## COTTON FINISHING.

### Bleaching.

(*Continued from page 75.*)

**Kiers:** With reference to their principle of construction, Kiers can be either of the Open, the Low Pressure, or of the Pressure type.

The first type is more or less out of date, on account of the excessive loss of heat by radiation, and the large amount of steam necessary to keep up circulation. When open kiers are used, see to it that the goods are kept below the surface of the liquor, since if cotton in presence of alkali comes in contact with the air at a high temperature, tendering of the goods will result.

The low pressure kier (5 to 10 lbs. pressure used) is a modification of the former, with a slight gain, and refers to a system occasionally met with in older bleacheries.

Pressure kiers are the kiers used by bleacheries at present, as we might say, universally. They are made either of wrought or boiler iron, cylindrical in shape, and are placed in an upright position. They vary in size to suit the capacity of the bleacheries, about 7½ feet diameter by 10 feet high, being a size frequently met with. They are mostly used with an average pressure of from 35 to 50 lbs., although some bleacheries, in connection with certain grades of goods, may run them at a lower pressure, in fact running them sometimes at as low as 10 lbs. pressure.

To give a description of the construction of the various makes of kiers in use, would be of little interest, for which reason we will only explain what is acknowledged the most prominent make, *i. e.,* the kier as built by the William Allen Sons Co., of Worcester, Mass.

Bleaching depends principally upon:

(1) the rapidity of circulation of the liquor through the goods,

(2) the even distribution of this liquor during its circulation,

(3) the temperature of the liquor, and

(4) the strength of the solution.

These four points have been most carefully taken into consideration in the construction of the Allen Kier.

(1) Rapidity of Circulation. The same is caused, in the Allen Kier, by the condensation of the steam as it leaves the projector points, causing a decrease of pressure in the vomit pipes, drawing the liquor from the basin to this point where the velocity of the issuing steam forces upward the liquor already in the pipes. Both of these actions are positive, hence the liquor is forced through the pipe onto the top of the goods by a positive action, which can in no way fail to work, and is independent of the working pressure of the kier, reducing the chances of kier tendering practically to nil.

(2) Even Distribution of Liquor During its Circulation. If the circulation of the liquor through the goods is uneven, that is, if more liquor passes through the goods at one point than at another, that point receiving the greater amount of circulation and having the greater chemical action will have the better boil. In order to obtain an even distribution of this liquor, it is essential that there should be sufficient liquor at all times on top of the goods to cover them, and deep enough to supply the downward trend of the liquor, without interruption at any point. This quantity of liquor on top of the goods is easily maintained in the Allen Kier, by the positive and rapid flow of liquor in the outside vomit pipes, as previously described.

It is absolutely essential for the even circulation of the liquor to have the kier evenly loaded and uniformly packed, for which one point should be as accessible as another, and there should be no chance to form channels down through the goods. The entire interior of the Allen Kier is clear of any piping or other obstructions, in turn giving the operator ample opportunity to spread the goods evenly, and pack them with equal pressure, a feature not possible to be done in connection with kiers where a center vomit pipe is used; or pipes or other parts pass up through the goods, such pipes or parts forming a natural channel down through the goods, for the liquor to flow more freely than in other parts of the kier. This consequently will result in an uneven boil, in turn giving an uneven bleach to the goods under operation. The convenience of having a perfectly clear space inside the kier for loading and unloading the cloth will at the same time be readily understood.

(3) The Temperature of the Liquor. With wooden or iron open kiers, it is impossible to boil at more than atmospheric pressure, which means a temperature of the liquor of 212 deg. F., whereas the Allen Kiers are constructed to withstand a working pressure of from 60 to 80 pounds if so desired, thus permitting the temperature to be raised to 300 or 325 deg. F., a feature which in connection with some classes of fabrics may be a desired item, again the extra thickness of the shell adds to the life of the kier. In connection with kiers, having internal vomit pipes, the temperature throughout the goods cannot be kept even, since the upward flow of liquor is considerably hotter than that which has been distributed and is coming down, for which reason the goods in the immediate vicinity of this pipe will be several degrees hotter than at any other point, a feature which again will produce an uneven boil and in turn an uneven bleach and strength to the goods under treatment.

(4) Strength of Solution. The thorough and rapid circulation in the Allen Kier, makes it possible to use in connection with this kier, a much weaker solution than can be used with kiers not having this rapid and even circulation of the liquor. A weaker solution used means less chemicals required for treating a given amount of goods, retaining also more of the strength of the goods.

Construction of the Allen Kier. Fig. 14 shows this kier in its side elevation, partly in section, and with a portion of the shell removed to show its interior construction. In this illustration letters of reference indicate thus: *A* the grate, or false bottom, supported in its center on a cast iron stand *B,* and at its circumference on an angle iron *C,* riveted to the shell of the kier at the outside. *D* is a bottom flange, tapped for 4" pipe connections for blow off; however, when so desired, connection can also be made to this flange for filling the kier. *E* is the boiling pipe, being a circular pipe, perforated with $\frac{1}{4}''$ holes, and *F* is its supply pipe, supplying steam to the boiling system. *G* is a circulation supply pipe, which supplies steam to the projector nozzles *H*, whose peculiar construction and formation cause the rapid circulation of liquor in this kier. *I* are the outside vomit pipes and *J* the reducing valve, which reduces the pressure on the main steam line to that desired in the kier. *K* indicates the main steam supply pipe for the bleach house, *L* the low pressure connection, for pressure regulator, *M* the safety valve flange, *N* the manhole, and *O* the air chambers.

The Operation of the Kier: In starting, open the valves on pipes *F* and *G*, which will cause the kier to boil quickly. The lever of a safety valve (not shown) connected to flange *M*, must be left up, so that the air pressure on top of the goods can escape as the boiling commences. When steam escapes from the safety valve, drop the lever, thus closing the safety valve, and then partly close off the valve on the pipe *F*, leaving the projector pipes wide open. Leave them in this position until the steam gauge begins to register, then partly shut off the supply for the projector nozzles *H*. The final adjustment of the valves on pipes *F* and *G* can only be determined by experiment, permitting in some instances the pipe *F* to be shut off entirely, the steam necessary to run the projector nozzles being in this instance sufficient to keep the kier boiling, however in most instances, this valve must be left open a very little. The valve on pipe *G*, and which governs the projector nozzles, should be shut off until the nozzles throw the liquor up through the pipes in a continuous stream, which is determined by opening the pet cock in the air chamber. Provided the valve on pipe *G* is open too far, there will be sputterings of steam and liquor from the pet cock, on the other hand, if it is closed down too far, nothing but steam or air will appear; again when the valve is closed to its proper point, nothing but liquor will appear at the pet cock. This point when once determined by the operator is always the same. The safety valve should be set to blow at the desired working pressure, and in case the pressure should get beyond this point, and blow too freely through the safety valve, then close down the boiling pipe *F*.

When working properly, the safety valve should not remain perfectly tight, but when up to its proper pressure should shake slightly and blow steam at short intervals, until the boil is finished.

In a great many bleacheries the water valve is connected to the tee on the under side of the safety valve. This pipe is used for washing out the goods after they have finished boiling, and also to cool the kier down as quickly as possible. When boiling at 15 pounds or over, there is a liability, if blown clear off and not cooled down, of stains showing in the goods when finished, due to the high temperature.

When iron kiers are new there is a chance of rust spots to the goods; but after some time the interior of the kier becomes covered with a hard coating of lime which prevents further oxidation to the iron. On this account it is customary to frequently apply a coating of whitewash to the inside of new kiers, and thus help along the quicker coating of the inside of the kier.

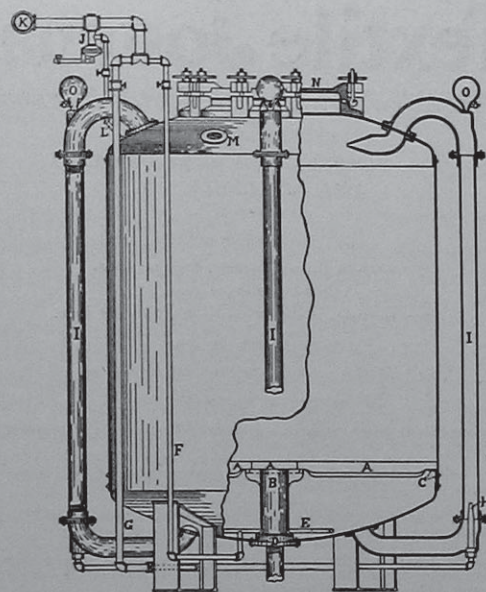

Fig. 14.

The amount of liquor necessary to add to the kier, after introducing the goods, previously to the proper point for the boiling, as a rule is not great, for the reason that each piece of cloth when entering the kier, in an average contains about one gallon of lime water.

(*To be continued*)

## Curtailing Cotton Manufacturing.

The Arkwright Club, of Boston, with which a great many of the cotton manufacturing corporations of New England are associated, is making a systematic effort to ascertain the sentiment of the cotton manufacturers of New England toward a general curtailment in production, while cotton prices continue so much higher, comparatively, than cloth prices. The following form of questions have been sent to cotton manufacturers, requesting them to send their replies to the Secretary of the Club.

1. Do you deem expedient a curtailment of production by cotton manufacturers?

2. Do you think such curtailment, if any, should be made immediately? If not, when, approximately, should it take effect?

3. Please state your views as to the proper extent of such curtailment, both as to the rate and as to the time that it should continue.

## Whitin High-Speed Combers.

The Bibb Manufacturing Company, of Columbus and Macon, Ga., has just placed an order for the latest Improved Combers for use in manufacturing sea island cotton to be placed in their Columbus plant. The Whitin Machine Works secured the order, the aggregate amount of which was \$25,000.

