THE

TEXTILE MANUFACTURER:

WITH WHICH IS INCORPORATED

The Textile Machinist, The Hosiery, Lace, and Silk Manufacturer, and The Textile Colourist.

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NOTES OF THE MONTH.

Our Trade With France.

ONE of the favourite topics of both speakers and writers for some time past has been the alleged loss of British trade with foreign countries. Our wares, measures, and methods have in turn been criticised, sometimes ignorantly and at other times with good cause, yet our business men plod along and our merchants continue to thrive, in spite of the condemnation of uninitiated, if well-disposed, critics. Naturally, the trade with different countries varies, and although some may show a falling off in their purchases, there are usually others who take their place, until they in turn suffer depression and are replaced by others. Our political relations with France in the years 1899 and 1900 were, thanks to the excitability of the lower class of Frenchman and the seemingly uncertain result of the South Africa war, far from friendly, yet during those years our trade with that country was of a very encouraging and gratifying nature. The trade between France and other countries, in both imports and exports, showed a marked falling off, while French imports from England showed a marked increase. The imports into France from all countries in 1899 were of the value of £188,000,000, and in 1900 £183,000,000, showing a decrease of £5,000,000. The exports from France to all countries in 1899 amounted to £173,000,000, and in 1900 to £170,000,000, a decrease of £3,000,000. Coming to the trade between England and France, this latter country imported from England goods to the value of £24,000,000 in 1899, and £25,000,000 in 1900, an increase of £1,000,000; but French exports to England show a slight falling off, being £103,000,000 in 1899, and about £500 less in 1900. The French trade with England, both ways, is very much larger than that of France and any other country, and as regards French exports to our country, the value for the last two years is much larger than in any preceding year, despite the slight reduction of last year. Almost the same may be said of French imports from our country, although in this case the value of either of the last two years was exceeded in 1890. During 1900 we received more yarn, more linen, and very much more flax, hemp, and jute goods from France than in 1899, but we took less woollen goods, less silk goods, less wool and wool waste, less cotton goods, and less machinery. We sent to France in the some year more woollen goods, more machinery, more jute, more cotton goods and yarn, more alpaca and mohair goods, more linen, and more flax and hemp. On the other hand, we sent very much less wool, about the same mohair yarn, less silk goods, less woollen yarn, less flax and hemp goods, less cotton, less silk, less jute goods, and much less floss silk yarn.

The Supply of Cocoanut Fibre.

WE are periodically threatened with, if we do not actually experience, a shortage of the cotton crop, as also of the supply of fine Botany wools; so it is rather an agreeable change to come across some fibre where the supply greatly exceeds the demand, and where such is likely to be the case for generations to come. This is how matters stand with regard to the fibre taken from the husk of the cocoanut. A correspondent in an India contemporary has recently drawn attention to the vast quantities of this material running to waste in India, and it is possible that his remarks may be equally applicable to many other tropical countries. As yet, the cocoanut fibre has had few applications in European countries, its roughness making it unsuitable for anything of a higher class than rough carpets and mats, or for roping; but the demand for even these might be greatly increased if the cost were lowered by a better arrangement of cultivating and shipping the material. All down the hundreds of miles of the West Coast of India the trees grow in abundance, and it is estimated that the crops could be more than doubled in any district by the introduction of some simple kind of irrigation for the dry season, water being plentiful in the ghauts above. Attention is drawn to the advantages which might be derived from the arrangement of certain centres where the trees could be cultivated and the crop increased. At present the district of Goa exports annually no less than 40,000,000 cocoanuts with their husks, and as the prices range from as low as sixteen shillings a thousand for the complete nut, some idea can be gained of the cheapness of the husk or fibrous portion—which is really considered a by-product — were the production doubled. It would undoubtedly pay some enterprising firm to put down a plant in some district like Goa, and extract, winnow, and clean the fibre by power on the spot, putting it at least into some reliable commercial form, if not actually working it up into material. Such a proceeding would enable the operators to work the fibre shortly after it was gathered—after, say, two days' soaking in water, instead, as at present, allowing it to lie rotting for months together until it is transhipped, or crudely treated by manual labour. Such a system would give better yarn and material as an ultimate result, and as all refuse would be left on the spot, a great saving of carriage would be effected.

The Certification of Engine and Boiler Attendants.

THE agitation which has been steadily maintained for several years past having for its ostensible object the certification of attendants in charge of steam engines and boilers, has been scotched, at least for the time being, and if the Labour members of Parliament do not now rest satisfied, it will probably be owing to the agitation of their trade union supporters rather than to a conviction of the reasonableness of contention. In any case, they cannot claim that their views have not received due consideration at the hands of the Committee which was appointed to investigate the point in dispute, nor can they complain of the character and variety of the evidence adduced at the inquiry. There is little doubt that the real object of the resolutions which have been repeatedly passed at the annual congresses of the trade unions is to limit the available supply of labour, and thus to further the objects of trade unionism by facilitating the combination of the certificated attendants. However, the evidence given almost invariably went to show that ignorance of technical matters on the part of those in charge of boilers very seldom affected the safety of boilers. As a matter of fact, the requirements needed in a boiler attendant are not of a very exigent character, and one never meets with a boiler tenter who does not realise the danger of shortness of water, while the instances in which the proper functions of a safety valve are wilfully interfered with are now exceedingly rare. The evidence afforded by a large number of boiler explosions goes to show that in so far as they are attributable to mistakes, negligence, and mismanagement, carelessness rather than lack of technical knowledge is the principal source of the mischief, and in all probability certificated attendants would not show any very marked improvement in this respect. The general conclusion arrived at by the Committee sums up the situation in the following statement:—In the opinion of the Committee there is no necessity for any system of certificates, seeing that the facts and figures brought to their knowledge indicate that great care appears to be taken in the selection of capable, trustworthy, and qualified persons to take charge of engines and boilers, and that the owner of the engine or boiler, on whom the liability rests in case of accidents and explosion, is the person on whom the absolute responsibility of selection should continue to be placed. They consider that if a system limiting the charge and control of boilers and engines to certificated persons were established, it would unduly restrict the opportunities of selection, especially in outlying localities; and whilst such certificates would offer some guarantee of technical knowledge, there would be a danger that less attention would be paid to the more important questions as to the practical experience, moral character, nerve, and commonsense of an individual applicant. Having regard to the enormous number of boilers in use, the figures for recent years, the Committee point out, do not indicate that accidents arising from ignorance on the part of the persons in charge are numerous; and, finally, the Committee, in view of the opinions they have expressed in the report, have therefore not considered it necessary to suggest amendments in the Bill which was referred to them.

Chemistry in Germany.

CHEMISTRY plays such an important part in the dyeing, bleaching, printing, and finishing of textiles, that it seems deplorable that the first textile country of the world should be so far behind another in matters of chemistry. However, the English industries, wide and far-reaching as they are, cannot expect to lead in every section, any more than a jack-of-all-trades can be supposed to excel in all his handicrafts. There is no doubt that English students, or English people generally, can make as good chemists as the Germans, given the same opportunities; and we have English chemists to-day who are equal to any that Germany can produce. These are, however, not numerous, for the conditions under which the higher branches of chemistry are studied in England make it impossible for any but a privileged few to make their mark. To train as a chemical expert in England means money, and a good deal of it—in fact, far more than any but the wealthy can afford. In Germany matters are very different, a state of things by no means new, seeing that for centuries the Germans have interested themselves in the chemical sciences. Most of the German universities teaching chemistry are of very ancient renown, and with the exception of the modern universities at Berlin, Bonn, and Breslau (which have only been established about 100 years), can look back upon an existence ranging from 200 to 500 years. The universities, of which there are a large number, are generally situated in small provincial towns, and many of them are the centres from which the earlier study of modern chemistry originally sprang, and in which it has been taught and studied ever since. The fees for a chemical course in the German universities are generally slightly higher than those for the same subject in a German technical school, but they are very reasonable and low when compared with those of an English university or college. For instance, the fees at the Berlin University are £6 per term for laboratory work and £5 for the lecture course, these being about the highest charges to be found. For the majority of German universities the fees per term are £5 for laboratory work and from £3 to £4 for the lecture course. There are two terms in the year, the summer and winter terms. In a technical school the fees are usually determined by the Ministers of Education in the various States, and therefore vary in different parts of the country. £9 per term, or £18 per annum, will cover the cost of lectures, laboratory practice, chemicals, and books, at the more expensive schools; but £15 per annum may be taken as a fair average. If the student is a native of the town, and lives with parents or relations, these fees are within reach of nearly every class of the community; whilst for strangers living is comparatively cheap, all necessary expenditure in that line being covered by about £75 a year, although economy can reduce that to a smaller sum. It is this interest in the science and practice of chemistry that has made the German chemical industries what they are to-day, for the country possesses no special natural advantages, although well supplied with springs and rivers. Many of the chemical industries date 250 years back, although it is only in comparatively recent years that the enormous extensions which have built up the present large industrial concerns commenced. The departments are many and the chemicals manufactured various, but confining oneself to those of textile interest only, it is found that gigantic businesses have been formed. Picric acid was really the first organic dye which was artificially prepared, and became generally known about 1845. In 1835 Runge in Berlin discovered aniline, and in 1845 Hofmann benzol in coal tar. In 1835 Mitscherlich discovered nitrobenzol, and Zinin showed in 1841 that it could be converted into aniline by reducing agents. Mansfield, working in Hofmann's laboratory, devised a process for the production of benzol from coal tar on a large scale, and by this means rendered the production of large quantities of aniline by way of benzol and nitrobenzol possible, as aniline itself only occurs in coal tar in very small quantities. These chemists may be considered to have laid the foundation of the German aniline dye industry, the discoveries of the various colours then commenced having now run far into the thousands. In 1868 Graebe and Liebermann superseded the madder root by their discovery of the artificial alizarin colours prepared from the anthracene contained in coal tar, a step which cut off from France alone an agricultural output of nearly £2,000,000 a year. This may be taken by many as a forerunner of what the natural indigo trade of India may expect at the hands of the artificial product recently introduced. The patents for the artificial production of indigo are in the hands of the Baden Aniline Dye and Soda Works, which employ more than 6000 workmen and more than 100 academically-trained chemists. The process used is that of Heumann's synthesis of indigo, which starts from ortho-amido-benzoic acid as raw material. Indigo is also manufactured synthetically, from ortho-nitrotoluol, probably, by the dyeworks at Höchst-on-the-Main, which are in possession of the Beyer-Drewsen patents for the synthesis of methyl indigoes, but this process is at present more costly, and even if it became cheaper there is scarcely enough toluol available to enable sufficient quantities to be manufactured for effective competition with natural indigo. That the chemical industries are worth cultivating is amply demonstrated by the dividends paid by the German companies, dyestuff manufacturers especially, whose profits for many years have ranged from 18 to 24 per cent. per annum, whilst there is every indication of a still better time to come. To save the expenses of carriage, and in some cases of import duty, the principal German dyestuff manufacturers have lately commenced erecting branch works in other countries. The Berlin Aniline Works have a branch works in America, of which all the shares are held by the mother firm; the Höchst Works have a branch at Moscow, of which they also hold all the shares; and the Baden Aniline Works have branch works in Neuville (France) and near Moscow, and others are projected.

Indexing Information.

IT is surprising, even in many large mills, how little attention is paid to the systematic arrangement and collection of useful and technical information. There seems to be an abhorrence of books and bookkeeping in general in the mind of the average manufacturer, his whole bibliographic interests being usually wrapped up in his order book and ledger: these two books he cannot do without, and he wouldn't if he could. Some go to the other extreme: they conceive some novel scheme of bookkeeping which is more elaborate than useful, its utility being nullified by the disposition of sundry items to be missing or ungetatable just at the time they are required. A mill office is more than often a true key to the mill itself: a clean, tidy, plain office with a respectful and business-like staff suggests method and discipline in the mill; and it is easy to judge the conditions in the workrooms on entering a dirty, untidy office containing sleepy and indifferent clerks. But apart from the ordinary routine of bookkeeping, which is the better for being simple, a most useful department of office work is more noticeable by its entire omission than by anything else: this is the systematic collection of information relating to the particular business or branch of industry in which the firm is interested. This may consist of useful recipes, technical information, processes which may some time be fashionable or otherwise in demand, a list of firms which supply materials which are not wanted, but may be some day, when their name is forgotten, and hundreds of little items which may at some time be required when they cannot be found. Many people begin collecting all such information that comes in their way, and in time the collection assumes quite a formidable form —more formidable than useful. It may be seen in many an office, perhaps in a disused corner of a desk, more often in some window bottom; but occasionally it is out of sight in some large, almost inaccessible bottom drawer in a dark corner, which precludes its being useful for anything. The piles on the desk or window ledge are composed of catalogues, cuttings, business cards, and other papers of almost every size, the top of each pile, as well as every protruding corner and edge, being covered with a copious supply of dust. The collection in the drawer is noticeable for its possession of less dust but more confusion. To be useful, a collection of information must be readily accessible, and also of such a form that it can grow to any bulk without becoming less easy to manipulate. A scrap-book, or books, is a very convenient form if indexed, and always indexed to date, although the necessary use of gum creates a disposition to allow the unpasted slips to accumulate inside. The handiest form is one where neither gum nor ink is required, many of such forms being in vogue, and the business man can easily choose the one best adapted to his particular needs. One way is to utilise old envelopes, marking a letter of the alphabet in the top corner, and then putting each cutting or other form of information in the envelope whose letter commences its title. The envelopes are arranged alphabetically in a narrow drawer, or a broad drawer divided into sections, and additional envelopes may be added as required. An elaboration of this system is to number the envelopes and have an alphabetical index of their contents: this means more work, but allows of the subjects being arranged under different letters, which makes them easier for reference if the title can be read in different ways. The favourite American system is that of arranging collected papers in a long drawer with cardboard slips acting as divisions, these slips bearing letters or numerals in the same way as the envelopes described above. These systems may be made more comprehensive by employing special cabinets, filing systems, and other conveniences; but such mean a substantial outlay of money, whilst those described cost practically nothing, and are almost as effective—in fact quite as much so on a small scale. The time saved by some such systematic collection and arrangement will well repay the trouble to any progressive manufacturer, for no little delay, irritation, and even loss, are frequently experienced by not being able to procure necessary information at the proper time.

ARTICLES.

Silk Novelties for Next Spring.

THE demand for printed dress fabrics is still in evidence, and these goods may be expected to form one of the chief styles for the spring season of 1902. Parisian merchants and Lyonese manufacturers are already preparing to meet the demand, both with direct printed goods and warp printed or chêne styles.

Speaking generally, the recent types of printed silks have been largely dependent upon the printed design for their effectiveness, but there is a tendency to make the weave more elaborate, so that, if anything, the woven effect is almost as striking as, and in many cases more so than, the printed design. Gauzes, muslins, grenadines, crêpes, will be used to print upon, both in the plainer and fancier styles, while some elaborate jacquard effects may be expected, consisting largely of floral, bouquet, and light running designs. Fancy and Pekin stripes, panne and velours effects will also be used. Although the plainer cloths, such as pongees and twills, will also be in demand to a certain extent, they have been abandoned by the Lyonese printers in favour of the more elaborate woven grounds, with which they expect to be overloaded before the anticipated demand is met.

FIG. 1.

SILK NOVELTIES.

FIG. 2.

The printed designs, especially in the more expensive cloths, are large—in fact, very large indeed. Running curves of the *art moderne* style, garlands of flowers and leaves, fruits, such as grapes and cherries, will be used, being intermixed with portions and running effects of imitation lace, guipure, or embroidery. These latter are at present in great favour, and will remain in fashion subject to slight variations.

As regards colourings, the familiar blue ground with its white figure will give place to newer and more assorted shades. There will be a few white grounds, but blue toile, blue elft, mauve, lilac, copper, aurora, the new greyish greens, nasturtium, red, crimson, light mouse grey, feutre, and mode will be the favourite shades for the worked grounds.

Figs. 1, 2, 3, and 4 are designs for direct printing suitable for silk goods for the coming spring, which have been specially designed for THE TEXTILE MANUFACTURER by M. H. Mauhin, 25, Rue des Jeuneurs, Paris, and are shown reduced to a little less than a quarter their actual sizes.

For warp printed effects rather different conditions prevail. Bright-looking shades may be used which would be much too loud for direct printing, but are subdued in warp prints by being broken up by the weft in the weaving operation. Figs. 5, 6, 7, and 8 are examples of these, being patterns which have been made for the coming autumn, and which are on the same lines as may be expected for the spring season. Fig. 5 shows a printed warp woven in a jacquard loom on a taffeta ground, the jacquard figure being outlined by floated shadings of white weft, which break up and subdue what would otherwise be a very loud print pattern. Fig. 6 is a printed warp woven into a coarse basket ground where the white weft slightly predominates, while the figure which is outlined with warp has a white repp centre portion. This method of designing gives bold and decided woven figures, and yet has a perfect chêne appearance.

Fig. 7 is a jacquard effect of indefinite form, being composed of sections of floated cord and striped taffeta, arranged in a broken geometrical design. The printed warp is more in evidence where the figuring is taking place, giving more definition to the woven design where the print is of a deep colour, but otherwise making the pattern look more indefinite as a whole. Fig. 8 is constructed on similar lines to the cloth illustrated in Fig. 5, with the addition of the black leaf worked in cut pile.

Another style which appears likely to be revived is the *genre Watteau*. At a recent very fashionable meeting near Versailles, many persons were dressed in costumes of the Marie Antoinette period, and these were so well received that Lyonese manufacturers at once set to work to bring out patterns of a suitable design. Two of these are given in Figs 9 and 10, being extra warp stripes on a cream ground.

FIG. 3.

SILK NOVELTIES.

FIG. 4.

The Mechanism of Spinning.—XVI.

By H. R. CARTER.

THE SPINNING OF VEGETABLE STALK FIBRES (*Continued*).—The fibre having been thoroughly cleaned, hackled, and prepared for spinning by the machinery which has been described, the next process towards the production of a fine and level yarn is the formation of a uniform sliver or continuous ribbon of material which is created by hand upon the table A of the spread board, Fig. 42. The pieces or bundles of fibre delivered to this frame from the hackling machine or sorters will be found to be of fairly uniform size if the pieces originally formed by the roughers or piecers-out were of regular size and weight—say six or eight per pound. To form a uniform sliver by hand, then, the spreader has to split up these pieces into as many smaller ones as her time will permit, and lay them one over the other in a continuous row upon the travelling leathers of the spread board. The degree of uniformity which she attains is inversely as the size of her pieces, and directly as the amount by which they overlap each other. These hand-formed slivers, to the number of from four to eight, are delivered by the endless leathers A to the feed rollers B, after passing through which they are pinned by the gills on the faller bars C, the working of which was explained in connection with Fig. 27 (page 80), as also the drafting by the rollers D, the doubling of the slivers upon the sliver plate E, and their delivery in a united sliver by the compressing rollers F.

For fine work the production of a uniform length of sliver from a given weight of fibre is usually left to the skill of the spreader, complete uniformity in the weight of the rove and yarn being maintained by the doubling together, upon the set frame, of a set of cans—say sixteen—collectively of given weight, and *each* containing the same length of sliver—say 1000yds—measured off by the bell mechanism, Fig. 27, attached to the spread board. Another method of obtaining yarn of uniform weight, which is often employed in medium and coarse mills, is known as the "clock system." Under this system the spreader can be compelled to put a given weight of material into a given length of sliver, the regularity with which she does so, however, depending upon her application and diligence. The necessary mechanism consists of a Salter's spring balance with a dial graduated up to say 20lb., and a dish to hold a like weight of fibre, both being placed convenient to the hand of the spreader. Upon the delivery roller F is a worm gearing with a changeable worm pinion upon a short shaft which lies underneath the sliver plate E. Upon the other end of this short shaft is a bevel pinion driving another upon a vertical spindle which, by means of more bevel gearing, gives motion to the hand of a dial graduated in a similar manner to that upon the Salter's balance. If 20lb. of fibre be placed in the tray when the hand of the geared dial points to 20, both dials will be alike. The "board" being started, the aim of the spreader must be to keep them alike by spreading the fibre regularly, taking it from the scale and reducing the indicated weight as fast as the geared hand moves round backward from 20 to 1. The 20lb. of fibre may thus be formed into any length of sliver as the weight of the yarn may require by changing the pinion governing the speed of the geared dial hand, the delivery remaining constant. The formation of sliver from the short and tangled fibre or tow which has been formed in the scutching and hackling processes requires machinery of quite a different nature, the process being known as carding. The "roller" card is the only one used for stalk fibres, the principles governing its action being identical with those of the cotton roller card explained on page 268 (August, 1900), although, of course, its construction and clothing are arranged to suit a much coarser and longer fibre than that of the cotton plant.

Fig. 43 shows such a card combined with an automatic feeder A, and a drawing head B, this type and combination being in general use for flax tow carding. The organs of the card consist of the feed sheet C, of canvas or leather; the feed roller D; the feed stripper E; the 1st, 2nd, 3rd, 4th, 5th, 6th, 7th, and 8th workers and strippers F, G, etc.; the main cylinder H; the doffers K; the doffing knives J; and

FIG. 5. SILK NOVELTIES.

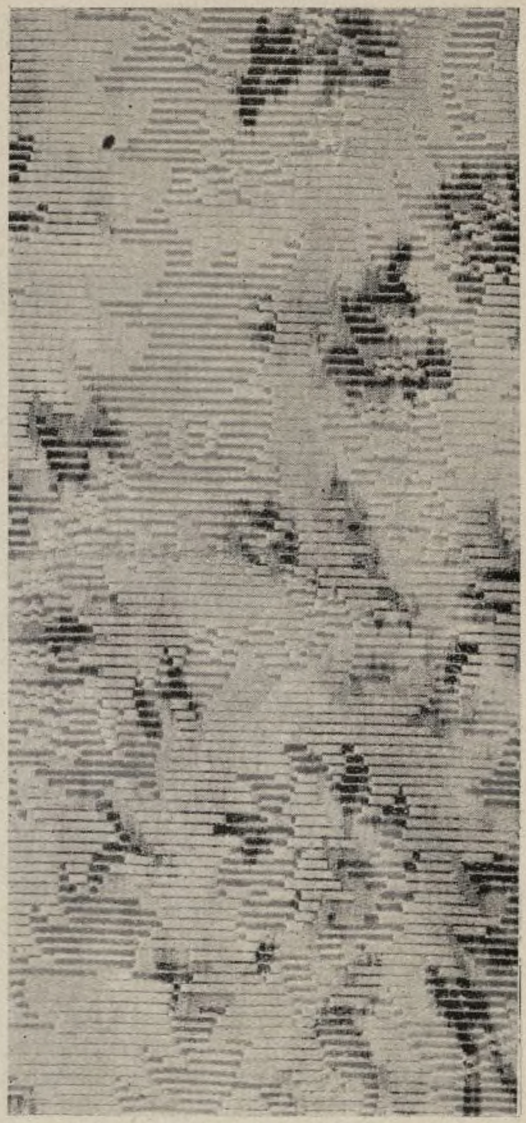


FIG. 7.

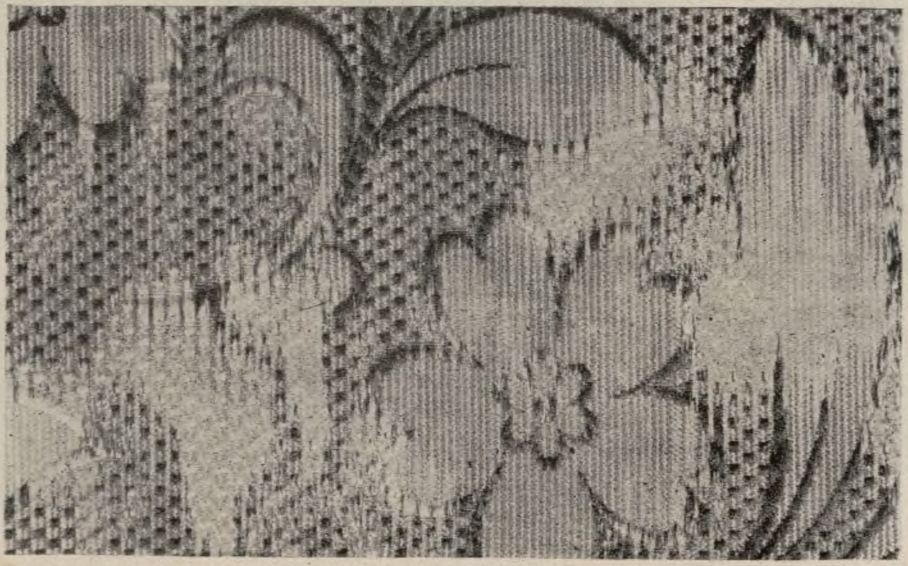


FIG. 6. SILK NOVELTIES.

