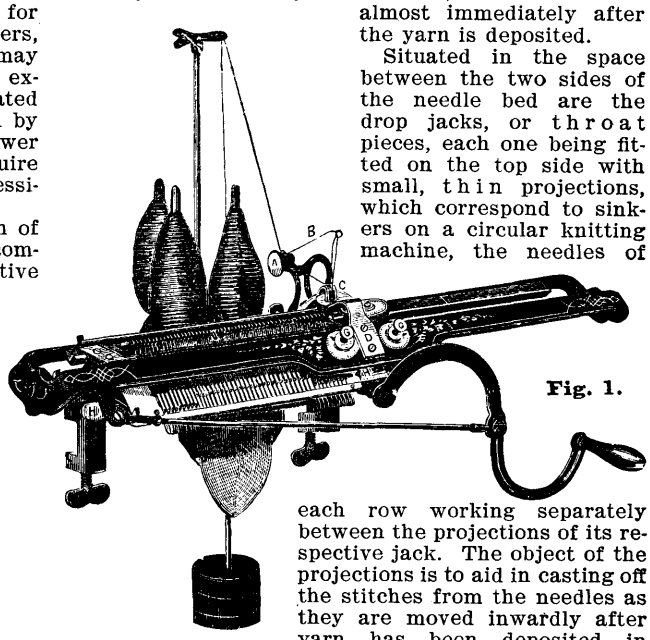


Fig. 1.

Situated in the space between the two sides of the needle bed are the drop jacks, or throat pieces, each one being fitted on the top side with small, thin projections, which correspond to sinkers on a circular knitting machine, the needles of each row working separately between the projections of its respective jack. The object of the projections is to aid in casting off the stitches from the needles as they are moved inwardly after yarn has been deposited in their hooks. These drop jacks are pivoted at the right hand side of the needle bed, as shown in Fig. 2, and may be swung down, as shown, out of the space between the needle rows, so as to make more space to facilitate the work of placing the fabric on the needles when required, such as half hose tops, or for picking in the stitches in knitting fingers and thumbs for gloves and mittens. The jacks are held in position in the space by means of a steel spring at the left hand side of the space, and to drop the jacks, it is only necessary to press this spring back and allow the jacks to swing on their pivot at the right hand end.

There are three principal styles of cams which may be used on the machine for operating the nee-

dles, which are the Common Locks or Cams, as shown in Fig. 3, this as previously mentioned, being a view taken of the under side of the carriage; the Automatic Drop Locks, as shown in Fig. 4; and the

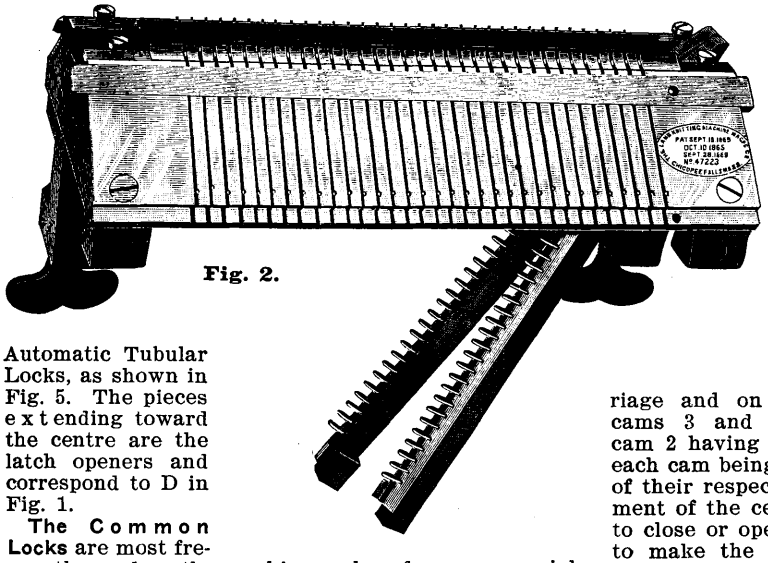


Fig. 2.

Automatic Tubular Locks, as shown in Fig. 5. The pieces extending toward the centre are the latch openers and correspond to D in Fig. 1.

The Common Locks are most frequently used on the machine, unless for some special style of fabric, since by them the greatest variety of stitches can be obtained on the same machine. With this style of locks, cam stops are attached to all four corners of the needle bed for some stitches and only to two opposite corners for other, etc., holes for these being shown in Fig. 2. The object of these stops is to throw the centre cam up or down, putting that cam respectively in or out of working position for operating the needles, that is, when the cam is in its highest position, the groove is closed and the needles are inoperative, and when moved down, the grooves are open and the butts of the needles move in them, thus giving the inward and outward movement to the needles.

By adjusting all four cam stops, the grooves are opened and closed, so as to continuously operate the front row of needles when the carriage is moving toward the left, with the back row of needles inoperative; then when the carriage moves to the right, the back row becomes operative and the front row inoperative, thus knitting a perfect *tubular or circular fabric.*

To operate both rows together in one direction, then only one row in the other, making the double flat web or *Afghan Stitch,* a cam stop is placed at each end of one row of needles with no stops on the other row.

To operate both rows together in both directions, for making the *ribbed or seamed flat web,* no stops are used.

The tuck or half cardigan stitch can also be made, as will be explained later.

To operate forward and back, first one row and then the other, so as to connect the two rows of knitting at one end, and leave them open at the other, forming the *wide flat web,* the locks have to be operated by hand.

Thus, we can produce five different styles of stitches with the same cam. In knitting these webs, if every second, third or fourth needle or combination of them, in one or both rows be not used, an almost unlimited variety of stitches may be produced.

As any number of needles, in one or both rows, can be employed at the start, and the number be increased or diminished at any time, so any size of work, tubular or flat, can be set up and widened or narrowed to any extent.

In order to give a more detailed description of the operation of the cam arrangement, and to explain how the stitch is made by the needles, we will refer to Fig. 6, which is a diagram of a cam, taken from one side of the carriage, showing how the centre cam is actuated to open and close the groove in which the butts of the needles work, the cam on the opposite side of the carriage being similarly constructed and operated, except to make the reverse movements, as will be explained.

Referring to this illustration, 1 indicates a plate which is rigidly secured to one of the under surfaces of the carriage and on which the centre cam 2 and side cams 3 and 4, are movably placed, the centre cam 2 having the greatest range of movement, and each cam being capable of movement in the direction of their respective arrows. The object of the movement of the centre cam, as mentioned previously, is to close or open the groove between the cams so as to make the needles of that row inoperative and operative respectively. The object in having the cams 3 and 4 to be slightly movable when desired, is to vary the length of the stitch made by the needles. These cams are moved by means of eccentrically placed pins 5 and 6, projecting into the slots 7 and 8 respectively, said pins being operated by hand from the pieces G, as shown in Fig. 1, dials being provided on the outside so that all cams may be set similarly to each other and produce a uniform stitch.

The centre cam 2 may be moved up or down by means of a horizontal slide 9 which is moved sufficiently by the different cam stops on the ends of the needle bed. The centre cam has a pin 10, which is placed in the vertical groove 11 of the stationary plate 1 and also in the oblique groove 12 in the horizontal slide 9, and from which construction it will be seen that a horizontal movement of the slide 9 will cause a movement of the pin 10 in the vertical groove and thus move the cam 2 at the same time. The pins 13 on the plate 1 and the grooves 14 in the slide 9 are used to keep said slide 9 in the proper horizontal position.

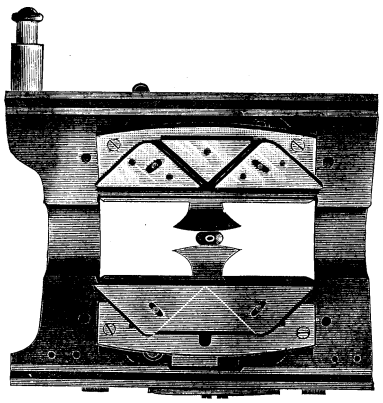


Fig. 3.

The method of making the different stitches will now be explained from the cam outline.

The Rib Stitch. This style of stitch of course requires the use of two sets of needles working in conjunction with each other, for which reason only straight rib work can be made on this machine, as distinguished from tubular rib work. For an exam-

ple, we will suppose that the carriage is moving in the direction of the arrow and that the cam shown is on the far side of the carriage, provided you were facing the machine. The cam 3 has no part in making the stitch when the carriage is moving in the direction indicated, and the needles fit their respective grooves in the needle bed sufficiently tight to prevent their moving except when actuated by the cam, so that the needles will remain inoperative until the point 15 on the centre cam strikes the butts of the needles, then they will be moved upwardly until the highest point 16 of the cam acts upon them, in which position the needles being acted upon, have their latches open to receive yarn in their hooks from the yarn carrier, with their previous stitch resting on the needle below the latch. The needles from each row are actuated at the same time and in coming to the highest position they form a kind of trough in which the yarn is laid, and as the point 17 of the cam 4 comes in contact with the butts of the needles immediately after the yarn is deposited, the needles of each row are pulled down and when they come below the projections on the drop jacks, corresponding to sinkers, the stitches are cast off, thus completing a single operation of making the rib stitch. On the return movement of the carriage, the cam 4 has no part in making the stitch, and the point 18 first actuates the needles to raise them. The point 19 on cam 3 starts the needles down after yarn has been deposited in the hooks and the previous stitch is cast off in the same way as just explained.

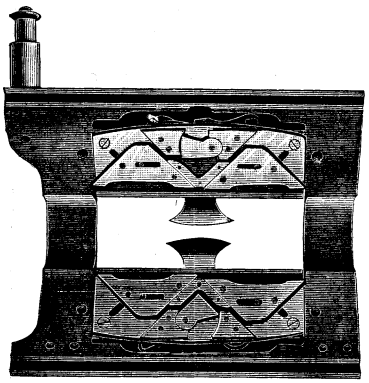


Fig. 4.

The Tuck Stitch. Although this cam can be made to knit a tuck stitch, when it is desired to do a great deal of that work, another cam is used, it being similar to this one, except that the points 20 and 21 on cams 3 and 4 respectively are not so long and besides this, these cams 3 and 4 are capable of a greater range of movement, by means of levers on the outside of the carriage, in the same way as explained.

There are two ways of making a tuck stitch, that is, so far as actuating the needles is concerned. The one explained in circular knitting was to have one set of needles work plain, and to have the other set to move out just far enough to open the latches of the needles without having the loop, which was in the hook, slide behind the latch, in this way casting off two stitches at the same time for every other course. The other way and the one used with this cam is to have one set of needles knit plain, while the other set, instead of not going out far enough for the loop to slip behind the latch, does not pull down far enough to cast off the stitch, although the stitch was behind the latch. On the next course, both stitches are cast off at the same time, thus making the required stitch. It will be seen that more strain is put on the yarn by this latter method, since the loop comes partly on the closed latch, which of course is wider than the body of the needle. The first method of making the tuck stitch can be used on this machine with another style of cam, as will be explained later. For making the tuck stitch on the cam shown, either one of the cams 3 or 4 must be raised to its highest point and the other left down, and for illustration we will consider the cam 4 as raised. The cam on the opposite side of the carriage will of course work plain as usual. As the carriage moves over the needles, the point 15 will start the needles up and yarn be deposited as usual, then the cam 4 will pull the needles down, but owing to its raised position will not pull them down far enough to cast the stitch over their hooks. On the return movement of the carriage, the needles will be moved up and yarn deposited, the other two loops resting behind the latches, and when the cam 3 acts on them, they are drawn down so that the two stitches are cast off at the same time, thus making the tuck stitch. The same operations are repeated and the complete tuck stitch made by the combined forward and backward movement of the carriage.

The Plain Knit Stitch is obtained by using one row of needles at a time and thus we may make tubular work. One row of needles must be inoperative when the other row is working, and to alternately throw one row out of action and the other into action, we have to make use of cam stops for moving the centre cam. The cams on opposite sides are arranged to work oppositely to each other, that is, a cam stop for each cam on the same end of the machine, will throw one centre cam up to close the groove, while the other stop will throw the cam down to open the groove, the same being true at the other end, so that one row of needles will always be working. The method of opening and closing the grooves by actuating the centre cams has been previously explained. The positions of the two cams for this plain knitting are shown in Fig. 3.

The Automatic Drop Locks (see Fig. 4) are only used for making straight work and where both rows of needles are always operated. A variety of stitches may be made with them, such as the plain rib, tuck, and cardigan; and with this style of locks, no cam stops are required, for which reason narrow work may be done without having to give the full sweep to the carriage, as is required when using said cam stops. Another advantage of this style of locks is that the tuck may be made by the first method explained and extra strain on the yarn prevented. The changes necessary to change the style of stitch are made on the pivoted centre cam.

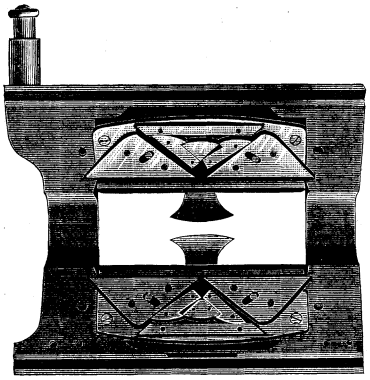


Fig. 5.

The plain rib stitch is made by having the centre cams of both locks held by a lever arrangement in the position shown at the lower side of the illustration.

The tuck stitch is made by releasing one of the centre cams, so that it is free to move, with the other cam held for making the plain stitch.

The action of the cam for making the tuck stitch is automatic and the changes made by the needles themselves. For example, suppose the carriage was moving in a left hand direction, then when the centre cam struck the butts or shanks of the needles, said cam would be pushed down by them, since it is easily moved, and hence the needles would not be raised to their highest possible position, but just far enough

to have the loop open the latch but not slide behind it. On the return movement of the carriage, the butts or shanks of the needles strike the centre cam in its lowered position and raise it as the carriage continues its motion. This brings the needles to their highest possible position and the two loops slide behind the latch, being in turn cast off by the

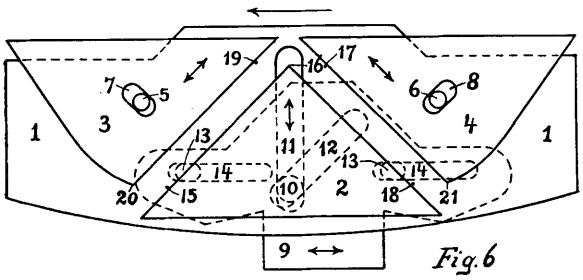


Fig. 6

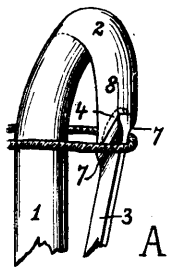
stitch cam. These movements are repeated and the tuck stitch continues to be made by the automatic movement of the centre cam.

The cardigan stitch is made by releasing both centre cams, which then act, as just explained.

The Automatic Tubular Locks shown in Fig. 5, as will be readily understood, are only used for tubular work and no cam stops are required, since the cams are arranged oppositely and while one works with the carriage moving in one direction, the other is inoperative, and vice versa on the return movement of the carriage. (Lamb Knitting Machine Co., Chicopee Falls, Mass.)