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## Worsted Dressgoods.

Diagonals, narrow and wide, in cheviot effects will be popular for the next spring season.

Voiles, panamas and serges appear to be sold ahead further than any of the other dress materials. All of the leading manufacturers of voiles are so well under contract that many looms are engaged for months and months to come. The best known makes of panamas are in a similar position and every indication points to a continuance of these weaves in favor. Serge orders have also been booked on a large scale for the next spring season, so that of all the dressgoods made entirely of wool it is doubtful whether any have been bespoken on so liberal a scale as the voiles, the panamas and the serges.

An advance of from 10 to 20 per cent in the cost of raw material is a factor to be reckoned with, and it is very likely that buyers will find it very difficult to procure duplicate orders for next spring at the figures named at the opening.

## The Silk Situation.

According to the semi-annual report of the American silk trade, as issued by the Silk Association, the past twelve months have been a period of recovery from the disturbed conditions which had prevailed throughout the industrial world the previous year. The comparatively low price of raw silk has allowed manufacturers to make goods which stimulated the consumption of silk.

Fashion has been very favorable to the use of silks and satins, and there is every reason to believe that this favor will increase rather than diminish.

The amount of business transacted the past year in the various branches of the industry has been good in spots; while mills making novelties which caught the popular fancy, as well as those running on raw weaves and piece-dyed lines, have been rushed with orders. The feeling prevails throughout the trade that the business as a whole is on a more solid foundation.

The trade at large regards the present fall season as somewhat late.

Among the new fall silks which have found favor in the fashionable world may be mentioned corded weaves, moires, cachemire de soie, serges and knitted silk jersey cloth. The prevailing styles continue to favor tight-fitting, clinging gowns and fabrics of high lustre.

The outlook for the spring season of 1910 leads many manufacturers to believe that it will be a record breaker. Tussah silks of various kinds in semi-rough and open weaves and foulards are spoken of as the fabrics which will undoubtedly be the leaders. There is some reason to believe that fancy silks and brocades will find considerable favor.

Taffetas in both blacks and colors are being taken in large quantities by the garment manufacturing trade, mostly for use in petticoats, linings and garments, but fashions point to their use also for outside dresses.

The ribbon situation has not been particularly satisfactory during the past season. Just recently the indications from Paris are to the effect that fall styles will favor them a great deal more for use as dress trimmings.

The demand for silk and cotton mixed goods has attained enormous proportions during the past few years, and large quantities of raw silk have been purchased by the cotton manufacturers of New England for the filling of these fabrics. Thousands of looms which used to weave cotton goods only, are now making silk and cotton fabrics. Many new mills have been recently constructed and more are being built, so that by January 1, 1910, several thousand additional looms of this character will be in operation in New England.

It is reported that the French silk cocoon crop of 1909 amounts to approximately 8,595,000 kilogs (18,909,000 pounds). The yield of silk from the 1909 crop, at the rate of the previous year, *viz,* 1 pound of raw silk from 12.63 pounds of cocoons, will be 1,497,000 pounds.

### Silk Industry In China.

There has been marked activity in pongees during the past season as a result of their growing popularity, particularly with the motoring public, in Europe and the United States. Prices have ruled high. The exports of silk from Chefoo to the U. S. during the five months ended May 31, 1909, show an increase over the corresponding period of 1908. While the United States takes a large share of the exports of pongees, the trade is entirely in British and German hands.

It is unlikely that any early decline in cocoon prices will be recorded, on account of the European demand and the cocoon prospect.

Two more foreign firms have this year entered the pongee business, which is rapidly becoming the leading industry of the region. One of these firms contemplates direct raw silk shipments to the United States and other foreign markets. Chinese firms have heretofore shipped the raw silk to Shanghai, where it was purchased by foreign exporting firms. The new system should materially reduce commissions, storage, and other charges on raw silk.

During the past season there has been a growing demand for the durable Chefoo silk lace. Its manufacture, although of recent origin, has assumed large proportions.

### Silk Raising In Hungary.

The Hungarian Government has made great endeavors to revive the sericulture industry, which, in 1879, had almost disappeared from the Kingdom.

There are numerous receiving stations and drying establishments. In the older houses the chrysalis is killed by steam and the cocoons afterwards dried by hot air; in the newer houses the whole operation is done by hot air, which gives much better results. The Government purchases all the cocoons produced. In order to prevent the cocoons from leaving the country and the work of reeling being given to foreigners, the Government has erected filatures at various centers. By this means all the natural high quality of Hungarian silk is made better known.

The special qualities of color, brilliancy, elasticity, and flexibility which are found combined in Hungarian silk are believed to be due to the leaf, which is from trees that have not been grafted. Though these trees give a smaller crop of leaf, it appears to be of a nature that imparts the better properties to the silk produced by worms fed on it. Many Italian reelers prefer Hungarian cocoons to all others.

### Germany to Raise Its Own Cotton.

Bernhard Dernburg, the Secretary of State of Germany for its Colonies, has come to the U. S. to study cotton raising in the South.

The Colonial Office of Germany has been experimenting for the last eight years with cotton planting in German Togoland, Africa. The exports of raw cotton from Togoland in 1906 amounted to 165,000 bales. This increased to 231,000 bales in 1907, and it is estimated that 285,000 bales were sent out in 1908.

Herr Dernburg has a reputation for energy and extraordinary business capacity. The German Colonial Society has been pointing out for some time that settlers could do very well raising cotton in Togo.

### Wool Clip In Australia.

The wool clip of Victoria for the 1908-9 season amounted to 68,930,200 pounds. The weight per fleece of the 1908-9 clip was 5.45 pounds. The total quantity produced in 1908-9, including wool stripped from skins and on skins exported was valued at $17,748,126. The exports to the United States amounted to 15,087,300 pounds, valued at $4,860,346.

The exports of wool from New South Wales, the product of the State, for the first nine months of the current season amounts to 932,402 bales. The total available supply of Australian wool for the season now drawing to a close, according to the best authorities, will be 1,750,000 bales, against 1,620,000 bales for the preceding season, an increase of 130,000 bales.

### Japanese Knitting Industry.

The growth of the knitting industry dates back to 1903. At that time comparatively little attention was given to the manufacture of knit goods, the amount of machinery purchased through Kobe amounting to only $877. Four years later there were purchased supplies for knit goods manufactures to the value of $37,004 in the Kobe consular district, which, however, dropped to $19,605 in 1908.

The U. S. made no sales of knitting machines until 1905, when goods valued at $409 were disposed of at Kobe. The following year the sales were increased to $6,477, which increased in 1907 to $10,682, but dropped to $2,701 in 1908. The only exporting nation making a gain at Kobe in that year was France. At Osaka the total imports in 1908 were $9,900, of which France supplied $9,691.

## Sizing.*

The principal material used for sizing warps is starch.

The only means of distinguishing one starch from another is a microscopical examination, the difference in appearance and size of the granules affording the distinguishing test.

Starch granules are not dissolved by cold water, alcohol or ether, but when starch is heated with water, from 114.6 deg. to 165.2 deg. F. the granules swell and split open, forming a thick mass called starch paste or size.

By boiling the paste with a larger quantity of water, the starch particles become so finely divided that they pass through a filter and if boiled for a long time the solution becomes clear and the starch is rendered soluble.

The sizing power of corn starch acts more uniformly on warps than either potato, wheat or any other starch. The size itself remains constant and dependable. The strength being uniform standing over night or over Sunday in the kettle or size box without altering, whereas, potato starch turns acid, falls down and separates into a gelatinous mass if left in size box or tank over night. A corn starch sizing after standing from Saturday until starting time Monday can be reboiled without affecting the sizing value.

Corn starch makes a size which is uniform in its results, gives body to the warp, penetrates the fibre thoroughly, strengthens and lays the fibre, smooths the yarn, and lets the individual thread separate freely without clinging, in a manner unequalled by size made from any other starch.

#### To Prevent Decay of Starch.

Starch is not fermentable, but like other organic sub-

*Abstract of Paper read before the Natl. Assoc. of Cotton Manufacturers, by J. W. Lindau, New York.

stances is subject to decay, although in a lesser degree than many other organic matters. It becomes musty when stored in damp, poorly ventilated warehouses. It is very hygroscopic and easily and quickly absorbs moisture from the atmosphere. Starch stored in a damp place has been known to absorb 30 per cent moisture. This mustiness is easily remedied by drying with a gentle heat or allowing dry air access to the starch. In general corn starch withstands this tendency with greater resistance than most other starches or vegetable substances.

All starch decays easily and quickly after being made into a paste or size solution in hot weather, unless some preventative, such as formaldehyde, or benzoate of soda is used.

Size when exposed to the air in consequence of a bacterial action, often sours. The addition of acetic acid, formaldehyde, or any good antiseptic prevents this.

Experience proves that corn starch size remains good and sweet for a longer period than other starch sizes.

### Application of Size to Yarn.

As previously stated, the process of sizing is a very important factor in the preparation of cotton yarns. Cotton fibre in itself has not the closeness or tensile strength necessary to withstand the vibration and pull of the heddle in the weaving process; therefore it requires a strengthening and lubricating material which will so thoroughly penetrate the fibres as to make a strong compact smooth thread.

Successful sizing requires not only a thorough penetration and saturation of the yarn, but also thorough and rapid drying without scorching, the proper distribution of the yarn and the making of a hard, uniform compact beam. The value of the size lies in the strengthening, lubricating and softening of the yarn, so as to render it strong, smooth and pliable.

If the yarn comes from the slasher too stiff or too soft, it is hard to weave well, poor production and a larger proportion of seconds result, and consequently, uniform sizing is absolutely necessary.