FIG. 8.

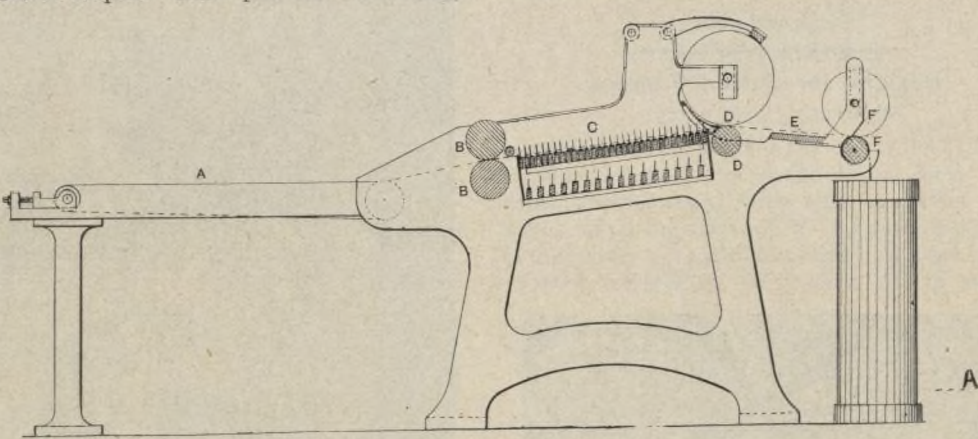
the calender or collecting rollers L. The cylinder is usually made either 4, 5, or 6ft. in diameter, and with a 4, 6, or 7ft. face. The diameter of the workers is from 4 to 7in., and of the strippers 5 to 8in. The doffers are from 18 to 24in. in diameter. The cylinder is driven at a speed of from 160 to 210 revolutions per minute, while the workers make 4 to 12, and the strippers 200 to 400 revolutions respectively in the same time. The cylinder is clothed with "lags" or staves of wood X, Fig. 44, set with needle-pointed steel pins at a distance of from 9 to 64 pins per square inch. The doffers, workers, and strippers may be clothed in a similar way, but are more generally covered with leather filleting set with iron wire teeth put in in the form of staples. Their pins are much longer than those of the cylinder, since it is their function to hold the fibre; for which reason, also, those of the workers especially are given what is known as a knee bend. The feed rollers are generally made on the "porcupine" principle, and are brass tubes set with steel pins. The angle or inclination of the pins on the cylinder and rollers is of great importance in increasing or diminishing the efficiency of the card, both as regards the quality of the work turned out and the quantity of waste made. The angles most usually employed are:—Cylinder, 75° with the surface; feed rollers, 60°; strippers, 25 to 55°; workers, 35 to 45°; and doffers, 35 to 45°. The teeth of the workers generally traverse their leather foundation at right angles, and are then "knee-bent" to the required angle. Each pair of rollers is set close to each other and to the cylinder without touching, the following being about the usual gauging, which we may remark is much coarser than that of the cotton card, on account of the coarseness of the material and of the clothing itself:—Feeds to cylinder, 13 to 14 B.W.G.; workers to the cylinder, 14 to 20 B.W.G.; strippers to the cylinder and workers, 16 to 18 B.W.G.; and doffers to the cylinder 16 to 22 B.W.G.

Since the clothing is comparatively coarse and the fibre long and "lofty," no "fancy" roller is required to raise the fibre for the doffer, as it is in roller cards for another material, nor do the cards require to be stripped or "fettled" if the clothing be kept in good order, for they clear themselves if run through. Differing from the cotton and woollen card, the flax, jute, and hemp card generally strikes downwards, for the main cylinder turns in the direction of the arrow, in order that (the doffers being placed in front of the card or on the same side as the feed) the whole surface of the cylinder may be used for carding purposes by the insertion of numerous pairs of rollers around its periphery. Although unnecessary for cotton and wool, a card intended for stalk fibre must have workers and strippers below its cylinder to throw off and cause to fall the shove or small particles of straw or boon found in almost all fibre of this class. Such impurities cannot be separated while the material is passing over the upper portion of the card, for they are not retained in the clothing of the card itself, as are the impurities in a cotton or woollen card. The card receives its motion by a belt which drives the main cylinder from a drum on the line shaft. The strippers and doffing knives are driven by one long belt from a pulley on the axle of the main cylinder. The workers, feeds, and doffers are driven by gearing from a pinion upon the other end of the main cylinder axle. As regards the direction of inclination of the pins, those on the workers and doffers oppose those on the cylinder, while, as regards direction of rotation, they recede before it. It will thus be seen that quick workers give less work, so that by providing change pinions the card may be adapted to obtain the best results from various classes of tow. A large cylinder pinion causes both feeds, workers, and doffers to run quicker, while the speed of the cylinder remains the same; so that in addition to a reduction in cleaning capacity caused by the quick workers, the material is actually run quicker through the card, receiving in its transit less work from the cylinder in consequence. The strippers throw off impurities in proportion to their speed, for which reason they are often run rather fast when working nappy tow. The draft of the card is the ratio between the length delivered by the calender rollers and the length taken in by the feeds. Fourteen is an average draft for a card of this sort. The fleece, as stripped from each of the doffers by the rapidly vibrating doffing knives J, is generally divided into three or four slivers drawn through trumpet mouths and condensing rollers L, passed round horns Z, and conducted along a sliver plate to be at once doubled together and deposited in a can Y, or to be first drawn out by a draft of 2 or 2½ upon a small drawing head, as shown at B.

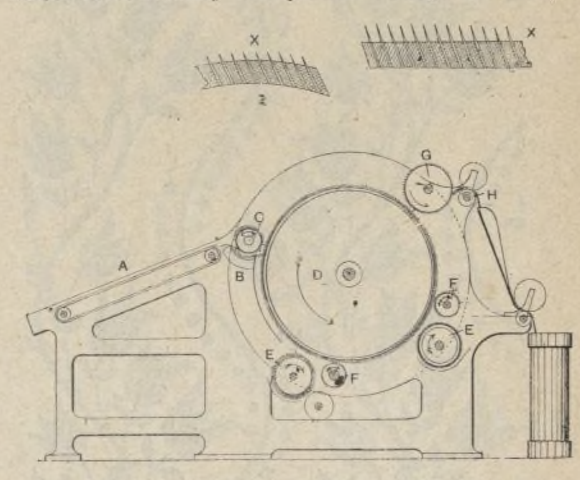
The automatic feeder shown is of the intermittent type—that is to say, laps of given weight are weighed in the balance 1, 2, and then deposited at regular intervals upon the travelling feed sheet C. The tow to be worked is placed in the hopper 3 and carried away by a spiked apron 4, which is driven by a friction clutch 5 and a belt from the feeder shaft 6, which receives motion from the

Fig. 9.

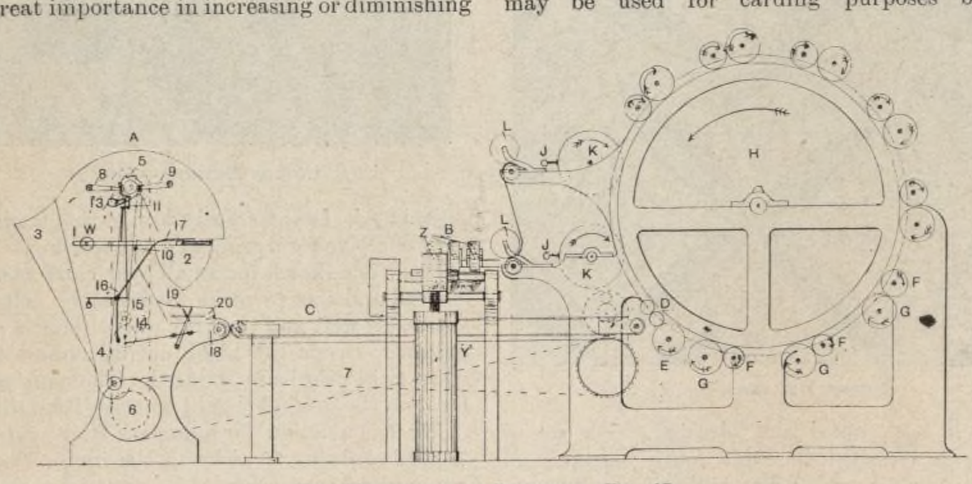
Silk Novelties. Fig. 10.



The Mechanism of Spinning.—Fig. 42.



The Mechanism of Spinning.—Fig. 44.



The Mechanism of Spinning.—Fig. 43.

card itself by the belt 7. The swinging knife 8 levels the tow upon the spiked apron and prevents too much from passing, while a similar knife 9 strips it off and throws it into the bucket 2 of the weighing apparatus. By shifting the weight W on the arm of the beam, which is balanced on a knife-edge 10, any weight of a lap may be formed; for when the bucket falls, owing to the weight of the tow in it, the tumbler 11 which

Cotton Designs.—Fig. 1.

has been holding the weighted dog or catch 13 out of contact with the notched disc of the friction clutch is moved, and the catch holds the spiked apron at rest, stopping the delivery of tow. When the proper moment for depositing the lap has arrived, or when a pin in the wheel 14 comes in contact with the tail end of a lever 15 fulcrumed in 16, the long sword arm 17 of the lever 15 is depressed, and coming in contact with a pin opens the two swinging sides of the bucket

Cotton Designs.—Fig. 2.

2, permitting its contents to fall upon the travelling lattice 18. A travelling board 19 actuated by a crank on the same wheel 14 follows up each lap and unites it with the previous one, while a beater 20 cements the union and levels the tow upon the sheet. The rising of the empty bucket places the tumbler 11 in a position to again hold the catch, which is now withdrawn by another lever actuated by the pin in the wheel 14, and a new cycle of operations commences. This feeder was introduced about ten years ago from the woollen trade, and has never been a great success as regards quality of work, owing to the length of the fibre and the high speed of feed sheet or short draft of tow cards.

The card in Fig. 44 is used to break up long fibre such as jute or matted scutching tow, etc., and render it fit to be submitted to a fine finishing card such as we have just described. The material is spread upon the inclined feed sheet A, passes between the shell B and the feed roller C, and is broken over the edge of the shell and carried away by the cylinder D. Two pairs of workers and strippers E and F open the material still further before it reaches the doffer G, which in a card of this description is stripped by the rollers H. The broad fleece delivered by these rollers may be either condensed into a sliver for a balling machine, or

Cotton Designs.—Fig. 3.

delivered loose into a receptacle ready to feed the finisher card, Fig. 43, either automatically or by hand.

(To be continued.)

Designs for Cotton Fabrics.

Specially Contributed.

Pattern No. 193 obtains its chief features from lappet effects, of which two are in evidence. The white lappet threads, which work down each side of the coloured stripe, break up the rigidity of this same stripe in a very marked manner, giving a wavy or undulating pattern

Cotton Designs.—Fig. 4.

which is both novel and pleasing. One set of needles is required for this stripe design and another for the spot effect, which is really composed of a pair of zig-zag patterns with the joining lines cut off at the back.

Pattern No. 194 is a check pattern in which mercerised cotton is largely used. The design is somewhat stiff in character, but this is toned down to a certain extent by the dobby weave effects which are intermingled with both ground and checking. The chief ground effect is that obtained by having a few ends weaving plain and then drawing the loose picks on either side of this together by floated ends, and so forming concave and convex lines across the piece.

Fig. 1 is a design for a cotton zephyr made in an 80-reed and shot about 76 picks to the inch. The figuring should be made from the warp and arranged to weave without much binding. Inside the leaves a fine oatmeal effect of warp and weft should be used. The ground should be plain.

Fig. 2 is a sketch for a dress cloth made with a 68-reed harness and shot 76 picks to the inch, of mercerised weft. The figuring should be made from the weft, and arranged to have as much float as possible on a tabby ground. Cloth woven on these lines should be made in shot effects so that the figure will stand up as much as possible.

Fig. 3 is a design for a cotton all-over cloth. The warp should be in a 96-reed and shot with 110 picks to the inch. The figure should be from the warp on a 4-and-1 weft satin ground. Inside the figure a bold warp and weft twill may be

Cotton Designs.—Fig. 5.

introduced. Designs worked up in this manner are very effective for dyeing and mercerising.

Fig. 4 is a sketch for an all-over cloth made in a 56-reed and shot 68 picks to the inch. The black should be weft and the grey warp, lying on a tabby ground. Inside the black outline shapes 2-and-1 warp twill may be introduced. The spots and oatmeal on the ground should be made from the warp.

Fig. 5 is a design for a damask stripe made in a 70-reed and shot 80 picks to the inch. The floral figure should be worked up with warp and weft, and some good floats should be left, for with a tabby ground the cloth will be firm. The black lines should be 4-and-1 warp satin, and the grey effect in the stripe should be 3-and-1 weft twill.

Fig. 6 is also a sketch for a damask stripe, but suitable for a better quality. The warp should be in an 84-reed shot with 90 picks to the inch. The

PATTERN SHEET No. 104.

Samples of Cotton Cloths.

PATTERN No. 193.

PATTERN No. 194.

NOTE.—*The samples of Woven Fabrics—except those marked as specially designed and woven for this Journal—may have been registered under the "Patents, Designs and Trade Marks Act."*

PATTERN SHEET No. 105.

Samples of Woollen and Worsted Fabrics.

PATTERN No. 195.

PATTERN No. 196.

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black figuring should be worked up from the weft, and the white portions of the flowers with 10-shaft warp satin, while a grey effect of weft oatmeal surrounds the warp figure. The ground should be 4-and-1 warp satin or 3-and-1 warp twill. The

COTTON DESIGNS.—FIG. 6.

grey stripe down the centre should be 3-and-1 weft twill with warp spots bound down with 5-and-1 twill. The outside black lines should be 4-and-1 warp satin, and the grey effect 3-and-1 weft twill.

Designs for Woollens and Worsteds.

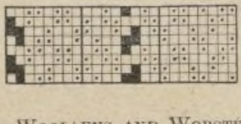
PATTERN No. 195 is a sample of nicely-coloured, full-handling, all-woollen suiting, made in the simple 2-and-2 twill weave. The arrangement of the threads is as follows :—

Warp.

1 end green (overchecking).
3 „ drab.
6 times { 4 „ twist. / 4 „ drab. }
4 „ twist.
1 „ claret (overchecking).
3 „ drab.
4 „ twist.

Weft.

1 pick green (overchecking).
31 times { 1 „ twist. / 1 „ drab. }
1 „ twist.
1 „ claret (overchecking).
3 times { 1 „ twist. / 1 „ drab. }
1 „ twist.

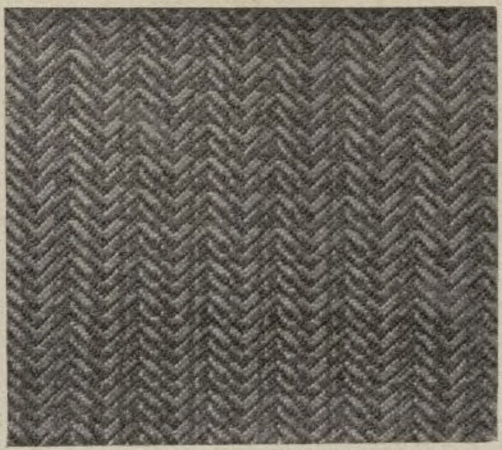


DESIGNS FOR WOOLLENS AND WORSTEDS.—FIG. 1.

Pattern No. 196 is a worsted trousering woven with four shafts, being a combination of twill, hopsack, and repp. The weft is all black, and the warping is as follows :—

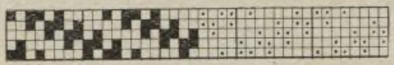
3 times { 2 ends slate. / 3 „ dark blue. / 4 „ black. / 3 „ dark blue. }
2 „ slate.
3 „ dark blue.
4 „ black.
2 „ dark blue.
1 „ ruby.

The design is given in Fig. 1, the slate ends being marked full squares.



DESIGNS FOR WOOLLENS AND WORSTEDS.—FIG. 2.

Fig. 2 is a rather novel type of trousering design, being dependent upon the weft, as well as the warp colouring, for the stripe effect, although a faint



DESIGNS FOR WOOLLENS AND WORSTEDS.—FIG. 3.

check design is also visible, making the cloth adaptable as a suiting. The arrangement of the threads is as follows :—

Warp.

7 times { 3 times { 1 end white. / 1 „ grey. } / 1 „ white. / 5 „ grey. / 1 „ white. / 7 „ grey. }
7 times { 4 times { 1 „ white. / 1 „ grey. } / 1 „ white. / 11 „ grey. }

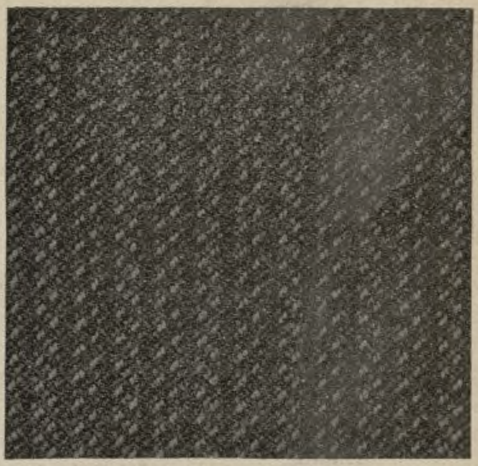
Weft.

6 times { 5 picks white. / 5 „ grey. }
6 times { 4 „ white. / 3 „ grey. / 1 „ white / 2 „ grey. }

DESIGNS FOR WOOLLENS AND WORSTEDS.—FIG. 4.

Both warp and weft yarns are two-fold worsted, and the design which is given in Fig. 3 is weavable on five shafts. It commences at the left-hand side with six ends grey, these being the last six of the group of seven given in the warping. The marks denote warp lifts in both this and the other designs.

The pattern illustrated in Fig. 4 is a heavy trousering whose weave gives the fabric a double-cloth appearance, thus getting the weight and a full handle without any troublesome stitching. The design is given in Fig. 5, the light-coloured (lavender) threads being marked by dots. The weft



DESIGNS FOR WOOLLENS AND WORSTEDS.—FIG. 6.

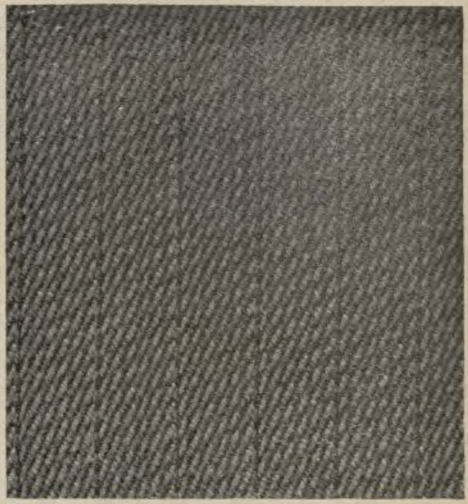
is all thick black woollen, whilst the warp, which is two-fold worsted, is arranged as follows :—

4 times { 1 end lavender. / 1 „ black. }
4 times { 1 „ dark twist. / 1 „ black. }

FIG. 5.—WOOLLENS AND WORSTEDS.—FIG. 7.

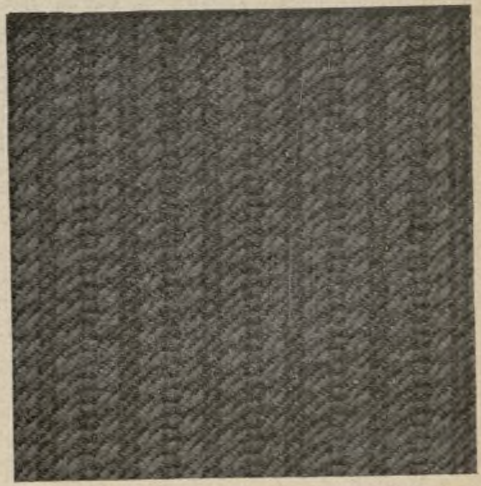
Fig. 6 is a cloth built on a similar principle. The weft is all black woollen, and the warp two-fold worsted, arranged as follows :—

2 ends dark blue.	1 end lavender.
1 „ lavender.	1 „ black.
1 „ black.	1 „ lavender.
1 „ lavender.	2 „ dark blue.
5 „ black.	9 „ black.



DESIGNS FOR WOOLLENS AND WORSTEDS.—FIG. 8.

The design is given in Fig. 7, and gives the double-cloth handle and appearance mentioned



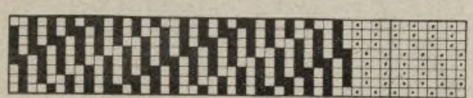
DESIGNS FOR WOOLLENS AND WORSTEDS.—FIG. 9.

with the preceding pattern. It does not repeat concurrently with the warping plan.

A neat worsted trousering pattern is shown in Fig. 8, being a slight variation of the 3 by-3 twill, but having an upright twill appearance, owing to there being less weft than warp threads. The twill is simply broken, not reversed, at either side of the two black threads. The weft is all black worsted, and the warping as follows :—

2 ends black.
2 „ dark twist.
5 times { 4 „ light twist.
4 „ dark twist.
4 „ light twist.

Fig. 9 is a trousering built on the corkscrew principle, the design being given in Fig. 10. The



Designs for Woollens and Worsteds.—Fig. 10.

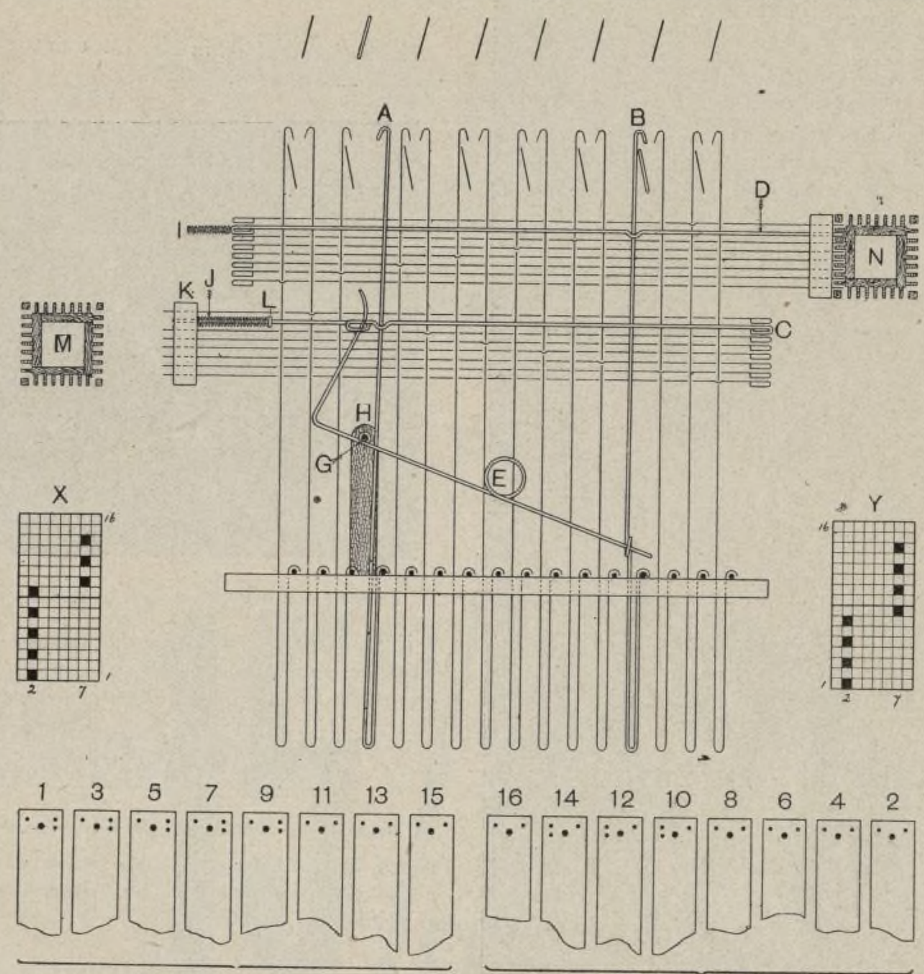
weft is all black woollen, and the warp, which is all worsted, is arranged as follows :—

4 ends black } weaving repp.
4 „ dark slate
4 „ black
3 times { 1 „ dark slate } weaving screw.
1 „ mid slate
3 times { 1 „ mid slate
1 „ dark slate
4 „ black
4 „ dark slate
4 „ black
3 times { 1 „ dark slate
1 „ mid slate
3 times { 1 „ mid slate
1 „ dark slate

Jute and Linen Weaving.—XX.