KNITTING MACHINE LATCH NEEDLES.

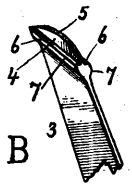
EGLY'S NEEDLE. The object is to provide a needle in which, when the latch is seated in the hook, said latch is laterally sustained in a firm and reliable manner and both its body and pivot are relieved of side strain. This needle consists principally of a hook, a recess in said hook, a latch pivoted to the needle and provided with a tongue adapted to be seated in said recess, said tongue having flanges on opposite sides, said offsets terminating in side walls which converge downwardly on curved lines to the body or side walls of the latch. The flanges are adapted to be flush with the side walls of the hook when the latch is in contact with it; in this manner not only the edges but the sides of said latch and hook forming an unbroken surface, consequently causing no obstruction to the stitch in the act of knitting.



A

The details of the needle are best shown by means of the accompanying illustrations, of which Fig. A is a perspective view of portions of the hook and latch in contact; Fig. B being a detail view of the latch shown in Fig. A. Referring to the illustrations, 1 indicates a knitting machine needle having a hook 2 and the pivoted latch 3, said latch being provided at its upper portion with a tongue 4, having the curved edge 5, while on opposite sides of said tongue are flanges 6, terminating in the rounded portions 7, which are of the same thickness as the adjoining side walls 8 of the hook 2, said rounded portions 7, sloping downward to the body of the latch 3. The hook 2 has a recess in the end, in which the tongue 4 is adapted to enter. The flanges 6 of the latch 3 and also the tongue 4 are made at an obtuse angle with the inside surface of the latch 3, the recess in the hook 2 having a corresponding inclination.

It will thus be seen from the foregoing explanation that by making the outer walls, as 7, of the latch and the other walls 8 of the hook of the same thickness and by curving the outer walls 7 gradually downwardly on each side of the latch, the result will be that when the latch is in contact with the hook there will be no obstruction or sharp edges presented to the stitch or thread, so that the latter will pass freely over the joint between said latch and hook. By making the recess in the hook and providing a tongue on the latch, the material of the hook is not unnecessarily thickened, and at the same time holds the latch laterally without straining it. (Keystone Knitting Machine Co., Philadelphia, Pa.)



B

WOODWARD'S NEEDLE. This latch needle is designed to be used on all kinds of knitting and rib machines, both in the needle cylinder as well as in the dial plate. Different lengths and sizes of needles are used for different classes of work, but the general style of construction is practically the same, and especially the upper portion of the needle, as carrying the latch, the advantages of the construction of the present make of needles over others it is claimed relates more particularly to the means for retaining the latch in the needle whereby the rivet forming the pivot for the latch may be held securely, so that it cannot work loose and project beyond the outer sides of the needle and destroy its usefulness.

The shape of the upper portion of a needle and the method of attaching the latch to said needle are shown by means of the accompanying illustrations, of which Fig. 1 is a side view of the upper portion of a needle, Fig. 2 is a top view of a portion of the needle being partially in cross section, showing the method of inserting the latch pin, and Fig. 3 is a similar view, showing the completed needle after inserting the latch pin.

Referring to the illustrations, 1 indicates the body portion of the needle, having a hook 2 at its top end, and being provided with a slot 3, in which one end of the latch 4 is pivoted on a pin 5, the outer end of said latch being made spoon shaped with a scooped

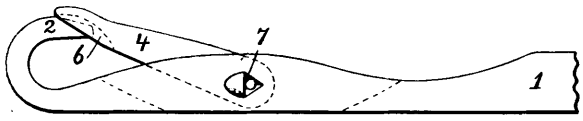


Fig. 1

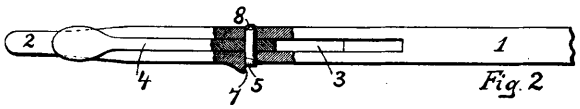


Fig. 2

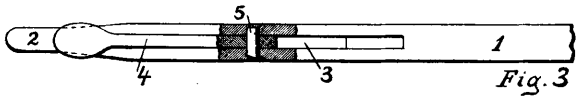


Fig. 3

out portion 6 on the under side to fit over the end of the hook 2. It will be noticed that the portion of the body of the needle back of the latch is cut in somewhat, the object of this being to provide a place for the latch when it is turned back off of the hook by a loop in the hook, so that the portion of the needle at that place will not be excessively large for the loop to pass over, and thus prevent a strain on the yarn. The method of inserting the latch pivot pin 5 in the needle is clearly shown in the cross sectional portions of Figs. 2 and 3, from which it will be seen

that a countersink is made in the needle and the metal from said countersink is pressed back at 7. A hole is then drilled in the needle at the edge of the metal 7 and extends almost through said needle, but leaving a burred end 8. The slot 3 is then cut out and the latch placed in it, then the pin 5 is inserted and the metal 7 beaten back over the countersink, the burred end 8 at the same time being beaten straight, thus the pin is imbedded in the needle, making it more or less impossible for the pin to work loose. (Stephen Woodward, Franklin Falls, N. H.)

ANOTHER LATCH NEEDLE. The object of this needle, besides performing the regular knitting operation, is to prevent the loop, which is on the needle, from being cast off in case new yarn is not deposited in the hook of the needle previous to casting off said previous loop, in this manner preventing "press offs" or lost stitches, and consequent losses in the quality of the fabric made. The details of the needle, as well as its method of operation are shown in the accompanying illustrations, of which Fig. 1 is a cross sectional view through the needle, Figs. 2, 3

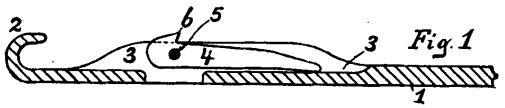


Fig. 1

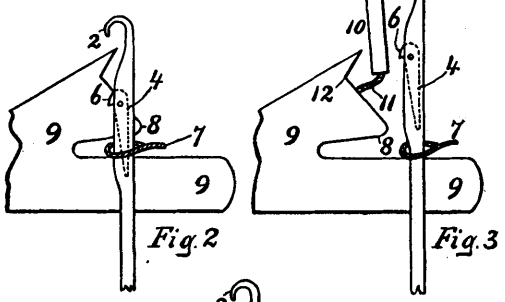


Fig. 2

Fig. 3

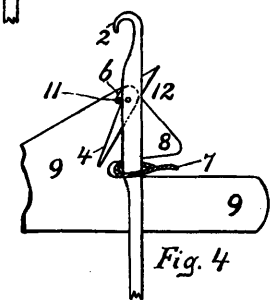


Fig. 4

and 4 being diagrams, illustrating the operation of knitting in connection with a sinker.

The needle is distinguished from others by the construction of its latch. Referring to the illustrations, 1 indicates a portion of the body of a needle, having the regular hook 2, and a slot 3 in which a specially shaped latch 4 is situated, the latter being pivoted in the sides at 5, and resting, when thrown back off of the hook 2, entirely within the slot 3, except a hook portion of it, 6, which projects out from the sides of the needle. With this construction, it will be seen that a loop of yarn which rests on the needle below the latch cannot pass over the hook 2 to be cast off, unless the end of the latch 4 is raised out of the slot 3, so that the loop will slide between it and the body of the needle, and close said latch as the needle goes down.

The latch 4 is raised by means of the new yarn, as will be seen by examining the diagrams Figs. 2, 3 and 4, which show the method of making the stitch in connection with a sinker. Fig. 2 shows the needle in its normal or resting position with the loop of yarn 7 resting on the needle around the lever end of the slot 3. When the raising cam of the cam cylinder reaches the needle, the latter is raised until the latch is clear of the loop 7 as seen in Fig. 3, which is held down by the lower neb 8 of the sinker 9. The sinker is then drawn back to permit the thread carrier 10 to deposit the new thread 11 for a new loop, said thread being laid below the latch hook portion 6. The sinker 9 is then moved forward and by means of its upper neb 12 presses the thread against the needle as seen in Fig. 4. At the same time, the needle descends, and the thread 11, coming into contact with the hook portion 6 of the latch 4, causes the lower end of said latch to move out of the slot 3, which then permits the loop 7 to pass under it, and in turn close the latch as the needle continues to descend. The loop 7 is then cast off, the sinker 9 in the meantime having moved back out of the way of the loop. After casting the loop 7 off, the needle rises again to its normal position, shown in Fig. 2 until the raising cam actuates it on the next revolution. When, however, the feeding thread 11 breaks or is not properly fed to the needle, the lower end of the latch 4 will not be moved out of its slot and consequently the loop will slide over it instead of under, and in turn go again into the hook 5 instead of being cast off over said hook as is done when knitting properly, thus preventing lost stitches, etc. (C. R. Woodward, Nottingham, Eng.)

SPRING NEEDLE CIRCULAR KNITTING MACHINE.

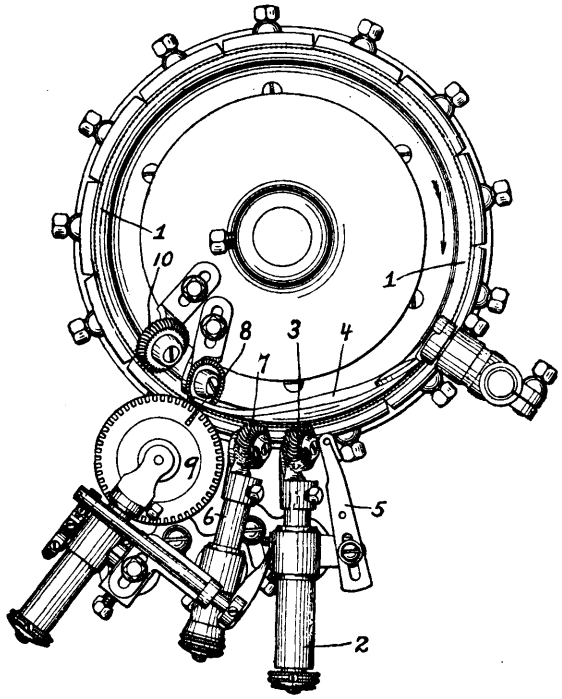
Knitting by means of spring beard needles requires a totally different style of machine from the latch needle machines, since the needles make the stitches in an entirely different manner, as has been pointed out at the beginning of the chapter when explaining the principle of this style of knitting. In this machine, the needles are secured in the needle cylinder and have practically no movement except by the revolutions of the needle cylinder itself. The needles are made to perform the knitting operation by means of burr wheels, situated on the machine, which act on said needles at the proper time, each one to perform its respective duty in the operation, there being one burr wheel to feed the yarn and make preparatory loops of it, also acting on the loops of the newly fed yarn to lower them on the needles below the ends of the spring beards, so that they may go up into the hooks of the needles. At the same time a cloth wheel or other arrangement pushes the web down on the needles, so that the previous loops which were in the hooks may be passed over the spring beards and be cast off over the top of the needles by the succeeding burrs in connection with a presser wheel. The first of these burrs to start the casting off is known as the *landing burr* and acts in conjunction with the presser wheel whose duty is to press the spring beards of the needles inwardly as they come around to that point during their revolution, and allow the landing burr to move the loop over said spring beards, so that the other burr known as the *casting off burr*, can complete the operation of casting off.

Another distinguishing feature of this machine, from the latch needle machine, is that the knitted fabric is delivered upwardly from the needles instead of downwardly, and also that the fabric has to revolve bodily with the rotation of the needle cylinder, which is obtained by having a revolving take-up mo-

tion which is adjusted to correspond in its revolutions to that of the needle cylinder.

The working of the machine, as well as the adjustment of the several burrs on the frame, are best explained by means of the accompanying illustration, which is a top plan view of the principal portion of the machine, showing the positions of burr wheels in the frame.

Referring to the illustration, 1 indicates the needles which are secured in the needle cylinder, said cylinder being positively rotated in the direction of the arrow. Situated without the needle cylinder, on the frame stand is the *feed burr* stand 2, on the inner end of which the feed burr 3 is journaled on a pin, said burr being set at such an angle that the thin



plates or teeth composing the burr will pass separately in between the spaces of the needles as they come around. Owing to the way in which the burrs are built and the angle at which they are set in the machine, the movement of the teeth, while in the spaces between the needles, will be downward and hence any yarn with which they come in contact will be pushed downwardly also. The needles themselves cause the rotation of the burrs. As shown in the illustration, a *push back* 4 is used to press the web down in front of the feed burr 3, although in many instances a wheel is used for that purpose.

Situated just to the right of the feed burr is the thread guide 5 through which the yarn is fed by means of the feed burr to the needles. The teeth of the feed burr, by entering into the spaces of the needles, carrying the yarn in with them, and thus produce enough slack yarn to properly make a stitch without straining the yarn. Located next to the feed burr stand is the dividing wheel stand 6, carrying at its end the *dividing burr* wheel 7, which is placed at a corresponding angle to that of the feed burr 3. It is used to even the loops formed by the feed burr 3.

The burr 8, known as the landing burr, is located within the needle cylinder and is inclined at such an angle that the movement of its teeth, when in the spaces of the needles, is upwardly and thus it serves to move the loops upwardly over the spring beards of the needles, said beards being pressed inwardly at the same time by a *presser wheel* 9, located on the outside of the needle cylinder, in order to allow the loops to pass over them.

The presser wheel plays a very important part in making different kinds of stitches, since by making grooves in its circumference, according to some pattern, certain loops are prevented from being cast off, because certain beards are not pressed in, and consequently the loops on those needles which are not pressed in, when actuated by the landing burr go up again into the hooks of their needles.

In the case of fancy stitches, it is necessary either to have two feeds and two presser wheels or to have the number of grooves in the presser bear a certain rotation to the number of needles in the cylinder, so that the needle that does not cast off its loop on one course, will cast off on the next course, or according to some other pattern, and vice versa for the needle that does cast off; because it will readily be seen that if the same needles cast off every time and certain needles did not, loops would accumulate in the hooks until they could hold no more.

The presser wheel arrangement in this instance consists of two grooved wheels which are actuated so as to produce the desired patterns, or they may make the regular plain work. For plain knitting, a smooth circumference wheel is used, so that every needle beard is pressed, thus allowing all the loops to be cast off at every course. The loops are only carried up a certain distance on the needles by the landing burr 8, the operation of casting off being completed by the casting off burr 10, which is placed at an angle corresponding to the landing burr. These operations complete one stitch and are repeated on each needle for every revolution of the needle cylinder. Where two or more feeds are used on the machine, a corresponding duplicate set of burr wheels and presser are used on the machine. (Charles Cooper, Bennington, Vt.)

AUTOMATIC STRIPING ARRANGEMENT FOR SPRING BEARD NEEDLE CIRCULAR KNITTING MACHINES.

The object of this arrangement is to produce different colored horizontal stripes in the knitted fabric, so as to make any design by a combination of such stripes, the ends of the yarns, after having been used to make the stripe, being cut off close to the fabric. The arrangement referred to in this instance will feed two different colored yarns.

