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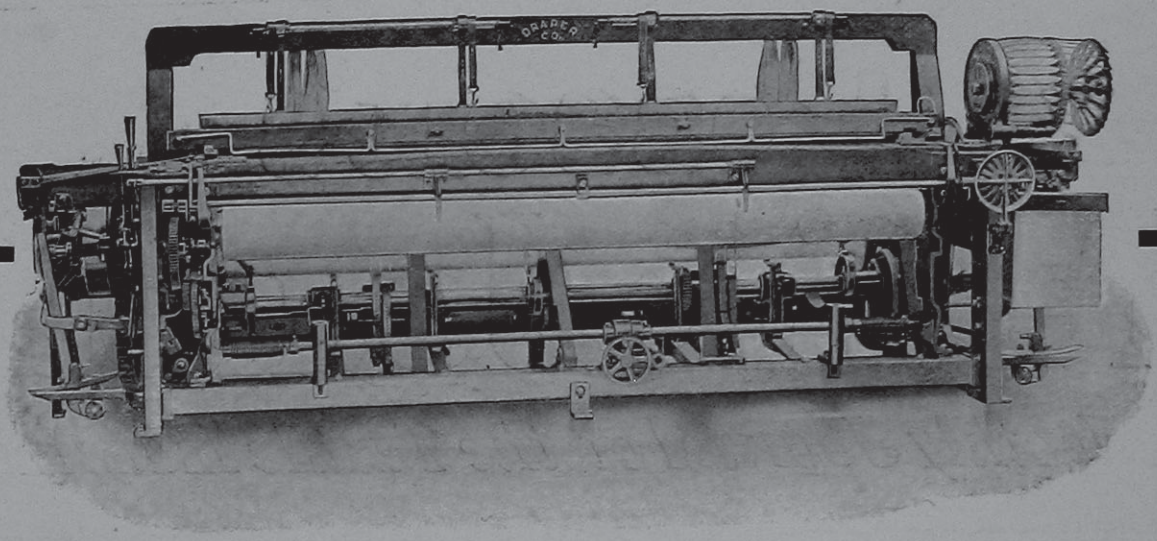

THE PRESENT SEASON DURING THE STOPPAGE OF MACHINERY INCIDENT TO HIGH PRICED COTTON IS AN IDEAL TIME TO REPLACE COMMON LOOMS WITH NEW NORTHROP LOOMS AND THUS AVOID THE USUAL DISTURBANCE AND REDUCTION OF PRODUCT INCIDENT TO SUCH REPLACEMENT.

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Vol. VI. **May, 1910.** **No. 5.**

The Knitting Industry—Past and Present.

The knitting industry of to-day is a very important factor in the commercial life of this country.

When we look upon the large, modern productive factories with their human-like machines, it is almost beyond comprehension, especially when we are confronted with the fact that the greatest development of this industry has only been through the last fifty years, and that but a few centuries ago, all the knitting was done by hand, the production limited, and the work coarse and crude.

The art of knitting was, it is thought, first practised by the people of the early ages, but up until the fourteenth century, very little of this industry was known; it is thought that the Scotch were the first to make use of it to any extent, and later on it was taken up by the English.

The knitting of caps appears to have been the first use to which knitting was applied generally, hosiery following. This conclusion is more feasible, when it is shown that knitted woolen caps were mentioned in an act of Parliament about the year 1488.

While hosiery may have been produced at this time also, little is known of it, its development remaining a mystery until the year 1553, when the subject is mentioned in connection with an act of Edward VI. From this time, until about 1563, it appears that the hosiery trade expanded considerably and that the trade was mentioned in a Parliamentary act of that date. Further emphasis is laid upon this condition when it is seen that Edward VI and Henry VIII were provided with silk stockings.

During all this time, it appears that the industry was carried on in the same manner, by the use of needles operated by hand, and it is not until the latter part of the sixteenth century that mechanical knitting was referred to.

History, regarding the first mechanical knitting machine, is clouded in considerable uncertainty, as to the inventor and the motive which prompted the idea.

From some sources, it is learned that one Jean Hindret, a Frenchman, claimed the distinction at an early date; but the weight of authority is in favor of William Lee, a member of the English clergy, whose idea was perfected in the latter part of the 16th century.

From this information, the conclusion and distinction is given to Lee, and it being an old saying that there is always a motive which prompts the idea, it may be interesting to know the reason Lee had for solving the problem and opening to the world a field which has proven profitable to many.

One view of the question is quite romantic, although it does not weigh heavily in deciding the motive.

It is said that Lee was intensely infatuated with a certain young lady whose attention was directed more toward the art of knitting than that of the company of Lee. It appears that every time Lee called on his lady friend, she was so deeply interested in knitting that he could find little or no time to press his attentions. Being of a clever turn of mind, Lee, although a clergyman, turned his attention to developing his mechanical instinct and to producing some sort of a contrivance which would allow the lady to continue her knitting and at the same time devote just a little of her time to his interest.

History informs us that Lee was successful and produced a machine which could be operated with one hand, leaving the other hand entirely free for the lovers' pastime of holding hands and building castles in the air.

While this theory is quite mythical, it appears that the following is more realistic, and in this case, necessity is again the mother of invention.

It appears that Lee married the lady of his choice, and he being a member of the clergy and marrying in violation of the rules, was expelled from that body. This naturally threw him on his own resources, and in order to earn a living, it is said, his wife worked day and night knitting stockings, in order to assist in sharing the burden of maintaining the household. As to how Lee contributed, is not known, but it is surmised that he conceived the idea while watching his wife at work, and being desirous of lightening her burden, set to work on the machine.

Again, it may have been that the business prospered and that Lee saw that the demand was greater than his wife was capable of supplying by the present method, and it is said that he spent five years in perfecting his idea.

Both of these theories seem plausible and are like many other romances of invention in which the inventor is either in love or in the deepest poverty, with a family to support him while he dreams; but these two facts settle the question as to whom the party was, and the only value that they possess is to settle definitely that the name of the inventor was William Lee, and that he was a clergyman.

From another authority—Cooper's *Athenæ Cantabrigienses*, quoted by Felkin in his history of Lee and his invention:—

William Lee was born in Woodborough in Notts, and is said to have been an heir to a good estate. He was matriculated as a sizar of Christ's College in May, 1579. He subsequently removed to St. John's College and as a member of that house proceeded B. A. in 1582-3. We believe that he commenced M. A. in 1586; but on this point, there seems to be ambiguity in the records of the University. In 1589, at which time it is stated he was a curate of Calverton, about five miles from Nottingham, he invented the stocking frame.

This information tends to further verify the fact that Lee was the inventor of the stocking frame, and was at the same time a very well educated person of a mechanical turn of mind with an originality of conception which surpasses any other inventors in the field of textile machinery. This is more apparent when it is taken into consideration that the process of knitting by hand and knitting by machine have scarcely a single common feature with each other in operation.

The stocking frame, which we give Lee the credit for inventing, is said to have consisted of a board having hooked wires around the outside edge, they being extended in a horizontal position from the board. These hooked wires are said to very much resemble, in general appearance, the spring needle of to-day. The latch, instead of being a part of the needle as to-day, consisted of another wire with a beveled edge, which was also inserted in the board, the beveled edge pressing against the hook of the needle or wire. The machine consisted of twelve needles, occupying an eighth to an inch.

Although Lee's idea was the foundation of the mechanical knitting industry of the world, it was not used to any great extent until a much later date.

Many minor improvements were made on Lee's machine, but the most noted was not made until 1758, at which time it is said that Jedediah Strutt of Derbyshire, England, added another set of needles to the frame for the production of ribbed work.

This set of needles was inserted in the machine in an opposite direction to Lee's. The latter was placed horizontally from the board, and Strutt's vertically, or at right angles, making it possible to work the two sets in combination, using the horizontal needles as used by Lee for the regular rib work. The extra set of needles were, or were not used, according to the work desired. The ribbed fabric produced by the use of this combination was known as *Derby Ribs* and was the means of making Derbyshire the knitting centre of England. As was the case with Lee's machine, only flat work was made, and it was not until the early part of the nineteenth century that fabrics, other than flat, were produced.

During the eighteenth century, the introduction of the manufacture of hosiery occurred in America by the Mennonites, who settled in Germantown, now a part of Philadelphia. They emigrated from Germany, bringing with them their crude hand frames, which they set up in their homes. The custom of that day was for the men to operate the frames, while the women sold the goods. A majority of the work was done with all wool yarn, and the hosiery was in great demand, selling for a price equivalent to $1.-to $2.- per pair.