By Thomas Woodhouse
(Of Dundee Technical Institute)
and
Thomas Milne
(Of Dunfermline Technical School).

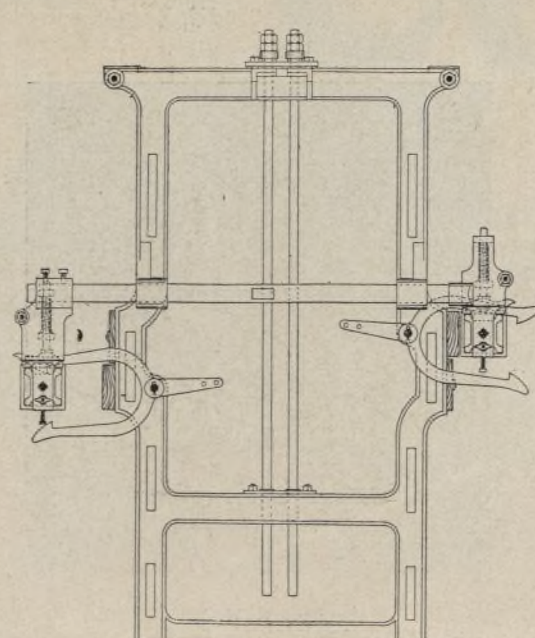
Double-lift Double-cylinder Machine (*Continued*). — In double-lift double-cylinder machines the main disadvantage is the liability of the cards on the two cylinders to get out of their proper rotation. Especially is this the case with inexperienced weavers. This fault has led to the introduction of various stop motions, the purpose of which is to bring the loom to a stop when the cards get out of order. One of the simplest and most widely adopted is that of Messrs. Devoge and Co., illustrated in Fig. 114. It consists of two special hooks A and B controlled by special needles C and D, and of spring wire E fulcrumed on a pin G in a special bracket H. One end of the wire E passes through a coil formed on the hook B, and is therefore controlled by this hook ; the other end of E is bent upwards and passes, as shown, through a loop on the needle C. All these parts are arranged on the machine at the driving side of the loom, and hook A is attached in a suitable manner to the set-on handle. Since the needle D is provided with a spring at its rear end (as usual), its normal position is on the knife. The spring J of the needle C, however, is at its forward end acting between the needle board K and a collar L on the needle, consequently the normal position of hook A is off the knife of the opposite griffe. When in this position —that of rest—the end of the needle C is flush or level with the face of the needle board K, as shown. It is obvious that if the hook B be lifted, the needle C will, by the action of spring wire E, be pressed forward until its point projects beyond the face of the needle board, at the same time placing the hook A on the knife. It is therefore evident that to prevent the hook A being lifted and the loom set off, the card on the cylinder M next presented to the needles must be uncut or blank opposite the needle C. Clearly, then, a hole in the card on cylinder N must always be followed by a blank in the card on cylinder M, if the loom is to continue running. The simplest order of cutting to obtain this is, of course, all holes on N and all blanks on M. This order, however, would be ineffectual for stopping the loom where one set of cards was any even number in advance of its proper time, and would therefore never be adopted. A suitable order of cutting the cards is shown at the bottom of Fig. 114, the odd-numbered cards being for the cylinder M and the even-numbered cards for the cylinder N. The lacing and peg holes are cut in each card, while the holes cut in approximately the same line as the peg hole are those which are intended for the needles C and D. These are in the second row for cylinder M, reading from the top needle ; and the seventh row for cylinder N, reading from the bottom.



Jute and Linen Weaving.—Fig. 114.

Any suitable order of cutting may be adopted, but the cards in the repeat must always be a measure of the total number employed. If the cards shown in the figure followed each other consecutively, the hook A would never be lifted, as it depends for lifting on a cut on the cylinder N being followed by a cut on the cylinder M. It is also obvious that if either set of cards gets 8, 16, 24, etc., places in advance of the other set, the same order of cutting would obtain and the loom would still run. This may seem an argument in favour of increasing the number of cards in a repeat of the arrangement ; but it must be remembered that the loom will not always stop immediately the cards get across, for in the arrangement given the loom may run a maximum number of 14 picks before being stopped, and as the cards in a repeat are increased this maximum number is also increased.

The order of cutting is indicated alongside the design proper, or on a detached piece of point paper (as shown at X and Y), which the card cutter may adjust to the design as he or she proceeds. The order shown at X is that cut on the cards in the figure : the alternative order of cutting shown at Y for the same number of picks is probably the better of the two, since where there are an equal number of cuts to each cylinder in the repeat, it is evident that the number of opportunities for the action of the stop motion will be at a maximum, seeing that the conditions for stoppage are that a cut on N is followed by a cut on M.



Jute and Linen Weaving.—Fig. 115.

One of the latest methods of connecting the two cylinders for the double-lift machine is that shown in Fig. 115. It is a slide motion, and the figure is introduced principally to show the relative positions of the various parts of the arrangement in connection with the framework.

Fig. 116 is a front view of the single-lift jacquard machine shown in Figs. 101 and 102. It is introduced principally to show the position of the heck and its necessity where jacquard shedding is applied in wide looms, as well as to illustrate a few minor details. The heck consists of a suitable number of steel wires A supported in and kept equidistant by two flat wooden bars B, whose distance apart must be somewhat greater than the space occupied by a short row of hooks. The heck is supported in position between the parts C and D, the former of which are fixtures to the beam E supporting the machine, while the parts D are screwed to the part C and kept in position by snibs F as shown. This arrangement enables the supported parts D to be withdrawn from under the heck so that the latter may be lowered in order to facilitate the mending of broken harness cords. The position of the heck, through which all harness cords must pass, is a little below the point of connection of the latter to the neck bands G when in their lowest position. The purpose for which it is introduced is to enable an equal lift or level shed being obtained from selvage to selvage of the cloth.

Suppose X Y to represent the comberboard through which all harness cords pass : it is obvious that when a heck is used the distance from J to H will remain constant, and therefore the lift at J and M, or any intermediate point in the comberboard, will be the same as that given to the hook.

The dotted lines K M and N J represent the positions these harness cords would assume in their lowest and highest positions were no heck used. The right-angled triangle K L M may be assumed as of the following dimensions :—

Length of cord K L, say 64in.

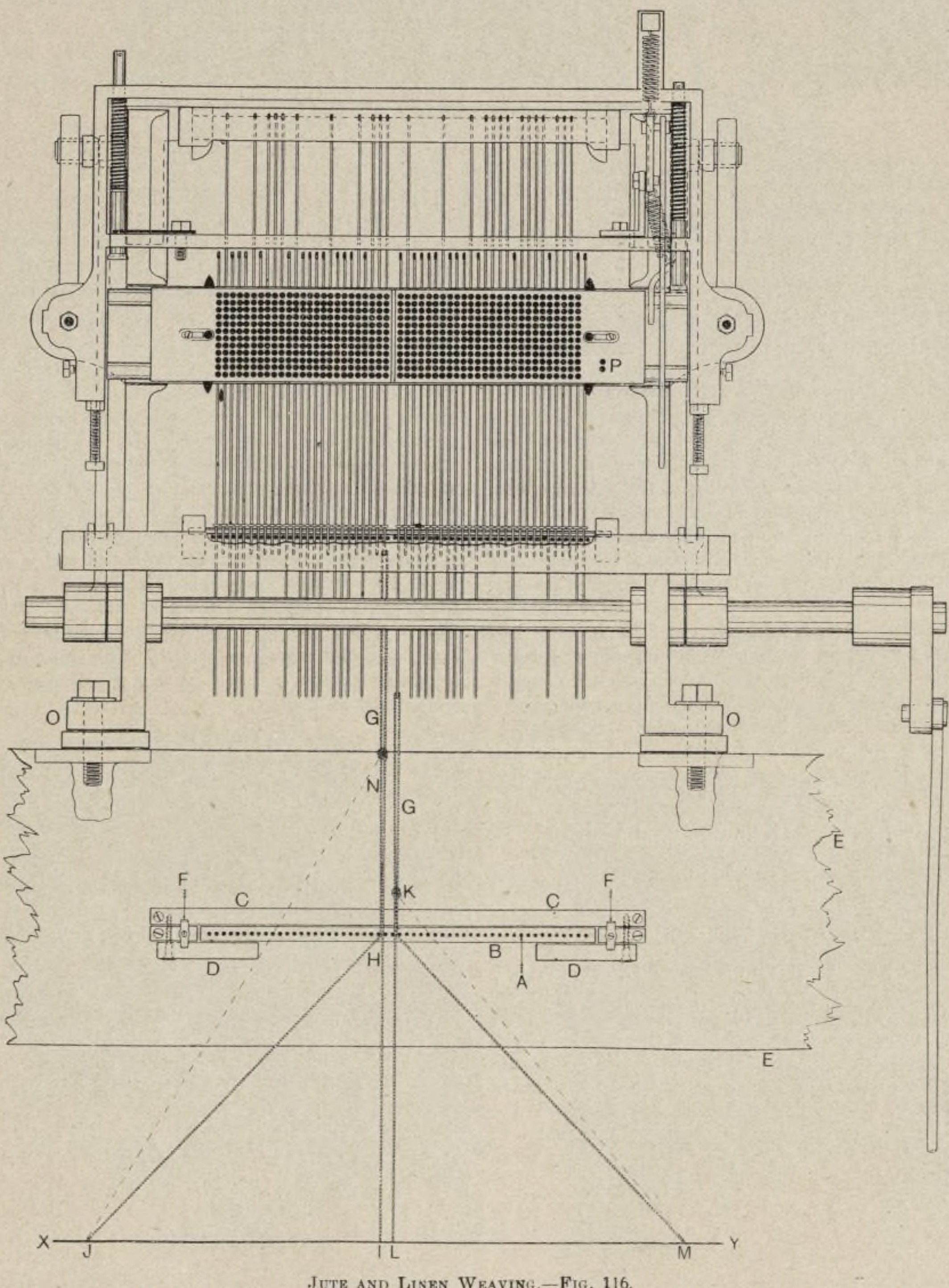
Length of comberboard between cords L and M, say 60in.

$$\therefore KM = \sqrt{KL^2 + LM^2}$$
$$KM = \sqrt{64^2 + 60^2}$$
$$KM = \sqrt{7696}$$
$$KM = 87{\cdot}7\text{in.}$$

Suppose the lift to be 4in. : the lifted cord K L now represented by N I will be 64 + 4 = 68in. I J = L M = 60in., and

$$NJ = \sqrt{NI^2 + IJ^2}$$
$$= \sqrt{68^2 + 60^2}$$
$$= 90{\cdot}7\text{in.}$$

But 90·7 – 87·7 = 3in. of a lift on harness cord N J as compared with the above-mentioned lift of 4in. on harness cord N I, showing a faulty lift of 1in. at



Jute and Linen Weaving.—Fig. 116.

a point 60in. from the centre of the cloth. This difference of lift gradually diminishes as the centre point is approached, but it just occurs in its most exaggerated form at the point where it is least desired.

One disadvantage of the heck—which, however, cannot be avoided—is the excessive friction generated between the harness cords and the steel rods of the heck, even although the rods are free to rotate with the moving cords. When the machine is set so that the cards hang over the end of the loom, the rods (9 for a 400-machine and 13 for a 600-machine) pass between the long rows of the harness cords, and consequently may be much greater in diameter than those represented in the figure. Due to atmospheric and other changes, the harness cords sometimes vary in length, and so produce a faulty shed. To meet these changes, and to ensure that the warp threads occupy their proper positions on the race board of the "lay," a method of adjustment frequently adopted is shown at O. This consists of increasing or decreasing to the necessary extent the thickness of the support O between the beam E and the feet of the machine proper. Another method often adopted is that of making the sword of the lay in two portions, so that it may be increased or decreased in length, and the lay lifted or lowered to suit the level of the warp threads.

To dispense with the necessity of punching every card of the design for a selvage, extra hooks actuated by bent needles are introduced into this and other machines. At a point P, on each face of the cylinder, and clear of the end of the card, extra holes are drilled for these bent needles to work into independently of the cards. It is evident that with this arrangement, and the cylinder bored to suit, any type of selvage, repeating on two or four picks, may be obtained.

(To be continued)

Silk Spinning.—IV.

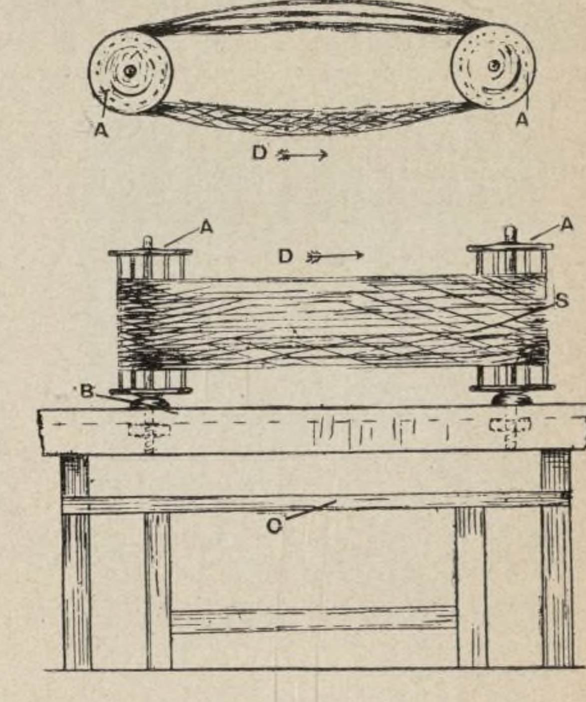
By Filsoie.

SILK THROWING.—Silk throwing is the name given to a series of operations through which the raw silk is worked to convert it into a weavable state for warp or weft, and the produce from a silk throwster's mill is known as thrown silk. The various kinds of thrown silks best known are: Singles, used for warp or weft ; tram, used for weft ; organzine, used for warp ; no-throw, used in the Derby and Leicester trade ; and silk sewings, used by tailors and in the boot trade. Fig. 7 shows a book of silk at A, and gives a good idea as to how a tsatlee-reeled China or Canton is made up. This book can be split up into mosses, and lesser slips. B shows a head or

Silk Spinning.—Fig. 7.

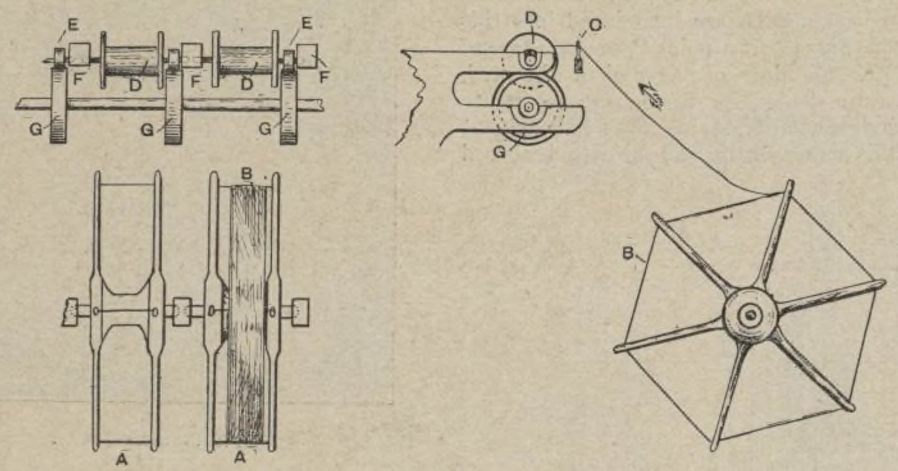
skein of Bengal silk opened out, while C and D are each a head of Japan and Italian filature respectively.

Splitting.—Taking first the tsatlees, the throwsters divide the books into the separate mosses (twelve mosses to a book). They are generally found entirely apart from each other, so there is not much difficulty in parting them unless the silk has been damaged in some way. The mosses, however, are too large and unwieldy to be put upon the swifts of the winding machine, for the strain on the single thread in the process of winding would be so great that the thread would be constantly breaking and so causing waste ; hence it is necessary that the mosses be split up into smaller skeins, which are generally termed slips. The sizes of



Silk Spinning.—Fig. 8.

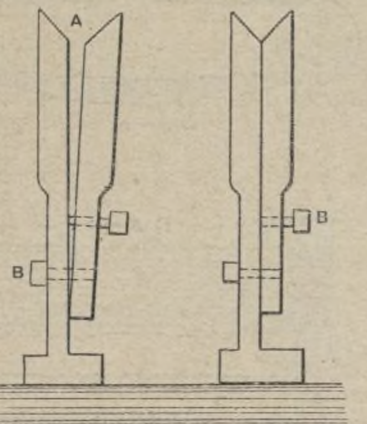
these slips vary, but it is the splitter's object to get them as nearly all one size as possible. One moss is generally split into about three slips. In some classes of silk where the reeling from the cocoon has been carelessly done this is a very tedious process, on account of the tangled threads, and unless the attendant is a very careful worker she can easily spoil a fair amount of silk. The machine used is but a simple contrivance, as will be seen from Fig. 8. The moss or skein S is opened out by the operator—generally a girl sitting on the seat C,—and placed over the two barrels or swifts A, the bottom one being movable in a slot B so as to accommodate mosses or skeins of different diameters. The operator then places her hands in between the two sides of the skein, and revolves it quickly round and round the swifts in the direction of the arrows D, D, which operation causes the skein to open out on the face of the swifts, tending to get the threads straight, and as nearly as possible in the same position as when the moss or skein was on the cocoon-reeling machine. In this way the moss is made ready for being divided into the required number of slips of similar size at the most suitable places, and split or parted with a minimum of broken threads between each division. The moss ready for



Silk Spinning.—Fig. 9.

division into three slips or skeins is shown at the top of Fig. 8. In this parting of the books into mosses, and the splitting of the mosses into slips, there is a certain amount of waste made, known in the trade as parters' and splitters' waste, which is always "bright"—that is to say, free from soap or other similar matters.

Sorting.—Having thus divided the books into workable slips, these are now carefully gone through and sorted—the coarse fibre from the fine, the good colour from the bad and indifferent, the nibby and doubtful removed, each being put in a separate heap and kept entirely apart until the doubling process, when some throwsters double or fold a fine and a coarse fibre together to get a certain size or thickness of thread—which, however, is very unsatisfactory, and is a practice not very often



Silk Spinning.—Fig. 10.

resorted to now. Generally speaking, it may be taken that when once the slips have been sorted they go through the mill entirely separate. It is part of the duty of the sorter not only to divide the slips into the different grades, but also to detach loose ends and straighten them. This process therefore entails waste again, and is known as sorters' waste, which is also "bright." Of the waste produced by throwsters the most valuable are the three previously mentioned—viz., parters, splitters, and sorters.

To none of the previous processes are the filatures or re-reels subjected, because they are already in the slip state, and are made of such a convenient size for winding that it is not at all necessary to divide them further.

Bright Silk.—At this stage the throwster must decide whether he will throw the silk "bright," or, as is generally the case in England with tsatlee reels, whether he will work it with soap. The term "worked bright" is understood in the trade to denote that the slips have not, prior to winding, cleaning, and throwing, been washed or soaked with soap, which is done to make the silk wind more easily. Filatures and re-reels, and on the Continent tsatlees even, are generally "worked bright," but it is understood that the Continental throwsters have some other ingredients besides soap, by using which they help the silk to wind better, and do not detract so much from the lustre of the silk as soap does. Slips, to be thrown "bright," are at once taken to the winding frame.

Washing.—Washing is not an elaborate process. The slips or hanks are taken and soaked in a solution of hot water and soap. The hot water, combined with the alkali of the soap, softens the natural gum of the silk and tends to make the thread pliable, and to loosen the threads one from the other; and the fatty matters of the soap counteract the tendency the fibres would have, on drying, of matting together. It is essential that a good white curd soap be used, on account of the absorbent power of silk, as an inferior soap of bad colour will diminish the value of the silk by affecting its colour, and may possibly make it sticky in working. The question of soap used in the washing process is also a very important matter to the silk waste spinner who buys the throwster's waste. Where dark-coloured soap is used, the waste from the processes following the washing is of a bad colour, which no subsequent boiling will dissipate. Some waste, which immediately after the winding and cleaning appears a good white colour, turns a yellowish brown when stored in a room which exposes the waste to sunlight. This is not the fault of the silk, but of the soap used in washing.

As mention has been made of the silk absorbing a proportion of the soap, a question naturally arises as to what extent this weighting is carried on. Some throwsters use more soap than others, but a good average, and an average which some throwsters guarantee, is that for every 1lb. of thrown silk the net result of boiled-off silk—that is, silk free from soap and its natural gum—should be 11½oz. net—a loss in degumming of 28 per cent. Silk thrown "bright," when boiled off, loses only from 20 to 22 per cent., which shows that soaped silk has picked up from 5 to 8 per cent. of soap; but some manufacturers complain of Continental "throwns" being adulterated with some compound which spoils the "bottom"—*i.e.*, colour—of the silk, and makes it impossible to thoroughly boil off the thread a small percentage of the ingredients used.

Drying.—After the washing comes the drying, which is generally done in one of the two following ways:—The slips are freed from as much moisture as possible by wringing by hand, and are then put into a hydro-extractor, which dries them so well that it is only necessary to hang them up for a few days in a room of ordinary temperature. Other throwsters have a steam-heated stove, in which they hang their washed slips for drying.

Winding.——The winding and following processes are the same for soaped slips as for silk thrown "bright." Winding, as the word implies is the name given to the process by which the slips, washed or "bright," as the case may be, are run in a continuous thread on to bobbins. The winding machine consists of a series of swifts A, Fig. 9, placed side by side, and revolving on their own axes quite independent of each other. The slip or hank is placed upon these swifts, one hank on each swift, as shown at B, and when in position the attendant's first duty is to find the end of the silk on the outer side of the skein. This end she passes through a guide or eyelet C, on to a bobbin D. The bobbin is revolved by means of a drum or pulley E, which is fixed firmly to a skewer or peg passed through the bobbin, and rests lightly in the brackets F. The small pulleys E are revolved by means of driving pulleys G, and the thread is traversed from end to end of the bobbin by means of the guide or eyelet shown at C.

By this means the thread is wound on the bobbin without any friction, which would tend to flatten it. When once the end of the silk is found in a hank it does not follow that the silk will wind in one continuous thread until the whole skein is complete, for in one hank there are frequently scores of lengths which the attendant is continually piecing up, necessitating her continual attention in finding fresh ends. There are also places in the raw silk which will not bear the strain of the tension between the bobbin and the swift, and so the end breaks. In such a case the attendant removes this fine place and continues to unwind by hand until she comes to the firm thread again. This fine silk which is taken out is put on one side and is known as winders' waste, and is what is called in the trade the fine, in contradistinction to the coarse or cleaner's waste made in the next process.

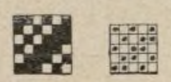
Cleaning.—Sometimes, during the winding, but preferably after as a separate process, a clearing or "cleaning" of the thread from gouty, slubby, and foul places is attempted. The method adopted is as follows:—The bobbin of silk is taken from the winding frame, the thread re-wound on to a fresh bobbin, and the thread passed in its transit through a series of guides or cleaners, which may either be a steel plate with a slot in, or two parallel plates placed so close to each other that the presence of any bulky knot, husk, foul place, or coarse thread is immediately detected, and by means of a simple automatic contrivance the receiving bobbin, which is worked on the same principle as in the winding frame, is stopped. The attendant then takes out the faulty thread, pieces up, and the process continues. These rejections from the cleaning mill are known as cleaners' waste. Fig. 10 shows the cleaning bars, the one at A being open, and the other one closed. The opening is regulated to any requisite distance by means of the set screws B, B.

(To be continued.)

Combining Twills.

By Jose Prat.