The details of the mechanism and its application to the knitting machine are best shown by means of the accompanying illustrations, of which Fig. 1 is a top plan view of a portion of the machine, showing the striping mechanism attached; Fig. 2 is a side view of the pattern arrangement, also showing the relation of the yarn fingers to the cylinder needles; Fig. 3 is an end view of the mechanism shown in Fig. 2; and Fig. 4 is a side view of the feeding arrangement which is used in connection with the pattern arrangement, to feed the yarn to the needles and cut out the other yarn which is not required when a change is made in feeding the two yarns.

Referring to the illustrations, 1 indicates the bed plate of the machine, and 2 the cylinder carrying the needles 3. The feed burr or stitch wheel is indicated by 4, the landing burr by 5, presser wheel by 6, and cast off burr by 7, the combined action of which performs the knitting operation in the usual manner.

The striping arrangement consists of a pattern wheel 8 which is provided with rows of holes for the insertion of screws, as at *a*, *b*, *c* and *d* to produce a desired pattern.

Pivotally mounted in front of the face of the pattern wheel 8 are three levers 9, 10 and 11 respectively, which are actuated by the screws in the holes

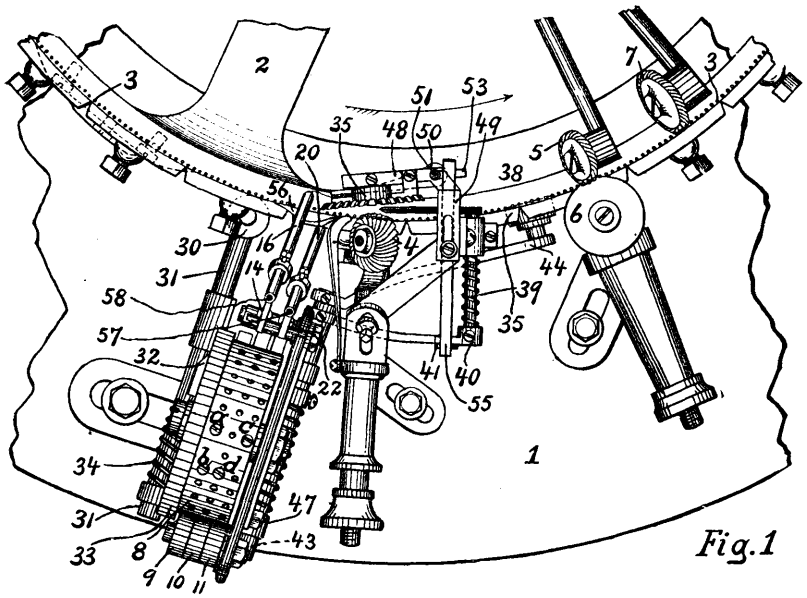


Fig.1

of said pattern wheel. Lever 11 is connected at its lower end to a horizontal rod (not shown), the other end of which is connected to the lower end of a lever 12 as pivoted at 13, the top end of said lever carrying an elbow lever 14 one end 15 of which carries a yarn finger 16 and the other end is provided with a slot 17 in which a pin 18 of the lever 19 works. The lever 10 is connected similarly to the yarn finger 20 through a horizontal rod (not shown), pivoted lever 21, and elbow lever 22 whose slot 23 also has the pin 18 sliding in it. The lever 9 is connected at its lower end to a horizontal rod 24 which has a spring 25 on it which tends to force said rod toward the needle cylinder. The rod 24 and each of the other two horizontal rods, which are not shown, have notches with which a snap catch 26 is adapted to engage. These other two horizontal rods are also provided with similar springs to 25 and tend to force the rods toward the needle cylinder, which would make the yarn fingers occupy the position of the yarn finger 20. The three levers 9, 10 and 11 are actuated from the pattern wheel by having respective projections 27, 28 and 29; projection 27 on lever 9 being slightly lower than the other two so that it may be acted upon first, with the pattern wheel revolving in the direction of the arrow. This is done to enable the rod 24 to raise the snap catch 26 out of the notches of the rods, so that the spring on the rod, which had been moved outwardly by a previous screw on the pattern wheel, may act to place the rod and consequently the yarn finger in its former position, and also to allow a screw which comes around to act on the other lever and push it outwardly. By moving either rod, controlling the yarn fingers, outwardly, causes the respective yarn finger to rise above the needles, and vice versa. Take the pattern arrangement as indicated by the screws *a*, *b*, *c* and *d*, then when the screws *a* and *c* come around, screw *a* will release the snap catch 26 and screw *c* will push lever 11 outwardly, thus raising the yarn finger 16 above the needles as shown in Fig. 2. After the cylinder has completed two courses, the pattern wheel will have brought the screws *b* and *d* into position to act on the levers 9 and 10. Lever 9 will first release the snap catch 26 which will release the rod connected to lever 11 and permit its spring to return it to its normal position, *i. e.* with the yarn finger 16 below the needles. The screw *d* will next act on the lever 10, which action will throw the yarn finger 20 up above the needles. The pattern can of course be regulated as to size of stripes by arranging the screws the desired distance apart on the pattern wheel.

The pattern wheel receives its motion from a special cam on the needle cylinder through the truck 30, rod 31, pawl 32 and ratchet 33, said rod 31 having a spring 34 on it which always moves the rod forward to be acted upon again by the cam on the needle

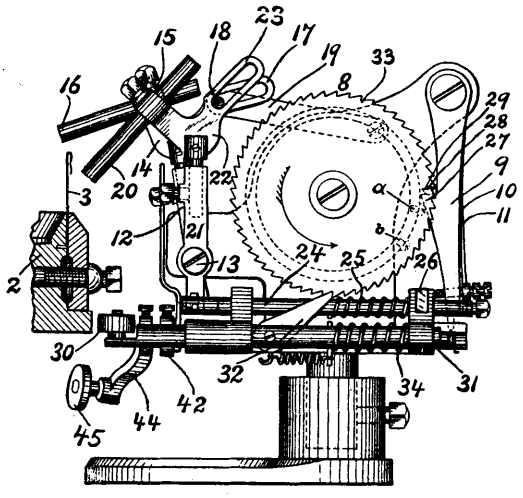


Fig.2

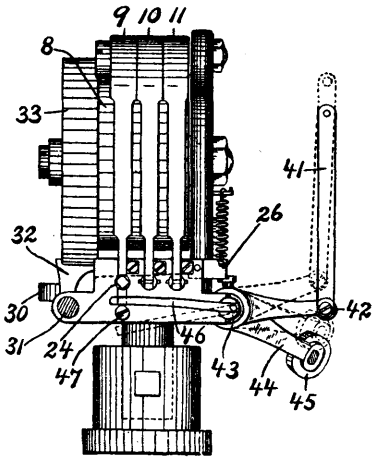


Fig.3

cylinder. The surface of the cam is made so that after said cam strikes the truck 30, the latter will remain at rest for a short period of time and during

this time both the yarn fingers 16 and 20 will be in operative positions to deliver the yarn to the needles to form the splice or joining. This splice will be very short and may be regulated by adjusting the cam on the cylinder.

The feeding arrangement is another important point to consider in the mechanism, since by means of it the yarn is guided to the needles and cut out at the proper time. This arrangement manipulates the yarn after it leaves the guide fingers and consists principally of a guide wheel 35 which is loosely journaled and revolves by means of its frictional contact with the web 36, the object of said guide wheel being to guide the yarn, which is to be cut out, into its proper place, that is, to the shearing and clamping devices. The shearing device consists of one stationary blade 37 and a movable blade 38 secured on the end of a shaft 39 to the other end of which is secured an arm 40. This arm 40 has connected to it a vertical rod 41, the lower end of which is attached to a lever 42, this last lever being secured to a shaft 43 which also carries a lever 44 with a roll 45. On the end of shaft 43 is a pivoted lever 46 resting on top of a screw 47 and thus holds the shaft 43 from turning, which is its tendency to do, through a spring on its shaft. The shears are thus kept closed until the lever 46 is moved off of the screw 47.

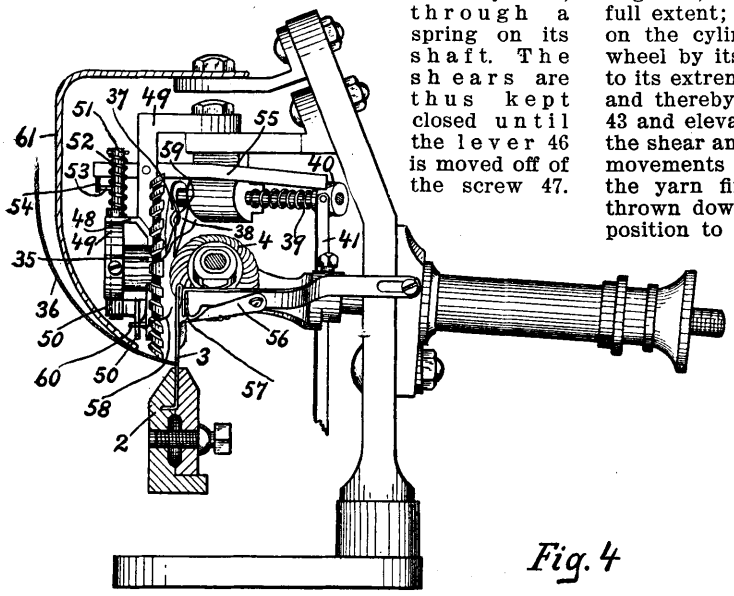


Fig. 4

The lever 46 is controlled by the lower end of lever 9, so that when said lever 9 is actuated by a screw on the pattern wheel, the lever is moved off the screw 47 and the spring on the shaft acts to open the shears through the levers previously explained.

The clamping or holding device for the yarn consists of a stationary piece 48 on the bracket 49, and a movable piece 50 on the lower end of a rod 51 having a spring 52 which tends to keep the two clamping pieces in contact. The rod 51 is provided with a projection 53 and against which a piece 54 on the end of a pivoted lever 55 presses to keep the clamping pieces out of contact with each other at the proper time. The other end of lever 55 rests on arm 40 and when the latter is raised, the piece 54 will press against the projection 53 and thus open the clamp. A specially shaped yarn guide 56 is used, so that the yarn can enter and leave its eye easily when being manipulated by the other arrangements.

The operation of the entire mechanism: To illustrate this point let us consider that a yarn 57, which runs through the yarn finger 20, is being knitted; while yarn 58, which runs through the yarn finger 16, is held in the yarn holder 48, 50. Assuming now that the pins on the pattern wheel are set to change the yarn, when the lifting surface of the cam on the needle cylinder engages the truck 30, the lever 9 will be actuated sufficiently to release the horizontal rod and throw the yarn finger 16 down to a position similar to that occupied by the yarn finger 20. This will result in bringing the yarn 58 between the needles and on the top of the arm of the yarn guide 56, and this yarn 58 will be carried along by the needles to the stitch wheel and knitted conjointly with the yarn 57, thereby forming the splice. This joint knitting will only be accomplished by three or four needles. The lifting surface of the cam on the needle cylinder will now engage the truck 30 and still further rotate the pattern wheel, which will result in lifting the yarn finger 20 to throw the yarn 57 out of action and inside the cylinder, and the guide wheel 35 will then engage this yarn 57 and by its rotation will guide it into the holder and between the blades of the shears. It must be here stated that the movement of the pattern wheel, which results in throwing down the yarn finger 16, does not move the lever 9 outwardly to its full extent; but when the higher surface of the cam on the cylinder engages the truck 30, the pattern wheel by its further rotation moves the lever 9 out to its extreme limit, thus releasing the snap catch 46 and thereby permitting the spring to turn the shaft 43 and elevate the link 41, which elevation will open the shear and also the yarn holder, and these opening movements occur simultaneously with the lifting of the yarn finger 20. When the yarn finger 16 is thrown down, the yarn 58 will also be brought into position to be engaged by the guide wheel 35, and this yarn will also be guided by the wheel between the blades of the shear, the several parts being so arranged that this yarn will reach the shears just as they are opened. The yarn 58 will therefore enter between the blades of the shear in advance of the yarn 57 and 58, which by this time will have been released from the holder 48, 50, will pass up the blades of the shear into the recesses 59. The continued revolution of the cylinder will now bring a cam into position to act on the truck 45, which will result in depressing the arm 44 and rotating the shaft 43 to bring the snap catch 46 back into locking position. The arm 42 will likewise be depressed, which will result in pulling down on the link 41, and thereby rotating the shaft 39 to close the blades of the shear and sever the yarn 57 while the yarn 58, by reason of its lying in the recesses 50, will not be cut. Simultaneously with the cutting action, the outer end of the lever 55 will be free to drop and the spring 52 free to exert its power to move the plate 50 toward the plate 48, and thereby close the yarn holder and clamp the thread 57. As the cylinder continues its movement, the loose end of the yarn 58 will be drawn through the recesses 59 in the shear.

In order to prevent the yarn between the plates 50 and 48 from winding around the hub of the guide wheel 35, a pin 60 is provided, which projects from the plate 48 through an opening or slot in the plate 50.

In order to keep the knitted cloth 36 out of contact with the bracket which supports the guide wheel and yarn holder, a shield 61 is provided. (Chas. Cooper, Bennington, Vt.)

JOINING FABRICS IN "SECTION-FLAT-RIB-KNITTERS."

The object is to produce a smooth, neat edge to the various sections of fabrics knitted side by side in these machines. For this purpose, the fabrics as joining, are united by a connecting thread, which later on, after the fabrics have been removed from the machine, is detached therefrom, by pulling one end of the same transversely of the sections of knitted fabric, and when thus withdrawn, leaves the adjacent ends of said sections with smooth, neat edges, said sections of knitted material being used afterwards in the manufacture of underwear, etc., etc.

Referring to the accompanying illustrations, Fig. 1

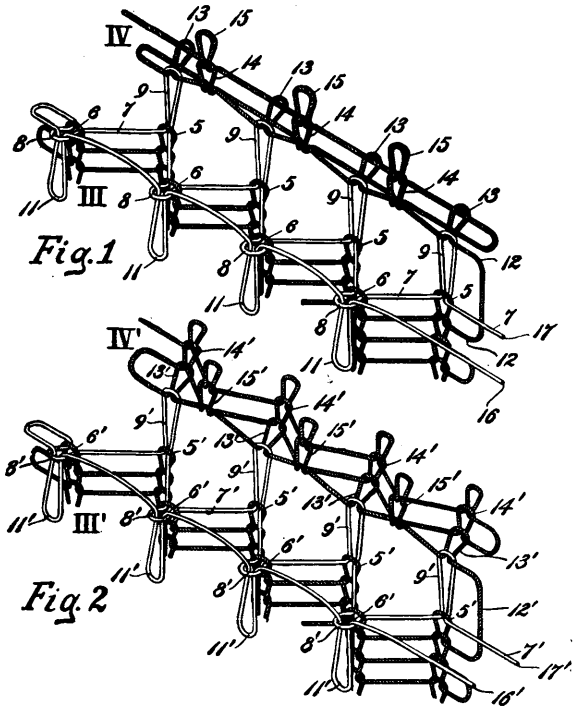


Fig. 1

Fig. 2

is a perspective view, illustrating one method of thus joining two sections of fabric, Fig. 2 showing another method.