Weavers claim that half of the weaving is done in the slashing room, for no skill can produce good results from a poorly sized warp. Careless work in the slashing causes poor production and poor quality. Sometimes the water of condensation thins down the size in the size box and soft warps follow.

By the use of corn starch a more uniform size is obtained and better results follow. The importance of sizing cannot be overestimated as it does more to make a cotton mill profitable or unprofitable than any other process or department, hardly excepting the card room.

### Defects in Slashing.

Among the defects in the process of slashing are the following:

Burning or scorching of the ends.

Imperfect drying by which the ends stick to one another on the beam.

Surface sizing in which the size lies on the surface of the yarn and is likely to be rubbed off in weaving, due entirely to the size being too thick and not sufficiently cooked.

Hard and boardy yarn, undersized yarn, soft beams, irregular or rough beams, beams with bad ends, excessive breakage of the threads, too much waste in end pieces, stains upon the yarn and discolored yarns.

The secret of preparing size lies in the boiling. Every granule of the starch must be open or else the full sizing value is not secured. The size must be cooked so that its full adhesive value is brought out, so as to adhere to the yarn, penetrate it and dry, practically cementing the filaments of the fibre together so well adhering that they withstand the chafing action of the working parts of the loom, with which the warp comes in contact.

A knowledge of the value of each ingredient used in making a size is very necessary to the boss slasher, that is, that antiseptics are used to prevent mildew in warps and fabrics, to preserve the size, that softeners are used to reduce the harsh effect of the starch alone, as well as to lubricate the heddle eye and the reed and make the yarn pliable; that starch strengthens the yarn, lays the fibre, smooths it and binds the filaments of the fibre together.

At same time the old fallacy that certain starches must be used should be removed, because the value of the size lies in the starchy contents, and not in the name of the starch. It has been proven that corn starch in proportionate quantities will produce the same effect and will successfully replace any other known starch.

## Limitation of American Cotton Production as Affected by the Labor Problem in the South.*

By Theodore Price.

James L. Watkins in his history of "King Cotton" says that "Fourteen years after the settlement of the Jamestown Colony (1621), cotton was planted at Newport News, Va. In the Carolinas the cultivation of it began in 1666, and in 1748 it began to be exported in small quantities from South Carolina."

It was not, however, until 1793 that Whitney made his famous invention of the gin, and it was some years thereafter that the possibilities of cotton as a basis of textile manufacture became apparent. Even then the progress was slow. In 1800 the cotton crop of the United States was 155,000 bales. In 1808-9, just a century ago, the cotton crop of the United States was estimated at 177,000 bales. In 1859-60 slave-labor had made it possible to raise a crop of 4,861,000 bales, the increase in the fifty-one years being 2,748 per cent. The crop of 1908-9 is approximately 13,851,000 bales, the increase in the last forty-nine years being about 285 per cent.

In other words, dividing the last century of cotton production into two approximately equal periods, the first half century being a period of negro slavery in the South, and the second half century that of negro freedom, we find that the increase (expressed in per cent) in production during the time of slavery was nearly ten times as great as that shown after the slaves were emancipated. When we come to consider, however, the later record of cotton production in America, we find that the ratio of increase in the cotton production of the Southern States is a continuously decreasing one.

Meantime the consumption of cotton goes on apace. What Whitney did for the producer, Hargrave, Arkwright, Crompton and Cartwright accomplished for the spinner and weaver.

*Cotton Plant at Full Maturity*

I shall not burden you now with figures, but will call your attention to the fact that in the twenty years, ending 1900, the white population of the South has increased 57.3 per cent. while the negro population has increased only 37.5 per cent. This increase has, however, been unequally distributed. In the ten years ending 1900, the total population of the cotton states increased 24 per cent, but of this increase by far the largest proportion was in the cities, the rural population having increased only 19 per cent, while the urban population increased 44.8 per cent.

Cotton production is practically dependent upon negro labor. White men cannot, or will not if they can, engage in the arduous toil necessary to the production of cotton under

*Abstract of Paper read before the Natl. Assoc. of Cotton Manufacturers.

the hot southern sun, and the industrial development of the South, the social attractions of the cities, and the higher wages obtainable at the urban centres of population, are all influences that are rapidly withdrawing from the cotton fields the negro labor upon which the world depends for the production of its most important textile fibre.

Of the cash proceeds of the crop in an average year, I think that fully 75 per cent is paid in cash to the manual labor which has produced the crop. There is but little doubt that the labor cost of cotton production in the South at present is substantially in excess of eight cents a pound. Of this total of labor cost by far the most important item is the cost of picking, and I am sure the negro is not overpaid for his labor when so employed.

*Picking Cotton by Hand.*

The negro picks cotton at a fixed price per hundred pounds. In some parts of the South the planters have thus far succeeded in keeping the negro's pay for picking cotton down to sixty cents per hundred pounds, but in by far the larger section the recognized tariff is from $1.00 to $1.25 per hundred pounds. In the northern part of Texas and in Oklahoma, $1.50 per hundred pounds was freely paid last year for picking cotton, and even at this price the labor necessary to pick the crop was not obtainable. In many portions of the cotton states, much cotton goes annually to waste because the labor to pick it is not to be had, or because toward the end of the season, while there is possibly still 20 per cent of the entire production on the stalks, the negro hands cannot be got to go into the fields to pick it except at prohibitive rates. They claim, and with justice, that previous pickings have left so little cotton on the plants that they cannot, in a day's work, pick enough cotton in weight to remunerate them for their labor, and consequently they decline to pick at all.

Taking the cotton belt as a whole, I think that the average cost of picking the crop at present may be estimated to be $1.00 per hundred pounds, or one cent a pound. The weight thus paid for includes, it is to be remembered, the seed, and as a general rule it takes three pounds of seed cotton to make one pound of lint cotton, the seed representing two-thirds of the weight of the cotton when picked. If the cost of picking be $1.00 per one hundred pounds of seed cotton, it is equal to $3.00 per hundred pounds, or three cents a pound, of lint cotton. This is the equivalent of about $15.00 a bale, and upon a crop of 14,000,000 bales represents the stupendous sum of $210,000,000 in cash which is annually paid for picking the American cotton crop. The tremendous economic value of any machine which would eliminate, even in a small degree, this enormous item of labor cost has long been recognized, and for years inventors have been attacking the problem. There are on file in the Patent Office at Washington records of something over 450 mechanical cotton-picking inventions. The difficulty of the problem is easily apparent to one who knows anything of cotton cultivation. While cotton is planted in rows as corn is, its lateral development is very luxuriant.

It ripens progressively, and its full fruition covers a period of from three to four months. The lower bolls, which develop first, ripen first, and the top bolls, which develop last, ripen last. It is an annual plant, but its growth seems to cover very nearly the full period of twelve months, and I have known cotton that commenced to bloom in July to continue to bloom, to put on squares and to open its bolls, until well into January. A machine to pick it successfully must therefore be a machine that is automatic in its selection of the ripened cotton, and one that in picking the ripened cotton that protrudes from the bolls will not injure the plant or its leaves. Furthermore, it must leave undisturbed the half-opened bolls, and unbruised and unbroken the blooms or the bolls that have not commenced to open.

Mr. Price claims that he has solved this problem in the construction of his Cotton Picking Machine.

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## Accidents to Cotton Mill Operatives.*

By Edward W. Thomas.

In gathering together some statistics relative to accidents occurring in several mill plants (covering Maryland, South Carolina, Georgia, Alabama and New Hampshire) under the writer's management, some very interesting facts were established, and which, tabulated in the interest of the Association, gave in detail the proportionate number of accidents to the number of employees at these plants, the hour of the day, the day of the week, the month of the year, the average age of the injured and the length of time such employees were engaged in mill work before being injured. The only mill in the series of mills under consideration in which foreign born employees are engaged in part is in New Hampshire, all the others having native born help.

Of the total number injured, table No. 1 showed that only 42.3 per cent were the result of machinery. The majority of these accidents were by picker beaters, card cylinders and lickerins, flyers, flying shuttles, gearing, loom lay and breast beam, caught in pulleys, picker sticks, etc. Many of these accidents were traceable to the carelessness of the injured party; some naturally occurred by reason of causes unforeseen and of which the operator was in no sense at fault. Of 442 accidents but one fatality occurred and when the machinery was in a sense the agent or contributory.

Table No. 2 showed that the larger percentage of accidents happened on Wednesday, and with the exception of Saturday the percentage for the other days of the week is generally uniform. Saturday shows a low percentage due to two reasons: Less working hours and a less amount of machinery in operation, thus reducing the chance of injury.

Table No. 3 showed that a larger per cent of the accidents occurred during the forenoon hours, while the lowest percentages are shown in the starting and stopping hours, viz.:—6 to 7 A. M., 1 to 2 and 5 to 6 P. M. These results are somewhat surprising, as I had considered without dealing with the facts in the aggregate before, that a larger number of accidents occurred during the morning, noon and evening hours at the starting and stopping of machinery.

Table No. 4 showed that the larger number of accidents occurred in May, June, July and August, and the smaller number in March and December.

Table No. 5 showed that 47.1 per cent of all accidents were of employees 21 years and under, from 21 to 30 inclusive 24.6 per cent, from 31 to 40 inclusive 12.5 per cent, from 41 to 50 inclusive 9.50 per cent and over that 6.3 per cent. The largest number of accidents occurred to those 16 years of age, the next smaller number to those 18 and 22 years of age.

Table No. 6 showed that the average time employed before injury was 2.78 years; nearly 5 per cent of the entire number of accidents occurring within a week of the time the parties entered upon service at the plants, about 13 per cent within a month and about 58 per cent within a year, the balance 42 per cent occurring between one year's service and 35 years' service.

*Abstract of Paper read before the Nat'l Assoc. of Cotton Manufacturers.