Some of the early inhabitants of Germantown who were engaged in the manufacture of Hosiery were, John Camm who was, in 1723, known as a stocking weaver; Alexander Mack, Jr., son of the founders of the Dunkers, who emigrated from Germany, settled in Germantown and was known as a stocking and glove weaver; Immanuel Kalckglosser, who was mentioned in the transfer of a deed in 1743; the Saurs, father and son, among other trades were also engaged in stocking weaving. The Pennsylvania Gazette of May 1st, 1766 contained an advertisement of David Mause, a hosier, who had erected a number of frames for the manufacture of hosiery; while John Murgatroyd advertised in the Gazette of August 16th, 1770 for stocking weavers to go to North Carolina, showing that Philadelphia was recognized as the seat of stocking weaving. In 1780 Balthasar Ernst and Peter Edenborn, both being hosiery weavers, were mentioned in a deed. About the same time, Godfried Bockius, who had several stocking frames, started his son Francis in the same line, by giving him the choice of his frames. Further evidence of the fact that the early settlers of Philadelphia and vicinity were engaged to a great extent in the manufacture of hosiery and knit good is manifested by the fact that the stocking weavers were identified with the ratification of the Constitution, and in the procession which followed, were identified by the color flag which was white, with a pair of blue stockings across, a cap above, a finger mit below, encircled with a gilded heart, a gilded crown with ten horns or points, each on a blue star, and above all the motto, *The Union of American Stocking Manufacturers.*

During the latter part of the eighteenth century, the knitting industry of Philadelphia took great strides, and the first association for the promotion of the industry was started in 1795.

The Mennonites of Germantown, with their crude frames, were the means of supplying the demand until the early part of the nineteenth century. About this time, it is said, a number of English knitters emigrated from Leicester and Nottingham and settled in Germantown, bringing their frames with them. Naturally, with their improved knitting frames, and by their industrious work and skill, they gradually secured the bulk of the trade which was being supplied by the Mennonites.

At the same time, about 1816, the first circular seamless knitting machine was invented in England by Sir Marc. I. Brunel, of Nottingham. This machine was named by the inventor the *Tricoteur*. It was based on the spring needle principle and consisted of a rotating cylinder having the needles secured around its outer edge, the cylinder being supported by a shaft or spindle, making it possible to remove the tubular fabric from below the machine. The cylinders were made in various diameters, several feeds being supplied for carrying the yarn. These rotated around the outer edge of the needles and were supplied with sinkers for actuating the needles. The production of the machine was considered marvelous, in as much as its operation was continuous. Very little, however, was done with the machine in a general way.

While these improvements were being made in England, the hosiery manufacturers in this country were progressing rapidly.

About the year 1825, the first knitting mill was started in America. By the word Knitting Mill is meant the collection of a number of machines under one roof, the selling being done by one person. The knitting mill, as we look upon it to-day, was unknown previous to this time, the machines then being operated independently in the homes of the operators.

To Thomas R. Fisher is given the distinction of being the first man to conceive and carry into effect the idea of bringing a number of machines together under one roof, thus forming a mill for the production of knit goods.

This mill was located at Fisher's Hollow, now Fisher's Lane Station, and was known as the Wakefield Mill. The machines used by the operators were their own property and it is supposed that the yarn was furnished by Fisher, the operators being paid a certain amount for their services.

Shortly after this, Fisher offered to buy the frames from the operators, but very few accepted his offer, knowing that while they had their frame, they were sure of a living. Not being able to buy the frames, he imported them from England and had English knitters come to Germantown and operate them.

The Hinckley Knitting Mills of Germantown, owe their foundation to Thomas Jones, an Englishman, who came to this country in 1830, and in 1832 set up two old fashioned knitting frames, thus commencing in a small way the manufacture of shirts, drawers, and woolen hosiery. His son Aaron followed his father's emigration and was employed by him as a salesman. In 1834 the machinery was disposed of to Thomas R. Fisher, Prop. of the Wakefield Mills, Fisher's Hollow, Germantown, previously alluded to, Aaron Jones becoming identified with these mills. He continued to manage the Wakefield Mills until 1840 when he commenced business on his own account.

The Fisher mill continued in operation until 1857, when through financial reverses, it was forced to close, it carrying the distinction of having been the first mill in Germantown and America.

Aaron Jones started operation with two knitting machines. In 1866 his three sons, Thomas, Aaron Jr., and John E. were taken into partnership, and the business when it was disbanded was known as Aaron Jones' Sons, and was located at 1825 Wister Street, Germantown, in the building now occupied by John M. Schwehms Sons; they employed about 200 persons.

While the growth of the industry had been very successful in this locality, particularly in the vicinity of Philadelphia, it appears that about the year 1818, a number of knitters emigrated from Nottingham, England, settling in Ipswich, Massachusetts. It is said that the first stocking machine to reach this part of the country came from England, secreted in the hold of a ship, packed deep in a cargo of salt, in order to be able to pass the custom inspectors in England, and thus save the excessive fine of £500, which was the penalty those days for exporting these machines. It is said that the machine was brought from Boston, where it landed, to Ipswich, in 1822 and the first work done in a private dwelling. Other machines followed, and a few years later an industry was established, headed by Augustine Heard, a resident of Ipswich. This is the earliest record known of the knitting industry in New England. The building used by Heards' Company was afterwards purchased by Amos A. Lawrence and again transferred in 1868 to the Ipswich Mills, forming the basis of their present gigantic plant.

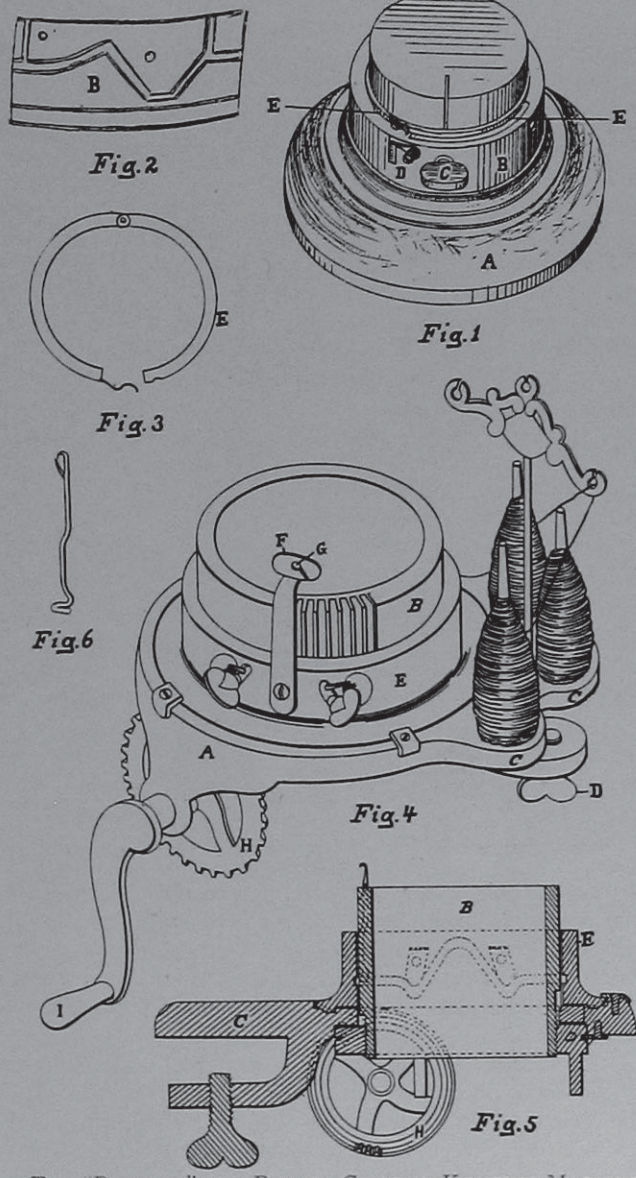
John Button, who established The Germantown Hosiery Mills in 1831, came from Leicestershire, England in 1830. He brought with him two small machines for knitting hosiery. The first year he manufactured children's socks, which on account of superior quality found ready sale. He was the first manufacturer of hosiery by machinery, and enjoyed the monopoly of trade for some years. Later on he installed eight other machines and commenced manufacturing men's hose and was very successful, so much so, that in 1835, he erected a building at Main Street and Walnut Lane, Germantown, and moved his plant there. Associated with him from the first was Conyers Smith, a brother-in-law, who retired in 1851 with a comfortable fortune. The same year Joseph Button,

CHARLES SPENCER

a son, was admitted to partnership. In 1861 John Button retired from the business, and in 1865 Joseph Button withdrew, his brother Conyers becoming sole proprietor. In 1869, a nephew, Theodore A. Flew entered the firm and the name was changed to Conyers Button & Co.