With reference to Fig. 1, the two sections of fabric thus to be knitted together are indicated respectively by numerals III and IV. Examining the illustration more particularly, we will see that the final loops upon opposite faces of the one-and-one rib knitted fabric III are indicated by numerals 5 and 6 respectively. 7 is the connecting thread which extends laterally across said sections of knitted fabric from right to left, passing through the final loops 5 and 6 of said fabric III alternately, and forming one course of a one-and-one rib fabric, the loops 9 of said connecting thread extending through the final loops 5, and the loops 8 of said connecting thread through the final loops 6. After arriving at the left hand side of the fabric III, the connecting thread 7 returns, forming one course or series of elongated loops 11, which extend through the loops 8, previously formed by said connecting thread in passing from right to left of the fabric.

The fabric IV is formed by the yarn 12, which is a continuation of the yarn forming the fabric III, as seen at the right hand side of the illustration, and as said yarn passes across the fabric from right to left thereof, it forms in the first course the primary loops 13, which extend through the loops 9 of the connecting thread 7. Upon its return movement from left to right, the yarn 12 forms a second course or series of loops 14, and in returning again from right to left a third course of loops 15, extending through said loops 14, thus forming the regular single loop or plain fabric. The fabric IV is knit for two or three courses with a single loop, and then a one-and-one rib knitted fabric.

With reference to the style of joining two series of one-and-one rib fabrics, as shown in connection with Fig. 2, fabric III′ is joined to fabric IV′ by connecting thread 7′, which in passing from right to left across the fabric forms a course of one-and-one rib fabric passing through the loops 5′ and 6′, forming loops 9′ 8′ upon opposite faces, respectively, of the fabric III′. Upon its return, from left to right, the connecting thread 7′ forms a second course, consisting of long loops 11′, which extend through the loops 8′ previously formed by said connecting thread in passing from right to left of said fabric. The yarn 12′ forming the fabric IV′ is a continuation of the yarn forming the fabric III′, and passing from right to left of the fabric, forms in its first course primary loops 13′, extending through the loops 9′ of the connecting thread 7′, and upon returning from left to right the yarn 12′ forms in its second course a one-and-one rib fabric with loops 14′ and 15′ upon opposite faces, respectively, of the fabric IV′.

It will be noted that the free ends 16 and 17 of the connecting thread 7 with reference to fabric structure shown in Fig. 1, as well as the free ends 16′ and 17′ of the connecting thread 7′, with reference to fabric structure Fig. 2, terminate both upon the same side of the fabric. In removing the connecting thread 7 from the two sections of knitted fabric which it joins together, the free end 16 is first drawn toward the right, Fig. 1, and the loops 11 are withdrawn one after the other from the loops 8 from the right to the left hand side of the fabric. The free end 16 is then passed over to the left hand side of the fabric, and drawn toward the left, thus pulling the loops 8 through the loops 6 until all of the loops 8 are withdrawn through the loops 6 from the left to the right of the fabric. Upon continuing to pull upon the free end 16 toward the left, the loops 9 are drawn up against the under side of the loops 5 until the connecting thread from one side to the other is practically straight and the loops 13 are drawn by the loops 9 up against the loops 5. The connecting thread being now practically straight, from one side to the other of the fabric, is easily withdrawn by a continuation of the pull toward the left upon the splicing thread, thus entirely disconnecting the fabric III from the fabric IV, the loops 13 forming the primary loops of the fabric IV and the loops 5 and 6 forming the final loops of the fabric III. The removing of the connecting thread 7′, which connects fabrics III′ and IV′ (see Fig. 2) is substantially the same as thus described in removing connecting thread 7, as connecting fabrics III and IV. (Charles Cooper, Bennington, Vt.)

RIBBED KNITTED FLEECE LINED FABRICS,

i. e. Ribbed Knitted Fabric Structures Having a Loop-pile Surface Formed for the Purpose of Permitting the Raising of a Superior Nap on the Goods Afterwards.

In this new structure of knit fabrics, the loops which form said pile surface are formed by one of the strands of a compound knitting yarn, this structure being an improvement over the method until now practiced and where the pile surface is obtained from a supplementary yarn engaging with the ribs formed

by said main knitting yarn or yarns, a structure which however always resulted in a comparatively inelastic fabric.

When in knitting a plain fabric an elongated loop is cast off of a needle of the machine, together with a loop of ordinary length, both loops will be thrown to the back of the fabric; but in knitting a ribbed fabric the simple elongation of the loop of one strand of the compound knitting yarn would result in the casting of said elongated loop between the front and back ribs of the fabric, so that it could not be acted upon by the card clothing of the napping machine in the after process of finishing the goods.

To overcome this disadvantage we find in the new structure one or more of the strands of the compound knitting yarn projected between the ribs of that face

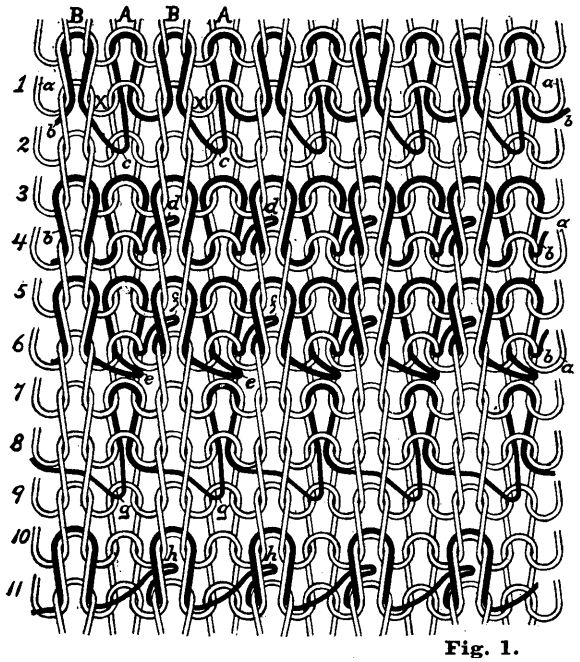


Fig. 1.

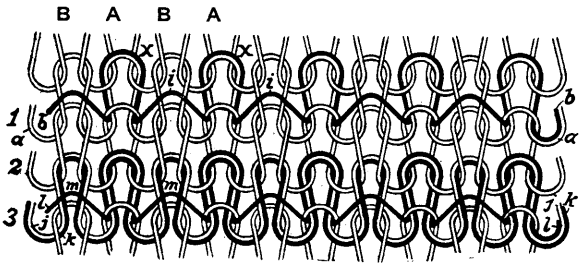


Fig. 2.

of the fabric selected for the pile surface, so as to form loops extending beyond said ribs, and whereby said loops can be properly napped in the process of finishing the goods, without injury to the body ribs of the fabric. The machine used for producing the new structure is such as has its sinkers so arranged that they can act upon one of the strands of the compound knitting yarn without acting upon the other strand or strands of the same.

In order to explain the new fabric structure the accompanying two illustrations are given, representing on an exaggerated scale, in outlines, pieces of regularly rib knitted fabric, showing, in full black, various ways of interlacing one of the strands of a compound knitting yarn as introduced specially for the formation of pile or fleece to the fabric during finishing (napping) the goods.

Numerals of reference in both illustrations (1 to 11 in Fig. 1 and 1 to 3 in Fig. 2), as will be readily understood, indicate successive courses of loop-formation in the structure, and letters of reference A and B, the respective ribs—Face and Back—characteristic to plain ribbed knit goods (see Fig. 12 on page 191 explaining the principles of knitting.) The stitches in the ribs A are drawn in one direction or to one face of the fabric and the stitches in the ribs B are drawn in the opposite direction or to the other face of the fabric, the yarn in the sinker-wales X extending from ribs of one face of the fabric to ribs of the other face, the same as is practiced with common plain ribbed knit fabrics.

As mentioned before, a compound knitting yarn however is used in connection with the new structure, the minor threads of said compound thread being indicated by letters of reference *a* and *b* respectively, and of which *a* (shown in outlines) refers to the regular yarn, as required for the plain ribbed structure, and *b* (shown in full lines) to the additional strand of the compound thread, either thread (*a* and *b*) being controlled by independent yarn guides or one guide with two feed holes, so that one strand can be acted upon independently of the other.

With reference to the first course of loop formation shown in the illustrations (see 1 in Fig. 1) the strand *b* is projected from the compound yarn where the same forms sinker-wales X so as to form loops *c*, which project outwardly beyond the ribs B in order that they can be readily napped during finishing the goods, and without injury to the knitting yarn constituting the said ribs, these loops being formed by applying the strand *b* of the knitting yarn to a projecting sinker in its course from the needle which produces the rib B, to the needle which produces the rib A.

In course 4 of the fabric structure shown in Fig. 1 the strand *b* of the knitting yarn is projected so as to form loops *d* on the opposite face of the fabric from that on which the loops *c* are formed, the operation being the same except that the sinkers draw the loop in the opposite direction from those which formed the loops *c*.

In course 6 of the fabric structure shown in Fig. 1 the formation of loops on both faces of the fabric is given, viz. *e* and *f* respectively.

In course 8, Fig. 1, the loops 9 as formed from the strands *b* of the knitting yarn do not form stitches in the ribs B of the fabric, the yarn guides in this case being so arranged that the guide which controls the strand *a* will feed the same to both sets of needles; but the guide which controls the strand *b* will feed the same only to the needles which produce the ribs A and to the sinkers, this strand passing behind or out of the path of the other set of needles, which produce the ribs B in the fabric.

In course 11 Fig. 1, the strand B of the knitting yarn forms loops *h* without forming stitches in the ribs A of the fabric. The yarn guide controlling strand *b* in this case feeds said yarn to the needles which form the ribs B in the fabric and to the sinkers, but lays said strand *b* behind or out of the path of the needles which form ribs A in the fabric.

A compound knitting yarn otherwise disposed, as in courses 8 or 11, as thus explained, may be caused to form loops on both faces of the fabric by subjecting its strand *b* to the action of sinkers disposed in every one of the spaces between the needles instead of only in every other space.

In course 1, Fig. 2, the loops *i* overlap ribs B instead of being drawn out between the ribs A and B.

In course 3, Fig. 2, is shown a similar fabric, in which, however, each compound yarn is composed

of three minor strands *j*, *k*, *l* instead of two strands, the strand *l* being the one which forms the loops *m*.

With reference to illustrations given it will be readily understood that whatever pattern used (of those seven illustrated) in practice the compound knitting yarn will usually be employed in every course in order to produce a uniform fabric, the single diagrams being given for sake of clearness.

This mode of producing a suitable surface for an improved nap in the finishing to knit goods, and thus shown in connection with a plain ribbed fabric, is also applicable to knitted fabrics in tuck stitch, the location and disposition of the fleecing loops in the latter case not varying materially from those shown in connection with illustrations given. (Scott & Williams, Phila., Pa.)

THE SCOTT & WILLIAMS LOOPING AND SEAMING MACHINE.

This machine is made with or without the elastic stitch attachment, and is designed for the joining or seaming of knitted fabrics, like the toes of seamless hosiery, heels and toes of regular made hosiery, as well as rib cuffs and bottoms for Balbriggan underwear. The machine is also used for the seaming of sweaters, and attaching of sweater necks, etc., and is most simple in its construction and operation, it being similar to a chain stitch sewing with the addi-

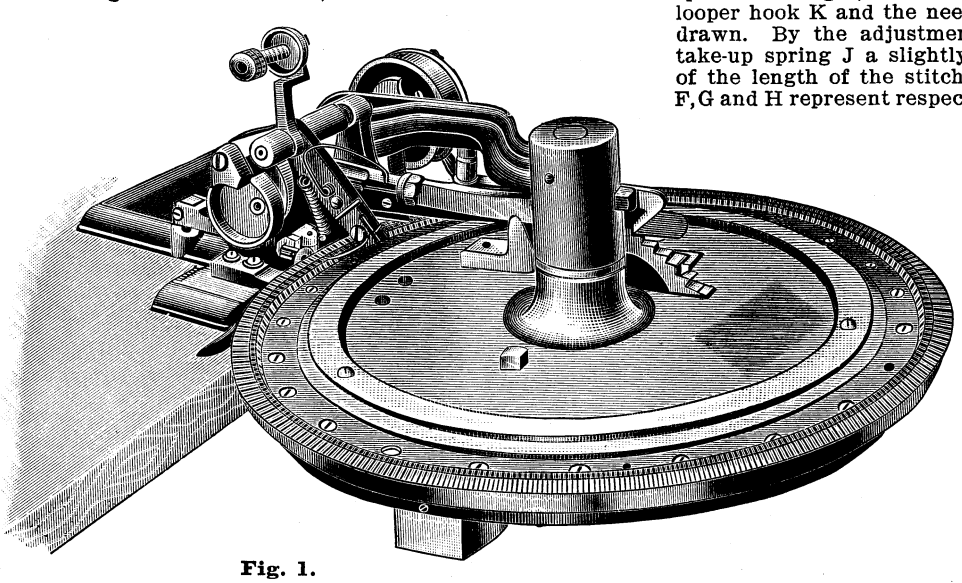


Fig. 1.

tion of the points upon which the fabric to be joined is set, thereby insuring the proper fastening of each stitch. The seam made on this machine is very small and elastic.

The construction and adjustment of the machines will be readily understood from the accompanying illustrations, of which Fig. 1 is a perspective view of this looper. Fig. 2 represents a sectional view of the bed plate and point ring. Fig. 3 represents a side elevation of all the working parts of the machine, and Fig. 4 a plan and side elevation (enlarged) of the points upon which the fabric is set for seaming.

In Fig. 2, A indicates the looping points, B the clamp plates, and C the clamp screws, for the replacing of broken or defective points. D represents a friction clamp, which is used to avoid the point ring from being easily moved out of alignment with the needle by the operator when putting the fabric on the points.

With reference to Fig. 3, E represents the sewing thread tension of the machine, and which should be always sufficiently tight to draw the loop tight enough to clear looper hook K after it has been cast off from it. The tension or take-up spring J draws the loop or stitch tight, after it has been cast off the looper hook K and the needle L has been withdrawn. By the adjustment of the tension or take-up spring J a slightly variable tightening of the length of the stitches may be obtained. F, G and H represent respectively the needle arm and its eccentric, also the cams and looper hook arm. All these parts are permanently adjusted on the machine before it leaves the works, hence no further reference to it is required. Looper hook K is adjustable, both in a horizontal and vertical position; the vertical position should be such as will permit the needle to enter the hook central between the tongues, whereas the horizontal position should be such as will permit the top tongue of the hook to take the thread from the needle about ¼ of an inch back of the eye, the needle L being adjustable for this purpose. I is a rack, having a suitable number of teeth to suit the gauge or number of points in the machine. It is adjustable on its shaft,

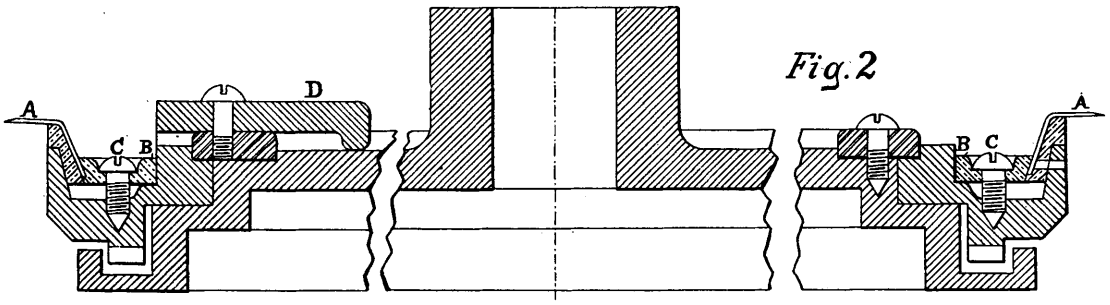


Fig. 2

so that the points can be set to index with the needle, a feature necessary with machines of this kind.