## The Legal Relation Existing Between Mill and Selling Agent.*

By Walter S. Newhouse.

The various kinds of agents may be classified as follows:

(1) The selling agent who sells his principal's goods on a strictly commission basis and who has no responsibility in regard to the payment of the purchase price.

(2) The factor who makes advances to the manufacturer up to a certain percentage of the value of the goods and who receives a commission for effecting their sale.

(3) The *"del credere"* agent who may or may not make advances upon goods and who guarantees the payment of the price at which the goods are sold in consideration of an extra commission in addition to his compensation for selling.

To whatever class the "agent" may belong, his first and main duty and obligation is to obey implicitly the instructions of his "principal." If he departs from such instructions, he is responsible to the "principal" (the mill) for any loss that may accrue thereby.

The usages of trade, however, determine in a large measure what the powers of the agent are in the absence of specific instructions to the contrary, and the "agent" is protected if he sells in accordance therewith even if the "principal" is ignorant of the usage, provided the same is general and uniformly acquiesced in by the merchants of the particular locality where the goods are sold.

Where a sale of goods has once been effected by the "agent," it is not within his power to consent to a cancellation of the order, his authority being limited to selling the goods of his "principal." This is the case no matter to which of the three classes of selling agencies named the agent belongs. It is believed, however, that this rule is more honored in the breach than in the observance.

If the mill warrants the quality of the goods to the "agent," the latter is justified in selling them with such a warranty and if the goods are not as warranted and a claim is made against him by the purchaser, the "agent," if he is compelled to compensate the purchaser, may recover from his "principal" the sum so paid; where, however, the "principal" merely consigns the goods to the agent without any representation as to quality and the "agent" in selling them warrants the goods, he cannot when called to account by the purchaser on his warranty escape liability on the ground that he was merely a selling agent and that the purchaser was aware of this fact; the representation will be considered his and not that of his "principal," the mill.

One of the chief duties of the "agent" is to keep his "principal" fully advised as to all facts relating to the consignment which may be of use or benefit to his "principal." For instance, it is the duty of the "agent" to give the name of the purchaser of the goods to the "principal;" to notify him of any information which may come to him in regard to the financial condition of the purchaser, and to keep him generally posted as to the condition of the market, and for failure so to do the agent may be held responsible.

A question often arises as to the right of the agent to receive commissions on goods sold by him where the sale has been rescinded by acquiescence and agreement between the principal and the ultimate purchaser. This is an instance where the right of the agent is determined to a large extent by the usage of the trade. Strictly speaking the agent has earned his commission as soon as he has effected the sale and brought to his principal a purchaser ready, willing and able to buy the "principal's" goods.

The practice, however, as determined by the usage of merchants seems to be that the "agent" is not entitled to his commission unless the purchaser actually receives the goods. Similarly where sales are made on credit and a loss occurs to the principal on account of the insolvency of the ultimate purchaser, the agent will or will not be entitled to his commissions in accordance with the custom and usage of the trade or in accordance with his particular agreement with the "principal."

The commission house of the present day, through which most of the sales of merchandise are effected, usually combines the functions of both factor and "del credere" agent.

In return for the additional liability, the commission house has corresponding advantages: thus, it is entitled to retain possession of goods consigned and their proceeds, to protect its lien for advances, and to collect and sue in its own name for the recovery of the price of the "principal's" goods which it has sold. These are rights of which the "agent" cannot be deprived except by reimbursing him for his advances or in case of a "del credere" factor by relieving him from his guarantee.

Although the factor presumably looks to the goods themselves to reimburse him, having made his advances upon his estimate of their value, that fact does not deprive him of his right to look to his "principal" where the goods are sold and the proceeds realized therefrom are insufficient to repay his advances, and while ordinarily an "agent" may only sell goods in accordance with the instructions of his "principal," a factor who has made advances may sell without such instructions, or even in violation thereof, for the purpose of reimbursing himself, where the "principal" after reasonable notice and demand has failed to repay the advances made.

Where the consignment is made by the "principal" without instructions as to the price at which the goods are to be sold and the factor has made advances thereon, he may sell in such a manner and at such a time as the usages of the business permit, and the consignor has not any power by subsequent order to suspend or control this right of sale; but where the factor sells without his "principal's" instructions he can sell only so much of the goods as will enable him to recover his advances and his commissions.

In cases where the factor has made advances on goods, but has not guaranteed their sale, the question often arises when the goods have been sold, whether the factor can recover the amount of his advances from the "principal" before payment thereof is due from the purchaser, and on this point the authorities differ. In some states it has been held that the factor can at any time demand the repayment by the "principal" of his advances, but in New York the courts have determined that the factor must wait until the purchaser fails to pay before he can look to the "principal" to reimburse him for his advances. This would seem to be the reasonable construction as the advances are made primarily upon the goods and only secondarily upon the credit of the "principal."

Where the purchaser has cancelled his order and there is an enforceable contract against him, the question at once presents itself as to who shall bring the action, whether the mill or the "agent," and the writer has found the impression almost uniform that such a suit must be brought by and in the name of the "agent" and that the mill has no right or interest in the transaction. But the mill on consignment of its goods to the factor always retains the right to enforce the payment for the purchase price of the goods. The consignor upon a consignment of goods to be sold on commission does not part with his title to the consignment, but he continues to be a part owner of the consigned property, and the rule is the same whether the consignee is a "del credere" agent or makes advances to his "principal" or is simply an agent for sale.

The mere fact that the purchaser may or may not have ever known the name of the mill manufacturing the goods is immaterial. The mill as undisclosed principal may bring the action, as the title of the goods remains in it subject only to the lien of the factor.

In the case of "del credere" agency the mill at the expiration of the term of credit at which the goods were sold may at its option, sue either the "del credere" agent or the ultimate purchaser for the purchase price, and this right is inherent in the mill at all stages of the transaction before it has received pay for the goods either from the purchaser or from the "del credere" agent, and the mere fact that the goods have been charged up by the mill to the commission house does not of itself take away from the mill the right to sue the ultimate purchaser in its own name. By so doing, however, the mill releases the factor from his guarantee if he be a "del credere" agent.

As soon as the mill becomes known as principal, the right of the factor to receive payment for the goods ceases, and the purchaser who after such knowledge chooses to deal with the factor does so at his own risk.

Although as has been seen, the mill has the right to sue the ultimate purchaser for the price of the goods; the factor who has made advances and the "del credere" agent who has guaranteed sales have an equal right so to do, and it is well established that such an action can be brought by the factor in his own name.

On the other hand, the purchaser, in case the goods were not in accordance with contract or in case of failure to deliver within the period contracted for, has the undoubted right to sue the factor in whose name the goods have been sold, or he may at his option sue the mill, the undisclosed "principal" in the transaction, for damages sustained on account of the failure to deliver.

*Abstract of Paper read before the Natl. Assoc. of Cotton Manufacturers.

Where goods have been sold in the name of the factor and suit thereon has been brought by the mill against the purchaser, the latter may offset in such a suit any claim which he has against the factor, and if suit is brought in the name of the factor, the purchaser may offset therein any claim which he has against the mill, the undisclosed "principal."

As long as the factor is the only person known to the purchaser the latter may look to him as his "principal," but as soon as the factor notifies the purchaser of the name of the mill, the undisclosed "principal," at that moment his liability as "principal" for future transactions ceases, and the purchaser will be deemed to be dealing with the mill direct.

If the factor therefore desires to protect himself in his dealings with the purchaser, he must in each instance before the sale is made, make known the name of his "principal." So in cases where the mill cannot make deliveries, the factor will be personally held responsible to the purchaser for such failure unless he has made known the name of the mill manufacturing the goods.

It seems to be the belief among commission merchants that if they describe themselves on their circulars and billheads as such, or as "selling agents" that by so doing they are relieved from responsibility to the purchaser—such is not the case—they are still liable to the ultimate purchaser as "principals" unless they fully disclose in each instance the name of the manufacturing mill; they cannot have the advantage of acting as principal in a transaction without the corresponding liability.

## Reinforced Concrete for Textile Mills.

The same was the subject of a paper read by J. P. H. Perry before the Nat'l Assoc. of Cotton Manufacturers, having for its object to ascertain why it is that reinforced concrete construction has been used so little for textile mill buildings, when for other types of industrial structures, he claims its adoption has been at an increasing rate.

A study of the situation, Mr. Perry claims, brings to light the fact that those men who have the decision as to the class of construction which shall be used in new textile mills seem to misunderstand concrete, or at least fail to appreciate certain of its properties.

The purpose of Mr. Perry's paper was to clear up some of this misapprehension—not by entering into a discussion of the history of concrete, nor into the theory of its calculation and design,—but by taking up a few of the points which are most frequently raised by owners, architects or engineers interested in the construction of new mills.

For instance, when concrete was first being introduced as a building material in this country, one of the chief difficulties confronting its sponsors was the fact that they had to ask the owner with whom they were negotiating to accept their statements as to the worth of the material almost wholly on faith. They could not cite as examples, factories or warehouses several years old which were built of reinforced concrete and which were in better shape than when first turned over to the owner.

Another prejudice of textile men against concrete buildings, he claims is that among the textile mill interests there seems to be a strong feeling that vibration is the one reason why reinforced concrete is not serviceable for their buildings; whereas among practically all other industrial executives, Mr. Perry claims, vibration is generally considered the chief factor in influencing them to use concrete.

The making of changes in piping or shafting or belt lines, Mr. Perry claims, has also caused many owners without experience in concrete buildings to decide against the material. This difficulty of cutting new holes through concrete floors or walls, he claims is not nearly so great as it seems on first thought. That concrete is hard to cut through he admits, but that this is a serious fault he denies.