Going a step in advance of the well-known method of making designs by the combination of twills—a method laboriously worked out in many technical schools, but seldom used in practice—is that of combining twills in bulk instead of thread by thread in one direction only. The procedure of producing such designs is very similar to that of making the plan of a double cloth, only all the threads, both warp and weft, take a share in making the face design. In Fig. 1 two separate twills are given, one a five-shaft and the other six. Fig. 2 shows the six-shaft twill arranged on every alternate end and pick of the point paper, whilst the completed



Combining Twills.—Fig. 1.

design, with the five-shaft twill painted on the intermediate ends and picks, is given in Fig. 3.

In considering how to find the number of ends and picks required for any combined pattern, there are three different cases which may occur:—

1. Where each pattern contains the same number of ends and picks, the combined design will naturally have twice as many ends and picks as one of them.

2. When the number of threads of one of the original patterns is double that of the other, then if both are of even number, they are added together and the result added to half the value of the larger pattern.

Example.—With a 4-end and an 8-end twill combination, 4 + 8 = 12, 12 + 4 = 16, the ends and picks required for the combined design.

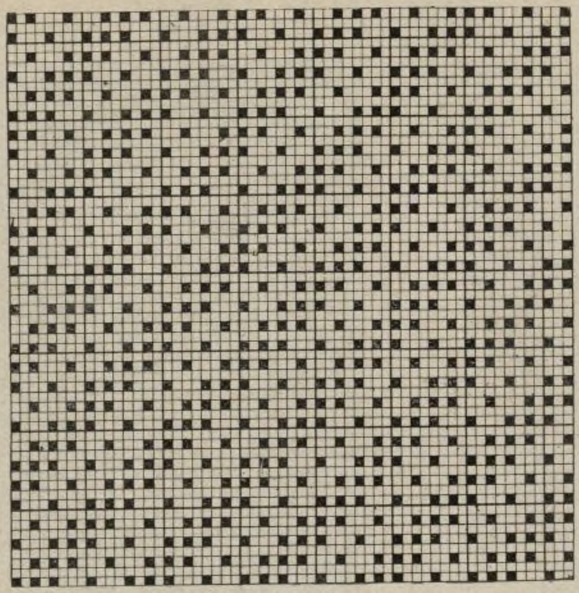


FIG. 2.

When one of the original twills is on an odd number of threads, the threads of the two twills are multiplied together, and the threads of the larger pattern added.

Example.—With a 3-end and 6-end twill combination, 3 × 6 = 18, 18 + 6 = 24.

3. When the numbers contain common denominators they are multiplied together, and if half of the result does not form a multiple of the two values, the quotient obtained by dividing this product by the common denominator of the original numbers must be added to the product. The sum then obtained is the number of threads required in the combined design.

Example.—With a 3-end and a 9-end twill combination, 3 × 9 = 27, 27 + 9 = 36. It should be stated here that the product obtained by multiplying together the numbers 3 and 9—namely, 27—gives, when halved, 13½, which is not a multiple of either original twill; therefore the product 27 is divided by 3, which is the common denominator of 3 and 9, the quotient 9 being then added to the original product, which is thus increased to 36, a number which, when halved, forms an exact multiple of the original numbers.

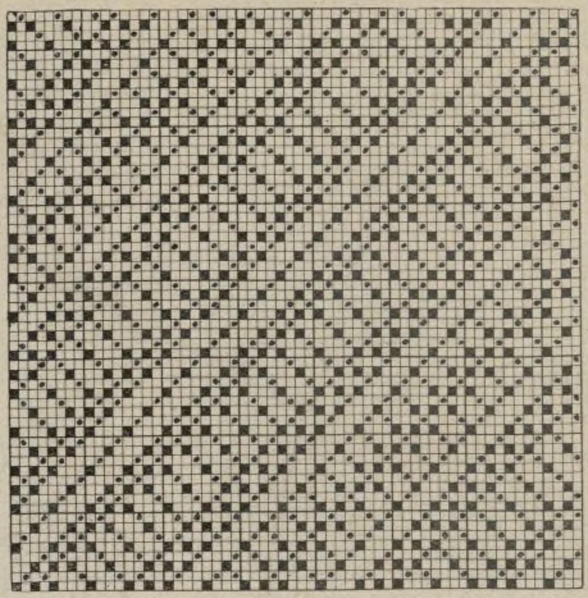
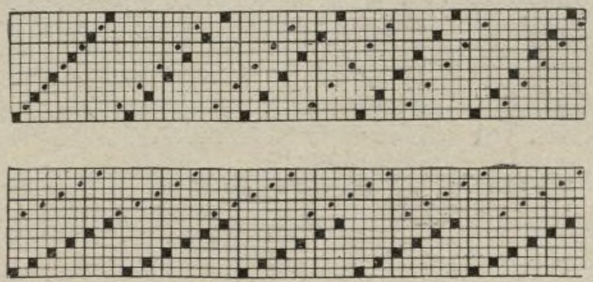


FIG. 3.

COMBINING TWILLS.



COMBINING TWILLS.—FIG. 4.

4. When the number of threads in the twills fulfil none of the above conditions, they are multiplied together, and if half of the product does not form a multiple of the original numbers, it is doubled.

Example.—With a 4-end and a 5-end twill combination, 4 × 5 = 20, 20 + 20 = 40. The half of 20—namely, 10—is not a multiple of 4 and 5, therefore 20 is doubled to get the requisite result. Fig. 3 is built up from 5 and 6-end twills, and comes under this heading: 5 × 6 = 30, 30 + 30 = 60.

Broad and fancy diagonal effects may be obtained in this manner by the use of very few healds, the number required being only that necessary for weaving the two primary twills. For instance Fig. 3 being composed of 5 and 6-end twills, 5 + 6 = 11 is the number of shafts required for the combined pattern, two forms of the draft being shown in Fig. 4.—"El Eco de la Industria."

Designs for Silk Fabrics.

SPECIALLY CONTRIBUTED.

FIG. 1 is a design for silk piece goods, and should be made with a 2000/2 spun silk shot with 100 picks to the inch of tram. The black figure should be weft, bound down with 8-shaft satin. The ground should be a 3-and-1 warp twill, and the stripes should be put in the reed 4-thread or double and of a different colour, bound with 8-shaft satin. With the lines put in good full net silk they will stand well up and give the cloth a rich appearance.

Fig. 2 is a sketch for a blouse cloth made with an 1800/2 spun silk warp, and shot with 90 picks of tram to the inch. The figuring should be chiefly weft with different bindings introduced to give the light and shade, and the ground a 3-and-1 warp twill. As a change small flecks or spots of weft might be scattered over the ground.

FIG. 1.

SILK DESIGNS.—FIG. 2.

FIG. 3.

Fig. 3 is a sketch for silk dress goods made with a 2000/4 net silk warp, and shot with 110 picks of tram to the inch. The black figures should be weft, lying on a 2-pick or tabby ground with small flecks of warp put on like a large storm. Inside the black figures should be 8-shaft warp satin, which on this quality will give a very rich effect to the cloth.

Fig. 4 is a design for a silk blouse cloth made with a net silk warp 1800/4 quality, and shot with 100 picks of tram to the inch. The black figures should be weft, floated as much as possible, the grey figures should be warp bound down with a 7-and-1 or 9-and-1 twill, but with an edging of tabby round to keep off the ground, which should be 3-and-1 warp twill.

Fig. 4.

Fig. 5 is a sprig pattern very suitable for dress cloth, made with a 2400/2 hard silk warp, and shot 100 picks to the inch of hard weft. The figuring should be worked up from the warp and weft and carefully bound down so that no long floats are left. The ground should be tabby. Patterns in this style, when nicely worked up, have a very good and bright appearance after the cloth has been boiled off. The tabby ground keeps the cloth firm and the figuring in its place.

Fig. 6 is a design for a silk scarf. The warp should be of net silk and a 2000/2 quality, shot with 100 picks to the inch of tram. The black figuring should be weft bound down on the larger places with 10 or 12 shaft satin. The grey effect inside the figure should be warp, bound with 7-and-1 satin. The grey effect on the ground should be 4-and-1 warp satin, and the white ground should be tabby. In working up this design plenty of fancy effect should be used on the groundwork, and when putting on the fine net lines care should be taken to run them by threads so that they have a nice sharp appearance.

Silk Designs.—Fig. 5.

Fig. 6.

Fancy Dress Fabrics.—XX.

By G. Washington.

In Figs. 197 and 198 is illustrated a cotton zephyr fabric imitating a lace effect. The sketch contains one-quarter of the 6 shaft sateen stripe, and also one-quarter of the gauze effect, these being separated from each other by two plain threads. The zig-zag gauze effect consists of a pair of small white threads crossing over two pairs of blue ones. In the honeycomb portion one thick thread of white crosses over three pairs of blue.

Warp.

2 ends 40's blue (plain) .... 1 reed.
24 „ 2/60's blue mercerised ... 4 „
2 „ 40's blue (plain) .... 1 „

4 times {
2 ends 2/40's white } .... 1 reed.
4 „ 40's blue }
empty .... 1 „
1 „ 3/15's white }
6 „ 40's blue } .... 1 „
6 „ 40's blue }
1 „ 3/15's white } .... 1 „
empty .... 1 „
4 „ 40's blue }
2 „ 2/40's white } .... 1 „
}

24 reeds per inch.

Weft.

40's white cotton.
66 picks per inch.

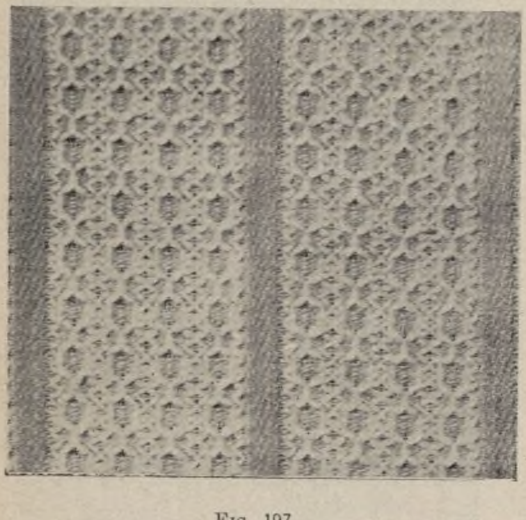
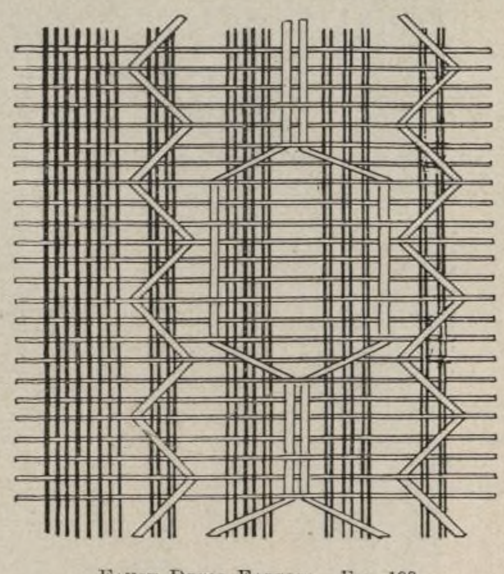


Fig. 197.



Fancy Dress Fabrics.—Fig. 198.

The black silk broché shown in Fig. 199 contains three weave effects—sateen ground marked in strokes; cord effect, with two picks in each cord, and the threads working in pairs; and solid weft floats, giving pronounced lustrous figures, with one of the picks from each cord floating on the surface, the remaining pick interweaving with the warp, and continuing the cord on the back, thus producing a compact and serviceable fabric. Fig. 200 is the design for the second bud of the upright spray arising out of the centre of the principal figure.

Warp.

Black organzine, 7000yds. per ounce.
256 ends per inch.

Weft.

Black tram, 2000yds. per ounce.
128 picks per inch.

The lustre of the yarn and the great number of threads and picks per inch render silk fabrics specially suitable for producing shaded effects. In Fig. 201 the ground is satin, the long bars warp cord, the small round spots solid weft, all similar in construction to the last example. It also contains long bars of corded weft effect, one cord having the odd picks and the next the even picks floating on the face, similar to the effect shown in Fig. 207. The principal feature of the design is the large shaded balls, which contrast well in form with the long, straight, secondary figures, in size with the small weft spots, and in light and shade with both ground and the remaining figures. Fig. 202 is part of the design for the least of the two balls, and shows the method of shading employed. The weft floats are arranged in 12-end sateen order, repeating on 24 threads and picks, and shading down gradually from floats of 22 to floats of 6, thus giving the shading a twilled appearance.

Fig. 199.

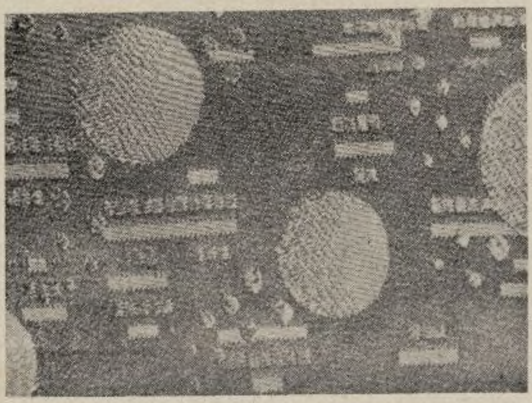
Warp.

Black silk, 7000yds. per ounce.
224 ends per inch.

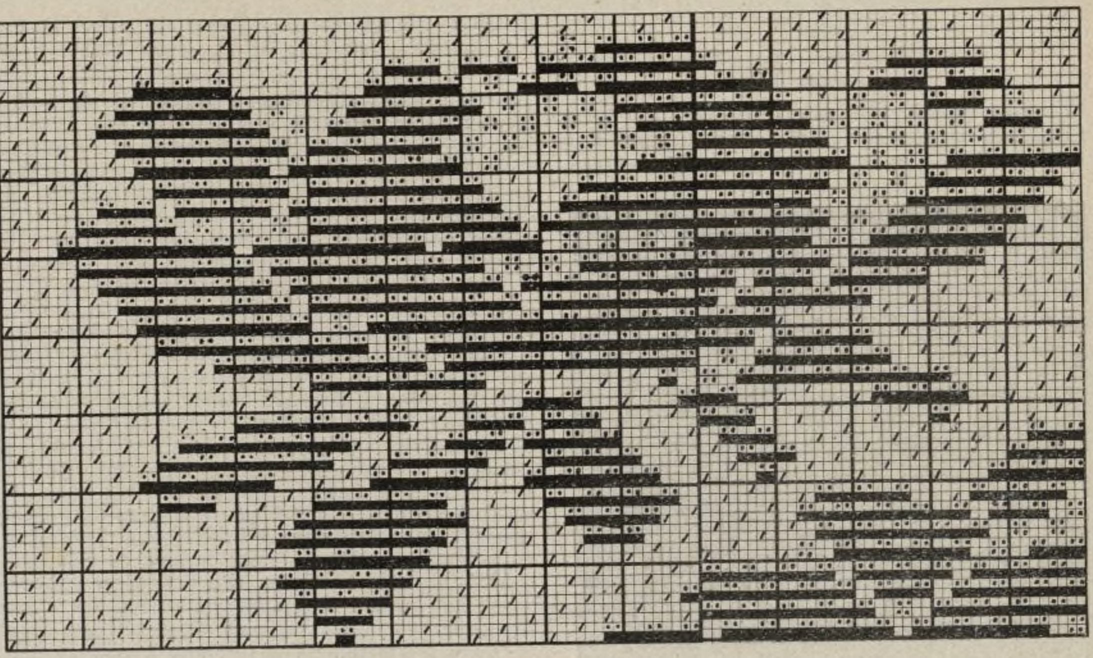
Weft.

Black silk, 2000yds. per ounce.
144 picks per inch.

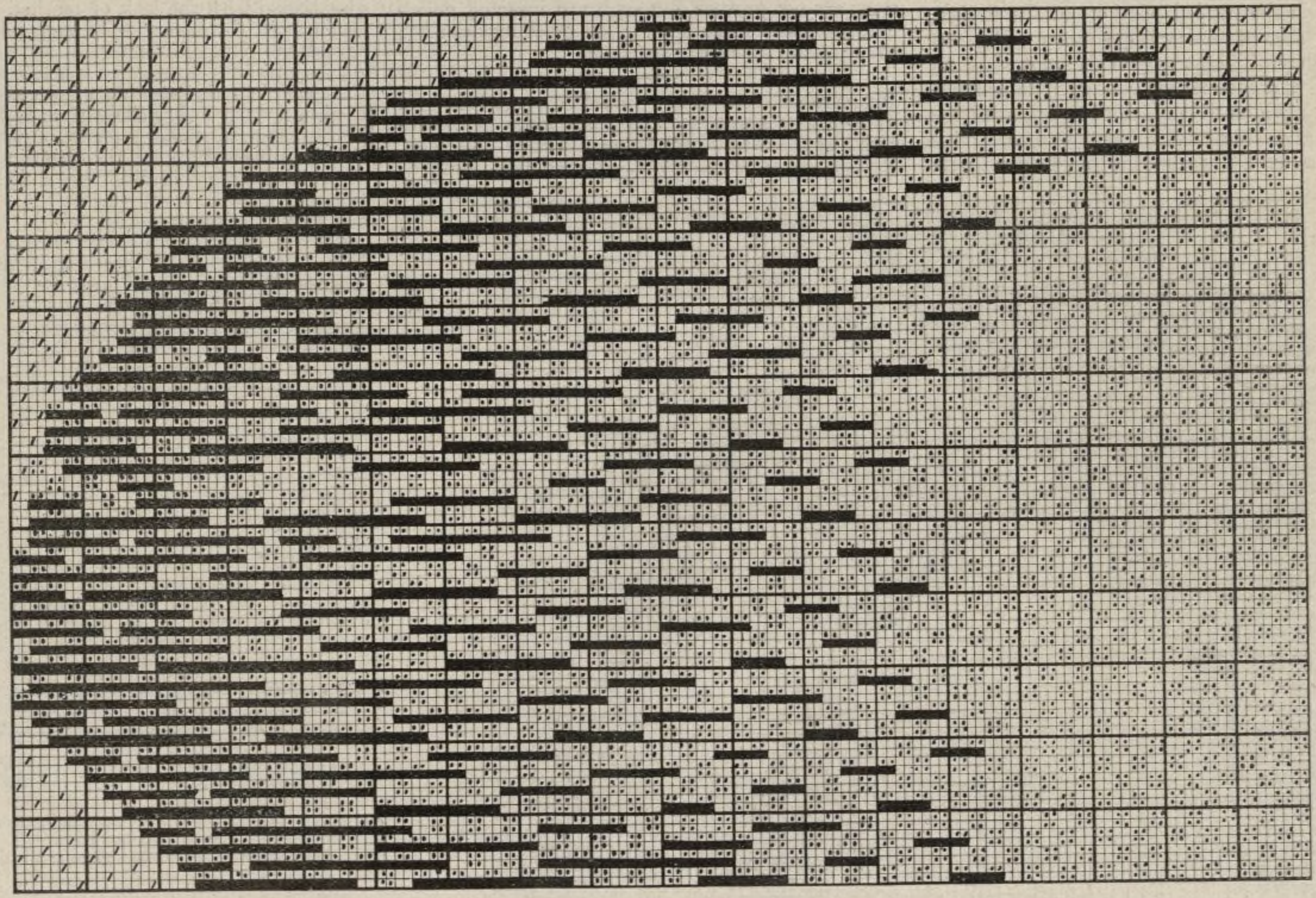
A portion of a very effective and elaborate design is shown in Fig. 203. The different parts of the large flower are developed in various ways to impart variety of form and surface, and the appearance of light and shade. Large and small twills, solid weft floats, and sateen shading, all appear to stand out prominently above the cord effect which represents the shaded portions of the flower. A small portion of shading taken from the right-hand side of the flower just below the centre is given in Fig. 204. The elongated horseshoe figures form a very effective contrast to the large flower, and consist of a number of solid weft spots, and a cord effect shaded off with warp into the ground at the open side. This warp shading is illustrated in Fig. 205. Single threads of warp are allowed to float over three cords at the place where the adjoining thread is marked in full squares, thus producing an intermediate effect between cord and sateen.



Fancy Dress Fabrics.—Fig. 201.

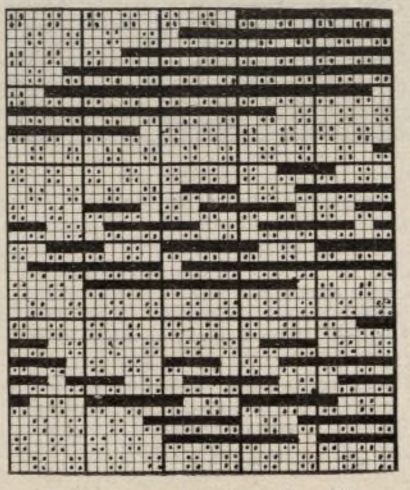


Fancy Dress Fabrics.—Fig. 200.



Fancy Dress Fabrics.—Fig. 202.

Fig. 203.



Fancy Dress Fabrics.—Fig. 204.

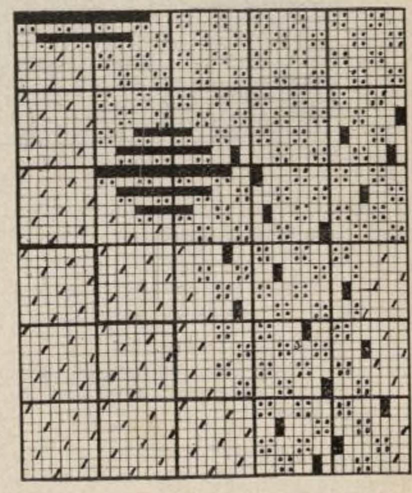


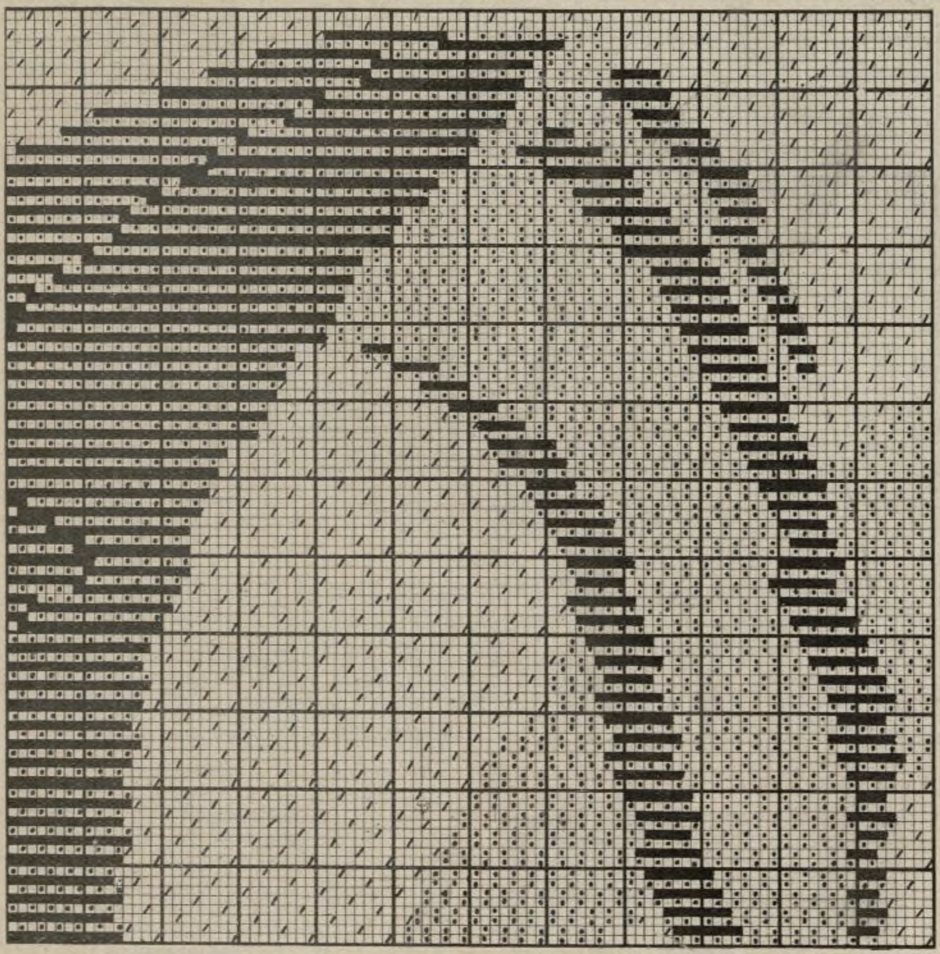
Fig. 205.