M, N and O represent an elastic stitch attachment which can be applied to any make of machine, the

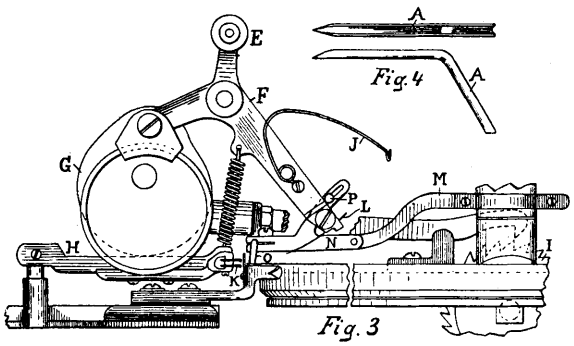


Fig. 3

Fig. 4

same consisting of a bracket M, which is clamped to the centre post of the machine. N is a pivoted lever, in which is set a stitch finger O, which being in the path of the thread, has the loop formed around it at the same time the stitch is through the loops. This finger remains in the loop until the needle arm F has nearly completed its movement, and when arm F comes in contact with stud P in arm N, it raises the finger O out of the old stitch prior to forming a new stitch.

Loopers are built in one size only, the number of points per inch varying to suit the gauge of the knitted fabrics to be looped or seamed. The following gauge and number of points will be found the most suitable for a general line of work:

16	to	20	needles	per	inch	= 20	point	loops.
14	"	17	"	"	"	= 18	"	"
11	"	15	"	"	"	= 17	"	"
10	"	12	"	"	"	= 16	"	"
8	"	10	"	"	"	= 14	"	"
7	"	9	"	"	"	= 12	"	"
6	"	8	"	"	"	= 10	"	"
5	"	7	"	"	"	= 9	"	"
4	"	6	"	"	"	= 7	"	"

The speed of machine should be equal to the skill of the operator, the production varying according to the gauge, from 30 to 100 doz. per day. (Scott & Williams, Philadelphia, Pa.)

SCOTT & WILLIAMS' FINISHING MACHINE

For Automatically Festooning and Taping Ladies' Undergarments at the Necks and Arms.

Of the accompanying illustrations, Fig. 1 shows this machine in its perspective view, Fig. 2 a garment finished by the machine. Production of finished necks and arms in connection with this fabric is 35 doz. per day of 10 hours, whereas if dealing with fabrics requiring the finishing of necks only, 100 doz. per day of 10 hours can be produced.

The machine automatically inserts the tape as the bars are formed and attached to the garment. This finish has many advantages over the old method of sewing the previously made lace to the garment, both as to cost and durability, as well as the appearance of the garment when finished.

The construction of the machine and its operation are best described in connection with Fig. 1, which is a regular twin needle, zig zag upon which is placed the festooning and braid attachment, as shown in detail in Fig. 3. In the latter illustration, A represents the needle bar, with its head, having two needles fitted therein, which are threaded and tensioned in the usual manner. B represents the bar lever, which forms the bars through which the tape is threaded, this lever being threaded with a chained thread, made from the regular knitting yarn, or an extra heavy plain yarn as desired. C represents the festooning lever, threaded the same as lever B. This lever is arranged with two thread holes, so that various colors or threads can be used for tipping the festoon edges with silk, and various effects can be produced by the arrangements of the threads. All of the threads in levers B and C should be put under a slight tension by the attachment supplied to the machine for this purpose. Levers B and C are operated by grooved cams, which are pinned to their shafts, no changes or adjustments being necessary.

D indicates the braiding attachment for inserting the braid as the bars or lace are attached to the garment, the braid finger E receiving its braid from a spool mounted on a spindle under the machine table and should be slightly tensioned to avoid the sewing of the braid to the garments.

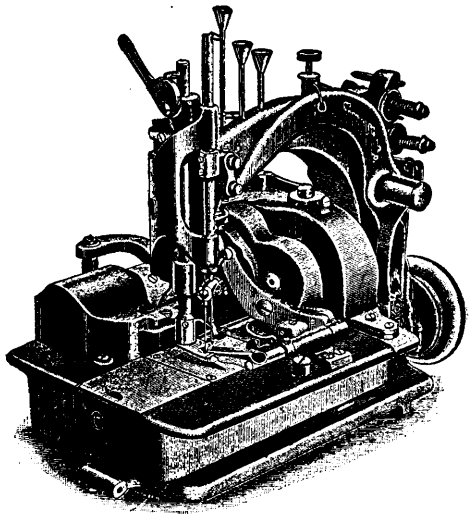


Fig. 1.

The operator feeds the garments to the machines in the usual manner, until the edging has been sewed

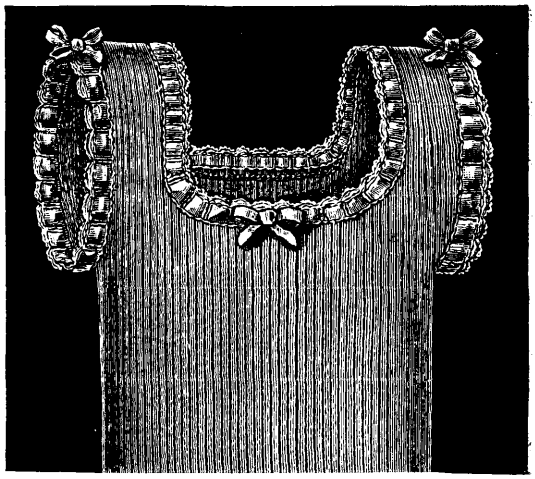


Fig. 2.

around the entire neck or arm hole, passing from under the presser foot of the machine at this point.

The operator then stops the machine and cuts the festoon apart, allowing the tape to be drawn through the machine sufficiently long to enable the operator

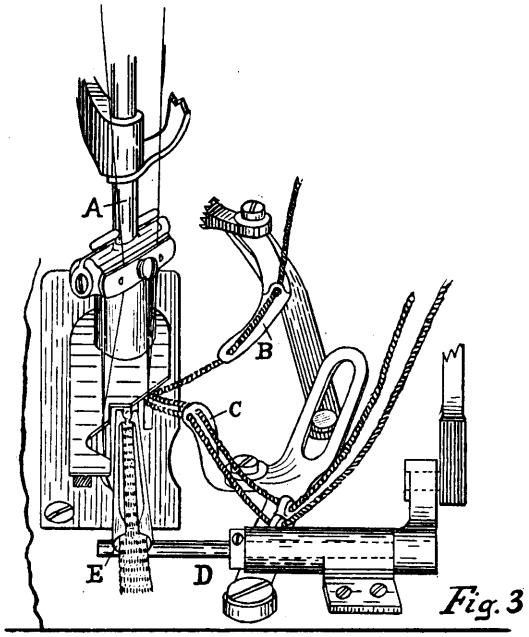


Fig. 3

to tie the ends of the tape into bow knots at the top of the garment, in the arm holes, and the front of the garment at the neck.

The converting of the knitting threads into chain threads, for use on this machine, is done by an ordinary Chain Machine. (Scott & Williams, Philadelphia, Pa.)

SCOTT & WILLIAMS' NECK SEWING AND CUTTING ATTACHMENT.

This attachment to sewing machines is designed for the automatic cutting and sewing of necks of knit underwear in one operation, thereby effecting, as will be readily understood, a considerable saving of labor, besides increasing the production. There is also less confusion in the new method of cutting and sewing the necks owing to the fact that two separate operations are dispensed with.

The machine is quite simple in its construction and operation, one operator being able to cut and sew from 125 to 150 doz. necks per day of 10 hours. The necks of the garments are marked in the usual way, some mills using for this work a power stamping machine, while others prefer the hand marking templet to mark the size and shape of the neck on the goods. Thereupon the goods are taken to the sewing machine, which completes the neck in one operation, thus saving the cost of the sewing by the single needle machine, and the cost of the cutting of the neck, which has always been a hard operation, requiring great skill. The new method also gives a neater finish owing to the fact, that it is impossible for an operator to fail to cover the raw edge when the cutting and sewing is done in one operation. The attachment can be applied to any twin needle flat bed machine of the Union Special Sewing Machine Company's type.

The adjustment of the attachment to suit the cloth to be operated upon is best described by means of quoting letters of reference in the accompanying illustrations, and of which Fig. 1 is a perspective view of the entire attachment, less the throat plate and presser foot. Fig. 2 is a side view of the upper and lower knives with fabric guard. Fig. 3 is a plan view of the knives and their relation to the feed dog. Fig. 4 is a plan view of the throat plate, showing the fabric diverter, for diverting the loose fabric from the path of the needle. Fig. 5 is a plan view of the knives and their lever. Fig. 6 is an end view of the fabric guard and its bracket, which is fastened to the front of the cloth plate.

Fig. 7 shows the completed shirt minus sleeves (more particularly given to show the completed neck), and Fig. 8 is a detail of the neck portion of this shirt (enlarged, compared to Fig. 7) showing the circular flap A as cut out (see B) of the material C sewed onto (*i. e.* reënforcing) the back portion of the shirt. Letters of reference *a* and *b* in Figs. 7 and 8 indicate corresponding portions in the shirt, *c*—*d* indicates the line on which the top of the shirt is sewed, the front portion of the shirt being shown turned back.

The top or movable knife A is shown in Fig. 2 at its highest position, prior to cutting the fabric. B represents the stationary or bottom knife, which should be set level with the top of the throat plate shown in Fig. 4. C represents the deflector, which is adjustable, as shown in Fig. 1, in combination with parts I and K, and of which I represents a lever, which through the deflector C can be adjusted to any one of three positions, it being understood that this member is employed to stop the cutting operation, and is also used as a gauge for the cutting of light Balbriggan fabrics. The deflector C is shown in all the illustrations as being set to its central position, suitable for light or Balbriggan fabrics, the forward throw of lever I, Figs. 1 and 6, raising the deflector C to such a position that all the fabric passes over the top of the knife A, thereby avoiding any cutting of the fabric. This is necessary, since an operator is sometimes called upon to re-sew a garment that has been previously cut around the neck by the machine,

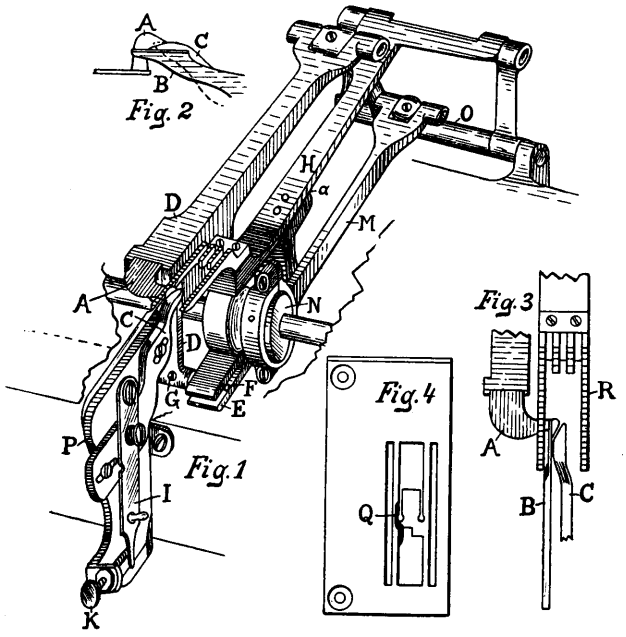


Fig. 2 Fig. 1 Fig. 4 Fig. 3

or where the machine has been running with a broken sewing thread.

When the lever I is put back to the extreme out-

ward position, by raising the lever I clear from the adjusting screw K in Figs. 1 and 6, the deflector C is at its lowest position, suitable for heavy fleece fabrics.

The adjusting screw K in Figs. 1 and 6 is used for setting the deflector C to a suitable position for light or thin fabrics, thus enabling the operator to finish any weight of garments at will; the best method of obtaining this adjustment being by sewing a small piece of waste fabric before commencing on a garment.

If the deflector C is too high, the knife will fail to cut; if too low, both layers of fabric will be cut.

The knife A is pointed, since it is necessary for it to pierce the fabric when a garment is first placed in the machine, the point of the knife A being somewhat lower than its back. When cutting one layer of fabric, the other will be entirely clear of the cutting point.

D in Fig. 1 represents the knife lever, upon which the movable knife A is mounted, this lever having both a vertical and a horizontal movement, giving the top knife A, a regular shearing motion. The vertical motion is obtained through the slotted bracket E, Fig. 1, mounted on the feed dog lever H at *a*, Fig. 1; the horizontal movement being obtained by the aid of the eccentric N and levers M and O, Fig. 1. The timing of the eccentric N should be opposite to that of the regular feed dog eccentric. Lever D, Fig. I, is connected to a bracket E by means of an eccentric stud F, held securely by a small screw G.

The bottom knife B is mounted to the deflector bracket P, as shown in Figs. 1 and 6, which in turn is securely mounted on the cloth plate of the machine, as shown at L in Fig. 6, in section.

Fig. 4 represents the throat plate of the machine, upon which is mounted a diverter Q for diverting one edge of the fabric out of the path of the needles, so that the backing of the neck of the garment only is sewed.

Fig. 3 shows the relative positions of the top and bottom knives A and B, with their cutting edges together, also the position of the deflector C, which should be as close to the knife A as possible, without actual contact. R represents the feed dog for feeding the fabric.