In closing his paper, Mr. Perry mentions that although as a rule textile executives who have concrete mill structures, seem loath to express opinions for publication, as to the satisfaction given by their buildings, yet at the same time Mr. Upson, the engineer who designed and built the building for the Hockanum Co., Rockville, Conn., states that he advised this construction principally for the reason of its non-vibrating characteristics, and the results obtained were fully borne out by his contentions in that respect, the buildings being eminently satisfactory for this class of manufacturing. Mr. Clark, Vice President of the Alexander Smith Co. Carpet Mills, states that their reinforced concrete buildings are satisfactory in every way, and that other things being equal, he would prefer concrete to mill construction, etc.

## Increasing the Earning Capacity of a Plant.*

To increase the earning capacity of a plant it is first necessary to increase the efficiency of the men. Everything depends on the man. A machine cannot produce better results than what the man puts into it. The returns are in proportion to the energy he interprets to it. Machinery is so skilfully made that it is almost human-like in its responses to man's dictates.

The capacity of a man is often problematical, but the capacity of a machine can always be closely figured out. With properly adjusted conditions, and given sufficient authority, a man, as a rule, may show a higher degree of efficiency than when he is only spoken to when driven.

The theoretical capacity of any mill can be easily ascertained under almost any circumstances. The actual earning capacity of some, as operated, is most always below par and disappointing. On the other hand many mills reach admirably high records of efficiency. It goes without much advertising to say, that the true virtue of good mill management is to secure the largest per cent of the possible production under such economical administration as to give the plant the largest margin of profit consistent with a reasonably permanent upkeep of the plant.

It is false economy and a false profit that is secured by neglecting the upkeep of the plant. This method of making money with a mill has been well demonstrated during the present generation to be unwise, because it is unfair and a failure. It is like taking part of the principal on a deposit to pay the interest due for its loan.

The earning capacity of a plant depends upon several other important and distinct measures analyzed as follows:

1. Convenient location of plant.
2. Proper layout of buildings.
3. Right kind of machinery.
4. Correct arrangement of machinery.
5. Uniform engagement of the processes.
6. Purchase of good raw material at lowest price available.
7. Skilled manufacturing organization.
8. Homogeneous service of the entire force.
9. Maximum production.
10. Minimum account of seconds.
11. Minimum waste account.
12. Lowest degree of wear and tear.
13. Sufficient expenditure to keep machinery in good running order.
14. Lowest cost of production.
15. There must be a good market for the finished product at fair selling prices.

Let any one or more of these measures be improperly laid out and it accordingly impairs the earning capacity of the whole plant. There must be a strong determination to push the business ahead all the time. You may have heard of the discouraged drummer who wired headquarters. Said he, "Must give up, there are forty drummers ahead of me." In answer to which the bright head of the house telegraphed, "Keep straight ahead—Don't you know that there are forty more drummers picking up business behind you!" This is the spirit of determination that should underlie the efforts of every man of the cloth who wants to get the goods. We know that good raw material and a good market do not complete the task of managing a plant. This is only the start and finish of the business.

From the time that the cotton enters the picker room until it is shipped to the markets, the mill man has one under his charge of the most complicated systems of industrial activities. His first aim is to secure a maximum production. This would be easily accomplished if all he had to do was to start the machinery and peel off the goods. But before securing a complete efficiency of the machine, he must increase the efficiency of the help at the machines under his charge.

Then the expert's most valuable asset is the help he has trained to work his way and to which he clings from year to year. This is the most important stronghold that there is to maintain and increase the efficiency of a mill from day to day. Make help useful and keep them; for they will follow the master mind's wishes and keep everything right very much in accordance to the strength of the mutual relationship and understanding existing between themselves and their superiors. It is not only a full production that is wanted

*Abstract of Paper read before the Natl. Assoc. of Cotton Manufacturers, by Henry D. Martin.

altogether. It must be a full production with everything else relatively right. You know that it is possible to have a full production and have some or all of the following things wrong, *viz:*

Wear and tear account too high.
Waste account too high.
Seconds account too high.
Cost account too high, etc.

It must be a full production with every one of these other things right. And in these days of close competition these conditions must be absolutely right, or the management is not getting all that could be earned by the plant. To accomplish all these good things we must begin with the man, make him as comfortable as possible, and train him to increase his efficiency. We must get into very close touch with him, whether he be overseer or bobbin boy.

Keep all overseers and second-hands interested by showing them how they can do better. Line up the figures and show them some progressive totals to indicate how the waste and the seconds are going down. Inspire them to feel that they believe they can and are going to do still better and they will take much more interest all along their daily tasks, and in turn train their help to do the same. If proper care is taken of even the little doffer's efforts, he will soon come to tell his boss that yesterday he doffed so many pounds from his frames; but tomorrow he will try to get off more work. If the boss says, "That's right my boy, keep on and you will come out all right.—Just keep those frames running." The boy or man soon becomes more useful. There are thousands of such simple ways in which help can be made to feel more interested and comfortable, and for which consideration they will give a much higher efficiency. This starts the maximum production coming along.

While all is being done that can be done to raise the efficiency of the help, the efficiency of the machinery must not be neglected. There are many ways in which machinery can be coaxed along to give a higher efficiency. Machines appear and act very human-like at times. A little higher or lower speed may prove beneficial; a little experimenting on one or more machines determines the most economic speed. It is a fact borne out by experience that in many instances reducing the speed of various machines increased the production rather than decreased it. An adjustable speed is another advantage. Run higher or lower speed according to conditions from day to day or from week to week.

It sometimes pays to rearrange the entire equipment of a department so that the light is more evenly and better distributed, or so that the traffic of goods before and after used on the machines is more easily transferred to and from same. The writer has in mind a warp room of about sixty warpers in a white goods mill that were operated for years with the creels toward the light instead of the front of the machine toward the light. It was finally decided to turn them around, and a much higher efficiency was secured from this department than previously.

Increasing or diminishing the size of bobbins, spools, chains or beams is a matter which is worth giving careful consideration. In some cases mills have increased the efficiency of a department very much by reducing the size of the spools and vice versa.

It is all in the matter of using good judgment in finding exactly the right fit or the exact proportions or relationships that should be established between the help, the machines and the processes. Widening and lengthening some machines has been very successfully done in some cases to increase the output. Giving a hand additional machinery and running it slower, or giving them less machinery and running it faster is another problem to work out.

Lastly the processes need to be expertly arranged. So closely related are the machines, their operations, and the arrangement of the processes, that one cannot be wrong without injuring the combination. Too much processing is as injurious to a high efficiency as is too little processing. Some goods are made better by going through an extra process, while others are made better by dropping one or more processes. Too much or too little draft at various points retards progress. So, starting with the picker room as the goods pass through the mill from machine to machine, and process to process, there is a vast chance for a very fine adjustment of the weight of the goods and the draught at each machine; also the matter of regulating the numbers from day to day is a following-up business that must employ the expert's most careful manipulation.

Competition is becoming closer all the time, and it must be borne in mind that the efficiency that gives a mill success today may have to be increased to give it success tomorrow. For a simple example it does not follow that although a mill having too much draught on its drawing frames for ten years and notwithstanding this, made money during this period, that it will continue to pay dividends in the future. If this evil had been remedied ten years back, it would certainly have been far better for the mill.

Starting and closing the operations on time must be the invariable rule. Balancing the mill is a good thing. Often times a few extra machines distributed where needed soon pay for themselves.

Automatic trafficking of material, especially empty bobbins, is being finely developed in some mills. Everything that can be more swiftly and conveniently handled without hands is a step forward.

The whole idea of this paper is to set the man to asking himself, "What can I do to improve the efficiency of the plant, as it is" and then observe the conditions and see what he can do for himself. A man who studies his business closely, every day, is sure to find something that he can improve without having to rebuild the entire plant.

## COTTON SPINNING.

### The Ring Frame.

*(Continued from page 71.)*

The evolution and development of spindles has resulted in the practical adoption of four principal types, which are known in the trade as the *Rabbeth* 49 D spindle, the *Draper* spindle, the *Whitin* spindle and the *McMullan* spindle. Of these, the last three are now mostly used, the Rabbeth 49 D spindle being replaced by the more modern Draper spindle.

THE RABBETH 49 D SPINDLE is shown in Fig. 271 assembled, its various parts being shown at the right hand side of the illustration. This spindle is similar in most respects to the Draper spindle, its chief difference in construction being the method of adjusting the position of the foot step, oil cup and wire hook (guard).

The spindle and the step by which it is supported are always in one position. Spindle and bolster are tapered, and the clearance between the two can be adjusted either by raising or lowering the bolster, which is bored and threaded to correspond with the screw on the step. Raising the bolster too high will cause the spindle to bind, whereas if set too low, the spindle will have too much play and consequently will run loose. Be sure that the bolster is not allowed to turn round, two pins being driven through the bolster case and riveted in position, one of said pins projecting into a slot in the bolster, and the other into a slot in the step. Only one slot is in the step, whereas there are four slots found in the bolster, in order to permit for a quarter turn adjustment. To tighten or loosen the spindle, the bolster is raised, and the step with it, however not far enough to come out of contact with its own pin; whereas the bolster is raised above the pin. The bolster is then turned around in the desired direction, either a quarter turn or a half turn, as the case may require, and in turn then dropped back into position, when it is again securely held from turning by the pin.

THE DRAPER SPINDLE is probably the best known spindle now on the market, it being evolved from the preceding 49 D and earlier Rabbeth types, and largely replacing them. It has been developed at the works of the Draper Co., though some of its characteristic features have been selected from other structures which are controlled by the Sawyer Spindle Company. Among the special features of this spindle and of modern spindles, is the oil reservoir, which holds a supply of oil, sufficient to run the spindle for weeks, and in which the lower part of the spindle is immersed.