Warp.
Black silk, 6500yds. per ounce.
224 ends per inch.
Weft.
Black silk, 2250yds. per ounce.
144 picks per inch.

The silk broché illustrated in Fig. 206 also contains several kinds of shaded effects to represent loops of ribbon knotted together. The sateen

Fancy Dress Fabrics.—Fig. 206.

ground weave twills to the left; the warp threads work singly in the corded portions of the design, giving it a rather smoother appearance. Fig. 207 is taken from the highest loop in the knot, showing its structure and the method employed to produce the cut effect which diversifies the surface of the ribbon and gives it a crinkled appearance. This result is obtained by causing the long floats of weft



Fancy Dress Fabrics.—Fig. 207.

on the surface to change places with those which interweave with the warp.

Warp.
Black silk, 6000yds. per ounce.
224 ends per inch.
Weft.
Black silk, 2000yds. per ounce.
144 picks per inch.

(*To be continued.*)

On the 7th inst. the mill belonging to the Lansdowne Spinning Company, Oldham, was offered for sale. There was a large attendance. The mill contains 28,008 twist and 22,152 weft spindles. There was keen competition, and eventually Mr. Samuel Wrigley became the purchaser at £7500. The mill is now stopped, and it is not known whether it will be restarted.

REVIEWS OF BOOKS.

Colour Matching on Textiles. By David Paterson. London: Scott, Greenwood and Co. 7s. 6d. net.

This is a practical book on a subject which gradually gains in importance under the ever-increasing number of dyestuffs which are being placed at the disposal of the dyer. Colour matching under the simplest conditions is surrounded by difficulties, whilst with the complications met with under present-day practice it becomes almost a science. The first chapter of the book treats on light and colour sensations in a general way, along with a brief description of the human eye and the colours of the spectrum. A chapter is devoted to the different kinds of natural light, and later on in the book the aspect of colours under the various artificial lights is taken. Chapter III. treats on the hue, luminosity, and purity of colours, and the use of screens and masks in matching bright colours or shades which are intermixed with other hues. A well-illustrated chapter is devoted to the examination of colours by reflected or transmitted light, the nature of the fibres or fabric being taken into consideration. These latter influences are more thoroughly discussed in the following chapter, when the various vegetable and animal fibres and the different fabric surfaces are described, along with erratic influences, or, it might be said, peculiar properties of the dyestuffs themselves. The book is not confined to colour matching generally, but takes the different kinds of fabrics and tissues which the dyer comes in contact with, giving useful suggestions and still more useful warnings. Illustrations are not profuse, but such are inserted where necessary, and a number of dyed specimens of cloth are given at the end of the book.

We have also received:—"The Progress of Natural Ventilation," a brochure treating on the system advocated by Messrs. Robert Boyle and Son Limited, 64, Holborn Viaduct, London.—"Steel-clad Motors," a catalogue issued by Messrs. Mather and Platt Limited, Manchester, describing the various types and sizes of their steel-clad hermetically-enclosed electric motors.—Price list of enclosed continuous-current motors and arc-lamp carbons made by the International Electrical Engineering Company, London.—The twenty-seventh annual report (for 1900) of the British Chamber of Commerce in Paris, containing statistics of the Anglo-French trade for the last two years, and full particulars of French treaties, customs, regulations, etc.—The No. 2 Supplement (1901) of "Sell's Directory of Registered Telegraphic Addresses."—The "Sprinkler Bulletin," containing an interesting article on the early machines and mills used in the cotton industry, and illustrated descriptions of new mills being fitted up with Grinnell sprinklers.

LETTERS TO THE EDITOR.

Correspondence is invited upon all practical subjects bearing upon the Textile Trades, Machinery, Dyeing, etc.; but as we allow freedom of discussion, we cannot be responsible for the opinions expressed. Names and Addresses of the writers must in all cases be sent, although not necessarily for publication.

THE CITY AND GUILDS EXAMINATIONS.

Sir,—With your permission I will make some comments on the report of the City and Guilds examiners, reviewed by you in your June issue, and as one who has sat in the examination in Wool and Worsted Weaving, point out some of the difficulties with which students, in that section at least, have to deal.

In the first place, I will speak regarding the bad impression which the report has conveyed to your mind of the lack of energy displayed by students; that, whatever it may be in other departments, the students taking the division in the above subject, which applies to the district, must, with the limited equipment he has at his command, be a very energetic individual if he is to qualify for the examination. The time involved in working the specified number of patterns required by the examiners leaves little time for him to learn the multitudinous items which it is necessary for him to know to successfully compete in the examination. Your remarks may apply to students who attend well-equipped colleges, and whose whole time is devoted to technical education; but you, I think, must admit that those who work ten hours a day, and sometimes overtime, must come within measurable distance of the Smiles-ian ideal to attain the necessary qualifications.

The examiners likewise appear to be greatly dissatisfied with the lack of method displayed by students in the execution of their papers. Now I would again plead "extenuating circumstances." At the rate it is necessary for the student to work to accomplish the number of questions necessary to obtain a pass, very little time is left to enable him to make his paper a model of neatness; and if the examiners were set the questions (about some of which there generally hangs a "glorious indefiniteness"), to do them within the specified time, the result, without doubt, would be that their judgment would be tempered with a little charity. You likewise hold the teacher's incapacity responsible in a great measure for the falling-off in the number of students. Now while this, together with the student's lack of energy, may account for a portion of the falling-off, the primary cause, I think, is the lack of encouragement given by manufacturers to students. In this district at least, with few exceptions, manufacturers, except in public utterances, appear to attach no importance to technical education; the point apparently considered by them when they have a situation vacant which calls for its exercise is practical experience. If the education received at the technical schools be not practical, it is surely their duty to make it so, and not go on publicly supporting what they privately consider theoretical nonsense. By their showing appreciation of the efforts of young men to master their trade they could do much towards helping technical education, for unfortunately, perhaps, people nowadays do not generally learn for the pure love of learning.

Galashiels, July 24. A Border Student.

QUERIES AND REPLIES.

Schifelle Loom.—Wanted, the names of the makers of the Schifelle loom, a swivel loom which puts in the figuring weft at the same time as the ground picks.—R. and W.

J. B. K. (Oldham).—From Mr. William Brown, junior, Leeds-road, Bradford.

A. W. (Atlanta, Ga.).—You can obtain them from Messrs. Homo and Co., 24, Boulevard Poissonnière, Paris.

J. B. (Whitefield).—We do not know the book, nor a recent version of it, but we understand that a work entitled "The Examination of Materials Used in Dyeing" is now in preparation, and will soon be issued.

System (Manchester).—In calculating the actual cost of making any cloth, the cost of winding and warping should be ascertained separately—a matter easily done in their respective departments,—and this cost should be added to that of the yarn. It is a "material," not a "working," expense, so far as the weaving department is concerned. The week's output of any frame or slasher put against that week's wages of the attendant and its fraction of the wages of overlooking, cost of repairs, power, etc., gives the cost per pound at once. In the weaving shed the calculation is rather more complicated. For one week (or a longer time if possible) the total wages of overlookers and manager, cost of power, repairs, and all other expenses should be taken. The total of the wages paid to weavers for the same time should be also taken, and both divided by the number of pieces produced in that time. This gives an average cost of weaving expenses and an average cost of weaver's wage per piece. The weaving expenses vary proportionately with the weaver's wage, and this latter being known, it is easy to find the former by simple proportion. Although not exactly treating this subject, "Factory Accounts," by Garcke and Fells (6s.), would be useful in deciding matters like the above.

THE TEXTILE MACHINIST:

Devoted to Machinery, Apparatus, Tools, Etc.

Automatic Safety Guard for Carding Engines.

MESSRS. JOHN HETHERINGTON AND SONS LIMITED, VULCAN WORKS, MANCHESTER.

WHEN public attention and official notice were first drawn to the dangerous condition of many moving parts of machinery in our factories, a remedy was tried in covering or partitioning off the dangerous parts by some shield or railing. Necessarily these protective mediums have to be occasionally removed for repairing or cleaning purposes, and in spite of the precautions taken by millowners their replacement is often delayed by the very persons whose safety is being so carefully considered. It has, in fact, been demonstrated over and over again that the average workman is utterly indifferent to any precaution or any improvement made for his welfare so long as it does not affect his wages and hours of labour. This being so, the employer has to protect his own interests, to guard against the loss of workpeople, or the loss incurred under the employers' liability laws, by resorting to automatically-guarded machines, provided with guards which, whilst being removable, are only so when the machine is standing and no danger is present. This seems to be the only way to guard against the usually indifferent interest which workpeople take in their own safety, and a way which seems to be gradually gaining in favour, being applied in different forms to various machines.

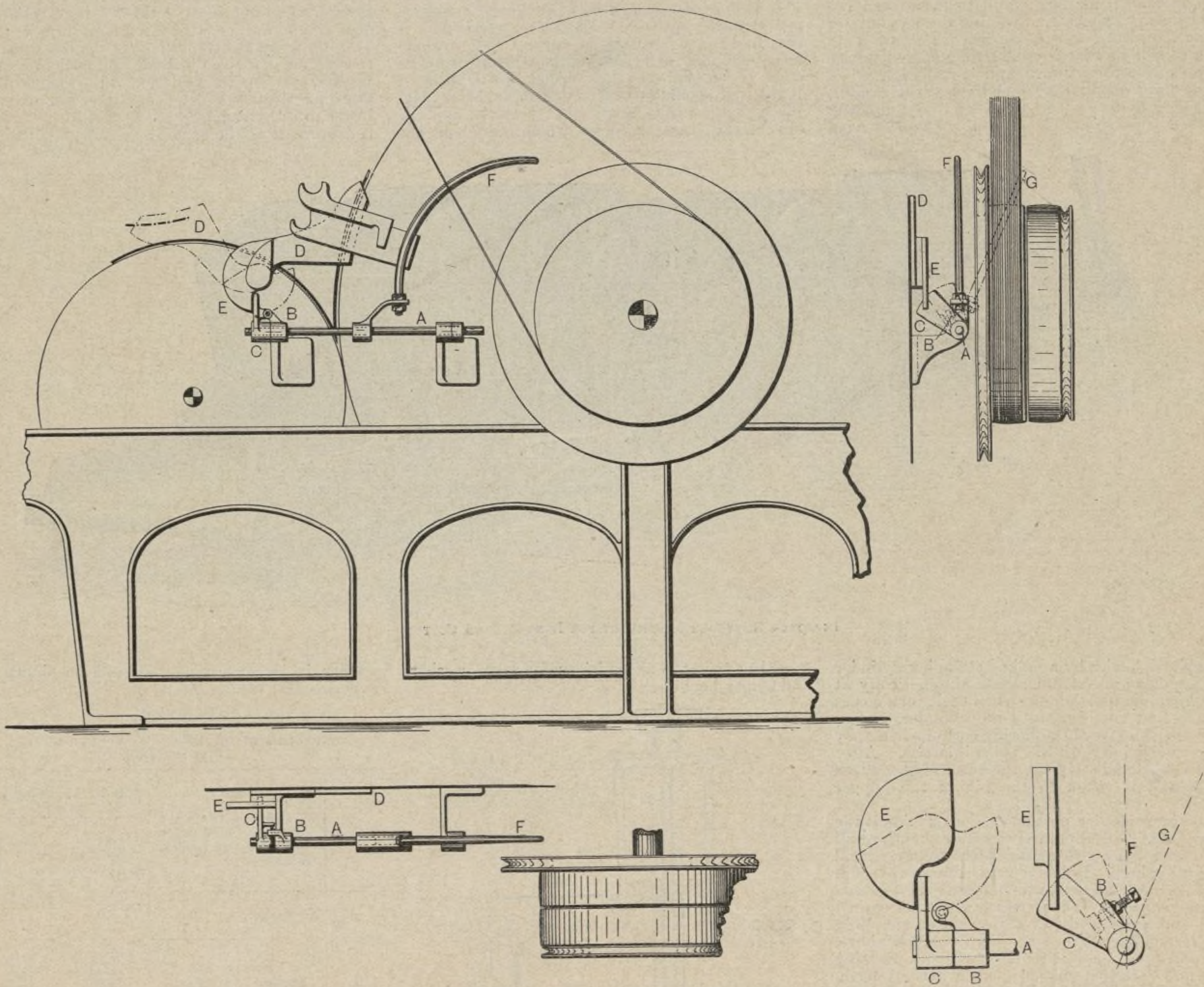
There has recently been put upon the market a very simple device of this kind for ensuring the front cover of the main cylinder in a carding engine being closed while the machine is running. This means that it is impossible to open the cover while the machine is in motion, and also that it is as impossible to start the machine until the cover has been closed. The system is therefore effective, regardless of the actions of careless or indifferent workpeople or of the forgetfulness to which everybody is more or less liable. The apparatus for accomplishing this is shown in the accompanying illustrations, the main drawing of which is a side elevation of the parts concerned, while a plan, side view, and details are also given.

The front cover of the main cylinder is shown carried upon arms D, which are hinged to the frame of the machine. The elevation shows the cover closed by the full lines, but the open position is also shown by the dotted lines. The end of one of the arms is extended—the end carrying the cam-like plate shown at E. This plate is one of the main factors in the motion, as will be shown later. The belt fork F is attached to a short-shaft or spindle A, a turn of which shaft moves the fork into the position shown at G, so that the belt is moved from the fast to the loose pulley, or *vice versâ*. On the end of the spindle A—that is, the end B, which is nearest to the camplate E—is fastened the stop-plate C, which works against the camplate E or is stopped from moving by it according to circumstances.

Assuming that for some purpose it is necessary to open the front cover. If the card is running, this is impossible, for the belt is on the fast pulley, and the stop-plate C, coming right in front of the cut-out portion of the camplate E, prevents this plate and also the hinged arm D of the cover being moved. When, however, the machine is stopped, the action of moving the belt fork gives a turn to the spindle A, and the stop-plate C is turned away, leaving the camplate E free to be moved, and along with it the hinge D and the cover it carries.

If it is now attempted to start the machine with the cover open, it will be found that in opening the cover the camplate E (which is fastened on an extension of the cover hinge) has moved round and forms an obstruction to the stop-plate C, without moving which it is impossible to give the necessary turn to the spindle A so as to move the belt fork. The machine, in fact, cannot be started until the cover is closed, when the closing action turns the solid portion of the camplate E away from the front of the stop-plate C, allows this latter to pass, and the spindle A and belt fork F to be operated.

We had the pleasure of recently inspecting and examining the apparatus when affixed to one of Messrs. Hetherington's cards (although it can easily be adapted to any make), and noticed the extreme simplicity (for it looks much simpler in metal than on paper) of the motion. We could readily see that, in spite of its few parts, it is one which cannot fail to act, and one which cannot get out of order. We also understand that, as a further step in the same direction, the firm are at present making a safety motion on similar lines, but more automatic in action. It possesses all the features of that just described, but instead of a deadlock occurring when it is attempted to start the machine with the cover open, the action of starting closes the cover.



AUTOMATIC SAFETY GUARD FOR CARDING ENGINES.

Improved Blowroom Machinery for Long-stapled Cotton.

MESSRS. HOWARD AND BULLOUGH LIMITED, ACCRINGTON.

THE tendency of the times, as can only be expected in an age of almost perfected machinery, is to make all mechanisms and processes as automatic in their action as possible. Machinery is becoming more and more the servant of man, instead of, as is still too often the case, a number of men being the attendant slaves of one machine. The skill of the mechanic and the machine designer is gradually evolving a series of machines in almost every branch of industry which save manual labour and human attention, with the attendant risks which are always present when illness, weakness, weariness, or laziness causes the human share of the responsibility to fail.

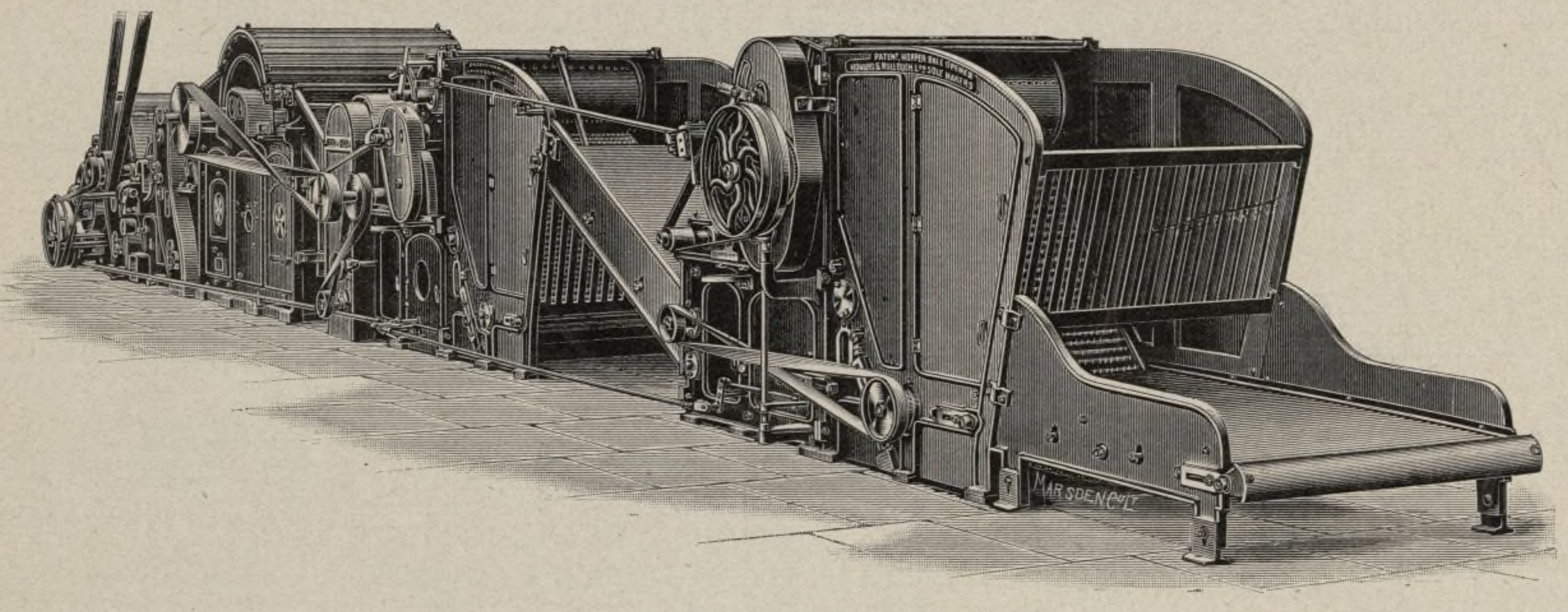
A very important improvement has been made in blowroom machinery which follows on the present lines of making machines more self contained and more independent of human aid in their various actions. Its adoption will lessen the amount of labour necessary for cotton preparing machinery, and. what is more important, will reduce the delays and stoppages necessary in changing the cotton from machine to machine by manual labour, or avoid the cumbersome apparatus present when the cotton is conveyed from room to room by flues. To describe the advantages of the machine briefly, it takes in the cotton from the bale at one end and delivers a lap at the other, performing all intermediate operations automatically.

The feed end of the machine, as may be seen from the accompanying illustration, consists of a low lattice upon which the cotton is fed from the bale, the height at which this lattice is placed making it very convenient for feeding on to, even when the bale is nearly exhausted, avoiding the necessity of lifting the cotton over the top bar of the cotton bin or on to a higher lattice. A strong spiked lattice carries the cotton forward, and is itself formed of intersecting wood laths which have a special joint, formed so as to prevent the cotton accumulating between the laths. The cotton is stripped from this spiked lattice by a spiked stripping cylinder whose spikes project and recede automatically at every revolution, being out when their turn comes to strip, but receding into the cylinder, and so clearing themselves of adhering cotton when they leave the vicinity of the spiked lattice. After being opened and stripped, the cotton falls on to a lattice and is taken to the bin of the hopper feeder.

The hopper feeder portion of the machine is the same as that made separately by the same firm, and is too well known to require more than a casual description here. It has a grid bar surface equal to that of the scutchers, which greatly increases its cleaning capacity. It is provided with a set of dust cages and a fan, and has also a spiked stripping cylinder similar to the one just described above. Its spiked lattice is provided with intersecting laths and spikes of suitable length and strength, and a pair of delivery rollers deliver the sheet of cotton directly on to the lattice of a "Buckley" opener.

This opener is specially designed for dealing with long stapled cotton. It has a large porcupine cylinder whose steel blades are arranged in the form of a spiral across the entire width of the cylinder, while the cylinder cover is provided internally with a series of projecting ribs. These act upon the cotton, which, after leaving the feed rollers, passes over two-thirds of the periphery of the porcupine cylinder. The front and lower portions of this porcupine cylinder are surrounded by bars which are continued so as to form a grid channel for the cotton to pass over on its way towards the cages. There are also special feed-rollers, cotton holders, and a vertical regulation box with horizontal cones.

The scutcher lap portion of the machine has four calender rollers, and although on the same lines as other scutchers, there are several minor improvements which have been suggested by practical experience. It is unnecessary, perhaps, to say that there are the necessary connections for stopping and starting the series as one machine, and, as in other machinery of the same makers, all gearing and dangerous moving parts are carefully guarded.

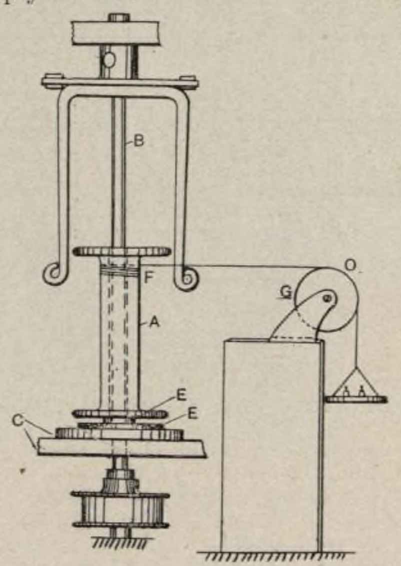


Improved Blowroom Machinery for Long-stapled Cotton.

Some Experiments on Drag.

By Geo. R. Smith and Geo. Long.

THE following observations and experimental data will be of some interest to those connected with worsted spinning, not because there is any new principle to impart, but because they are actual data describing the variation in amount of drag on one frame under different conditions. The object of these experiments was to find what pull was actually necessary to drag a drawing bobbin and a spinning bobbin round when different sizes and different arrangements of washers were adopted. No special means were taken beyond that of ordinary cleaning in fixing up the experiment. The spindle and lifter plate were considered to be at right angles to each other, and so was the hole in the bobbin with the end of the bobbin. For lack of work the surfaces were not highly polished, but they were bright and clean. The washers experimented with were not greasy, nor were they quite new, though no worse than if they had run a few days in works. The arrangements adopted for measuring the drag or the resistance to motion of the washer are shown in Fig. 1. It should be observed that the lifter plate was put at various heights in its travel, and the drag in each case measured, which was about the same in amount in all positions for large washers and empty bobbins.



Some Experiments on Drag.—Fig. 1.

A is the bobbin on the spindle B ; C is the lifter plate on which rests the washer or washers E for producing the drag ; F O is a cord wrapped round the bobbin in such a manner that the unwinding of the string from the body of the bobbin leaves the length F O horizontal ; and G is a light brass pulley which runs on conical centres. This figure shows the bobbin in its lowest position with the cord F O horizontal, so that the pull in the cord has no tendency to lift or press the bobbin on the washer.

It was thought that when the bobbin was in this position, and resting on a small washer, the pull of the cord would *tend to tip* the bobbin—*i.e.*, pull the top somewhat nearer the spindle,—and in this particular case, when the spindle is standing, make the drag greater owing to the inside of the bobbin rubbing against the spindle. Such a tendency to tip, with the spindle running, would reduce the drag, because the spindle and bobbin are going in the same direction. In these experiments no observations were recorded on matters outside those of measuring the drag under the conditions stated below. The experiments were carried out with the same washer or washers, and the washers used were compared with a number of similar washers to see if they were alike so far as drag is considered. Weights were put in the scale pan, and the weight pan just pressed a little to overcome the friction of rest, which is rather greater than friction when in motion.