Review of general adjustment: See that all screws in the machine are secure, adjust the sewing in the usual way as the attachment requires no special

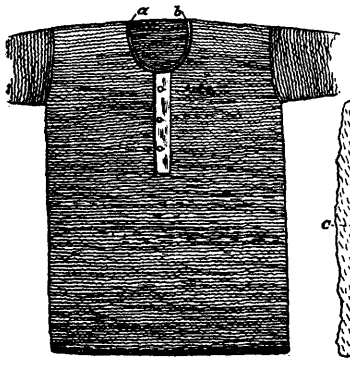


Fig. 7

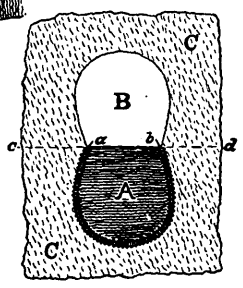


Fig. 8

adjustment in relation to the sewing parts. Set the knife A securely to lever D, set deflector C to its lowest position, try the cutting by using a heavy piece of fabric, two ply, in the same manner as a garment is sewed. If the knife is too high, both layers of fabric will be cut, if too low, neither layer will be cut; correct adjustments can be quickly made by turning the eccentric stud F in lever D (see Fig. 1.) See that the eccentric holding screw G in lever D is secured after each adjustment. After these adjustments are made, set the deflector C to

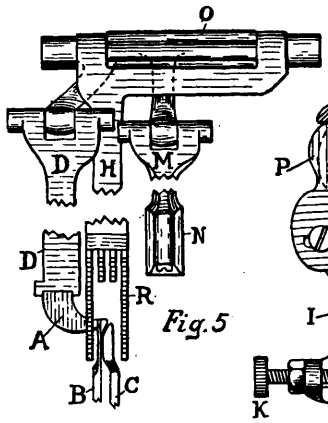


Fig. 5

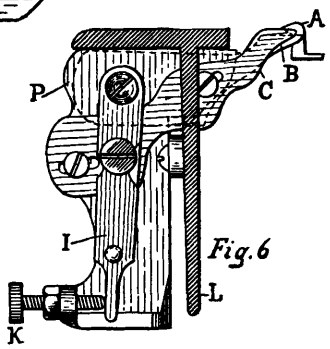


Fig. 6

its central position, as shown in Figs. 1 and 6 by lever I. Then try the lighter fabric you wish to operate upon, adjust the screw K (Figs. 1 and 6) until one only of the two layers of fabric is cleanly cut, whereupon the machine is ready for use. (Scott & Williams, Philadelphia, Pa.)

THE MERROW SYSTEM OF ORNAMENTING FABRICS.

The Merrow System of Crocheting and Overseaming machinery and methods for finishing or ornamenting the raw or cut edges of textile fabrics has been in use for several years and includes many unique machines and results.

As the name implies, the finishes are after the order of those frequently made by hand crocheting and some of them are really the same as hand work, while others are similar but more elaborate.

The machines are in general much like sewing machines and the fabrics are handled by the operator in substantially the same manner as work is handled upon an ordinary sewing machine. All of the machines, however, are of special design and construction, adapted to their peculiar purposes and needs, and are built expressly for continuous operation at high speed in factories.

Single Thread Finish. Some of the finishes are made from a single thread which is carried through the fabric near the edge and interlooped along the edge alternately from either side of the fabric. This finish seems to be especially adapted to protecting and ornamenting heavy blankets and has been generally adopted for use upon the edges of horse blankets.

Fig. 1 is a perspective view of such a single thread crochet machine as made for this purpose, and which is usually provided with a hemmer which folds or doubles over the edge, and the crochet finish extends deep into the fabric including and covering the hem, making a heavy substantial edge with the minimum expenditure of covering material. These machines are built to run as rapidly as an expert operator can properly handle the blankets; therefore the production is very great, and the total cost of finishing is reduced to the minimum.

Two Thread Finish. Another class of the Merrow machines is especially designed for producing the two thread, double loop finish in which the needle

thread is interlooped in double loops together with a supplemental thread along the edge of the fabric, producing a substantial and ornamental finish which

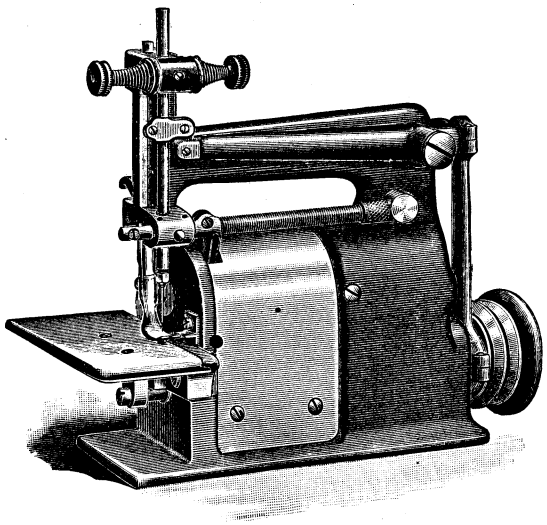


Fig. 1.

may be varied in elasticity to suit the work by varying the tension and size of the supplemental thread, and the appearance may further be varied by the use of a supplemental thread of contrasting shade or color. When desired the single thread finish can be made by the machines of this class by simply dispensing with the supplemental thread.

The machines of this class are made in two principal varieties, viz.: those making the plain finish where the work is fed intermittently at every stitch, and the other making the scallop or shell stitch finish, both of which resemble, but are improvements upon, hand crocheted finishes.

The Plain Crochet Machines are largely used in finishing the edges of the heavier grades of knit goods; tops of Lumbermen's socks; the bottoms of leggings; and all heavy ribbed fabric; the edges of wool blankets, light and heavy; the edges of cotton plush or napped blankets; the bottoms of flannel skirts, either cotton or wool; and very many other goods.

The machines are adapted to form a smooth, clean finish upon the roughest and most obstinate edges of any kind of fabric, and they are specially built for almost any purpose—some producing fine, narrow finishes; others very deep, very heavy borders, and others for the intermediate degrees of thickness of fabric and depth of finish.

The Scallop or Shell Stitch Machines are specially designed for producing the two thread scallop or shell stitch finish, which is an improvement upon the hand crocheted shell stitch in that the shell is reenforced with an extra thread interlooped along the edge, making it possible to produce effects not made by hand by introducing a supplemental thread of contrasting shade or color, and at the same time the shells are more substantial and retain their form in washing, and wear better than the handmade.

Fig. 2 shows in its perspective view one of these scallop or shell stitch machines, and which are very largely used in finishing the edges of knit underwear of all sorts, blankets, laprobes, horse covers, bottoms of skirts in cotton or wool flannel, and a large variety of other manufactured goods.

This finish on account of its low cost of production, its durability, and its beauty has come into general use. These machines are made in several varieties according to the width or depth of finish required.

The Overedging Machines produce a fine edge finish in buttonhole stitch with either three threads or two threads as wanted.

This stitch is made by locking a covering thread with the needle thread at or near the edge of the fabric and at the point of penetration of the needle, forming a purl with two threads or a "boxing" with three threads at the very edge.

Fig. 3 shows in its perspective view one of these overedging machines, and which is made in various modifications to produce a finish from the very narrowest stripe on a folded edge to a wide or deep finish on cut or selvage edges, and are very generally used in finishing the edges of knit underwear and for forming stripe effects in the body of fabrics by folding the fabric, then finishing the folded edge and afterwards flattening out the fabric. This variety of Merrow machines is built expressly for continuous running at very high speed in factories.

The Trimming and Overseaming Machines are in general appearance similar to the overedging machines previously referred to, only they are improved in many of their details and are provided with improved cutters which trim the edges of the fabric ahead of the needle and simultaneously with the sewing operation.

These machines are made for producing either the two or the three thread finish and some varieties of them are made so that they can be easily changed to produce the one or the other. They are in general use and their efficiency and durability, running continuously at three thousand or more stitches per minute, have been fully proved. These machines are usually provided with an edge controller designed to prevent the edge of the fabric from pouting or being stretched during the seaming operation.

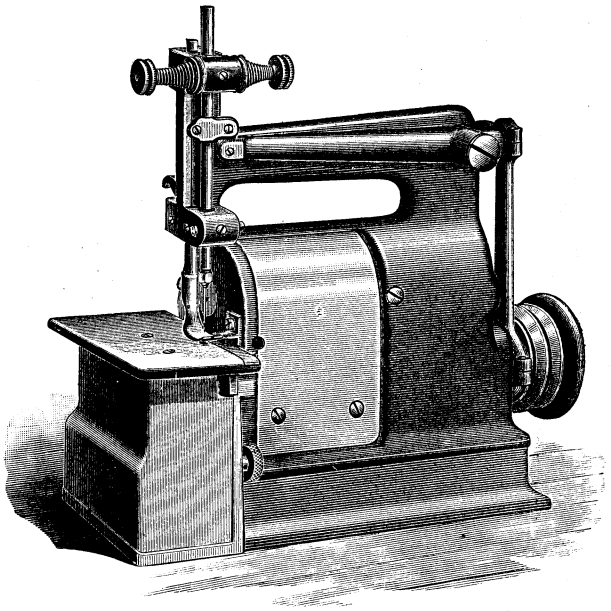


Fig. 2.

Many varieties of this type of machines are made, some of them being adapted to special purposes. Besides ordinary seaming and edge finishing, some are adapted to make a blind hem or concealed stitch very

accurately by the use of special guides and appliances, and some are made for producing unusually

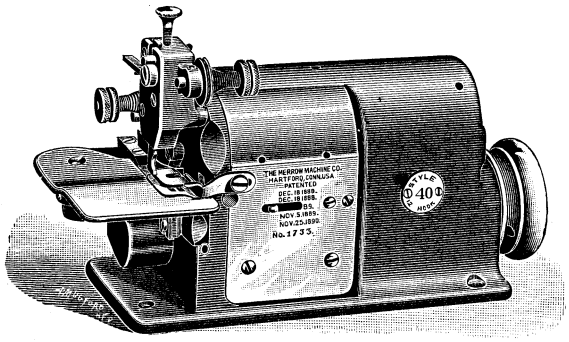


Fig. 3.

narrow or extra wide or deep seams or finishes. (The Merrow Machine Co., Hartford, Conn.)

TAYLOR'S BAND FOLDING AND CUTTING MACHINE.

The object of this machine is to automatically fold the edges and cut the cloth into the proper sizes or lengths required for trimming all kinds of knit fabrics and especially knit underwear, as for instance, the button stays, facings, waist bands, tapes, etc.

The machine is characterized by its simplicity, and consists principally of a folding piece for turning over the edges of the cloth which has been previously cut into the desired widths, a pair of feed rolls for passing the cloth through the machine, and a measuring and cutting arrangement for cutting the folded strip into the desired lengths according to the fabric on which it is to be used.

A point of interest in connection with the cutting arrangement is a device for stopping the delivery of the folded cloth while the cutting operation is going on, which prevents the material from choking the machine by accumulating behind the knife. The machine is very compactly made and occupies only a small space on a bench.

The accompanying illustrations will readily explain the details of the machine, Fig. 1 being a front elevation of the machine, and Fig. 2 a partial end view, showing the clutch mechanism for driving the machine.

Referring to the illustrations, 1 indicates the bed plate of the machine to which is secured two upright arms 2 and 3 which have bearings provided for the bottom feed roll 4 and also hold the movable bearings for the top roll 5. The shaft 6 of the bottom roll 4 extends across the length of the machine and has a clutch 7 secured to it at the left hand end, which when in clutch with the pulley 8, will drive the machine.

Secured to the front sides of the arms 2 and 3 is a work plate 9 which carries the folding piece 10 and through which the strip of cloth to have its edges folded first passes before being gripped and pressed by the feed rolls 4 and 5. This piece 10 is specially shaped at each side, *i. e.* with its edges turned over so that the cloth in passing through it will have its edges follow the curve of the edges of the piece 10 and thus be folded over by them. This piece 10 is easily removable and may be replaced by another size when it is necessary to fold different widths of strips.

Situated in back of the rolls 4 and 5 is a table on which the folded cloth passes, its outer edge being used as a cutting edge in connection with the cutting knife 11. This knife 11 is secured to a shaft 12, said shaft having a finger 13 which is actuated at the proper time to cause the knife 11 to descend and cut the cloth into lengths. The finger 13 is moved in an outward direction by means of raisers 14 on a chain 15, coming against it, which causes the knife to descend, a spring on the shaft 12 (not shown) also aiding in this movement, the knife being raised after the raiser passes the finger 13, by means of a spring 16 connected to the lower end of the finger 13 and to the work plate 9. The knife is prevented from raising too high by a stop piece 17 which is situated over its left hand end, and thus the finger 13 does not come in contact with the joints of the chain 15. The chain is positively driven from the front roll through bevel gears 18 and 19, the latter

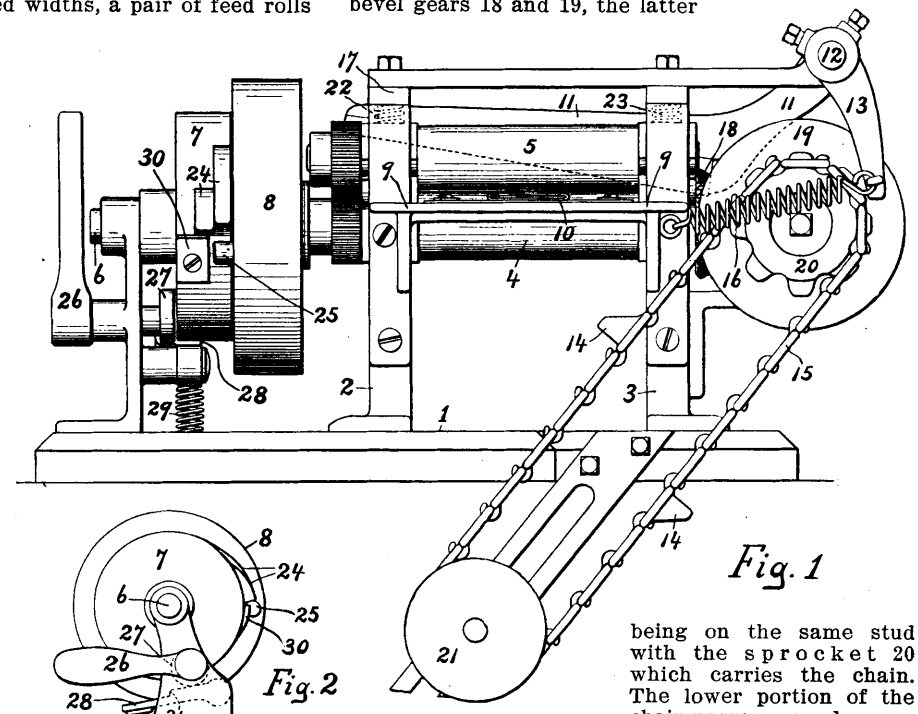


Fig. 1

Fig. 2

being on the same stud with the sprocket 20 which carries the chain. The lower portion of the chain passes around a movable wheel 21 which may be moved to suit the length of chain required. The distance between the raisers on the chain regulates the length to which the pieces of cloth are to be cut and thus by simply changing the position of the raisers on the chain, the lengths cut may be changed, and also the chain may be so built as to cut alternately different lengths.

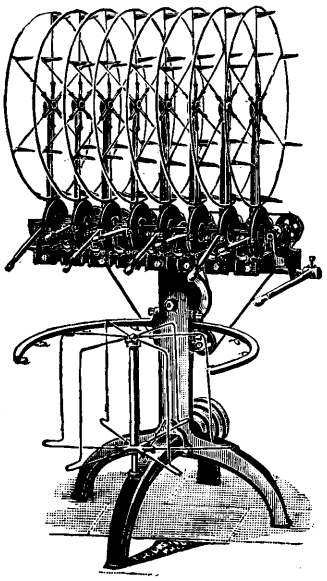
When the knife is cutting, the delivery of the material is stopped by raising the top roll 5 so that the rolls do not grip the material. The top roll 5 is raised by having a finger rest under each bearing of the roll, the other ends of the fingers being attached to a shaft which also has a backwardly projecting finger attached to it and situated under the right hand end of the knife, so that as the latter descends, a small piece attached to it presses on the finger and raises the other two fingers which in turn raise the roll. Springs 22 and 23 press the roll down again after the cutting is completed.