Another mill of which we have record was started by William Fullroth, a stocking weaver, in a room in the back of his house which he used for a shop, at Main and Coulter Streets, Germantown. This new venture proved very successful for Mr. Fullroth, sufficiently so, that he was enabled thereby to give employment to several journeymen who had their looms in his shop. He married a sister of the late Charles Spencer, who a few years previously came from England with his father. In England, Mr. Spencer had been a schoolmaster, but on coming to this country, he entered the service of a mercantile firm in Philadelphia. With this firm, he not only learned business habits and methods, but his aptness, his close attention to business details, and his gentlemanly deportment won for him many

firm friends. He entered into partnership with his brother-in-law, Mr. Fullroth in about 1843 and was ambitious to put the business of stocking making upon a more profitable basis. The little back room soon became too small, and in 1846, they removed to the site of St. Stephen's Methodist Episcopal Church, and in 1848 to the flour mill of W. H. Stokes on Mill Street (Church Lane) where they remained until 1850. Mr. Spencer proved too progressive for Mr. Fullroth and the partnership was soon dissolved.



THE "BICKFORD," THE PIONEER CIRCULAR KNITTING MACHINE.

The small industry transplanted from the little room in the house at Bockius' Lane (now Coulter Street) and Main Street, through the business ability of Mr. Spencer, became, in the course of time, a very large and important business concern. Mr. Spencer, after this, in 1850, erected and founded the Leicester Knitting Mills on Cumberland Street, which in later years developed into the large and successful Leicester and Continental Mills, now located at Lena and Armat Streets, Germantown.

The superintendent of these mills was Mr. Spencer's father, up until his death in 1863. In 1857, Chas. Spencer, admitted his brother William into the business, and the firm name became Chas. Spencer & Co. In 1867, Chas. Poulson was admitted to the firm, and in 1868 Robert S. Spencer became a partner in business; in 1869, William G. Spencer, retired from business and in 1870, Chas. H. Spencer was admitted to the firm.

Martin Landenberger started the manufacture of hosiery in 1842. His business steadily increased until 1847, when the financial panic which ruined so many others, enabled him to purchase a considerable quantity of wool at very low figures, which enabled him, when trade revived, to increase his works. In 1849 his business demanding more extensive quarters, he moved to a building containing eighteen rooms. In 1856 he moved to the present site in Germantown. His two sons, Martin and Charles, with Charles Wyler were admitted to the concern.

Thomas Dolan, Philadelphia's most prominent manufacturer, started the Keystone Knitting Mills in May 1861, at Hancock and Oxford Streets, the buildings of which are still standing. This was early in the era of the Germantown goods and he speedily built up a big trade. In 1866, however, there had been a heavy over-production in the line of knit goods and the market became sluggish and rather unprofitable for a while. At this time Mr. Dolan inaugurated the use of the finest worsted yarns in the manufacture of various lines of goods, particularly of Berlin Shawls as they were called. In 1872 he abandoned the manufacture of this line of goods, having run up a business in five years amounting to $1,000,000; they having begun to decline, he began making worsted material for men's wear. In 1878 he abandoned entirely the manufacture of hosiery, and in 1882 the manufacture of knit goods which had been carried on since his start in business in 1861, and devoted his entire time and attention to men's wear.

Another very early hosiery mill was that of William Allen, father of the late John and Benjamin Allen. This mill was started in the lower part of Germantown, near Spring Alley, which is now known as Reger Street. His descendents still operate the mill, manufacturing hosiery under the name of J. and B. Allen, and are now located at 4980 Pheldon Street.

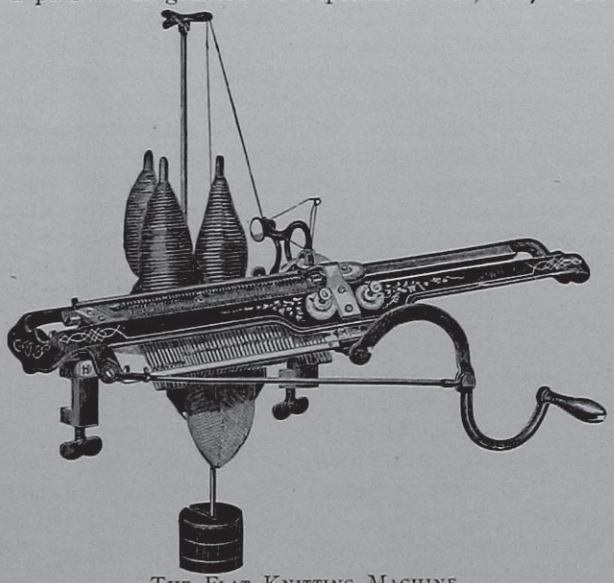
Mills thus referred to, formed the foundation of the knitting industry in Philadelphia, the mills following, being started in many instances by persons connected with the first mills.

The credit for starting the first knitting mill in the West is given to Edward Wust. It was started in Cincinnati, Ohio, about 1845 and it is said worked six months of the year on cotton goods and the other six months on woolen goods. In 1860, more modern machines were installed and the mill operated entirely on woolen and worsted hosiery. The mill is still operated by Edward Wust Jr., the son of the originator, and is located at 1013 Main Street, Cincinnati, Ohio.

While many changes were made in machines up to this time, it was not until about 1858 that the latch needle was invented. It was about this time that a

Mr. Townsend produced this style of needles which have changed comparatively little in their principle of construction during the past fifty years.

Among the early circular knitting machines was the one designed by Dana Bickford, of Boston, Mass. His first machine was a rather crude affair, for which a patent was granted on September 10th, 1867. An



THE FLAT KNITTING MACHINE.

illustration of the general principle of the same may be had from Fig. 1. Fig. 2 is a section of the revolving cam cylinder, showing the pivoted cam. Fig. 3 shows the cylinder ring for holding the needles in position.

The machine in question consisted of bed plate *A*, having a cam cylinder *B* constructed somewhat after the principle used to-day for raising and lowering the needles.

In order to regulate the length of the stitches, a set screw *C* was used, and in order to guide the operator in making this stitch, an indicator *D* was used. This consisted of an indicator finger and a graduated scale on the side of the cam cylinder, the needles being held in position by the cylinder ring *E* which also acted to hold down the cam cylinder *B*.

This was the first machine; a year later, or in 1868, Dana Bickford brought out his improved circular knitting machine. It was somewhat after the principle of his first one.

In this machine he used the latch needle, and from what can be learned, it was the first machine which was capable of producing the goods whether it was run forward or backward, enabling the operator to produce a tubular or a flat web at will, or to widen or narrow the same without changing the size of the needle cylinder ring.

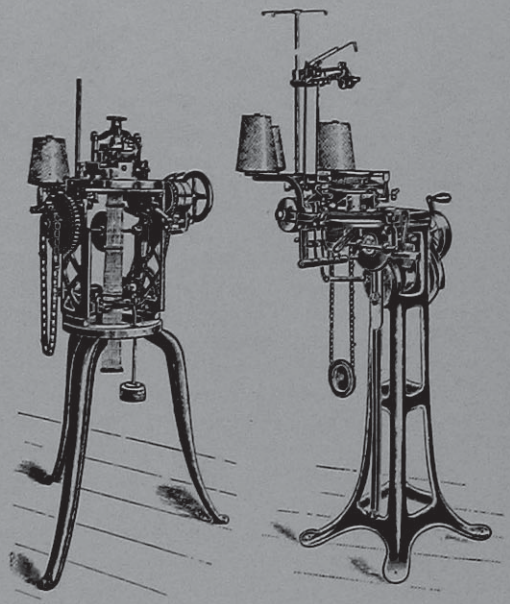
This machine was operated by hand, as can be seen from Fig. 4, which is a perspective view of the machine; Fig. 5 is a cross sectional view, through the cylinder and the cam ring, showing the action of the cams. Fig. 6 shows a latch needle as was used in these machines.