Enough weights were put into the pan to cause it to descend at a uniform and very slow speed. This pull in the string—*i.e.*, weight in the scale pan—measured the drag or resistance to motion produced by the washer. With no washer the drag is great, not necessarily because the friction between the wood bobbin and the iron plate is great, but because the centre of resistance is far from the centre of the spindle. It is easy to show the radius and position of the centre of resistance of a single washer which is of uniform texture. This centre of resistance is far from the centre of the spindle in a large washer, and near in a small washer, and it is the variation of the length of this arm of resistance which constitutes the variation in the drag by changing the size of washers. The resistance R is the same in amount whether the washer is large or small, as will be shown by experimental results later.

TABLE I.

Experiments on Drag on a Four-spindle Drawing Box.

Case.	Number and Arrangement of Washers.	Diameter of Washers in Inches.	Spindle A. Load in Scale Pan in Ounces.	Spindle B. Load in Scale Pan in Ounces.
—	No washer.	0	13	15
I.	Single.	2	6·75	6·50
		3	10·50	9·50
		4·5	13·75	17·25
		6	17·00	20·50
II.	Two. Both same diameter.	2	7·5	8·5
		3	13·5	12·0
		4·5	19 0	21·0
		6	21·5	23·5
III.	Two. Small one on the top of the large one	2 and 3	5·00	6·75
		2 ,, 4·5	5·25	7·50
		2 ,, 6	7·75	8·50
IV.	Two. Small one on the top.	3 and 4·5	9·0	9·5
		3 ,, 6	9·5	10·5
V.	Small one on the top.	4·5 and 6	14	18

Bobbin not quite new : 14in. long, 7in. diameter. Barrel of bobbin, 2·5in. diameter. Weight of bobbin, 2lb. 9·5oz.

Columns IV. and V. in Table I. show the greatest difference in drag in the four spindles tested. The difference seems great, and so far as can be remembered the same surface of the washer was in contact with the lifter plate each time; if it were not the same on spindle A as on spindle B, this might account for the difference observed in Case I. The results observed in Case II., spindle A, differ largely from the results obtained in Case I. This can only be due to the centre of resistance having moved farther from the centre of the spindle. How such an outward movement of the centre of resistance can take place is not quite clear when the washers are both the same size. However, it is probably due to the more even transmission of pressure from the bobbin through the thick yielding substance of two washers, and on account of the yielding nature of the washers this centre of resistance is carried a little farther from the centre of the spindle.

Case III. in Table I. is very interesting, because the cause of little drag is not quite clear. These results show that in this instance this arrangement of washers drags even less than the single 2in. washer in Case I., whereas one would expect the centre of resistance due to this combination of washers to be at a greater distance from the centre of the spindle than in Case I. with the 2in. single washer. Either such is not the case, or else the actual resistance at the sliding surfaces is less than for the single washer. Now the single washer has three possible chances of producing drag—viz., rotating on the lifter plate, standing still on the lifter plate and permitting the bobbin to slide on it, and sliding on the lifter plate as well as permitting the bobbin to slide on its surface.

The washers in Case III. have an additional chance of producing drag over that in Case I.—viz., by the small washer rotating on the large one. This possible cause is scarcely likely to be the probable cause; for if it were, the friction between the two rough cloth surfaces would be less than between cloth and iron, or between the cloth and wood bobbin end. As the results of this experiment do not yield enough information, other experiments must be cited to explain this apparent paradox. The percentage variations in Table II. are very much the same as those in Table I., and the same contrast is again observed between Cases III. and I. Table II. shows a less variation of drag between the spindles than is to be found in Table I.

TABLE II.

EXPERIMENTS ON DRAG ON A DANDY ROVER.

Case.	Number and Arrangement of Washers.	Diameter of Washers in Inches.	Spindle A. Load in Scale Pan in Ounces.	Spindle B. Load in Scale Pan in Ounces.
I.	One.	1 1·5 2 3	1·75 2·75 3·75 5·5	2 3 3·75 5·25
II.	Two. Equal diameter.	1 1·5 2 3	1·75 2·75 3·75 5·5	2 2·75 3·25 4·5
III.	Large washer at the bottom.	1 and 1·5 1 ,, 2 1 ,, 3	2·25 2·50 2·50	2 2·5 2·75
IV.	Large washer at the bottom.	1·5 and 2 1·5 ,, 3	3 3·25	2·5 3·25
V.	Large washer at the bottom.	2 and 3	4	3·5

Bobbin not quite new: 6in. long. Diameter of end, $3\frac{1}{2}$in. Weight of bobbin, 5·75oz. Diameter of barrel of bobbin, 1in.

Tables III. and IV. show results obtained from a spool bobbin on a spinning frame when the drag washer or washers are respectively cloth and leather. These results differ from the other results in that two extra columns are added to each table. It is a well-known scientific fact that when a body is at rest it takes a greater force to set that body in motion than it does to keep it in motion. The reason of this is that when two surfaces are together and at rest their surfaces appear to become joggled together, and cohere. Now, the pull required to start the body from rest, and thus break this bond of cohesion, is called the static pull; whereas the pull required to *just keep the body moving* when the experimenter breaks the bond of cohesion by tapping—the bobbin in this case—is called the dynamic pull. This dynamic pull is the actual resistance to the motion of the bobbin—*i.e.*, the drag. Now, we are interested in both the static and dynamic drag, because they are both to deal with; for one comes into play on starting a frame, and the other when in motion.

In Table III., when Cases III., IV. and V. are compared with I. and II., they show a less difference than do similar comparisons in Tables I. and II. This appears to be owing to the comparatively small difference between the top and bottom washers in the latter case—*i.e.*, Case III. more nearly approaches Case II. Table IV. shows us that the difference between the static and the dynamic pull is larger for leather washers than for cloth, and that this difference is largest when the washer is the right side up, as used in the first part of the table. Of course, this is owing to the cohesion being greatest when the two rough surfaces become joggled together. The dynamic pull is uneven on account of the bobbin occasionally sliding on the washer.

TABLE III.

EXPERIMENTS ON DRAG WITH CLOTH WASHERS ON A SPINNING FRAME.

Case.	Number and Arrangement of Washers.	Diameter of Washer in Inches.	Load in Scale Pan in Drams. Pull. Spindle A. Dynamic.	Static.	Pull. Spindle B. Dynamic.	Static.
—	—	0	12·1	12·65	11·5	12·65
I.	One only.	$\frac{7}{8}$ $1\frac{1}{8}$ $1\frac{1}{4}$ $1\frac{1}{2}$	13·25 14·35 15·45 16·55	14·85 14·85 15 95 18·7	13·75 14·3 14·85 18·7	15·4 15·9 15·95 19·8
II.	Two. Equal in size.	$\frac{7}{8}$ $1\frac{1}{8}$ $1\frac{1}{4}$ $1\frac{1}{2}$	12 65 14·3 13·75 15·95	13·2 14·85 14·3 18·5	12·9 14·0 14·85 16·5	14·0 14·1 16·5 18·2
III.	Two. Small one on the top.	$\frac{7}{8}$ and $1\frac{1}{8}$ $\frac{7}{8}$,, $1\frac{1}{4}$ $\frac{7}{8}$,, $1\frac{1}{2}$	12·65 12·65 13·75	13·75 13·2 14·85	13·75 13·75 13·75	14·3 14·85 15·4
IV.	Two. Small one on the top.	$1\frac{1}{8}$ and $1\frac{1}{4}$ $1\frac{1}{8}$,, $1\frac{1}{2}$	14·4 15·3	14·3 15·95	13·45 14·3	15·4 16·5
V.	Two. Small one on the top.	$1\frac{1}{4}$ and $1\frac{1}{2}$	15·95	17·05	15·4	17·05

Spool, $\frac{15}{16}$in. diameter, 5in. long; weight, 0·7oz. Diameter of end, $1\frac{3}{16}$in.

TABLE IV.

EXPERIMENTS ON DRAG, WITH LEATHER WASHER ON A FLYER SPINNING FRAME.

Case.	Number and Arrangement of Washers.	Diameter of Washer in Inches.	Load in Scale Pan in Drams. Pull. Spindle A. Dynamic.	Static.	Pull. Spindle B. Dynamic.	Static.
I.	One. Rough side down.	$1\frac{1}{4}$ $1\frac{3}{4}$ 2	11 14·9 19·25	12·1 19·8 20·9	18 7 18·7 15·95	24·2 20·9 20·35
II.	Two. Rough side down.	$1\frac{1}{4}$ $1\frac{3}{4}$ 2	18·7 17·05 20·35	22 18·7 20·45	18·7 17·7 19·8	23·1 22 22
III.	Two. Rough side down.	$1\frac{1}{4}$ and $1\frac{3}{4}$ $1\frac{1}{4}$,, 2 $1\frac{3}{4}$,, 2	18·15 22 18·7	22 23·65 20·35	16·05 15·95 19·8	19·25 19·25 21·45
IV.	One. Smooth side down.	$1\frac{1}{4}$ $1\frac{3}{4}$ 2	18·7 17·6 18·1	22 19·8 22	17·05 17·05 17.6	18·7 18·7 19·8
V.	Two. Smooth side down.	$1\frac{1}{4}$ $1\frac{3}{4}$ 2	20·35 18·15 19·25	23·1 20·35 22·5	21·45 17·05 19·25	24·75 19·8 22
VI.	Two. Smooth side down.	$1\frac{1}{4}$ and $1\frac{3}{4}$ $1\frac{1}{4}$,, 2 $1\frac{3}{4}$,, 2	18·1 18·7 18·7	20·9 22·5 19·8	15·95 15·95 17·6	18·7 18·15 19·8

Sometimes the washer went round and sometimes it stood. Particulars of bobbin as in Table III.

Electric Motors and Dynamos in Textile Mills.

THE following is a copy of the revised rules just issued by the combined fire insurance offices, which apply to electromotors and dynamos in textile mills and other premises where the use of open motors is attended with danger. The main point of difference between the new rules and those hitherto in force is that ventilating holes in the outer metal case of motors are allowed, provided they are protected by two thicknesses of wire gauze set at least $\frac{1}{4}$in. apart, and permanently attached to the case:—

1. Motors, when not in an engine-room or in a separate compartment expressly set apart for their use, and built of or lined with incombustible material, must be completely enclosed in an efficient metal case, forming part of the designed construction thereof.

2. Resistances must be similarly situated, or enclosed and constructed entirely of incombustible materials. They must not be fixed within 6in. of any combustible material. (Note: Inspection holes fitted with plate glass are allowed. Motors and resistances must be suitably designed to withstand, without serious overheating, the effect of the absence of ventilation incidental to the use of a metal case. Ventilation, if any, must be only by direct communication with the outer air, or by openings in the vertical portion of the metal case, protected by two thicknesses of wire gauze, set at least $\frac{1}{4}$in. apart, permanently attached to the case.)

3. The motor pulley (or other mechanical device for transmitting power from the motor) must be external to the metal case enclosing the motor. Only the shaft and the connecting conductors may be carried through into the metal case, or through the wall of the compartment. No belts, ropes, or other corresponding gear may be so carried. (Note: Holes in the case, to admit connecting conductors, must have proper insulating bushings to prevent short-circuiting.)

4. Dynamos must be treated as motors.

5. Each motor and each dynamo must have a "switch" and a "cut-out" upon each of its connecting conductors.

6. Switches, cuts-outs, and all other regulating and controlling devices must be made of incombustible materials only.

7. Fusible cut-outs not on main or distribution boards must have efficient incombustible covers.

8. All switches when not "on" must automatically turn full "off," and must work from "on" to "off" with a sharp break. The "break" in a switch or other disconnecting device must be of such a length that an arc cannot be sustained.

9. Connecting conductors must have their sectional areas so proportioned that, if of copper, the maximum working current must not exceed the ratio of 1000 ampères per square inch of such sectional area for currents not exceeding 100 ampères.

10. Motors must not be supplied with current from dynamos or conductors having an earth return.

11. Waste oil from motor bearings and from dynamo bearings must be collected in suitable metal receptacles. Deep metal cans must be provided for oily waste for removal daily.

Machine for Testing Yarns and Fabrics.

MR. HENRY GRANDAGE, BROWN ROYD DYEWORKS, BRADFORD.

THE more general recognition of conditioning and testing houses on one hand, and the increased quantity of inferior imitations which modern competition has put upon the market, on the other, make any textile testing apparatus of much more interest at the present time than would have been the case a few years ago. The machine about to be described has some very novel features, the chief being the adoption of a liquid for obtaining the variable weights required. At first sight the machine looks rather intricate, but after a careful examination this impression is lost, and its adaptability, especially for giving accurate readings after the shock following the collapse of the article being tested, is such as to make it worth a careful study.

The cloth or yarn to be tested is placed between the two pairs of jaws A (shown in side elevation and plan in Figs. 1 and 2), which are tightened up by binding screws, although, if small hanks are being tested, the strands are looped around the rods D as being more convenient and reliable, for the strain is then felt equally on all the threads at the same time. If it is desired to test a number of threads twisted together, the pins Z and the clamp nut B are removed, and this allows the front set of jaws A to rotate as the screw is turned. The presence of the pins Z and the yoke E prevents this and allows only a longitudinal movement. The front set of jaws A is rigidly attached to the yoke E, whose ends are provided with holes slotted out to fit and slide on the guide rods F, which latter are carried by standards fixed to the bed of the machine.

The screw H is held in the yoke E by the clamp nut B at one end, and at the other by a guide block J, through which it passes loosely, and then through the worm-wheel K. This wheel is so mounted on the guide block J that it is free to rotate, but cannot move longitudinally, and its boss is made with a sliding feather engaging in the slot G of the screw H. The worm C (by which power is applied) drives the worm wheel K, so that when the worm is rotated the worm wheel revolves and carries round the screw H, and slowly draws it through the fixed nut block J, moving the yoke E and smaller jaw A backwards away from the other jaw. A scale is marked upon the upper surface of one of the guide rods F, so that the distance through which the yoke E moves during the test can be read with accuracy to measure the distance through which the material stretches. A hand lever Y is mounted on the guide block J, which engages with the split nut in the block J so that it may be disengaged from the screw H by a movement of the lever Y.

The rear pair of jaws A are constructed in a similar manner to the pair just described, but weight of the liquid in the bucket, can be read off with ease at any time without disturbing the apparatus. An inverted cup P is provided on the end of the arm X, and an indiarubber pad inserted in its underside. A pillar Q, fixed in the bed of the machine, carries a clamp, which holds the tube R rigidly in position. This tube is in connection with a small water tank, and is provided with a cock by which the flow of water can be stopped as required. The lower end of the pipe R is turned up and terminates in a nozzle, which comes just under the indiarubber pad beneath P. This pad rests upon the nozzle when the elbow lever is free, and prevents water flowing, even if the tap in the pipe R is turned on.

Coming to the actual working of the machine, it must be supposed that the cloth or yarn to be tested has been clamped between the two pairs of jaws A. The lever Y is then moved so as to disengage the boss of the worm wheel K, and the screw H is drawn by hand until the material is stretched tight without having any appreciable strain put upon it. The length of the material between the jaws is then measured, the nut is put back into engagement with the screw H, the adjustable weight at W is regulated until the pad the pivot point N is so selected that it is an exact fraction of the length of the arm X to the point at which the bucket is suspended. Say, for example, that the arm at which the bucket acts is ten times as long as the arm at which the links —that is to say, the rear jaw, and, through the medium of the material, the other jaw and gearing H K—act: then a load of 1lb. of water in the bucket O will indicate a load of 10lb. on the material under test. The scale on the bucket being graduated in pounds and ounces, or any other scale of weights, the weight on the arm X can be accurately determined at sight. The scale may even be marked to indicate the load on the material—that is to say, if the relationship of the lever arms to one another be 10 : 1, a volume weighing 1lb. of water in the bucket O might indicate 10lb. on the scale, which would be the exact load upon the material in the jaws.

As the front jaw A is drawn farther backwards by the strain on the material, the stress increases as water flows in through the nozzle of R to counterbalance it. When finally the material gives way the arm X merely rests upon the nozzle, and there is no sudden strain thrown upon the apparatus; the gearing K is immediately thrown out of gear and

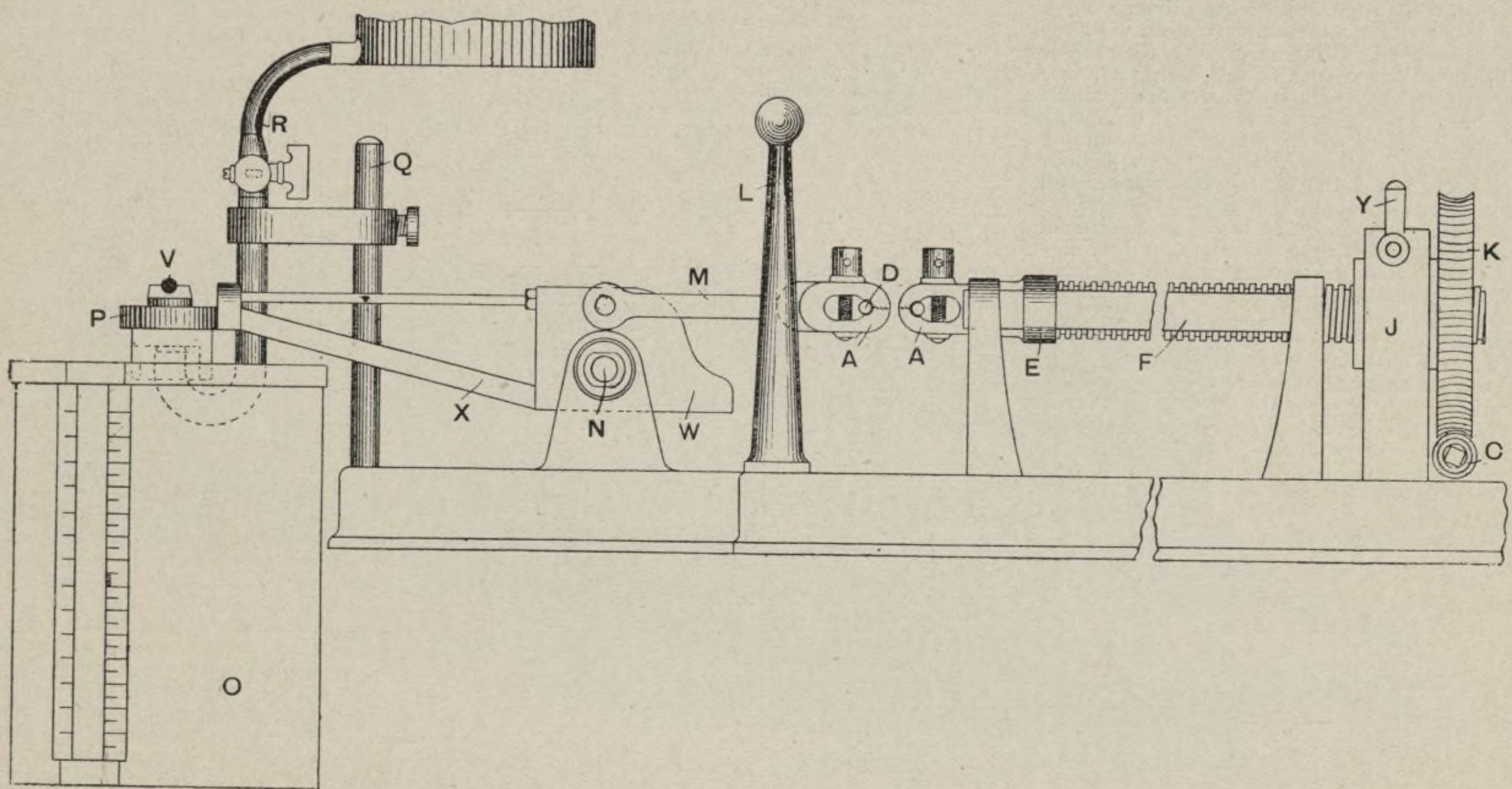


FIG. 1.

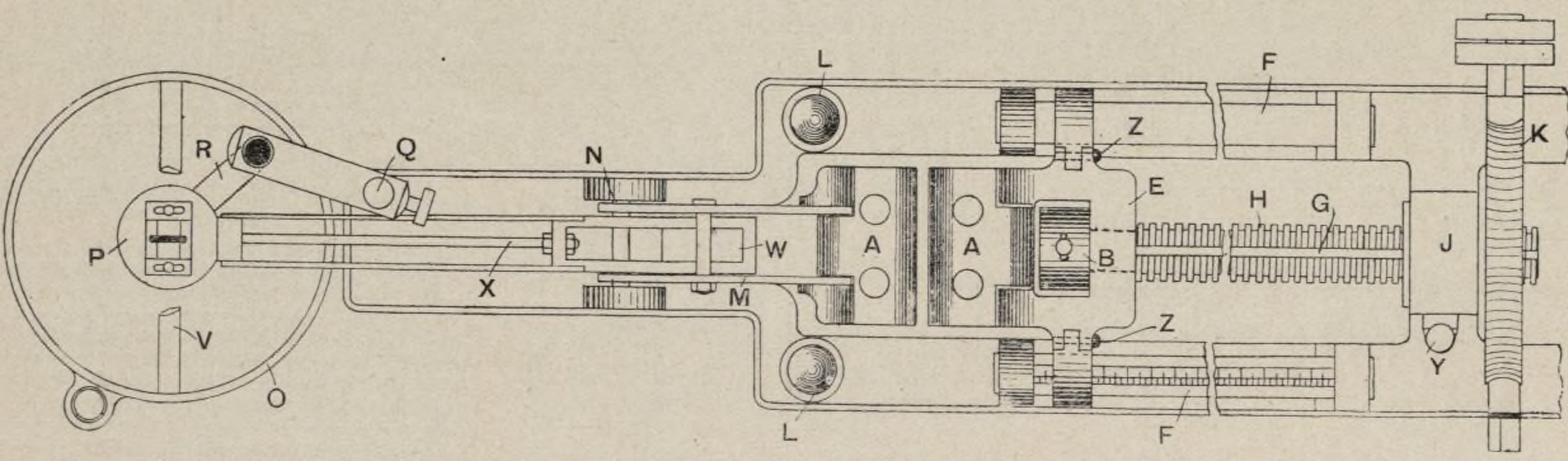


FIG. 2.

operated in a very different manner. Two standards L are mounted upon the bedplate of the machine, and through their heads a cross bar is passed, from which depend two rods (not shown) pivoted to the block of the jaw. By this means the jaw is suspended in space, and its weight is not carried in the slightest degree by the material under test. It is also perfectly free to move longitudinally without any appreciable friction resulting. From the rear of the jaw two link arms M extend backwards, and are pivoted to the short arm of an elbow lever X, which has its centre of rotation upon knife-edges at N. The part of the elbow lever W is provided with an adjustable weight (not shown), so that the elbow lever can be accurately adjusted to balance about the centre of rotation N. From the end of the long arm X of this elbow lever a bucket O is hung by a bar V, and this bucket is provided, as shown, with a graduated scale at one side, so that the exact volume, or, if desired, the beneath P just rests upon the water-supply nozzle, the water is turned on, a reading is taken from the scale on the end of the guide rod F, and the test is commenced.

As the worm C and the worm wheel K are rotated, the yoke E is slowly drawn back by the screw H and a strain put upon the material between the jaws. As the elbow lever is balanced, and the rear jaw is so suspended that it can move freely for a considerable distance without perceptible friction, the arm X rises and allows water to pass through the pipe R and into the bucket O. When a small amount of water has fallen, the weight on the arm X is sufficient to counterbalance the stress put upon the material by the screw gearing, and the arm X falls and closes the nozzle of R. This action continues, the weight of water in the bucket O always giving an exact indication of the stress upon the material as the test proceeds. The arm at which the links M act about the amount of stretch read from the scale on the rod F. The percentage stretch is easily calculated, the length of material under the test having been ascertained, as stated above, before the test was commenced. The load at the moment of fracture is also ascertained from the weight of water in the bucket, as stated above, as the nozzle is closed by the end of the beam covering it. Thus it will be seen that a very accurate determination can be made of the strength and elasticity of any fabric or material in a short time, in a very easy manner, and as the operations are automatic there is little risk of error.

A NEW mill is to be erected in the neighbourhood of Hollinwood, to be called the Monarch Mill Company Limited. The machinery will be supplied by Messrs. Howard and Bullough Limited, of Accrington, and will contain 90,000 spindles.