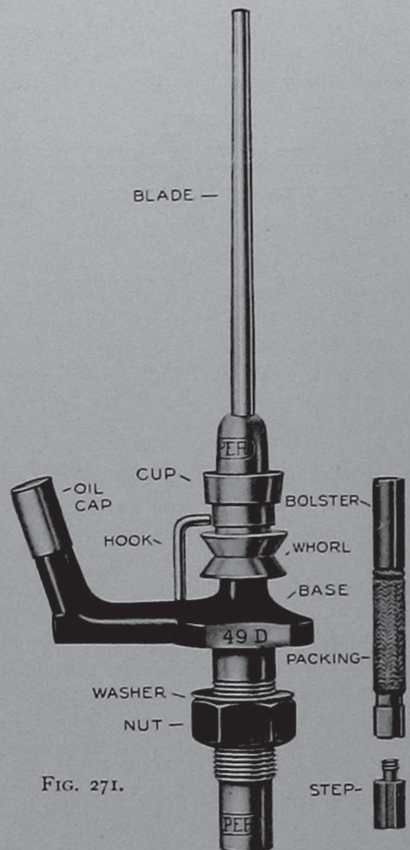



FIG. 271.

Another feature of this spindle is, in being what is known as a gravity spindle, sometimes called a top, an elastic or a flexible spindle, it is allowed to find its own best centre of rotation within certain limits, and thus reduce or remove the liability of vibration and wear, which occurred with the old type of rigid spindle when it was slightly out of balance, or when using untrue bobbins.

*(To be continued.)*

## IMPROVEMENTS FOR THE WEAVE ROOM.

### Quill For Narrow Ware Shuttles.

Quills for narrow ware shuttles must be small and light, and yet they must be able to carry a maximum amount of yarn without the coils thereof becoming disarranged in the normal workings of the loom, due to the sudden starting and stopping of the shuttles.

Heretofore, these quills have been made of wood and provided with heads, to serve as a bearing for the tension device. These end heads were objectionable, adding weight to the quill and affording a lodgment between them and the body of the yarn, wherein a convolution of thread or yarn would slip and catch, ultimately resulting in a broken end.

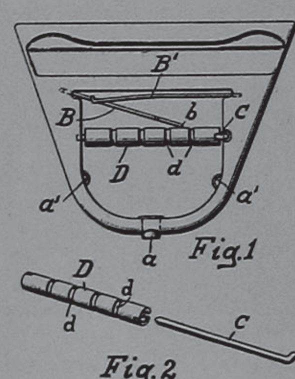
To overcome these defects, the heads were removed from the cylindrical wooden barrel, the convolutions of the yarn being given a quick traverse back and forth during winding, so that they would support each other. The heads omitted, the tension device had now to bear upon the body of the yarn, which when nearly exhausted, compelled said tension device to act directly on the wooden quill itself, eventually making its wooden surface rough to such an extent as to interfere with proper unwinding of the yarn. Again, the headless wooden quill would wear in its bearing and eventually split, catch the yarn and cause damage, especially to the finer silk yarns employed, and such thread would slip endwise of the wooden quill, catch in splintered parts of its surface and cause further damage.

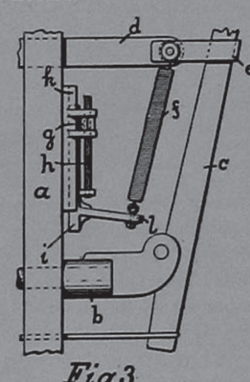
To overcome these disadvantages is the object of the new bobbin, which is a metallic headless quill, formed of a thin, seamless, drawn tube, provided with circular grooves between which the tension device bears, as the yarn reaches exhaustion.

To better explain the new quill, the accompanying two illustrations are given, of which Fig. 1 is a plan view of a narrow ware shuttle, showing empty quill. Fig. 2 is a detached view of the quill and its supporting spindle.

Letters of reference accompanying the illustrations indicate thus: *a* the guide eye, *a'* tension eyes, *B* the tension arm, the end *b* of which bears upon the yarn, or when the latter has reached depletion upon the cylindrical surface of the quill. *B'* is a tension spring, *C* the quill spindle, *D* the quill, provided with circular grooves *d*, disposed with such relation that the end *b* of the tension arm *B* bears upon the cylindrical surface of the quill between two grooves when the yarn on the quill is exhausted. Grooves *d* hold the yarn evenly on the quill, giving it no chance of being displaced as the shuttle is suddenly started and stopped.

### Sweep Stick Adjusting Attachment For Broad Looms.




The object is the construction of a picking mechanism, whereby the sweep stick is attached to and may be finely adjusted on the picker stick without weakening the latter.

A further object is to flexibly connect the sweep stick with the adjusting members, whereby the sweep stick is held in a predetermined position on the picker stick without interfering with the free forward and back, or in and out movements of the picker stick.

To better explain the construction and working of the new attachment, illustration Fig. 3 is given, the same being a detail front view of the right hand end of the loom, showing the flexible connection between the new adjusting member and the sweep stick.

In this illustration, *a* indicates one of the side frames of the loom, *b* the rocking rail, *c* the picker stick, *d* the sweep stick, the inner end of which is pivotally secured to the free end of its mate picking arm (not shown) which is operated by the picking cones and picking bowls (not shown) of the loom, in the usual way. The other portions of the illustration refer to the new sweep stick adjusting attachment.

In operation, the strap *e* which is secured to the end of the sweep stick *d* is held in its adjusted position on the picker stick *c* by the flexible connecting member *f* which swings on its pivots and adjusts itself to the movements of the picker stick. The strap can be micrometrically adjusted vertically on the picker stick to vary the power of the sweep stick on the picker stick for different counts or weights of cloth under operation, by turning the nut *g* on the screw *h*, which raises or lowers the slide member *i* on the fixed member *k* and through the arm *l*, and the member *f* correspondingly raises or lowers the sweep stick *d* and strap *e* on the picker stick *c*.

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## SILK FINISHING.

*(Continued from page 77.)*

### Calendering.

A *Calender*, is a machine, having two, three, or in some instances as many as five large heavy rollers, placed one above the other in a heavy framing; provisions being also made for pressing them heavily together. One of the rollers is usually made hollow, to permit heating it from the inside, either by *gas* or *steam*, the old fashioned system of heating by *bars*

Fig. 9.

having become obsolete, on account of being too troublesome to work. The other one, or more rollers, provided more than two rollers are used in the Calender, are solid rollers, made either of metal, cotton, paper or some patented compositions. Fig. 9 shows one of the latter rollers in its perspective view.

Calender rollers must be true, smooth and free from any flaws, since such, if present, will mark the fabrics. For this reason, in connection with metal rollers, cast iron makes unsatisfactory rollers; steel will do for solid rollers, but for rollers to be heated, nothing is more satisfactory than chilled iron.

When calender rollers are found to be out of true, they must be brought into a true state by means of grinding. The device used for this work is known as a *Calender Roll Traverse Grinder,* Fig. 10 showing a specimen of it, in its perspective view. Suitable brackets are fastened to the housings on which are set the adjustable stands and boxes in which the grinder is run. By means of these adjustable stands the grinder can be adjusted horizontally and perpendicularly, while running, to suit. The grinder is fitted with a solid emery wheel, of the proper diameter to

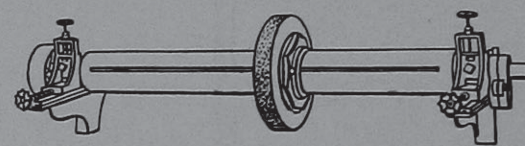

Fig. 10.

reach the rollers from outside the housings, with 2″ face as a rule, and with a special slow, positive, differential motion for slowly traversing the emery wheel, while revolving, until the high places are ground down. The emery wheel should be set very lightly on the roller, just so it can be heard striking the high places.

In connection with heating one of the metal rollers by *gas*, a perforated ¾″ iron gas pipe traverses its whole length, and a mixture of gas and air is forced in. This burns at the perforations in the form of non-luminous flame. By careful regulation of the amount of gas burnt, the temperature of the roller can be regulated with nicety, and every variety of glazing finish can be obtained. The proportion of air and gas requires careful regulation, so that a perfectly smokeless flame is obtained. Too little air and too much gas leads to production of luminous, smoky flames giving comparatively little heat; too great a force of air prevents the gas from burning properly.

If heating the rollers with *steam*, the latter is fitted with steam-tight flanges. A supply conveys steam from a boiler and an exit pipe carries away the exhaust steam. This system is the most convenient but can be used only where lower temperatures are required. The solid rollers will last longer where steam is used, the temperature never gets high enough to damage them as it is liable to do with gas heating, and the lower temperature may be counterbalanced any time by higher speed and heavier pressure.

Calenders should be provided with an arrangement so that when out of use the rollers can be separated from one another, since if left in contact, the softer solid rollers, are liable to become flattened somewhat at the nip, and what is rather detrimental to the finish of the cloth. Too much care cannot be taken to keep the rollers of a calender in good condition, because upon the polish of the surface, and its smoothness, depends the quality of the finish produced by it. Steel and chilled iron rollers require frequent wiping down with dry cloths to keep them free from damp or water which would cause them to rust and pit, in which condition they are useless. Solid rollers, whether cotton, paper or any other combination, are not so sensitive to dampness, but still, it is advisable to keep them dry, as long exposure to it would injure them by softening their surfaces unevenly in places.

Oil and grease must not be allowed to get on the rollers, for although it will not damage them, it might lead to stains on the cloth, which it is next to impossible to eradicate.

Goods may have to be run through the Calender more than once before the desired finish is obtained, again some fabrics may have to be calendered cold.