In order to more clearly show the construction of the machine, reference is made to letters of reference accompanying the illustrations, and of which *A* indicates the frame or bed plate of the machine, *B* is the needle cylinder. In order that the machine may be secured to a foundation, the bed plate is provided with the two extensions *C* which are used in connection with the thumb screw *D*, for clamping the machine to a table or bench. The cam ring is shown at *E* and the yarn feeding device *F* is attached to it, the latter having slotted eye *G* at the top for passing the thread through.

The motion of the machine was produced by rotating the gear wheel *H*, the teeth of which meshed with those of the cam ring *E;* for turning the gear wheel *H* the handle *I* is provided.

Previous to this time, about the year 1865, a knitting machine, known as the *American Machine* for family use was put on the market. This machine was very cheaply constructed and production on it was limited to a circular web only. The machine was very slow in producing the fabric, it being necessary to make three complete turns of the crank to produce one round of the knitted fabric.

The Lamb Flat Knitting Machine was brought out about the year 1869 and as was the case with the others, was designed primarily for family work. It was based on the parallel needle principle, each set working on an angle against each other, and by means of cams, the narrowing of the leg of the stocking was accomplished, the same acting upon the sets of needles in changing from one row to the other. Although the



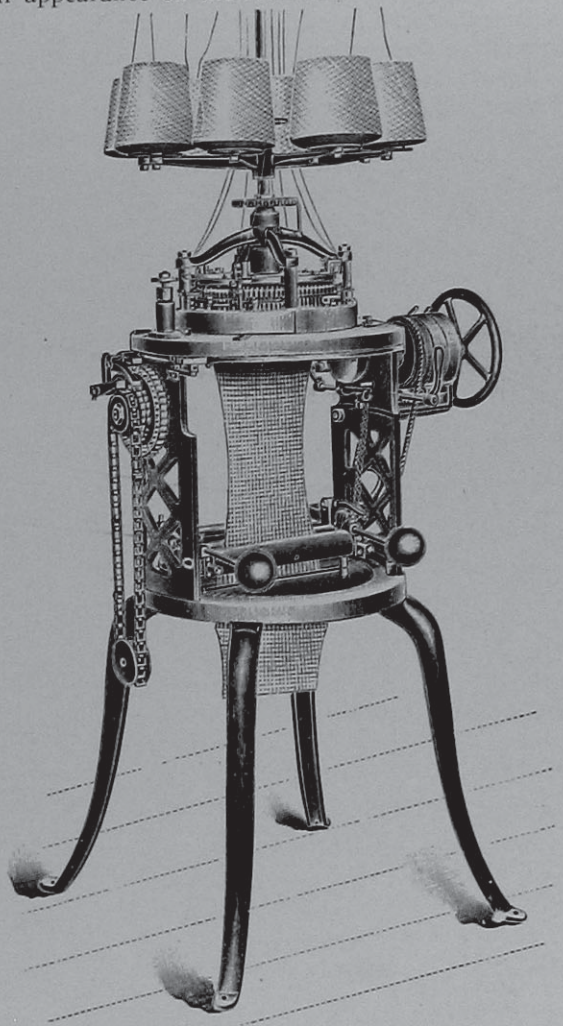
THE "BRINTON" AUTOMATIC RIBBER.

THE "BRINTON" FULL AUTOMATIC KNITTER.

machine was very slow in producing, it made a stocking nearer complete than any other machine, the stocking requiring but 6 to 8 stitches to close the toe.

About the year 1874, J. L. Branson put a circular hand machine on the market, for family work only, and later on added to this, by using cams for producing the variations in the stocking and the heel and toe.

During the next five years, although a number of knitting machines were patented, few, if any, made their appearance on the market.



The "Brinton" Automatic Body Machine.

In 1880, the first seamless power machine for use in mills was put on the market by Branson. The action of the machine was rapid, there being a few of these original machines, it is said, still in operation.

The year 1874 also developed the introduction of the circular rib machine for knitting a circular tubular web for making the cut or sewed foot hosiery. The first type of these machines were introduced by Charles Shurtleff, of 2nd and Norris Streets, Philadelphia, and he was followed, it is claimed, by Joseph Higgenbottom.

For about ten years, or until 1884, this line of goods was in demand, but about this time, they began to lose favor and the seamless gained considerable headway and formed competition for the former up until about 1899, when they practically dropped out of use.

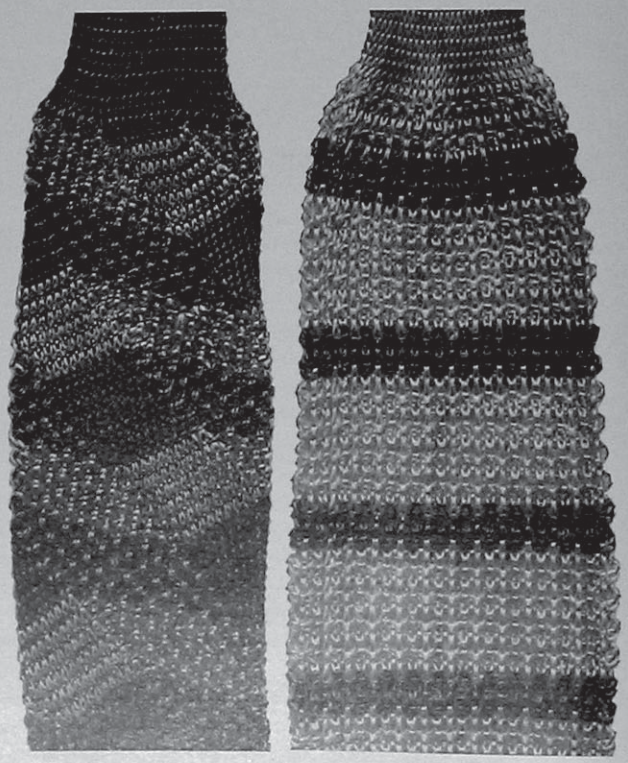
Further progress in the industry is noted by the fact that in 1883 the automatic rib frame and rib top machines were brought into the market. This distinction is given to Higgenbottom and Branson, each producing a machine of a different type. In 1890, Branson brought out the semi-automatic footer.

From the foregoing facts, the foundation of the knitting industry of to-day was built, and the progress is well shown by comparing the machines with the high type machines of to-day.

For this comparison, it is necessary to refer to a type of the higher class of knitting machines built, and in this instance it might be well to consider those of the H. Brinton Co., of Philadelphia. Like the others in the industry, they had a starting, and it might be interesting to know that the foundation of these machines was laid in 1888, when Mr. Brinton then entered the knitting machine building field for himself. The first machines were of the old fashioned, hand power type, being equipped with facilities for power for straight work, it being necessary to do the narrowing and the knitting of the heel and toe by hand.

In 1891 the first rib frames were put on the market by Mr. Brinton, and from that time on the machines have been improved upon, bringing them up to the highest point of efficiency and making them the foremost knitting machines on the market.

A conclusion as to the advancement made in this class of machinery may be had by referring to their Full Automatic Knitter. This machine is of very simple construction and the most easily operated machine on the market for making ladies' hosiery, men's half hose and footing ribbed stockings. It is entirely automatic in all its actions, and on ladies' hosiery it runs continuously, passing from one stocking to the other without any attention on the part of the operator. In the making of half hose, and footing ribbed hose, it is also automatic as far as the knitting goes, but it must stop at the end of each foot, so that another rib



Produced on the "Brinton" Necktie Machine.

top may be put on the machine. In transfer work, while the foot is being knit on one stocking, the operator is preparing another rib top to be placed on the needles, and this is put on the machine as soon as the first stocking is completed.

Further evidence of the advancement in the building of this high type of knitting machinery for the hosiery trade is shown in the Automatic Ribber. This machine is built in many varieties, the base being the ordinary ribber, and the improvements being the automatic ribber with its attachments necessary in producing the best quality of work consistent with quantity of production.

The progress made in the building of the machines for manufacturing underwear, sweaters and union suit fabrics is seen from the illustration of the Automatic Body Machine built by the H. Brinton Co., shown in the illustration. These machines are equipped with all the latest improvements, as are also the Automatic Sleevers for making the sleeves, the Automatic Toque Machine, and the Automatic Necktie Knitter, for producing all kinds of knitted tubular ties, including plain stitch, tuck stitch, horizontal, vertical and spiral stripes and fancy effects.