The clutch mechanism is shown in front elevation in Fig. 1 and in side elevation in Fig. 2. As was mentioned, the clutch 7 is secured to the shaft 6, and has a pivoted projection 24 in its perimeter, which is normally held in the position shown, by a spring on the inside of the clutch.

A pin 25, secured in the side of the pulley 8 comes in contact with this projection 24 and thus revolves the clutch and consequently the shaft 6. When it is desired to stop the machine, the lever 26 is raised by hand and the cam 27 allows the piece 28 to be raised by the spring 29, so that when the projection 24 comes around, it is pushed inwardly by the piece 28, which liberates the pin 25 from engagement with said projection. The momentum of the clutch will take it around slightly until the stationary projection 30 on the clutch comes in contact with the shoulder 31 on the piece 28, which immediately stops it. To start the machine again, the lever 26 is lowered, and which causes the cam 27 to press the piece 28 out of the path of the projection 24, so that when the pin 25 comes around, it will come in contact with said projection and revolve it in the usual manner. (James Taylor, Philadelphia, Pa.)

TAYLOR'S BACK WINDING MACHINE FOR WASTE KNIT FABRICS.

The object of this machine is to unravel imperfect pieces of knitted fabrics and wind the yarn thus obtained into a convenient form for handling and reusing. It will back-wind cardigan, half cardigan or tuck stitch, plain ribbed or flat goods, plaited goods, in fact any fabric as knitted with eight feeds or less may be thus unraveled, and in cases where two yarns had been originally, when knitting the fabric, fed through one yarn carrier, they may be separated and wound on separate reels. The advantage of this machine is at once apparent, in cases where high price material has been used, since the same can then be used again, whereas without this arrangement, the imperfect fabrics could only be sold as seconds or waste.



A perspective view of the machine is shown in the accompanying illustration, from which it will be seen that the same consists principally of eight upright arms, being provided at their top ends with open bearings for their respective reels to fit into, which construction allows each reel to be easily lifted out separately of its bearing in order to enable the operator to doff as the reels become full.

Each reel consists of a wire hoop with six spokes on which short pieces are secured, near the rim, projecting horizontally from said spokes, and on which the yarn is wound.

The reels are driven by having each rim in frictional contact with a grooved plate, the latter being driven by friction from a small plate in contact with its side face, said small plate being horizontally movable on to large and small diameters of the groove plate, by means of levers shown at the front of the machine. This allows each reel to be driven at any speed required by the stitch of the fabric it is back winding the yarn from, as is the case, for example, in tuck stitches. Each shaft of the small plates is driven by the same belt from the main pulley by having said belt pass alternately over and under small pulleys on the ends of the shafts.

The fabric to be raveled is placed on a wire frame, shown near the bottom of the machine in the illustration, different size frames being provided for different size fabrics, the former being easily taken off to be replaced by the proper size frame. The ends of yarn after being found on the fabric, are passed separately up through thread guides near the levers and from there to the reels where they are wound into skeins. (James Taylor, Philadelphia, Pa.)

FULLING MILL FOR KNIT GOODS.

There are two general kinds of construction of fulling mills used in connection with knit goods as require fulling, viz.: the hammer mill and the pendulum mill.

In the *hammer mill*, two beaters, as hanging suspended from the frame work of the machine, are alternately raised and lowered vertically by means of a revolving roll having prominent projections on its surface, and which projections in turn engage respectively with one projection on each beater and thus raise them, said beaters dropping by their own weight onto the fabrics under operation as soon as the two projections, which raised them — separate, and when the procedure of raising the beaters in turn is repeated. There are two beaters used for each trough as holding the fabrics and which trough generally is zinc lined, the feet of said beaters being at their lower ends, which come in contact with the cloth to be fulled, step-shaped at an angle of about 45 degrees, and by means of which shape they impart to the fabric under operation a rolling motion, which continually will bring different fabrics or portions of one fabric, under the direct operation of the feet of the beaters. This vertical movement of the beaters, however may be obtained in another way, for example by means of crank and lever or disk and lever connections.

In the *pendulum mill*, the feet of the beaters are operated in a more or less horizontal direction, by means of suitable crank and lever connections. The accompanying two diagrams are given to illustrate the construction and operation of such a fulling mill, and of which Fig. 1 is a side elevation of the machine with a portion of one of the sides broken away to more clearly show the means for loading and unloading the machine, Fig. 2 being a view in detail. With reference to Fig. 1 it will be seen that the trough into which the goods to be fulled are placed is fixed at an inclination to the floor line.

This angle of inclination is of service when changing the position of the beater feet, since the path in which the driving shaft moves during alteration is practically concentric with an arc struck from the line shaft and from which the beater is driven. The beater feet are suspended from a fixed centre and fall diagonally, making 180 strokes per minute or 90

each foot or pendulum. The beater feet being worked by an eccentric on the driving shaft, and the driving shaft being movable to the extent of 13 inches, the position of the feet may thus be varied to the same extent, in turn enabling the pressure on the cloth

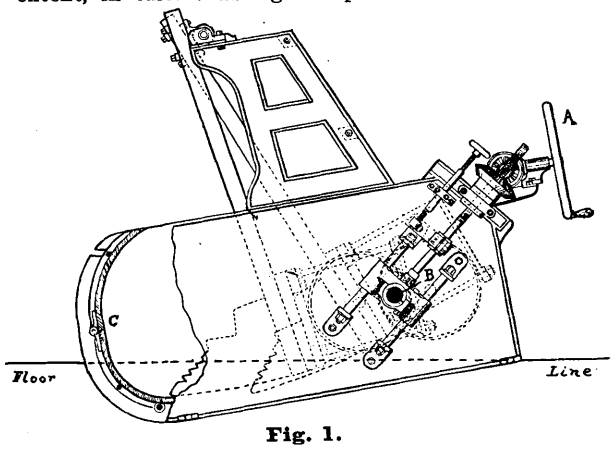


Fig. 1.

to be varied at pleasure. Diagram Fig. 2 shows the extent to which the alteration can be made. When the centre of the driving shaft is at F, that is, as forward as it can be, the position of the beater feet is shown at D, and when the shaft B is wound back by the hand wheel A and bevel wheels shown (see Fig. 1), as far as it will go, that is to G (see Fig. 2 again), the position of the beater feet is as shown by E, which is 13 inches farther back than D. It may

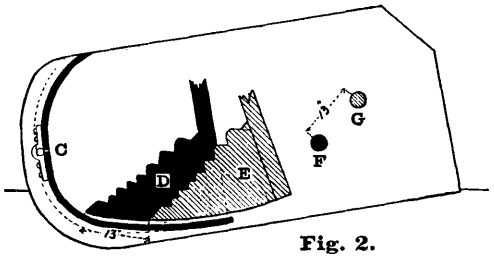


Fig. 2.

be said that when the feet are at E, the fulling mill has half as much more space for being loaded with goods to be fulled than when at D. From this it will be obvious that the same machine may be conveniently used for handling knit goods, or any other fabrics, in varying quantities. The front portion C of the fulling mill is hinged so that it can fall back and allow of the piece being quickly changed. Besides being used for a fulling mill the same machine can be also used for cleansing purposes after fulling or as the case may require.

JONES' NAPPER FOR FLEECED HOSIERY AND UNDERWEAR.

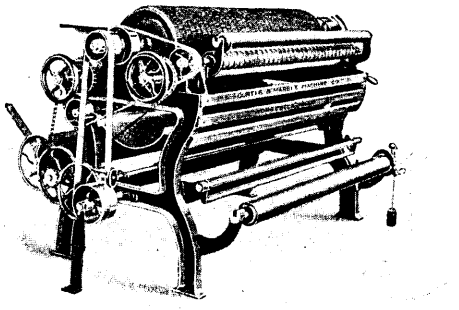
The same is a very simple and inexpensive machine for this purpose. In this machine the goods are fed between two corrugated rolls which revolve slowly, and pass the goods between two rapidly revolving rolls, covered with card clothing, which brush against the cloth and thus produce the required nap on the fabric. Revolving fans or paddles are placed close to the rolls, near the point where the goods leave, to prevent them from winding on the rolls.

A very long heavy nap can thus be produced by this machine. It is an invaluable machine for some lines of fabrics, since very short pieces can be napped by it, other styles of these machines for this purpose requiring an "endless" fabric to work upon.

Previous to submitting the fabric to the machine, see that all raveled ends are trimmed off, so as to avoid their catching in the card clothing. Run the revolving fans or paddles close to the card clothing, but without touching, since otherwise the latter will be dulled. Do not let the card clothing on top and bottom rolls touch. To sharpen the card clothing, cross the belts (thus running the machine back), and hold a strickle against the card clothing for about five minutes. Always sharpen ends the most to avoid making centre hollow. Hand screws are placed on front of the machine for regulating the pressure on the goods. Tighten the set screws when the proper adjustment is obtained. For satisfactory work in connection with hosiery, run Napping rolls 1200 r. p. m., countershaft as carrying tight and loose pulleys 600 r. p. m.; six inch pulleys on both. For underwear increase speed to 1500 r. p. m. (Lewis Jones, West Philadelphia, Pa.)

CURTIS & MARBLE KNIT GOODS NAPPER.

The accompanying illustration shows this napper in its perspective view, the same being designed for napping knit goods, such as fleecings, linings, stockinets, eiderdowns, etc., where a very thick and even nap is desired. The napping is done in the web or piece, one run of the fabric through the machine being in most instances all the napping required. The goods may be wound on the lower roll in front, or run from the fold and after passing through the machine are rolled up in the brackets at the back. Revolving spiral spreader rolls keep the goods out to their full width, and at the same time prevent their edges from curling over. The feed rolls, covered with card clothing, are placed close to the points of contact with the napping cylinder, to avoid any stretch of the goods, and insure even work. The napping cylinder, clothed with tempered steel clothing, is of large size, and acts upon the goods twice in their passage through the machine, napping them as they pass over the sharp edges of the cloth rests, which may be readily thrown away from the cylinder to allow a seam to pass, and be returned to the same position by means of levers. The amount of contact on the goods is easily regulated by hand wheels, and either light or heavy goods may be napped without delay in adjusting. An arrangement of hand wheels and ratchets is provided for convenience in threading the goods in the machine, and the feed of the cloth may be stopped and started while the cylinder is in motion. The speed of the cloth can be altered by change of pulleys or gears, so as to obtain the best results on different classes of goods. Brackets



are placed on the machine, for holding a traverse grinder for grinding the cylinder when required. The machine is built in different widths, for 40 inch, 60 inch, 74 inch, or 90 inch goods; its usual speed being 300 r. p. m. (Curtis & Marble Machine Co., Worcester, Mass.)

J. H. A. KLAUDER, Pres. and Gen'l Manager.
HENRY HIGGS, Superintendent.

J. H. GILES, Treasurer.
E. HEPPENSTALL, Huddersfield, England.

THE KLAUDER-WELDON
DYEING MACHINE COMPANY
AMSTERDAM, NEW YORK, U. S. A.

BUILDERS OF MACHINES FOR

DYEING
RAW WOOL,
RAW COTTON,
WASTE,
RAGS,
KNIT CLOTH,
SHIRTS,
DRAWERS,
HOSIERY,
HATS, CAPS,

DYEING
COTTON SKEINS,
WOOLEN SKEINS,
SLUBBING,
WORSTED SKEINS,
SILK SKEINS.

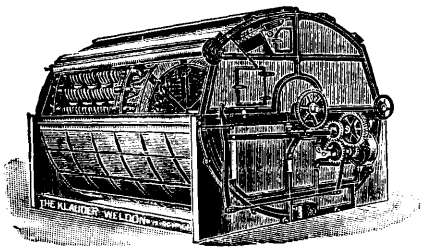
DYEING
SULPHUR COLORS
RAW COTTON,
HOSIERY,
SKEINS.

BLEACHING
RAW COTTON,
SKEIN.

SCOURING
YARNS.

MERCERIZING MACHINES, FOR WARPS AND SKEIN.

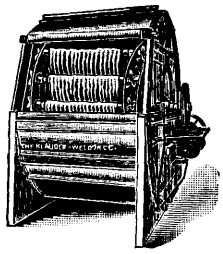
SKEIN AND SLUBBING DYEING MACHINES.



SAVES

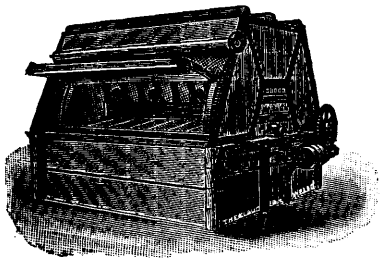
75 per cent. in Labor.
30 per cent. in Winding.
Steam and Dye Stuffs.
Perfectly Even Dyeing.

CAPACITY:
50 to 700 pounds per batch.



No Friction on the Skeins. No Matting or Tangling of the Yarn.
Universally Used.

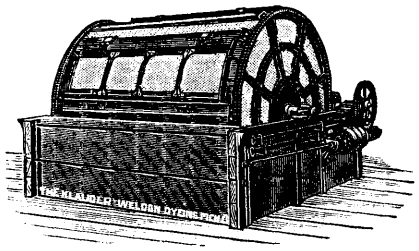
RAW WOOL AND COTTON DYEING MACHINES.



SAVES

50 per cent. in Labor
besides Steam and Dye Stuffs.
Practically Indestructible.

CAPACITY:
200 to 1000 pounds per batch.



Leaves Stock in Perfect Condition. Does not Mat or Tangle the Fibre.
A Perfect Machine.

DYEING, BLEACHING, MERCERIZING, ETC., MACHINERY, DYESTUFFS, CHEMICALS.

THE KLAUDER-WELDON RAW STOCK DYEING MACHINE.

The object of this machine is to dye raw cotton or wool with an even and uniform color throughout the

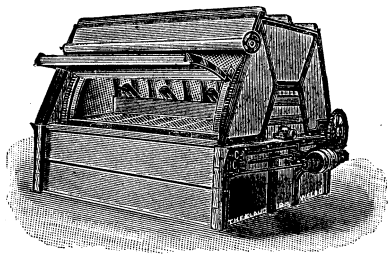


Fig. 1.

entire batch, and this without matting or massing the fibres into a big lump during the operation.

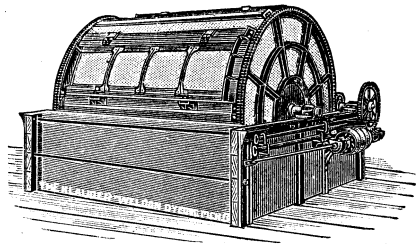


Fig. 2.

The machine is of the revolving type and consists principally of a hollow metal cylinder made into compartments for holding the stock to be dyed, a wooden tank containing the dye-liquor and in which the lower half of the metal cylinder revolves, and a wooden covering to enclose the cylinder and tank.