*(To be continued.)*

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### The Tussah Silkworm in India.*

In addition to the mulberry silkworm, *Bombyx mori,* there are several varieties of silk moths, the larvæ of which are capable of producing silk in sufficient quantity and of such a quality as to be of considerable commercial value. When such silkworms are found in a wild state, the silk produced by them is known as *wild silk.* In some cases it is possible to hatch such worms and rear them under artificial conditions, when the silk produced is much superior in quality to the wild variety, owing to its being preserved in one unbroken length and not disturbed by the worm during its emergence from the cocoon.

The silkworms generally referred to as *wild* belong, for the most part, to the family *Saturniidæ,* whereas the domestic or mulberry-feeding silkworms belong to the family *Bombycidæ.* Some genera of the *Saturniidæ,* however, have been domesticated, and of these perhaps the one of greatest commercial importance is that from which tussah, tussur, or tasar, silk is obtained.

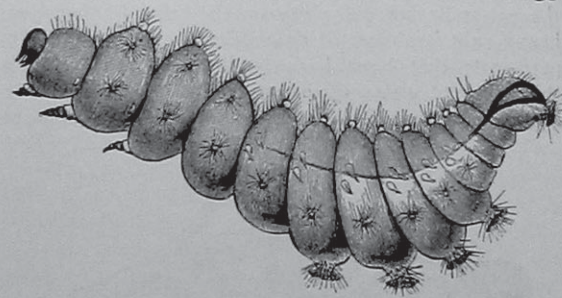
The cocoon of the Indian tussah silkworm is attached to the food plant by a strong silken stem, generally about three inches in length, and which terminates at the other end from the cocoon in a strong loop by which it is securely fastened to the branch, so that there is little danger of it becoming loose and falling to the ground. The cocoons are hard and compact in structure, and contain a large amount of coarse, strong, buff colored silk. They have a considerable value both for reeling and spinning, and are largely used in the manufacture of plush and other silk fabrics.

The Indian tussah moth was formerly generally known as *Antheræa mylitta,* but Sir George Watt, in "The Commercial Products of India," refers to it as *Antheræa paphia,* Linn.

Chinese tussah silk is the product of a related insect, *A. pernyi,* so that the Chinese tussah silk is distinct from that of India.

When full grown, the tussah worm is about four inches in length and of a pale green color, and has twelve joints, each marked with reddish spots and a reddish-yellow band, which runs along either side.

REARING OF THE WORM: Although the tussah silkworm is found in a wild state in India, the Indian tussah silk of commerce is obtained from worms which have been reared in a state of semi-domestication. This is effected by growing suitable food plants and attaching to them wild cocoons collected from the jungle. Moths emerge from these cocoons, eggs



*Tussah Worm.*

are laid almost immediately, and the worms, on hatching, commence to feed on the plants provided. The worms moult their skins five times, at intervals of from five to eight days, and commence to spin cocoons

*Tussah Cocoon, fastened to Branch.*

in about 36 to 40 days after hatching. The first crop of cocoons is usually reserved for the production of eggs. The wild cocoons are collected in the early part of the hot season, generally about March, and

*Tussah Moth.*

the moths of the second generation emerge about August. The eggs they lay are used for rearing the main crop of cocoons in the latter part of the rainy season. Generally speaking, the cocoons of the sec-

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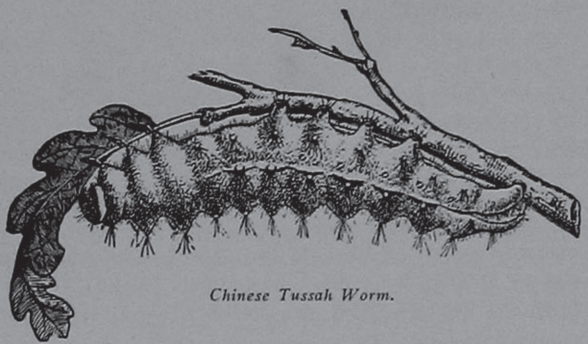
*Bulletin of the Imperial Institute.

ond generation do not produce moths until the rainy season, but much depends upon the conditions of warmth and moisture that obtain. During the time the caterpillars are feeding on the trees in the open, heavy rain is almost of daily occurrence, and the experiments that have been made show that without this frequent watering the caterpillars will not thrive.

From time to time the Bengal Government have



*Chinese Tussah Worm.*

endeavored to foster the rearing of the tussah silkworm, but in spite of this the industry has gradually declined in the province, ascribed to the successful supply, by China, of a cocoon suitable for the same purposes as tussah, and to the cheaper manufactures of Europe. Recently, however, the Bengal Department of Agriculture decided to inaugurate tussah silkworm rearing experiments on model farms.

In commencing experiments on these model farms, the Government were desirous of ascertaining whether the decline in the tussah silk industry was due (1) to neglect on the part of the rearers, or (2) to some inherent defect in the methods used.

The Government propose to gather the large wild tussah cocoons, called *muga,* from the jungle, allow the moths to emerge and lay their eggs, and afterwards issue the domesticated seed to rearers. It is hoped that by these means the stock will be strengthened and the decline arrested.

## Finishing Silk Goods.

In the finishing of raw silk fabrics weak solutions of Senegal gum or of gum arabicum are very largely employed, and dextrine also comes into use on account of the lustre it gives to the color and the improvement of the appearance of the fibre. But to protect these goods, more or less permanently, from the spotting influence of dampness and rain, these compounds alone do not suffice.

Beyermann prescribes a water-repelling finish for use on cotton and linen as well as silk goods but which contains no gum. For silks a solution of 450 grms. of Marseilles soap in 6½ litres of boiling water is prepared, and the goods are worked in this at a temperature of 87 deg. C., and then passed through a second bath, at the same temperature, consisting of 665 grms. of alum dissolved in 6½ litres of water. After this the silk goods are air-dried.

Another process is given by Jaquelain, according to which a solution of acetate of alumina is used by steeping the fibre for many hours, and after squeezing, drying. In addition to this, a filmy coating of paraffin, brought into solution by the medium of benzine, may also be applied to the face of the fabric.

## Producing a Tin Weighted Silk of a Uniform Blue Black Color.

It is claimed for the new process that no matter how heavily the silk is weighted, it is stronger and generally more satisfactory than is the case with weighted blue black silks as heretofore produced.

In connection with the new process, the silk is first weighted and directly thereafter subject to a bath of pyrolignite of iron (black iron) or its equivalent, and after this to a bath containing tannin.

In the weighting treatment, a solution of tin tetrachlorid, is used in combination with a solution of phosphate of soda, either alone or with a solution of silicate of soda. Instead of using the phosphate of soda or the phosphate and silicate of soda, a solution of ammonia, soda or potash, or a carbonate of one of these may be used, the alkalies being the equivalents of the phosphate or phosphate and silicate of soda.

In the process, the silk is first boiled off and thereafter put into a cold solution of tin tetra-chlorid of about 30 deg. B. and subjected to this solution for about an hour, after which the silk is washed and then worked in a warm solution of phosphate of soda or other alkali of 4 deg. B. at a temperature of about 150 deg. F. for about one hour. It is then again washed and thereafter subjected to a warm solution of silicate of soda of 3 deg. B., at a temperature of about 120 deg. F. for about one hour. The silk is then again washed and the treatment repeated until the desired weight is obtained.

The silk is next subjected to *the blue black dye treatment,* which consists in first subjecting the weighted silk to a solution of pyrolignite of iron, *i. e.,* a solution of iron in crude acetic acid and then to a solution of tannin-containing material.

A bath of iron pyrolignite solution of 1 deg. to 5 deg. B. is generally used, the strength of the solution depending upon the shade desired; the stronger the solution, the bluer will be the shade resulting from the treatment.

The silk is worked in the solution of iron pyrolignite at a temperature of approximately 60 deg. F., for about one hour, and is then wrung out and after being covered for about two hours, is worked and then placed in the tannin-containing bath. The latter, by preference, is composed of a solution of gambier, or rather tannin-containing material to which has been added extracts of logwood and fustic or other yellow vegetable dye, the proportions of which ingredients vary according to the shade desired, the silk being worked in this solution for about two hours. Good results are obtained from a solution of about 100 pounds of gambier to 100 pounds of silk, the solution having added thereto about 20 pounds of logwood extract, and 40 pounds of fustic.

During the last described operation, which is continued for about two hours, the solution is preferably maintained at a temperature of about 160 deg. F.

After the treatment in the tannin-containing bath, the solution is worked and subjected to a solution of logwood extract and soap, and thereafter the silk is finished by treatment with lemon juice and oil.

The bath of logwood extract and soap should contain about 20 pounds of logwood extract and 50 pounds of soap to each 100 pounds of silk treated, the silk being allowed to remain in this solution for about two hours, at a temperature of about 110 deg. F., at the outset until the desired blue color is obtained. This will usually occur at a temperature of about 150 deg. F., although the results vary somewhat according to the character of the silk under treatment and the difference in working in the weighting process.

In the final step of the process, a solution of approximately two gallons of lemon juice and one and one-half pounds of oil, preferably olive oil, to each hundred pounds of silk treated is used.

The product of this process may be identified and recognized by its behavior upon being subjected to the usual burning and acid tests. Upon immersion in concentrated oxalic acid, the product produced will be found to turn a reddish brown or light yellow, and upon burning, such product will leave a well preserved ash structure having a slightly brownish or salmon shade.

### A New Process for Sizing Silk Yarns.

This is a new French process just patented, and consists in the impregnation of silk or other threads, with a substance or artificial grease having like the natural grease of silk, the property of giving body or strength to the thread, preventing it from entangling and facilitating the manipulations to which said threads or filaments are subjected to before and during weaving.

This impregnation or coating of grease, the inventor claims, is advantageous more particularly for raw silks such as Canton, Bengal, Tussah and fancy silks and the like.