REINFORCED HOSIERY.

Of recent years, a system of selling hosiery by guaranteeing the same to wear for a definite length of time, has been followed by a number of manufacturers, and, from a general standpoint, it appears that the method has met with favor among the buying public

The general method of construction of these classes of goods is known to a majority of those interested in the industry, yet, a number of new ideas are brought forward from time to time, and it is with reference to these, that attention is called to the following.

In a majority of cases the point aimed at, to be reinforced, is where the hose gets the most wear, which is naturally at the heel and toe.

The fundamental principle in this instance is the spliced double heel and toe.

Before going into detail and in order to make the idea clearer, attention is called to the accompanying illustrations:

Fig. 1 gives an idea of a flat view of the half hose blank as it comes from the machine, showing the spliced heel and toe. Fig. 2 shows one toe folded within the other, previous to looping the two toes together. Fig. 3 shows the two heels, cut through at the portion designated at 5, between the two welts. Fig. 4 shows the stocking completed, the two toes having been secured together and the two heels likewise, forming a re-inforced heel and toe.

From this explanation and the illustrations, a general outline of the idea of re-inforced hosiery may be obtained, but to make it more clear, a detailed explanation of the process is given:

From the illustration Fig. 1 an idea of the blank as it leaves the machine may be obtained, showing the double toe at 1 and 2 and the double heel at 3 and 4, previous to cutting the same apart between the welts, at 6 and 5 respectively.

The general principle of knitting the stocking is the same as in any other case until the heel is reached. At this point, the heel 3 is made first, then one or more extra courses of the yarn between the welts (see 5) are run on the machine and then the second or outer heel 4 is made; the two heels being joined together, and both with the body of the stocking forming a solid surface. The heels being made, the foot portion of the stocking is run off, and the first or outer toe 2 is then made in the usual way, then several courses of yarn are run on the machine, forming the turning part of the toe, as shown at 7, after which the inner toe 1 is knitted, thus completing the stocking.

This gives an idea of how the hose is produced on the machine and ready to be formed into the finished article, thus:

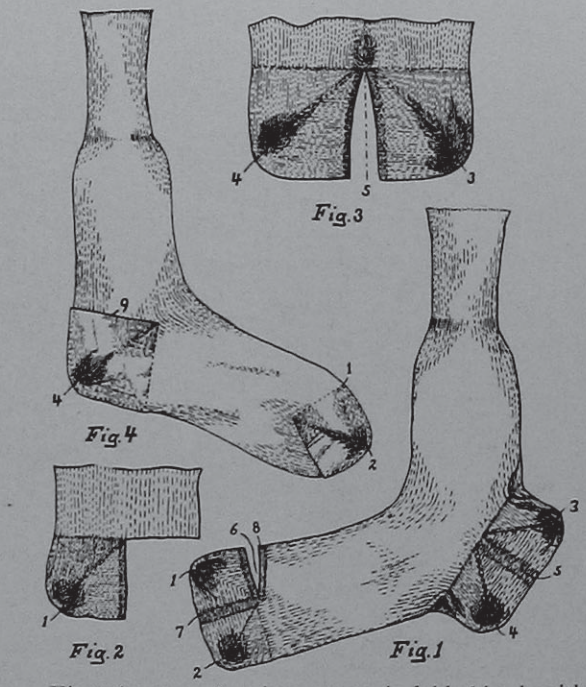


Fig. 3 Fig. 4 Fig. 2 Fig. 1

First the second or inner toe 1 is folded back within the outer toe 2, at 7. The loose edge of the second or inner toe 1 is then sewed securely to the corresponding outer toe 2 and the double toe brought up and joined with the top of the stocking at 8, thus forming the complete double toe, as shown in Fig. 4. This being done, the heel is cut at 5, as shown in Fig. 3, leaving each heel with a free edge. The first heel 3 is then fitted within the outer heel 4, and the free edges of the inner heel 3 securely fastened to the bottom of the heel 4. The free edge of the outer heel 4 is then secured to the back of the leg of the stocking, as shown at 9 in Fig. 4.

This being done, the stocking is complete, the heel and the toe being reinforced and of two thicknesses, while the remainder of the stocking is of but a single thickness.

While, as explained, the reinforced parts have been knit with the same yarn as the body, if so desired, a special reinforced yarn may be used for the heel and toe in order to give greater wearing qualities at these points.

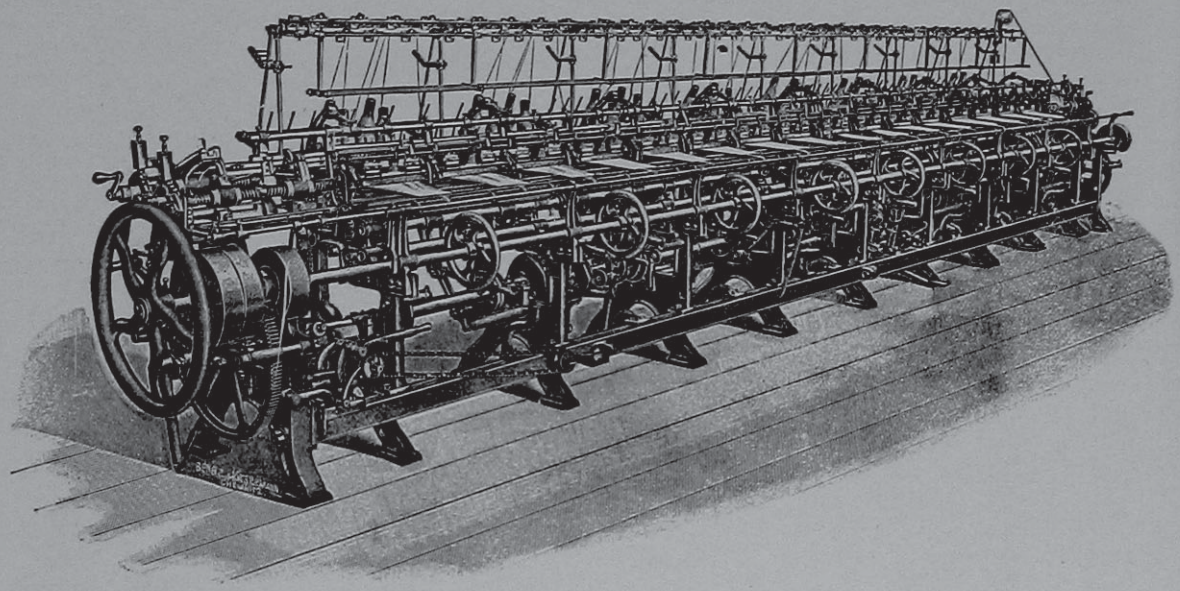
Full Fashioned Hosiery.

The manufacture of full fashioned hosiery forms one of the most important factors in the knit goods industry.

Its growth of recent years has been marvelous, and to-day we have some of the finest mills in the country running on this class of goods.

The success of this industry was made possible by use of the most up to date machinery.

It is with reference to this that we desire to call attention to the famous *Ludwig* Full Fashioned Hosiery Machines, operating on Cotton's System; and Rib Top Machines, Ludwig's High System and Cotton's System.



The former machines are equipped with the latest improvements necessary for greater production and better quality of goods.

One of the improvements to this class of machines is the narrowing attachment, which naturally is of the greatest importance to the manufacturer.

Machines equipped with this attachment are built for ladies' hose up to 24 section and for men's half hose up to 28 section, and in any gauge up to 50.

The narrowing device has been greatly improved upon. Instead of the bars running entirely from side to side, they reach only to the middle of the machine and are operated by four spindles. From this it can be seen that the narrowing machine moves from the left side of the machine in the left half and from the right side of the machine in the right half. For instance, in a 16 section machine, the narrowing machine would be equal to an 8 section machine, since only 8 sections are moved from each side and not 16 as heretofore.

This feature is one which greatly minimizes the difference of contraction or expansion, occurring from the change of temperature, which arises on other machines in connection with the narrowing, owing to the non-fitting of the narrowing points upon the frame needles, and climatic conditions for this reason have no effect whatever.

These variations, as it is well known, very often make themselves unpleasantly felt to such an extent that the machine must be stopped and one must wait until the narrowing machines have taken again their normal position. This disadvantage has been entirely done away with by this improvement, and the machine can be started without any loss of time as it is no longer necessary to wait until the temperature has become such as to be normal for the proper running of the machine.