The details of the arrangement and the method of operation of the machine are given in the accompanying illustrations, of which Fig. 1 is a perspective view from the front of the stock dyeing machine; Fig. 2 a similar view, with the top cover removed, and Fig. 3 a section view through the machine, showing the arrangement of the compartments, method of driving the cylinder, etc.

Referring to the latter illustration, 1 indicates the wooden tank for holding the dye-liquor, said tank being made very thick to insure its durability. Heavy cast iron frames are attached to the sides of the tank to strengthen it. When installed in a plant, the tank is placed from 12 to 24 inches below the floor level, according to the capacity of the machine, in order to bring the doors of the cylinder conveniently low, so that the material to be dyed can be loaded and unloaded quickly and economically.

The cylinder is indicated by 2, and is constructed of heavy iron and bronze side castings and cross pieces fastened with large copper rivets and bolts. In the illustration, the cylinder is shown divided into four compartments, which is the arrangement used for cotton and coarse wool, while for fine wools six compartment machines are used.

It will be seen that the partitions 3 forming the compartments are not set radially from the centre of the cylinder but at an angle, the object in thus dividing the cylinder into compartments being to divide the material to be dyed into different batches in order to insure the thorough penetration of the dye-liquor and to prevent the material from matting and tangling during the process.

Outwardly projecting pieces 4 are also placed in each compartment of the cylinder in order to aid in keeping the material in a loosened condition.

To obtain a perfect circulation of the dye-liquor through the material while the cylinder is passing through the bath, the copper sheets, with which the compartments, cylinder heads, and partitions are lined, are perforated. Each compartment has a door 5, extending the full length of the cylinder, which when opened, allows the material to be loaded into or unloaded from its respective compartment.

The material is loaded into each compartment separately from the back of the machine, whereas the unloading is done at the front of the machine, the bottom partition of each compartment forming a

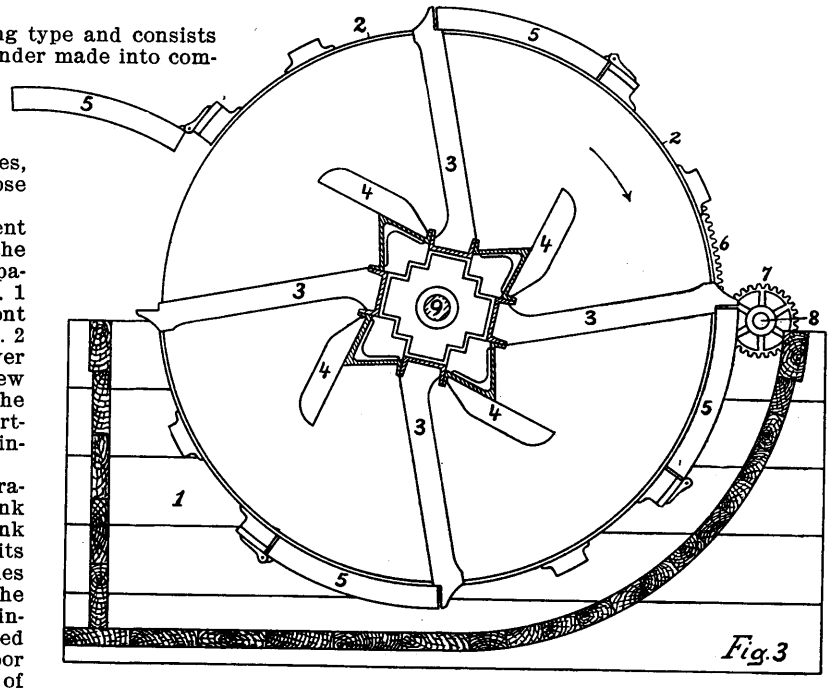


Fig. 3

table from which the stock is pulled with rakes into trucks or boxes. During the dyeing process the

doors 5 are fastened securely to the cylinder by heavy bronze screws.

Attached to the periphery of each cylinder head are heavy bronze gear racks 6 into which mesh pinion gears 7 attached to a shaft 8, placed across the back end of the tank, said shaft being driven through gears from a belt and pulley. The cylinder is rotated slowly in the direction of the arrow on the centre shaft 9, thus carrying the material being dyed down into and through the dye-bath.

The compartments of the cylinder are so constructed that material in them is turned over at every revolution of the cylinder without any rolling motion, thereby preventing the stock from forming a mass or ball, and at the same time allowing all parts of the batch to be thoroughly penetrated by the liquor.

It has been demonstrated time and time again by practical experiments, that raw cotton or wool cannot be dyed in a cylinder that is not divided into compartments, for the reason that the material being dyed becomes matted and massed, thereby preventing a thorough and even penetration of the dye-liquor, and also leaving the stock in a very poor condition for after the operations.

The outside wooden cover of the machine has cast iron frames attached to each end, and to insure strength and rigidity, these are coupled together by rods extending from one side frame to the other.

The openings in each slide of the cover, where the machine is loaded and unloaded, are covered with canvas curtains when the machine is in operation. These roll up and leave the openings clear when the machine is being loaded or unloaded, as seen in Fig. 1.

This cover is used on the machine to confine the steam, thereby keeping the bath at an even temperature with less steam than it would be possible to do if the cylinder was exposed; also keeping the dye house free from steam which would be impossible if the covering was not used.

The machine is equipped for fast and slow speed, and the cylinder can also be reversed if desired. The method of driving the cylinder from a shaft extending across the back of the machine, and to which two pinion gears are attached that mesh with the racks fastened to the periphery of each cylinder head, is used on account of the enormous weight of the soaked material being dyed.

All the strain is thus taken from the main shaft, and at the same time insures a steady, even, driving motion which prevents the cylinder from being racked and strained by the irregular movement of the material being dyed.

The dye-liquor is heated by steam from perforated steam pipes which are located in the bottom of the tank. These are entered from both sides of the tank and run to the centre to insure an even boiling of the bath.

The capacity of the machine varies from 200 pounds to 1000 pounds per batch, depending on the size of the machine, and requiring from 1½ H.P. for the smallest machine, to 3 H.P. for the largest machine.

Bleaching Raw Cotton. The machine as just explained for dyeing raw stock may also be used for bleaching raw cotton, but in which case it is necessary to have special linings for the tank, etc., and for economical reasons, it is best to have in addition to the machine, a separate tank to hold the bleach liquor when it is not being used, and a pump for pumping the bleach liquor from this tank to the machine, when required. Previously to bleaching, the cotton is wetted out with hot water in the machine.

In the machine, the raw cotton is thus successively wetted out, bleached, scoured, washed, tinted, and if desired, dyed without being handled or removed from the machine, the only thing necessary being to change the baths for the different processes. This makes the complete process practically a continuous one and by which the most economical results can be obtained, since one man can attend to the machine while in operation and thus the cost of labor is reduced to a minimum.

The tank of the machine is lined with heavy sheet copper, which allows the machine to be thoroughly and quickly cleaned after the different processes, and also prevents the wood work from being attacked by the bleaching liquor.

The cylinder is made entirely of bronze and perforated sheet copper, since it is absolutely essential that no iron shall enter into the construction of a bleaching apparatus, in order to guard against any possibility of rust spots, which would stain the cotton and thus be the cause of unsatisfactory work.

By having the cylinder enclosed, besides confining the steam, it also prevents the water, bleach liquor, etc., from splashing out, and on to the bleach house floor. The tank for holding the bleach liquor, when not in use, is preferably located below the level of the machine tank and under the floor. When the bleaching process is finished, the liquor is run out into this tank, and pumped back again when required. If circumstances do not allow the tank being placed below the floor, it could, of course, be located above the machine, and in which instance the pump would be used to take the liquor to this storing tank; however the location of the tank below the floor is preferable in all cases where possible to do so.

The machine is practically devoid of intricate or delicate parts, and consequently the expense and annoyance of break downs are almost nothing.

When not required for bleaching, the machine, of course, can be used as a dyeing machine, as previously explained. (Klauder-Weldon Dyeing Machine Co., Amsterdam, N. Y.)

THE KLAUDER-WELDON SKEIN DYEING MACHINE.

This machine is used for dyeing wool, worsted, cotton or silk, which has reached the stage of its manufacture where it has been reeled and made into skeins, so that the machine can operate on it in this form. It may be slubbing to be dyed, and which afterwards has to be twisted with some other yarn to make the completed product, or it may be the completed yarn, either single or ply yarn as the case may be, but in any case it must come to the dye house in the form of skeins.

The machine for dyeing the skeins is of the revolving type, and consists of a wooden tank, in which

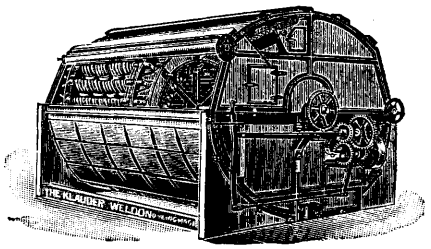


Fig. 1.

the dye-liquor is put and through which the skeins are passed, a metal reel, specially constructed for holding the skeins of yarn, and a wooden covering for enclosing the tank and reel.

The details of the machine and its method of oper-

ation are best shown by means of the accompanying illustrations, of which Fig. 1 is a perspective view of a double width machine, Fig. 2 a perspective view of a single width machine, Fig. 3 a cross sectional view of the machine, showing the centre spider which is the main portion of the reel, Fig. 4 is a detached holder from the outer series of holders on an outside spider, and Fig. 5 a detail view of a special inside holder for the dye sticks, taken from a centre spider, shown enlarged compared to Figs. 3 and 4.

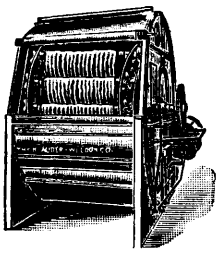


Fig. 2.

Referring to Fig. 3, numeral of reference 1 indicates the tank for holding the dye-liquor, in which a partition or false back 2 is placed at one end of said tank, and under which the steam pipes 3 are placed, the tank, when positioned in a dye house, being placed from 12 to 24 inches below the floor level, according to the capacity of the machine, to allow the operator to load and unload the machine handily, quickly and economically.

The reel 4, for holding the dye sticks on which the skeins to be dyed are placed, consists of three metal spiders in this machine, and of two spiders in a single width machine. These spiders are constructed of heavy iron and bronze castings, except when used for acid dyeing, when the whole construction is of bronze. They consist of skeleton frames, to which are fitted two series of attachments 5 and 6, for holding the ends of the square and round dye sticks on which the skeins 7 are placed, there being only two sections of the spider shown fitted with these attachments, but in the machine the other five sections are similarly fitted up.

Two styles of dye sticks are used in the machine, square sticks being used to rest in the outer holders of the spiders, and round ones are used to rest in the inner holders. The square sticks are left square at one end and made round at the other, the square end of each stick of the two series fitting into an outer holder, as shown in Fig. 4, as located on the outside spiders, while the round end of each stick fits into the holder 5 on the centre spider. This arrangement of having one end square is to allow the stick to be turned on its axis and consequently also the skeins of yarn, the method of doing this being to have the holder made rotary, and having projections 8 on all four sides, so that one always projects outwardly, and as the reel revolves, this projection comes into contact with a tripping arrangement and the holder and stick are turned one-quarter of a revolution on their axes. A ratchet 9 and pawl 10 are used to hold the stick after it is turned.

The round end of the stick is held by a corresponding outer holder 5 on the centre spider, and which consists of a semi-circular piece 11 in which the end of the stick is placed, and a latch 12 which secures said stick in its place, said latch being held in place by a spring 13.

To place a stick in the holder, or take one out, it is only necessary to press on the outer end of the latch in the direction of the arrow, which causes the latch to be moved on its pivot 14 and thus leaves the piece 11 open for the stick to be placed in it or taken out, as the case may be.

The round dye sticks are made round at both ends, one end fitting into the inner series of holders 6 on the centre spider, which operate similarly to those at 5, the other end fitting into a corresponding round hole on the outside spiders. These sticks do not require to be automatically driven, since the friction of the yarn will rotate them.

Another style of these holders, used as an inner series, on a centre spider is shown in Fig. 5. They are used where different length skeins are to be dyed in one machine, and where the stick may be placed in either hole 15 or 16, according to the length of the skein. The stick is held in by latches 17 and 18 respectively, said latches being pivoted at 19 and 20 and connected to an elbow lever 21, so that both are actuated by the lever 22. A spring 23, connected to one end of the elbow lever 21, keeps the latches always in position over the holes in which a stick is held.

When loading the machine for dyeing, each set of skeins is hung over one square and one round stick. The square stick is first placed in the machine; then the round stick. When unloading, the round stick is first removed from its bearings; then the square stick, and both sticks and yarn are then carried from the machine.

After placing the skeins in the machine, they are tightened by a lever 24 which is connected to the movable ring 25 on which the holders 6 are secured.

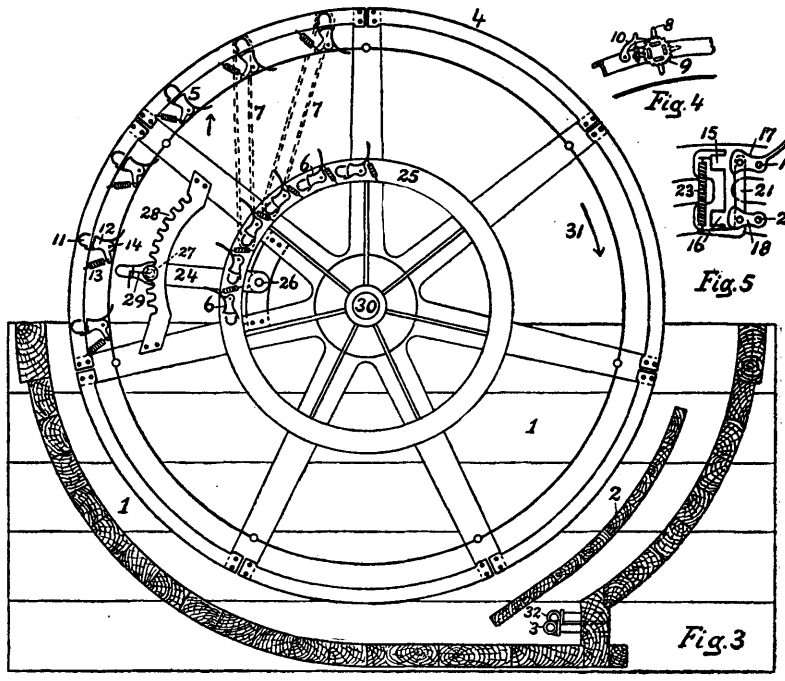


Fig. 3

Fig. 4

Fig. 5

This lever 24 is pivoted at 26, and after pulling the skeins as tight as required, said lever is secured in that position by letting a pin 27 into a groove 28 directly under it by means of a small rod 29.

The spiders composing the reel are attached to the shaft 30, and to the end of this shaft is fastened a driving worm gear, which, when the machine is in operation, causes the reel to rotate slowly in the dye-liquor, in the direction of the arrow 31.