The grease is formed from a special preparation on a base of linseed oil and is perfectly adherent and at the same time supple and elastic and is advantageous to the threads while they are submitted to the usual operations preparatory to and during weaving. The impregnating or coating substance is permanent and is not rendered sticky by the action of alkaline solutions. The linseed oil boiled or raw is applied in the form of a mixture with any volatile liquid such as commercial benzine for example, to which is added a certain quantity of beeswax and in certain cases a little resinous substance. The proportions of these substances vary according to the nature of the material to be treated.

FOR RAW SILKS the solution is composed of commercial benzine 1 kilogram, boiled linseed oil 450 gr., beeswax 15 gr. This solution is heated in a water bath to about 30 degrees C., so as to liquefy the wax and to render the oil more penetrating. The threads or filaments of raw material are immersed in the solution without being unraveled or undone, unless they are in a close mass, in which case they are loosened a little. After sufficient time has been allowed for soaking, the filaments are then subjected to a straining process to remove the surplus liquid, are then laid or spread out still without being undone on tables in a chamber heated to a temperature of 30 degrees C., where they remain about 30 hours. At the end of this time the benzine being evaporated the filaments remain impregnated by the oil and wax. These dry filaments have now the properties, previously described, in a high degree.

The process described is also applicable to raw or other silks on bobbins, reels, spindles, or in warps or separate threads.

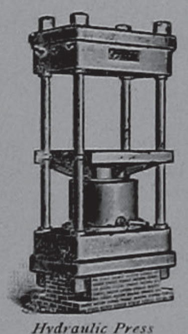
This preparation gives the silk to which it is applied an added weight or bulk of about 5%.

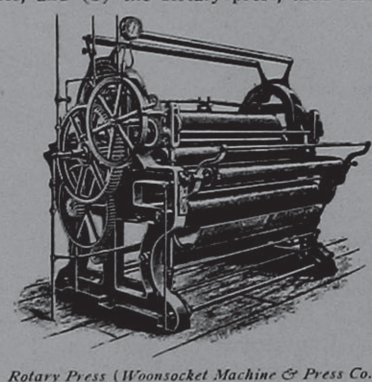
For other silks the same composition is employed but the proportions of the substances used vary according to the added weight or bulk it is desired to give to the threads or finished fabric. For Tussah, for instance, it is convenient to give an addition of 12 to 15 %. For this purpose it is only necessary to increase the quantities of oil and wax in proportion to the weight or bulk required. Further one can add to each kilogram of oil mastic in solution 20 grams or good resin 30 grams. The manipulation is the same as for raw silks, with the exception that after the soaking, the filaments arè undone, laid on rods and warmed and dried for 48 hours. The process can also be applied to cotton yarns, giving in connection with the latter, an addition of 15 to 30%.

## DICTIONARY OF TECHNICAL TERMS RELATING TO THE TEXTILE INDUSTRY.

*(Continued from page 82.)*

HOT PRESS:—There are two kinds of hot presses in use for textile fabrics, (a) the Hydraulic press, where the fabric, folded between glazed paper boards, is pressed between heated iron plates, and (b) the Rotary press, then running the fabric between an iron roller and bed, one of which is heated; a cold pressing may also be desired.


*Hydraulic Press*


*Rotary Press (Woonsocket Machine & Press Co.)*

HOURIAR:—A small wild sheep (Ovis vignei) of western Tibet.

HUCCATOON:—A cotton cloth made in England, expressly for the African export trade.

HUCK OR HUCKABACK:—A coarse and very durable cloth of cotton, linen, or linen and cotton, woven with alternate elevations and depressions so as to present a rough surface. It is used especially for towels, and is woven either in separate towels, or in rolls, which may be cut at will.

HUE:—Color, by wave length, much the same as color; the chief quality by which one color differs from another color, as red differs from blue or green.

HULLER GIN:—A cotton gin for ginning cotton gathered with the bolls.

HURDS:—The coarse part of flax or hemp; hards.
HUSK:—The outer protective part of a cocoon, composed of a hard gummy substance; also called knub.
HYDRO EXTRACTOR:—A machine for removing moisture from yarns or cloth, woven or knit, in Dyeing, Bleaching or Finishing Plants. The machine consists of two concentric drums or cylinders, one within the other, open at the top, and having the inner cylinder perforated with holes. This cylinder is rotated with great velocity, and by centrifugal action forces the water out of the material and through the holes out of the machine.
HYGROMETER, PSYCHROMETER OR WET BULB HYGROMETER:—The instrument for measuring the degree of relative humidity, *i. e.*, drying power of the atmosphere.
HYPERNIC:—A name given to Nicaragua wood, and sometimes to any other redwood extract of the same class.

(*To be continued*)

## A STUDY OF KNITTING.

(*Continued from July issue.*)

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.

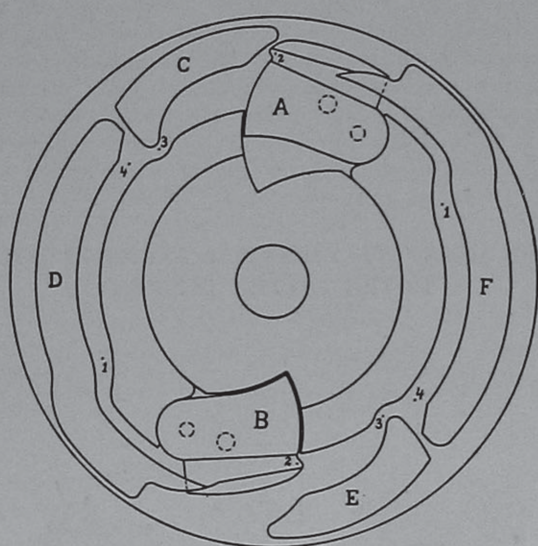



FIG. 29.

*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. 24, page 151 of the November issue, 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. 24, 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.

### An Improved Rib-Knitted Fabric Structure.

This fabric is produced upon a rib knitting machine having a cylinder and a dial needle bed, the cylinder needles producing the stitches which constitute the face of the web, and the dial needles producing the ribbing stitches which constitute the back of the web.

Two different makes of webs are shown, a distinguishing feature of both being in that they present on the face, needle wales having in alternation large and small stitches, and on the back, needle wales in which all of the stitches are of substantially the same size, thus in the illustrations *a* represents the needle wales of the face of the fabric and *b* the needle wales of the back of the same.

In the fabric structure shown in Fig. 1, there are as many courses of stitches in the back wales as in the face wales, while in the fabric structure shown in Fig. 2 there are only half as many courses of stitches in the back wales as in the face wales.

In producing the fabric shown in Fig. 1, the cams for operating the dial needles which produce the stitches of the back wales of the web, all have the same draft and all act in producing each course of the web. The cams which act upon the cylinder needles for producing the face wales of the web are alternately long and short draft cams, the long draft cams producing stitches of any length desired, while the short draft cams produce stitches of much smaller size (as short as they can be knitted) these cams retracting the needles only to a sufficient extent to knock over their stitches.

The fabrics shown are best produced upon a machine having a plurality of yarn feeds.

In producing the fabric shown in Fig. 1, the cylinder draft cams corresponding with every other yarn feed are long draft cams, while the cylinder draft cams corresponding with the alternate feeds are short draft cams, all of the dial draft cams being alike.

In producing the fabric shown in Fig. 2, the cylinder draft cams are the same as for producing the fabric shown in Fig. 1, but the projecting dial cams corresponding with the cylinder cams having the long draft are short cams which do not project the dial needles to such an extent as to receive the knitting yarn, the dial needles receiving the yarn and forming the stitches only in those courses in which the short stitches are drawn by the cylinder needles. A fabric

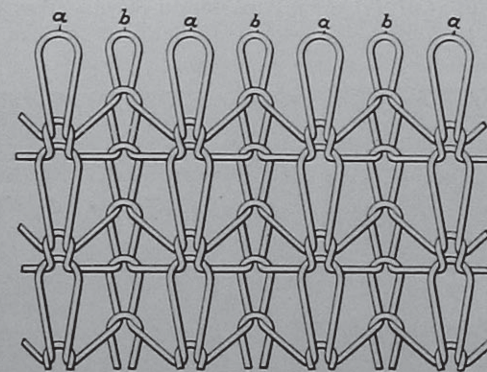



Fig. 1

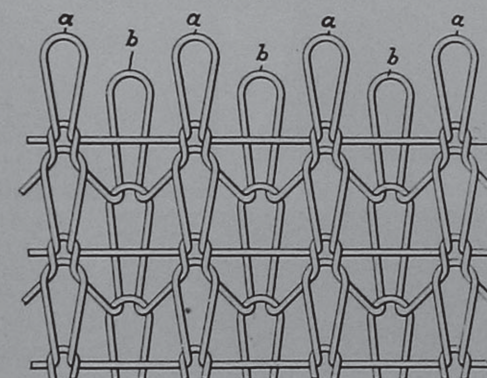



Fig. 2

of this character can be produced with less yarn than is required when stitches are formed in each course, in both the face and back wales.

Both fabric structures shown, permit of the production of a web which is relatively light in weight, but which because of the small or tightly drawn stitches possesses greater stability than an ordinary slack knitted fabric, the new fabrics also presenting on the face, a peculiar mesh appearance which is a desirable feature; a machine of a given diameter producing a web of a greater diameter than it would if all of the stitches were of the same size, representing a medium between the long and short stitches of the face wales.

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Delphin M. Delmas, the noted lawyer, returned to New York from abroad. He went there in July in answer to a cable from Count Luxemburg and his nephew, who have a large artificial silk factory in Prussia and intend to start a similar plant here.

Mr. Delmas said he had spent a month in Berlin attending to the legal end of the business and had held several conferences with his clients.

It has not been decided where the factory will be situated, but Mr. Delmas said it would be in the East.