Another improvement which is adding greatly to the production of these famous machines is the patented internal cam movement.

The same consists in an internal cam movement of the principal levers for the needle bars, for the press and sinkers. With the construction used so far, these levers were drawn by large and powerful springs towards the excentrics, and at the high point of the excentrics, these springs were considerably extended. The consequence was that the strain to which these springs were exposed, was rather irregular, which at the high point of the excentrics, for instance while making the loops, produced a greater wear and required a greater amount of power. This deficiency becomes more and more emphasized, the larger the numbers of sections on a machine. All these disadvantages have been done away with by creating for the excentrics already existing, certain counter cams, providing the main lever in question with a movable arm and connecting the two lever arms by a shorter and weaker spring. In this way, the spring is under a uniform and very slight strain and a greater amount of power for overcoming the high points is no longer necessary, because for each high point, there is provided a correspondingly low point of the counter cam and the two rollers at the arms of the lever do not change their respective position. In this manner, an absolute quiet and uniform working of the machine is obtained, an advantage which also admits the increase of the number of revolutions, turning out at the same time absolutely perfect goods, while the machine saves

also 25% - 30% of the power, necessary on other machines to overcome the high points.

For the manufacture of silk goods, another attachment known as Ludwig's Movable Striking Off Combs is to be had, which enables the manufacturer to use silk even if it is wound dry, and still turn out perfect goods, eliminating the possibility of streaky goods caused by the uneven dampening of the silk.

These machines and the improvements are manufactured by H. Alban Ludwig, Chemnitz, Saxony, and are being introduced in this country by Louis Hirsch, 260 West Broadway, New York City. They are very extensively used by the large hosiery manufacturers in Europe, and the hosiery trade in this country is being rapidly made acquainted with their advantages.

Rib Top Hosiery.

The manufacture of hosiery to-day presents many opportunities for eliminating to a certain extent some of the unnecessary work and expense of production.

There are many operations in the manufacture of various classes of goods which require what may be termed unnecessary labor in transferring the work or parts of it from one machine to the other, or from one part of the machine to the other.

It is with reference to one of the latter processes that we desire to show a method of reducing the cost, and, at the same time, simplifying the operation.

In this instance, the quality of goods in question relates to ribbed fabrics, the leg of the stocking being of a heavy ribbed construction, to greatly increase the wearing properties and the foot of a plain web.

This class of goods is knit in two parts; the leg is produced on a rib machine, termed the ribber, and the foot on a cylinder machine called the footer.

As is usually the case with this class of goods, there are twice as many wales in the leg or ribbed web, as there are in the plain or foot web.

In transferring the leg to the needles of the footer, or topping as it is called, it is necessary that the loops of the leg be transferred to the needles which carry the corresponding loops of the foot.

In as much as there are twice as many stitches in the heavy ribbed fabric, it is necessary that first the corresponding face wales be put on the needles, and then the stitches of the back wales.

These stitches have to be drawn or forced upon the hooks in as much as in ordinary ribbed fabrics, the back wales alternate with or lie midway between the face wales.

From this explanation, it will be seen that the operation requires considerable time and necessarily a skillful manipulation of the fingers and eyes, and naturally adds materially to the expense of production. That this unnecessary expense and labor can be materially lessened may readily be seen from the illustration and the following explanation.

It is with reference to this that attention is called to Fig. 1, which conveys an idea of a flat stocking, the upper or leg portion being of the heavy rib and the foot of the plain web. In Fig. 2, an idea of how the web is formed in both the leg and foot may be obtained, and, at the same time, the manner of joining the two parts together.

In order to give a better working idea of the method pursued, we will confine the explanation to Fig. 2. The heavy rib top is shown at *A* and the foot at *B*.

In the first instance, one set of wales are shown shaded and the other set unshaded, forming the face wales and the back wales. It will be readily seen from the illustration, that instead of the web being made up of face wales alternating with the back wales, the two sets are parallel, that is, lay one upon the other. From this it can be seen, that instead of transferring first the face wale stitches and then the back wale stitches, together with the unnecessary loss of time in getting them in position, both stitches can be transferred at the same time, reducing the cost of production.

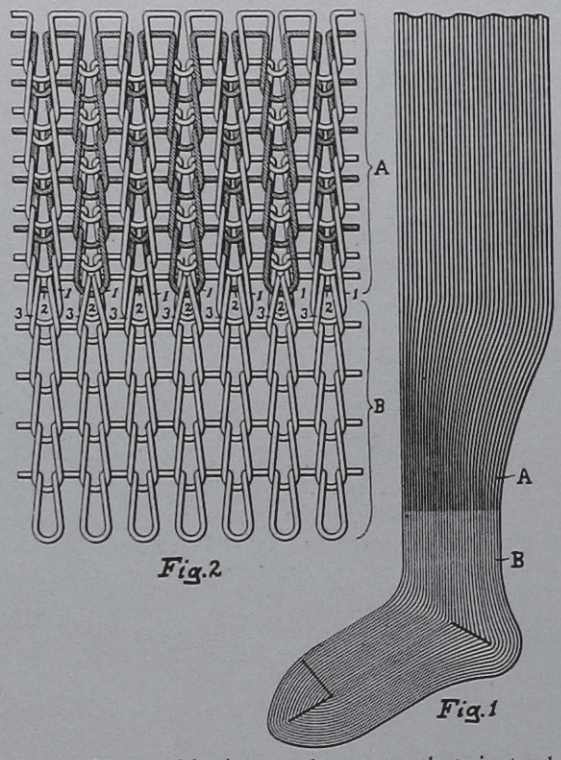


Fig. 2 Fig. 1

In topping, the terminals or free stitches of the face wales, as shown at 1, and the back wales as shown at 2, are put upon the needles, which in turn produce the foot of the stocking, the same being a plain web. The first stitch is shown at 3 and indicates the manner in which the foot and leg are joined together, making it possible to produce the desired class of goods with the same appearance, but at a considerable saving in the cost of production.

An attractive catalogue, showing the various machines built by the H. Brinton Co., 213-217 Race Street, Philadelphia, has just been issued and should be on the desk of every hosiery and knit goods manufacturer.

Every machine built by these progressive machine builders are shown, and manufacturers desiring the same can secure a copy by addressing the builders.

After May 1st., the sales office and demonstrating room of John W. Fries, the builders of the "Hygrosso," will be located in the Federal Bldg., 88-90 Centre Street, third floor, New York, City.

THE DRYING OF HOSIERY.

This process forms a most important part in the finishing of hose. Upon it depends to a great extent the general appearance, feel, strength, brightness of color, etc., of the finished fabric.

To accomplish the most desirable result, requires the use of the most approved construction of a Hosiery Dryer, or Stocking Dryer as more frequently called.

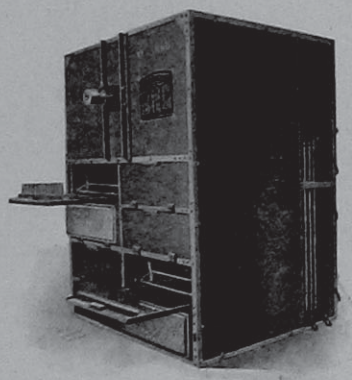


FIG. 1

The most prominent make of these is the one built by the Philadelphia Textile Machinery Co., Hancock and Somerset Street, Phila., the pioneer builders in that line of machinery.

This Dryer is shown in Fig. 1 in its perspective view, Fig. 2 being a cross section of it, showing the interior of the machine and the system of air circulation.

Superior points of this stocking dryer are:

These dryers are fitted with adjustable drawers so that any length hosiery may be handled in the same machine.

The heel support is made in one piece and has notches in the bottom which fit into corresponding notches in the side of the drawer so that it may be adjusted to any length hosiery.

The entire machine is made up of metal. The framework is of structural steel, and the panels and doors are made up on small steel frames and two sheets of metal with $\frac{5}{8}$" thick air-cell asbestos between. These panels are made small so that they may be removed, thereby making the interior of the machine accessible.