Knitting Machine for Fleecy Goods.

MESSRS. SCOTT AND WILLIAMS, EAST CUMBERLAND-STREET, PHILADELPHIA, U.S.A.

FOR some time past very special attention has been devoted to knitting and hosiery machinery by American machinists, and rapid progress has been made towards the perfection of machines of this class. As things stand at the present time, there is a decided indication that Nottingham and Leicester will have to awaken to a more active and progressive business spirit if they mean to retain the place and standing which has been theirs from the earliest times of modern knit and hosiery goods, but which can only be retained by perpetual and untiring energy devoted to the perfection of every detailed part of their machines, and a rapid development of automatic or labour-saving attachments.

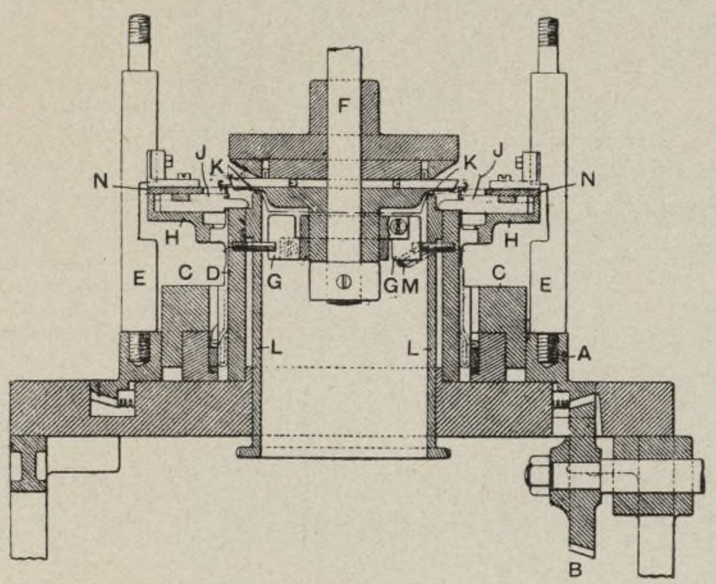


FIG. 1.

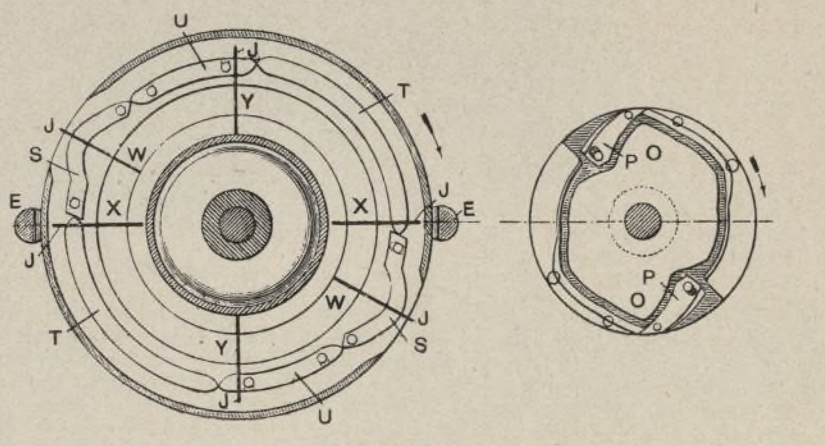


FIG. 2.

A new machine has recently been introduced which, whilst producing ribbed knit fabrics, works projecting loops on one side which are afterwards brushed or gigged, and are so made to form a smooth, fleecy surface. The machine has other new features in addition to this: the feeding of the fleecing yarn is simplified, and it is so guided to the web that it runs no chance of injury or interference in its passage from any portion of the machine. A vertical section of the parts of a knitting machine affected by the improvements is given in Fig. 1, where part of the fixed bedplate of the machine is shown, constituting a bearing for a ring A, which has bevel teeth gearing with a bevel pinion B on the driving shaft, this ring A having mounted upon it, so as to rotate with it, the ring C, which carries the cams for imparting vertical reciprocating movement to the needles of the cylinder D, the latter being fixedly mounted upon the bed. The ring A also has vertical posts E which carry the usual arch (not shown), from which is suspended the central vertical spindle F, which carries the cap upon which are mounted the

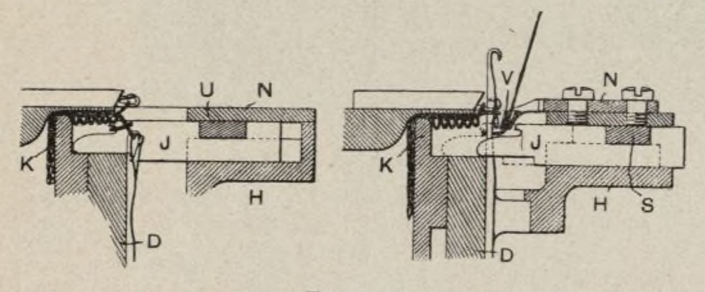


FIG. 3.

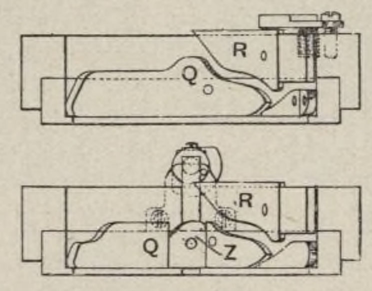


FIG. 4.

cams for imparting radial reciprocating movement to the needles of the dial, the latter being supported vertically upon the spindle F by means of a collar at the lower end of the spindle, but being free from rotative connection with the spindle, so that the latter can turn while the dial is held in engagement with the needle cylinder D so as to be prevented from turning. This engagement of the needle cylinder and dial is effected by means of dogs G, projecting from clamp rings on the hub of the dial, and engaging with pins projecting inwardly from the needle cylinder.

Fixedly mounted upon the upper portion of the needle cylinder is a radially-grooved annular bed or ring H for the reception and guidance of a series of sinkers J, which alternate with and play laterally between the needles of the cylinder D, the inner ends of the sinkers projecting over the top of the needle cylinder as shown in Figs. 1 and 3. To provide for the reception of the inner ends of these sinkers the outer portion of the dial is recessed on the underside as shown in Figs. 1 and 3, and in order that the fabric as it passes from the needles shall be prevented from interfering with or being injured by the inner portions of the sinkers, the needle cylinder has on the inner side a vertically-projecting rib or shoulder K extending up closely to the underside of the recessed portion of the dial, but permitting space enough between the two to provide for the free passage of the knitted web.

An internal cylinder L, of which the upper edge forms the rib K, is provided with cam slots M, engaging with the inwardly projecting pins of the needle cylinder, so that a partial turn of the cylinder L will raise or lower the rib K, the cylinder being provided with a notched or milled flange at the lower end, and having such frictional contact with the interior of the needle cylinder D or the bed, as to prevent any likelihood of accidental movement from the position to which it has been adjusted. The reciprocating movement of the sinkers J is effected by means of cams on the underside of a cam ring N, connected to the posts E so as to be caused to rotate in unison with the dial cam cap and the cylinder cam ring C. The machine shown in Fig. 1 is a double feed machine, the dial cam cap having two needle projecting cams O and two draw-in cams P, as shown in the cross section Fig. 2, and each half of the cylinder cam ring likewise has a needle projecting cam Q and a drawn-down cam R (Fig. 4), and the sinker cam ring N is provided with two cams, each cam comprising the three sections S, T, and V shown in the left-hand cross section in Fig. 2, the section S being so formed as to first quickly withdraw and then quickly project each of the sinkers. The section T follows the section S, and is concentric with the axis of rotation of the sinker cam ring, so that it acts to retain the sinker in the projected position to which it has been moved by the section S. The section U acts to still further project the sinkers, and its action is followed by that of the section S of the following cam. The section S of each cam is adjustable radially at its delivery end, so that the extent of projection of the sinkers J thereby can be varied to form fleecing loops of any required size, and the section U of the cam is likewise adjustable radially so as to properly follow the action of the cam section S.

In the manufacture of ribbed knitted fabric the yarn is usually drawn by the cylinder needles, and the stitches formed by these needles constitute the face of the fabric, the dial needles drawing no yarn from the yarn guide, but simply forming short loops of the yarn which have been already drawn from the yarn guide by the cylinder needles. This is effected by giving the draw-down cam of the cylinder cam ring a comparatively abrupt angle, while the draw-in cam of the dial cam cap is curved and of a less angle, so that the dial needle draws inwardly more slowly than the cylinder needle is drawn downwardly. As, however, the fleecing yarn is applied to the cylinder needles, and as the stitches drawn by these needles should therefore form the back of the fabric, the construction of the cams usually employed is reversed, and therefore the dial cam cap is provided with the abrupt draw-in cams shown in the right-hand portion of Fig. 2, while the cylinder cam ring is provided with a long and gentle curved draw-down cam such as is shown in Fig. 4. The fleecing yarn is fed to the sinkers J by means of a fleecing-yarn guide V mounted upon and rotating with the sinker cam ring N, and in a double-feed machine, such as shown in the drawing, there may be two of these fleecing-yarn guides when it is desired to introduce a fleecing yarn for each course of stitches in the fabric, or there may be but a single fleecing-yarn guide when it is only desired to introduce the fleecing yarn in every other course of stitches.

The operation of the machine is as follows:— The machine being supposed to be without work on the needles, the cylinder L is first lowered, and a piece of work drawn up through it and between the top of the lowered rib K, and the underside of the recessed outer edge of the dial has the stitches at or near its outer edge "jabbed" upon the needles in the ordinary way, when the cylinder L is again raised so that its rib K will carry the work close up against the underside of the recessed outer portion of the dial. Knitting yarn being introduced to the dial needles just before they are drawn in by the cams P, the stitches are formed by the joint action of the dial needles and the cylinder needles, and a plain ribbed fabric is produced in the usual way, except that the dial needles perform the primary function, and the cylinder needles the secondary function, as has already been pointed out. The fleecing yarn guides V are so situated in respect to the sections S of the sinker cams that the fleecing yarn will be laid in the throats of the sinkers J when the latter are fully retracted, as shown in the position to the right of Fig. 3, and, on the projection of the sinkers, the fleecing yarn will be pressed around the shanks of the cylinder needles, as shown by the dotted lines in the same drawing. The cylinder needles at this point are elevated so that the bottoms of their latches will be above the fleecing yarn thus laid around the needle shanks, so that when the cylinder needle is drawn down, the fleecing yarn will be "knocked over" with the old stitch from the needle, and the fleecing yarn will consequently not be knitted into the fabric, but will simply be laid between the face and back wales of the fabric, the loops of fleecing yarn projecting beyond the back wales to an extent dependent upon the extent of inward projection of the sinkers J.

In order to ensure the drawing of the fleecing yarn tightly around the rear wales of the fabric so that it will not be likely to show on the face, and also to assist the cylinder needle in shedding its stitch, as well as to hold the previously-knitted web away from the rising cylinder needle, and thereby lessen the strain otherwise necessary in the take-up to prevent the rising needle from stabbing the work, the sinkers J, after being acted upon by the dwell section T of the sinker cams, are subjected to the action of the section U, whereby a slight further inward movement is imparted to the sinkers, and they are held in this position during the rise of the cylinder needles. This will be understood on reference to the left-hand section in Fig. 2, which represents the three positions imparted to a sinker by the action of the sinker cams. Thus at W the sinker is represented in the fully-retracted position which it assumes preparatory to receiving the fleecing yarn, at X the sinker is represented in the position to which it has been projected in order to draw the fleecing yarn around the shank of the cylinder needle, and at Y the sinker is represented in the fully-projected position, due to the action of the cam section U, this position being also shown in the left-hand position in Fig. 3. At this point the fleecing yarn has been incorporated with the fabric; hence the sinker, by reason of its engagement with it, pulls the whole fabric inward and away from the hooked end of the cylinder needle as it rises.

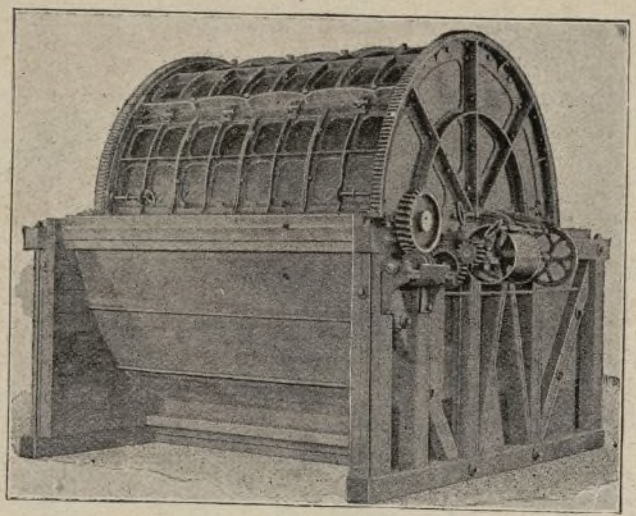
In making shaped garments, where the wide part of the tube is formed by tuck stitches and the narrow part by plain stitches, it is desirable to make but one row of fleecing loops for every two courses of fabric knitted, and in order to make such garments upon the machine the throw of the lifting cam of the cylinder cam ring is adjusted by vertically adjusting the part Z of the cam by automatic means such as those represented in Fig. 4, on reference to which it will be observed that the movable portion Z of the lifting cam has a shank recessed on the outer face for the reception of a cam, which is mounted upon a shaft carried in bearings on the cam ring C, the shaft having, at the outer end, a tappet which can be struck so as to be moved in one direction or the other by a toe, adjustable vertically by pattern mechanism of the character common in this class of machinery. It will be apparent that this fleecing attachment constitutes a very simple addition to the ordinary mechanism of a rib-knitting machine, the sinker bed and sinker cam ring being mounted so as to be readily accessible and so situated as not to interfere with the ready application of work to the needles of the machine, or so as to obstruct a full view of the needles and of the knitting operation, the attachment, moreover, comprising but a minimum of parts, and therefore adding but little to the cost of the machine.

Loose Wool Dyeing Machine.

THE DELAHUNTY DYEING MACHINE COMPANY, PITTSTON, U.S.A.

THE time has now gone by when all textile machinery can be traced to an English maker, and although this country still leads in the manufacture of the more important textile machines, every year shows more and more that good ideas may be obtained by an examination of the work of other countries. Unpleasant as it may be, there is no doubt that, as regards hosiery and knitting machinery, American builders have of late shown much more activity than those around our own centres of Leicester and Nottingham; the race in the process of improvement has been keener, and the number of patented appliances has been greater, although some good work is quietly, yet steadily, progressing in our own country.

The dyeing machine about to be described has been designed really to meet the requirements of the American hosiery trade, though treating the wool in its unmanufactured state makes it adaptable to the dyeing of loose wool for any section of the textile industry. It is composed of a stationary vat, the ends of which are built radially to conform to the diameter of the rotating cylinder, which revolves in the vat about half submerged in the dye liquor as shown in Fig. 1, which illustrates the machine with the top removed. The inner surface of the cylinder is covered with perforated bronze sheet metal, while across the face of the cylinder are eight cross bars running from head to head. In each of these cross bars are set five curved-shaped bronze hooks. The hooks are designed to pick and open up the wool as the cylinder rotates, thus taking it from the dye liquor at the proper angle and dropping it back again from the hooks into the liquor. This action of the hooks in handling the wool is similar in its work to the old hand process of "poling" stock, where they picked and separated the mass of stock, opening up the same and allowing the dye liquor to thoroughly permeate all its parts. Thus it will be seen that by this action of bringing the stock from the liquor and passing it through the atmosphere a uniformity in oxidation and even colour is obtained. The screens, or drainers, as shown in Fig. 2 (where the machine is represented open), are devised so that when ready to unload, all the wool is brought up from the liquor to drain at the same time and movement, the operation of bringing it from the liquor requiring only from three to five minutes' time and labour. The cylinder is 8ft. in diameter, open and clear, has no compartments or pockets, and the wool is always in a loose state, never becoming matted or massed, thus giving the same treatment to every fibre. It can be thoroughly rinsed and cleaned in the machine, which leaves the material in better condition than is usually the case, and all mordant and process colours are perfectly done in the machine. Fig. 3 shows the cylinder closed and ready for operation.



LOOSE WOOL DYEING MACHINE.—FIG. 1.

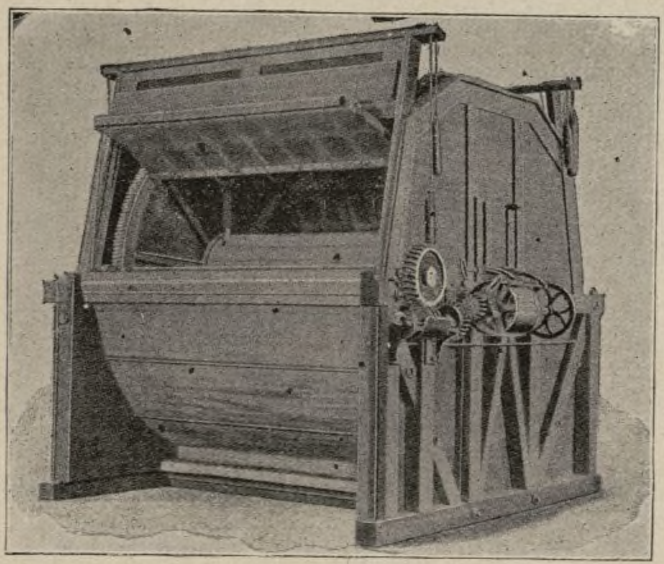


FIG. 2.

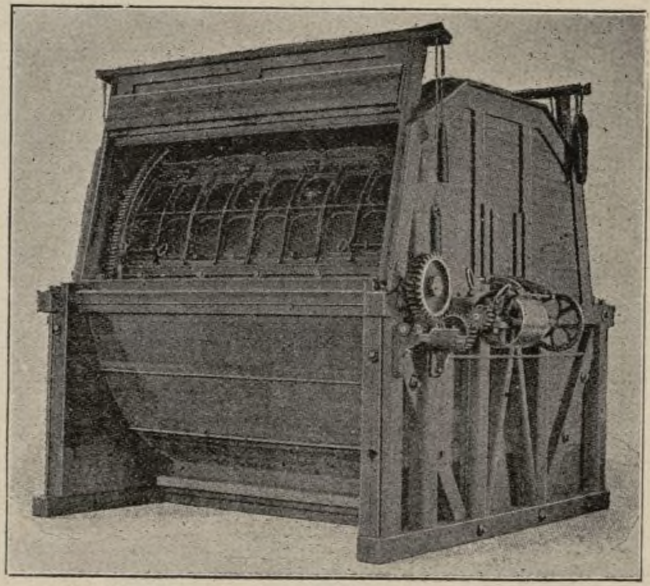


FIG. 3.

LOOSE WOOL DYEING MACHINE.

It is said that this type of machine saves 50 per cent. in labour, 50 per cent. in steam, and from 15 to 30 per cent. in drugs and dyestuffs. All the metallic parts which come in contact with the dye liquors are made of bronze or copper, while the woodwork is made up of pine and cypress. Different sizes of machines are made, ranging so as to take from 300 to 1500lb. of wool per batch, which means outputs of from 1000 to 5000lb. per day when direct colours are used.

Machinery at the Glasgow Exhibition.—IV.

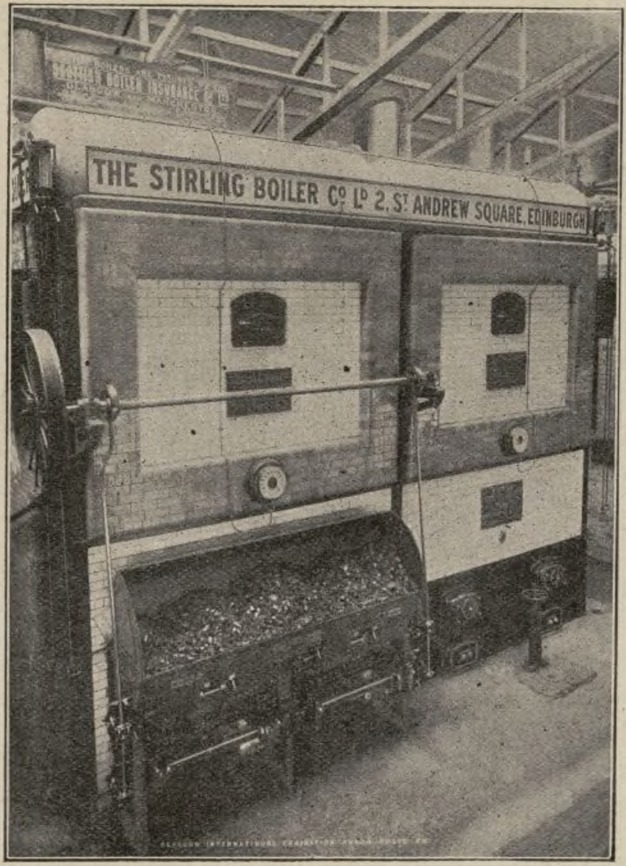
THE Stirling Boiler Company's exhibit consists of two of their patent water-tube boilers, each having a heating surface of 3250 sq. ft. and a grate area of $55\frac{1}{4}$ sq. ft., one being fed by a Vicars mechanical stoker, while the other is fired with gas from a Mason gas producer. Fig. 22 is an illustration of the exhibit, while Figs. 23 and 24 will enable the construction to be readily understood. As will be seen, the tubes are nearly vertical, and hence are not liable to accumulate a deposit either on the outside or inside to the same extent as with horizontally-disposed tubes. The course of the gases—which is clearly shown in Fig. 23—ensures the full utilisation of the heat they contain, while as the feed enters at the point most remote from the fire the bulk of the deposit takes place at a point where the temperature is comparatively low, and in the mud drums, where it can be blown off as required.

The practically perfect character of the circulation was fully demonstrated to us by means of glass models, by the aid of which it was clearly shown that the steam is principally formed in the two front banks of tubes. These tubes are inclined at a good angle for allowing the steam to freely pass to the steam space, while a free circulation between the front and middle drums is maintained by the numerous tubes connecting these chambers below the water line. The main tubes are straight throughout the greater part of their length, but curve with easy bends towards each end to enable them to enter the drum perpendicularly, the ends being expanded into the drums. There are no brickwork supports under the lower drums, which hang by the tubes to the upper drums, the latter being supported on iron girders. The whole structure is therefore well adapted to allow for expansion and contraction. A large combustion chamber is provided, three sides being lined with firebrick, the refractory action of which assists to perfect the high-temperature combustion caused by the effective mixing of the furnace gases in the large combustion chamber before the gases give out their heat to the water tubes of the boiler. The boiler is designed so that any single tube can be readily replaced without disturbing the others in the event of a tube giving out, and we understand that a defective tube can be taken out and a new one inserted within an hour. Access to each drum and to the ends of every tube is obtained by removing a manhole door, and hence the tubes can be readily cleaned, this object being facilitated by the easy bends of the tubes. Tests have shown that exceptionally dry steam is produced by the Stirling boiler, this being due, not only to the rapid circulation, but also to the manner in which the steam outlet is arranged.

Messrs. E. Green and Son Limited, of Manchester, show in the Machinery Hall an economiser of seventy-two tubes suitable for one boiler, with a small steam engine attached to the gearing frame for driving the scrapers. In the same room they show a 5in. double-ram pump for feeding economisers and steam boilers, a 5in. horizontal engine for driving economiser scrapers, and some specimens of economiser castings, including some examples of tubes which have burst at a pressure exceeding 3000lb. per square inch. In the North Gardens a special pavilion has been built for the erection of a larger size of economiser containing

192 tubes, arranged on the latest principle of three groups coupled together at the top, the bottom with expansion elbows, and with a space at the back affording easy access to all parts of the apparatus. The scraper motion of this economiser is actuated by a 1H.P. motor in a glass case, and a 5in. double-ram pump is coupled up to show the method of feeding. The economiser contains nearly 2000 sq. ft. of heating surface. In addition to the above exhibits, the firm have loaned to the Exhibition authorities a high-pressure economiser of 192 pipes, in sections of eight, arranged in groups, which is working in connection with four Lancashire boilers supplying steam for driving the machinery plant in the Exhibition. The scrapers of this economiser are worked with a small independent engine attached to the gearing frame. Another economiser of 120 pipes, in sections of six, arranged in two groups, is working with a battery of Davey-Paxman boilers supplying power for the electric lighting of the Exhibition. Both are fitted with the usual blow-off and safety valves, and are built for boiler pressures of 200lb. to the square inch. The scrapers in this economiser are also worked by a small independent 3½in.-cylinder engine attached to the gearing frame.