Particular attention is called to the method of re-circulating the air currents. The arrows in Fig. 2 shows the direction of the air current. It will be noted that the air is re-circulated over and over again through the heating coils and through the chamber containing the hosiery which is being dried. In most drying machines the cold air is drawn over the heater coils, blown through the material to be dried, then thrown away into the atmosphere, wasting a great many heat units. In the system utilized in these dryers, this loss is overcome by the method of re-circulating the air. The air passes through the heating coils and takes up some of the heat units; it goes up through the hosiery and takes up the moisture, then it is drawn back into the heating coils again where it takes up more heat, and again through the hosiery. A very small percentage of this air is blown through a pipe in the top of the machine and wasted to the atmosphere. The builders of the machine have found, by exhaustive tests, the exact amount of air to waste from the machine so as to attain the greatest efficiency. The small percentage of air that is wasted, leaves the machine almost at the saturation point. The condensation in the heater coils in this system is not so rapid as where cold air is drawn over the heater coils, because it is a continuous re-circulation of hot air in the machine. In order to attain perfect uniformity of air circulation, no matter how long or how short the hosiery may be, a system of metal barriers are furnished as shown in the illustration. These barriers break up the air currents and cause them to flow uniformly through the hosiery, no matter how short or how long the hosiery may be.

The radiators are built complete and tested to 175 pounds pressure before being shipped, to insure them against leaks after delivery.

In the operation of the apparatus, one workman can easily keep four dozen boards in use. They are placed in the machine in successive lots of one dozen each; the drawer being divided up into one dozen lots. Three dozen are kept in the machine by each workman, while the fourth dozen is being stripped and reboarded. The time occupied in drying is from four to

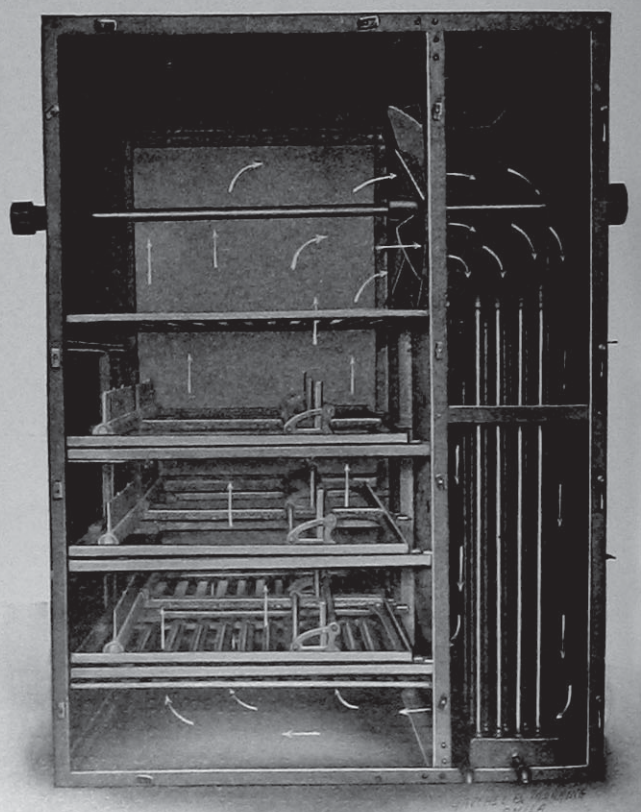


FIG. 2.

twelve minutes, depending upon the weight and character of the stockings. The stockings are brought direct from the hydro-extractor and dried. After dry-

ing, they may be paper pressed and boxed for shipment, but, in ribbed work the dryer gives the goods such an excellent finish as to preclude the necessity of paper pressing, and often in other grades, many manufacturers having these dryers have entirely discarded paper pressing.

This system of drying is adapted to all solid colors, whether fast or otherwise, cotton and woolen alike, but the machines are not recommended for mixtures, and when one color would run into the other while the goods are in a wet condition.

Sometimes these dryers are fitted with special racks for drying mittens and the like; for *opera lengths*, special drawers are arranged.

The fan bearings are located on both sides of the dryer. The fan is mounted on a large shaft so that the bearings are in the cold air all the time and there is no possibility of any oil from the bearings getting on the hosiery.

The builders of this Hosiery Dryer issue handsomely illustrated catalogues on Modern Drying Machinery for all purposes, and which they will be pleased to send to any one interested in the subject.

Bleaching of Knit Goods.

During the past year a marked change has been felt in the demands of the public regarding the quality of the underwear it buys, particularly in its insistence on a fast white, or delicate colors, and on soft and elastic textures. Moreover the goods are wanted strong.

This tendency may be ascribed to the energy of certain mills laying particular stress on these points in their magazine advertisements and in their selling arguments to the retailers.

It is therefore opportune to inquire into the justification of these claims and discuss methods how those qualities can be produced.

It is admitted on all sides that the lime bleach—or we had better say chlorine bleach to include the bleaching solutions made electrolytically—is hard on the fibre. Analyzing this untechnical expression we find that the by-products of the chlorine bleach have a decomposing effect on the cotton fibre which are more or less marked according to the strength of the treatment, or the care with which it is carried out. The individual fibres are thereby roughened and stiffened, the consequence being that they do not slide freely one against the other, and as a permanent lubricant cannot be supplied, the consequence is that the goods lose their spring and the power to go back when stretched. The injury to the fibre has also of course weakened its tensile strength.

The same drawbacks, but from another chemical standpoint, influence the character of woolen goods and mixtures. These when bleached with sulphur or its solutions are injured in their cotton part through the carbonizing effect of the sulphur through which practically the same conditions are produced which deteriorate the all-cotton goods.

At no time therefore can a fast white, softness and elasticity, and unimpaired strength be justly claimed for lime or sulphur-bleached goods, and those mills who have built up a reputation for these qualities have done away with older, unsatisfactory bleaching methods and are using the all around, more satisfactory Peroxide for that purpose.

Since all goods, irrespective of the source of the yarn of which they are composed, are bleached in the same Peroxide bath without in any way affecting the fibres, those mills that put out a miscellaneous line of goods need arrange themselves for but one process which at the same time takes up less factory space than either of the old ones.

The process itself is much simpler, once it is understood. Like all improvements it must be carefully tried and a judgment rendered only after the cause of possible failures has been studied and done away with. A point not to be overlooked is that in Peroxide bleaching (Peroxide of Sodium is the cheapest) there are practically no chances of spoiling the goods as against the constant watchfulness required with lime and sulphur. Therefore there are no seconds or throw-outs. K. W. G.

THE DYEING OF KNIT GOODS.

Description of the Process and Modern Machinery.

Successful shades, as well as quality and quantity of work produced in the dyeing of knit goods, depend to a great extent upon the type of machinery used for the process. A most prominent place in this line of machinery belongs to the *Klauder-Weldon* Machines, hence we selected them for illustrating this article.

In connection with the dyeing of hosiery, underwear, caps, etc., they come to the dye house in an unfinished condition, that is with reference to the underwear, made up into unfinished garments.

After coming to the dye house, the fabrics to be dyed are first boiled out, in the same machine as is afterwards used for dyeing, and which consists of

(1) a tank for holding the dye liquor, through which the goods are passed,

(2) a wooden cylinder divided into compartments, which holds the goods to be dyed, and which revolves with its lower half submerged in the dye liquor, and

(3) a wooden cover which may either cover tank and cylinder or only the tank.

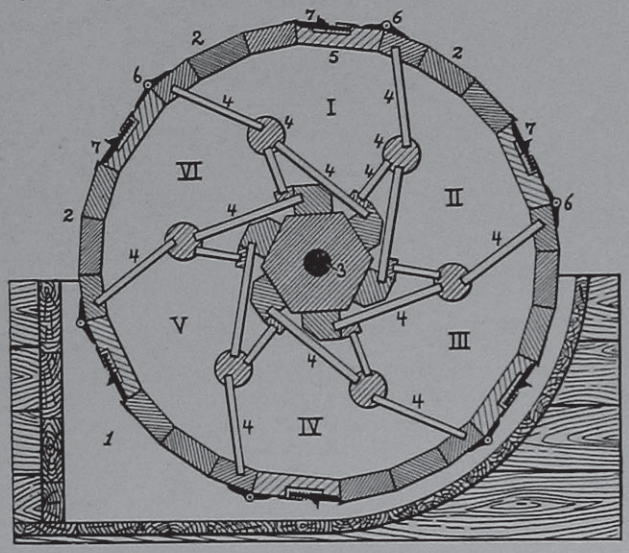
The details of the construction and operation of the machine are best shown by means of the accompanying illustration, which is a cross sectional view of the machine.

In this illustration, 1 indicates a wooden tank reinforced with heavy cast iron frames at each end, to which the gearing is attached. The cylinder, comprising the various compartments as holding the material to be dyed, is indicated by 2. Said cylinder is made almost entirely of white pine and cypress, each end head being supported by a bronze casting, the hub of which is keyed to a shaft 3, so that the cylinder and its contents revolve with it. This steel shaft 3 extends through the centre of the cylinder and rests in bearings on the sides of the tank. It is covered with wood on the inside of the cylinder to prevent the goods from coming in contact with the steel, thus preventing rust spots on the goods.

The cylinder is divided into six compartments by the partitions 4, which are so shaped as to prevent the goods being matted together by the revolution of the cylinder during the dyeing process, thus enabling the goods to be more evenly and thoroughly dyed.

The partitions of the compartments consist either of perforated boards or series of round pins, so placed that a perfect circulation of the dye liquor is obtained. Each compartment is provided with a door 5, through which the goods are loaded and unloaded. The doors are perforated to allow the dye liquor to circulate from the tank through the compartments, and are provided with heavy bronze hinges 6 and catches 7 to close and fasten said doors.

A steam pipe is entered in the side of the tank at the bottom and extends across said tank. The goods, being inside the cylinder, are thus not disturbed or injured by the steam.



An outlet valve for discharging the water, etc., is located on the side of the tank and is constructed of cast iron, bronze and rubber.

The top covering is supported on each end by cast iron frames. The openings at the back and front of the machine are covered by canvas curtains, which are rolled up during the loading and unloading process. The object of covering the machine during the dyeing process is to save steam, as it confines the heat; the volume of liquor is also reduced to a minimum, as compared with the amount of material being dyed, which results in using dyestuffs to the best advantage.

The cylinder 2 is driven either from the side or from the back of the tank. When driven from the side, a worm gear is attached to the end of the main shaft 3, that runs through the centre of the cylinder, and this gear is driven from a worm located on the same shaft with the driving pulley. When driven from the back, a bronze rack is attached to the periphery of each end head of the cylinder, and the same driven from a shaft extending across the back of the tank on which are placed two pinion gears which mesh with the bronze rack. On the end of this back shaft is located a worm gear which is driven by a worm on the same shaft with the driving pulley.

The back drive is preferable, for the reason that it relieves the main shaft of all strain, since the latter simply rests and rotates in the bearings on the sides of the tank.

A hand crank is furnished with each machine, so that should accidents occur, or power be cut off, the machine can be operated by hand, thus preventing the batch of goods being spoiled.

The Dyeing Process.

The goods to be dyed are first counted so that each compartment will have about an equal share of the batch. The doors are then closed and the goods boiled out, after which they are washed in running water in the machine, and when sufficiently washed, the water allowed to run off, after which the dyeing process is begun, the material thus not being handled until the process is finished.

The cylinder rotates slowly through the liquor and the machine requires no attention other than the regulating of steam and entering the dyestuff. The goods are thus alternately brought into the liquor and then carried around with the cylinder. During this passage, the goods in each compartment fall from one side to the other, and thus are always in a different position when entering the dye liquor from that during the preceding immersion. In this way all parts of the material are exposed to the action of the dye liquor in the same degree.

Care must be taken not to run the machines at too great a speed and cause the goods to roll and knot up, as this will cause uneven dyeing. One man can attend three or four machines. From 150 to 400 pounds of goods per batch can be dyed in the standard size of a machine, and from 5 to 10 batches per day, according to the material handled.

Among the advantages of the machine, are the uniform application of the color, the large production, small amount of labor required, economy of steam and dyestuffs, and simplicity of construction.

The dyeing of knit goods requires care and experience. The dyes used are nearly all of the *direct* type, that is, colors which require no previous mordanting. For light shades, the goods are generally boiled for one-half hour in the dye liquor before adding salt or Glauber's salt, and then the dyeing continued for one-half hour longer in order to complete the process and thoroughly exhaust the dye bath.

The dyes chosen for this work are those which are fast to washing and hot pressing and those which are easily soluble and go on evenly. For very light shades the goods are bleached before dyeing, but in most cases this is omitted and the dyeing is done in the gray.

Finishing, Trimming, Boxing.

After being dyed, rinsed and extracted, the goods are sent to the boarding room to be shaped and dried. This is done by putting the garments on wooden forms, called boards, when they are wet, and drying them in this stretched condition. The garments are next removed from the boards to be finished, that is, to have the bands and buttons sewed on and to be pressed and boxed.

The SILK ASSOCIATION OF AMERICA has issued their thirty-eighth annual report. The same is attractively gotten up and contains an outline of the work of the Association during the year including the proceedings at the annual meeting March 22nd., 1910 and the Addresses at the Banquet, February 11th., 1910.

The officers of the Association that were elected March 22nd., 1910 are:

President, Jerome C. Read, President Read & Lovatt Mfg. Co.

First Vice-President, Charles Cheney, Treasurer Cheney Brothers.

Second Vice-President, David Valentine, President Valentine & Bentley Silk Co.

Third Vice-President, H. Schniewind, Jr., Treasurer Susquehanna Silk Mills.

Treasurer, Charles F. Homer.

Secretary, Jacques Huber.

Assistant Secretary, Ramsay Peugnet.

DIRECTORY OF TRADE MARKS RELATING TO THE TEXTILE INDUSTRY.

Registered April, 1910. (Complete.)

1. Rugs, Mats and Carpets.—McCleary, Wallin & Crouse, Amsterdam, N. Y.

2 Carpets and Rugs.—Hardwick & Magee Co., Philadelphia.

3. Cravats, Neckties, Neckscarfs, Garters, Apparel Belts and Suspenders.—Susquehanna Silk Mills, New York.

4. Damask Tablecloths, Napkins, Towels, Pillowcases, Sheets and Linen Piece Goods.—Neuss Hesslein & Co., New York.

5. Laces.—Sherman & Sons Co., New York.

6, 7, 8 and 9. Rugs and Carpets.—Bigelow Carpet Co., Clinton, Lowell and Boston.

10. Cotton Shirtings.—Cone Export and Commission Co., New York and Greensboro, N. C.

11. Brown Cotton Piece Goods.—Grendel Mills, Greenwood, S. C.

12. Brown Cotton Sheeting without Finishing or Coloring.—Grendel Mills, Greenwood, S. C.

13. Cotton Piece Goods.—Bliss, Fabyan & Co., Boston.

14. Spool Silk and Mercerized Thread on Spools and Tubes.—Peerless Spool Silk Co., New York.

15. Cotton Crapé.—Hamilton Manufacturing Co., Lowell and Boston.

16. Handkerchiefs.—Moses Isaacs, New York.

17. Hosiery.—Richmond Hosiery Mills, Chattanooga, Tenn., and Rossville, Ga.

18. Woolen Cloth Piece Goods, Linings for Garments and Blankets.—The Mianus Mfg. Co., Coscob, Conn.

19. Knit Union Suits, Infants' Knit Shirts and Infants' Knit Slips.—Minneapolis Knitting Works, Minneapolis, Minn.

20 and 21. Hosiery.—Glidden, Hyde & Co., Boston.

22. Hosiery.—Miller & Sons Co., Philadelphia.

23. Linen Thread.—Lindsay Thompson & Co., Ltd., Belfast, Ireland.

24. Cotton Cloth Piece Goods.—Franklin Manufacturing Co., Baltimore, Md.

25. Hosiery.—Saxony Hosiery Company, Philadelphia.

26. Undershirts, Undervests, Drawers and Union Suits.—High Rock Knitting Co., Philmont, N. Y.

27. Cotton Duck and Sheeting.—The Putnam-Hooker Co., Cincinnati, O.

28. Worsted and Woolen Piece Goods.—Downing, Clark & Co., New York.

29. Cotton Duck, Drills, Twills, Sheetings and other Cotton Piece Goods of every description, and also Crashes.—Consolidated Cotton Duck Company, Baltimore, Md.

The attention of manufacturers is called to the facilities of the Textile Finishing Machinery Co., of Providence, R. I., the most prominent concern in that line. Their machinery is designed to assist the mill in increasing production in connection with Bleaching, Dyeing, Drying and Finishing.

At the same time it will be of interest to the Hosiery and Knit Goods trade to know that the Textile Finishing Machinery Co., is prepared to install complete plants for Bleaching by the Kier System Yarn and Knit Goods; Mercerizing Machinery for Yarns and Piece Goods; their machinery and processes representing the highest point of efficiency.