(To be continued.)



MACHINERY AT THE GLASGOW EXHIBITION.—FIG. 22.

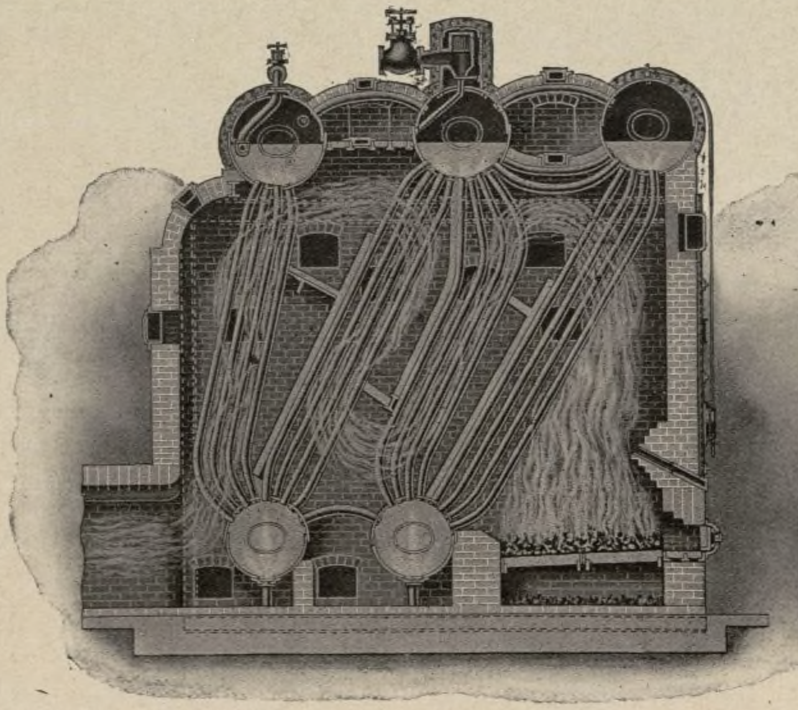


FIG. 23.—MACHINERY AT THE GLASGOW EXHIBITION.

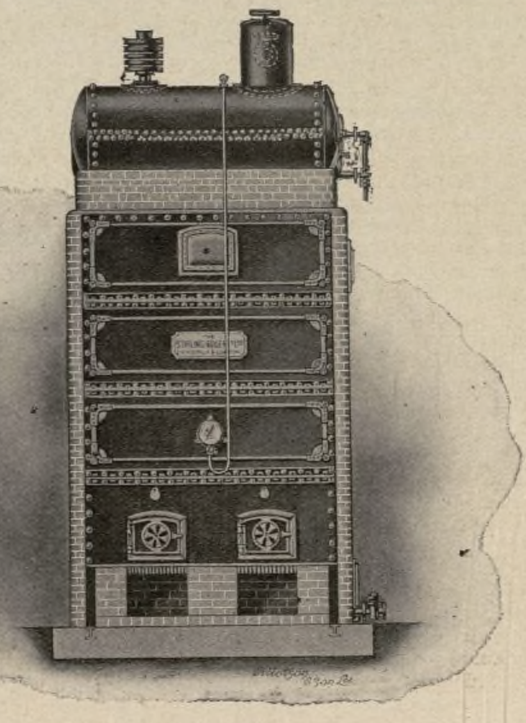


FIG. 24.

MR. RICHARD THRELFALL, of Bolton, is busy erecting new mules at the mill of Messrs. Joshua Crook and Sons Limited.

Smoky Furnaces, and How to Avoid Them.*

IT has been remarked that from the days of Watt to the present time the prevention of smoke has been the constant study of engineers and others, and has never been satisfactorily attained. We read much of chemistry of combustion, of the necessity for air, and of the temperature of ignition, but we hear little of forms of furnaces or of suitable arrangements for leading the gases away from the furnace.

No single remedy will serve in an ordinary case. The air necessary for combustion is stated as 12lb. per pound of coal. This should rather be stated as the amount of air that will combine, as regards its oxygen, with 1lb. of coal. But it is extremely improbable that it represents the quantity of air to which, given perfect mixture and the necessary temperature, it would be possible to reduce the supply, for the law of chemical mass action steps in and tells us that probably carbon and hydrogen can both exist in the uncombined form in the presence of free oxygen, if there be also present a sufficient quantity of water vapour and carbon dioxide—*i.e.*, of already oxidised hydrogen and carbon—that, in fact, perfect combustion demands an excess of oxygen, and that the nominal minimum of 12lb. of air should not be attempted.

If we examine systems of smoke prevention we shall see that they resolve themselves into two classes. In the one class there is admission of air above the fire to burn the hydrocarbon gases evolved from the fuel. In the second there is the use of masses of highly-heated firebrick placed beyond the fire to absorb heat when the fire is at its maximum temperature, and to give it out to the gases when the fire is cooled by a fresh charge of fuel. Both methods are correct in principle, but do not form complete systems. The one recognises an insufficiency of air at the period when the openings of the fire are choked up by fresh fuel; the other recognises that the furnace gases are too cold, and attempts to add heat to help them to burn. Both may be successful when other essentials are present to give a complete system. The principle of air admission at the right time, in the right place, and in proper form was carried out by one J. K. Broadbent for many years. His apparatus consisted of a set of weighted louvre openings in the firedoor which were so connected by a chain to a piece of simple clockwork that when the door was closed, after firing, the louvres were pulled open, and then by their weight they actuated the clockwork, which had a verge escapement and allowed the louvres to shut gradually, thereby approximating the air supply to the volume of the gases distilled off the fuel. The device was good, and it was based on good principles. It was often successful, and sometimes effected a small economy of fuel. It was difficult to make it act well when the draught was poor, for in such cases the amount of air drawn through the louvres was insufficient, and a velocity of draught of not less than 30ft. per second seemed to be necessary to successful action. The second device—that of masses of firebrick placed beyond the furnace—was so far correct that it embraced the transference of surplus heat from one period of the furnace to another and a less heated period. The system had the merit of simplicity and easy application, so that after a few years of "supplying half a load of firebrick for £20" the proprietor was able to retire to classic Blackpool, whereas those whose apparatus required castings or mechanism or alterations to furnace fronts were probably less successful in the worldly and vulgar sense.

Besides these two named systems there were the multitude of steam-jet men. The merit of the steam jet was that it helped a bad draught and enabled a flow of air to be maintained above the surface. But there was sometimes a peculiar action from introducing the merest breath of steam—not a jet in the ordinary sense of the term—as small an escape as one could admit the small steam valve to give. This effect, where the steam was admitted just over the door of a Lancashire boiler furnace, was to cause a sluggish fire to leap into a brisk, full flame, an action I have never had explained, but that may have been connected with the claim made that, except in presence of water vapour, hydrocarbons will not burn. There are certain conditions under which smokeless combustion is not practicable. One of these is a vibratory draught. This phenomenon is really a rapid succession of explosive combustions of the furnace gases and an equally rapid extinction. It is usually curable by a further admission of air, and it is often caused by apparently very trivial forms of flues: square bends where round corners would be better, the lack of a mid-feather wall, or some equally simple cause. Attention is drawn to these various points to enable an idea to be

* By W. H. Booth, in the "Electrical Review."

formed of the very narrow limit between success and failure in all the attempts at smokelessness that have come under my notice. Thus, for example, there were two boilers alike in every particular except that one had a water-pipe built right up to the bridge wall. In the other it was absent. The boiler with the pipe smoked, the other did not smoke. The smoky boiler was cured by bringing the bridge back clear of the pipe. This action of cross water-pipes is common and usual and what may be expected. The smoke or green gas from freshly-stoked coal is a very impure gas, and, as may be observed in an ordinary house fire, will flicker into flame and become extinguished indifferently. The flame in a boiler flue is similarly but indifferently alight. It will extinguish with slight shock, and this shock is given to the flame by every cross water-pipe.

Clear evidence of the action of cross water-pipes is given by boilers with or without them. A perfectly plain boiler will always be found much cleaner and more free from soot than a boiler that has cross pipes. This is no theory, but the result of thousands of observations of this and similar causes and effects.

In the successful cases of smoke prevention that are sometimes encountered, observation will show, in the case of Lancashire boilers, that the draught is good, the air admission is well regulated (ashpit dampers perhaps being applied in addition to flue dampers), and that there is uninterrupted space behind the bridge wall in which the gases complete their combustion. A study of such a furnace will show that the fresh or secondary air admitted at the door is drawn over the whole length of the furnace and well mixed with the gases that pour off each unit of area of the grate. The resultant volume is thus well mixed and fairly homogeneous when it arrives at the bridge, and is also at a temperature sufficient to burn (and does burn) in the space beyond the bridge, and smokeless, or practically smokeless, combustion is the result. But this end is only attained in exceptional cases What is wanting to assure the process in every case? Even the model examples occasionally fall from grace and produce smoke. There can be but one reason, and that is that the coal gases being impure and difficult of ignition and combustion, except in favourable circumstances, some determining factor is absent. The one factor that is left to the boiler itself to fix is that of temperature. No one ever pays any heed to this. The inside of the boiler contains boiling water—therefore 'tis hot. Any idea of comparative temperatures rarely enters the mind of boiler designers. That a boiler at 350° is really a remarkably chilly body is not to be thought of, and yet of course this is so. The boiler is 650° colder than the minimum temperature necessary for gaseous combustion, and there are ample evidences that the work of a boiler is mostly done in the furnace on the first few inches of fire tube or the first of the water tubes; that, in fact, the temperature of the furnace gases is reduced below the necessary point before they have the chance to ignite. In the presence of this fact it is difficult to understand the constant cry that smoke cannot be prevented, or that, whereas the chemistry of combustion is so much talked about, this same chemistry cannot be applied in practice.

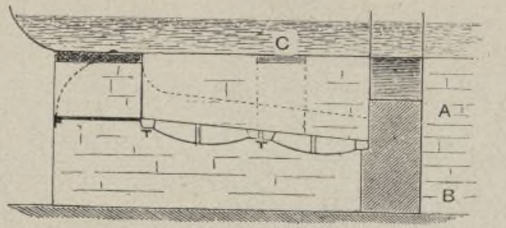
My contention is, and long has been, that few genuine attempts have ever been made to apply the principles of chemistry to practical combustion. One or all of the essentials have steadily and persistently been neglected, and none more so than that most essential one of temperature. This essential must be present. An odd one of the others might perhaps be omitted without any serious results, if only that of temperature be present.

In what follows I propose to deal with a few furnaces as we find them, with a view to show how far they are constructed on correct lines, and in what points they fail, or may fail, to effect perfect combustion.

Such an examination may well commence with the old-fashioned cylinder boiler, underfired, such as was familiar to James Watt, and which is still used in a modified form so largely in America and in collieries and ironworks. The longitudinal section of the furnace was very much as in the annexed sketch (Fig. 1).

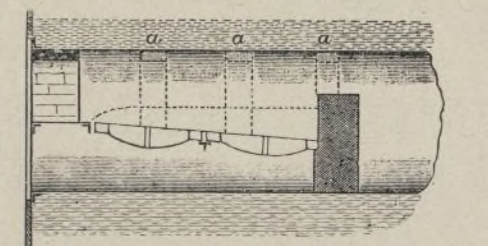
In Watt's day there was no door, merely a heap of coal as per the dotted line. In such a furnace as this there are present most esssentials for smokeless combustion. First, there is the production of most of the volume of hydrocarbon gas at the front end of the furnace. It is there produced from the heap of coal, that serves as a door, by a process of gradual distillation spread over a considerable period of time. As produced, it is mingled with fresh air, which leaks in through the interstices of the heap of coal, and the admixture is probably very perfect indeed. The mixed gases then pass over the extreme length of the furnace exposed to the radiation of the hot fire of coked fuel, which is itself now giving off little or no hydrocarbon gas. There is thus the possibility that by the time the gases reach the bridge they are heated sufficiently to combine. It will also be observed that when the coked or partially coked heap of coal upon the dead-plate is pushed back and spread upon the fire, it will obtain its secondary air to consume such gases as still remain undistilled by leakage through the heap of fresh fuel during the few minutes that elapse before this begins to give out much gas.

The arrangement is, so far, altogether good in principle, though skill is needed in the fireman to enable him to arrange the coking so as to produce the best amount of air admission. The heated gases should now be well ignited as they pass over the bridge, and should complete their combustion in the space beyond, the bottom of which space is



SMOKY FURNACES.—FIG. 1.

sometimes as at A, and sometimes lower, as at B. Formerly the boiler would be placed from 16 to 18in. above the grate surface, but now from 24 to 30in. would be considered better practice. If this type of furnace is so good, where does it fail? It fails to be perfectly smokeless in some cases because of its failure to secure adequate temperature. This may be brought about by the cold roof of the furnace, which is, of course, the plate of the boiler bottom. This, at a temperature of about 220° and upwards, according to date, the lower limit coinciding with Watt's time, is 2000° or so below the fire temperature, and has a most chilling effect, and this same effect continues right along the combustion chamber. The furnace sides are brick, and so far help the furnace, which would assuredly be smokeless if its roof also were of firebrick. As a proof of this may be cited the chain grate known



SMOKY FURNACES.—FIG 2.

as the Juckes furnace, at one time much used in the Halifax district for underfiring Lancashire boilers. The Juckes furnace always had a very long brick arch thrown over the front end of the furnace to protect the end of the boiler and to assist in coking the fresh fuel as it travelled it on the moving grate. The Juckes furnace was thus of a distinctly coking type, and it did very well, though possibly it had the fault of all coking stokers, that of admitting air too freely through the less thickly-covered bars at the back end of the grate—a fault, however, that was mitigated in this furnace by the check of the bridge, which held back the fuel and

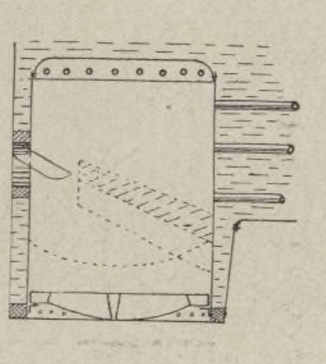


FIG. 3.—SMOKY FURNACES.

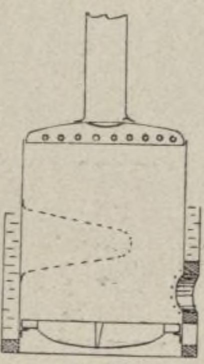


FIG. 4.

skimmed it off the retreating grate, so heaping it upon the rear end of the grate surface, otherwise too thinly covered. Unfortunately the underfiring of boilers is held to be unsafe, but as regards efficiency of combustion, under-firing did afford room for good machine stokers of the Juckes type, than which nothing better has ever been introduced, and that, where heavily worked and liable to smoke, could probably be made smokeless by a second arch of firebrick thrown over the fire as shown dotted at C in Fig. 1, as a means of preventing a part of the chilling action of the boiler. Apart from the cold roof of this furnace, this is the system to be followed for smokelessness, and so far as it is departed from in modern boilers, just so far will the use of bituminous fuels entail fines or the gentle attention of Sir W. B. Richmond's artistic photography.

The introduction of firedoors—usually unprovided with air inlet holes—deprived this furnace of much of its excellence, for firemen discover that open or part-open doors admit air in lumps and destroy the benefit of finely-divided air streams such as filter through a heap of coal.

The development of the Cornish and Lancashire types of boilers made matters worse. In these boilers the furnaces are arranged as in Fig. 2, and the long deadplate of Fig. 1 was practically reduced, like the human hibernating sac, to a mere rudiment, and for many years air openings in the doors were omitted or negligible in area. Where they existed the furnace had a correct form, but was deficient in facilities for coking, and there was the crown of the furnace very near the fire, but the whole furnace periphery that was not grate surface consisted of cold plates, and the effect of this surrounding is such that it is only under most favourable conditions that smokeless combustion is secured, while the presence of cross water tubes in the combustion space beyond the bridge is almost sure to cause smoke. These water-cooled furnaces are the fault of all the internally-fired boilers, and the most obvious remedy would be several arches *a*, *a*, *a*, of firebrick thrown over the fire to ward off the cooling effect of the plates and endeavour to conserve the temperature of the gases. There is no evidence to show that such arches would be very durable. Certainly the most refractory clays would be necessary. The remedy is, however, worth trying, for the cost is low, and if the arches tumble down, they merely require raking out.

The locomotive type of furnace, Fig. 3, may now be considered. Surrounded on all sides and at the crown with cold plate, and with ready and direct escape of the gases to the tubes, this furnace is bad in principle, for the gases rise directly from the fire and pass directly into small cold tubes. There is no admixture possible, even when extra air is admitted, and smoke is inevitable. But as the locomotive has a powerful forced draught, a thick fire can be carried, and combustion is intense on the grate, and it is only its form and its surroundings that make the furnace bad. Could the form be improved, the effect of cold-plate surroundings would be partly nullified by the high temperature. Some genius introduced the brick arch as outlined in Fig. 3. This altered the whole complexion of the furnace. It compelled all the gases that rose from the fire to travel round the projecting brick arch on their way to the tubes. This mixed the gases through the whole of the furnace area with air admitted by a scoop at the door, and the hot arch had a conserving effect on temperature. The space above the arch acted as a combustion chamber, and the gases only finally reached the tubes after a long journey. With a steam-induced powerful draught the locomotive is thus made fairly smokeless, if its fireman cares to make it so. A study of a locomotive firebox with the brick arch will show that the conditions of Fig. 1 have been fairly complied with.

A similar chain of reasoning led Broadbent to design his smokeless vertical boiler. No boiler is so bad as a smoke producer as the plain vertical, for the now obvious reason that the products of the furnace rise vertically upwards, and escape directly to the chimney quite unmixed with air or amongst themselves (see Fig. 4). To remedy this, Broadbent introduced a water table, as per dotted lines, which, though water cooled, and so far an undesirable element, did put the furnace into proper form and compelled the gases to mix with air admitted at the door, and there was formed an ignition point, and a space for combination was left above the water bridge.

The Largest Loom in the World.

IN reference to the large loom described in a recent issue, we have received the letter given below. We are very pleased to receive this and similar information, but our correspondent omits to give any particulars other than those of length, so that it is impossible to judge correctly. We hear, however, on the authority of a gentleman who has seen both looms, that the German loom, although longer, is narrower and lower than that made by Messrs. Robert Hall and Sons (Bury) Limited, and our informant judges it to be only about half the weight. We therefore still consider the Bury loom the largest, but are open to conviction, and shall be glad to receive further particulars, photograph, or other information regarding the Chemnitz or other large loom:—

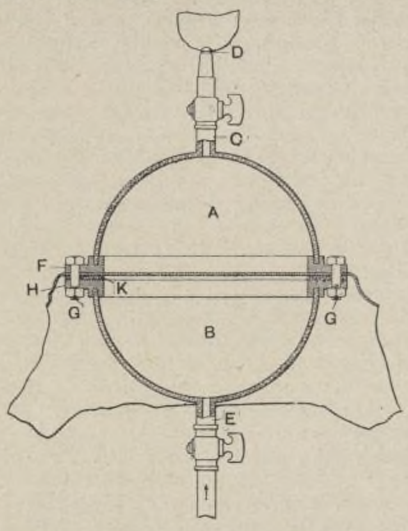
SIR,—With reference to the article in the June number of your esteemed journal, on "The Largest Loom in the World," I beg to state that at the Commercial and Industrial Exhibition (1897) in Leipzig there was exhibited by Messrs. Sächsische Webstuhlfabrik vorm. Louis Schönherr, in Chemnitz, a power loom weaving artist's painting cloth of a width of 10m. = 32·8ft., and having 11m. = 36ft. reed space.

Chemnitz, July 19. CHARLES LAMBERGER.

RAW MATERIALS, PROCESSES, FABRICS, &c.

Testing the Porosity of Fabrics.

IT is sometimes desirable that the porosity of a fabric should be known, or that its relative porosity to other fabrics should be obtainable. A means of ascertaining this in a simple manner has recently been devised by an American, the apparatus required being of compact and easily-constructed form, and such as can readily be put together by any mechanic or plumber. Generally speaking, it consists of a separable two-part chamber, one of the parts being provided with an inlet and the other with an outlet, both being so constructed as to be properly secured together with the fabric under test between them. The principle of the testing device is the arrangement of the cloth to be tested in such a manner that gas under pressure is caused to percolate through and to pass to some suitable indicating device after passing through the fabric. The porosity of the cloth will be indicated by the quantity of gas passing through it in a given time. The accompanying drawing illustrates the apparatus by a vertical sectional view.



TESTING THE POROSITY OF FABRICS.

The separable chamber comprising the two parts A and B are provided with corresponding flanges F and H, which are adapted to fit close together when the device is in operation. If necessary, a rubber packing ring or gasket as shown at K is inserted between the two flanges, which are then drawn tightly together by means of the locking bolts G. One of the parts—in this case the lower member B—is provided with an inlet pipe E, which is connected with a gas reservoir or main containing gas under pressure. This inlet is controlled by a suitable stop-cock. The other member is provided with an outlet shell at C. In this case the outlet is provided with an ordinary gas burner tip, as shown at D, so that the gas passing through the outlet may be ignited and burst into flame, the size of the flame indicating the amount of gas escaping through the fabric being tested. The cloth under test is stretched smoothly across the upper edge of the lower member, the upper member is then placed over it, and the two flanges drawn tightly together by means of the bolts G. Thus the fabric forms a diaphragm entirely separating the two parts of the testing chamber. The gas issuing through the inlet E forces its way through this diaphragm into the upper chamber, whence it passes to the flame, which may be in turn tested by a photometer or other standardising means.

Imitation Netting.

A FABRIC has recently been introduced which gives a good imitation of netting and possesses the required strength to a certain degree, being at anyrate firmer in build than the usual leno netting imitations, although it is woven on the same system. It is, in fact, purely a douped fabric, and the only change from usual practice is in the arrangement of the threads, two douped ends working opposite to each other being supplied for every stationary end. It resolves itself thus into groups of three threads each, the outer ends of each group crossing each other and the central end at intervals (according to the mesh being woven), and forming a series of loops in staggered order. This build is used so as to provide a very strong yet open fabric, which, whilst being of attractive appearance, will retain its pattern under great longitudinal stress, such as that put upon hammock nets and similar tissues.

Fig. 1 represents a view of one face of such a fabric; Fig. 2 represents a view of the other face; and Fig. 3 is a sectional view. Each group of three threads in the warp consists of two outer threads A and B and a middle thread C. The outer threads A and B of each group cross each other at intervals, forming a series of loops, as shown. The middle thread C of each group extends along the crossings and middle of the series of

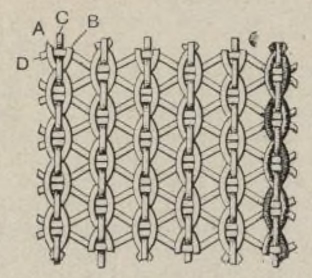


FIG. 1.

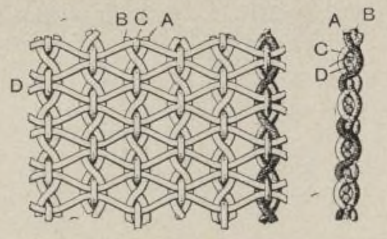


FIG. 2.—IMITATION NETTING.—FIG. 3.

loops. The loops in one group of threads are opposite the crossings in the adjacent groups, so that the loops are arranged in opposite order. The weft threads are shown at D, and each two adjacent weft threads alternately approach each other and pass together between the middle and outer threads of a loop in one of the groups, and then diverge and pass separately between the middle and outer threads of two adjacent loops in the next group of warp threads.

Mohair Plush.

DURING recent years much has been done towards cheapening the manufacture of plushes in America. It is not so long ago that about all the plush used there came from Germany or England, and in those days plush was very expensive. But the days of its scarcity are about over, and with better methods and new materials, plush can be turned out so easily and so reasonably that it is in the reach of nearly everyone. Only the rich could at one time own plush-covered furniture for the parlour; now, it is within the reach of the poor, says the "Textile Manufacturers' Journal," and it finds a ready and profitable market. Not so long ago plushes were made almost entirely upon hand looms. Take this fact, and the costly materials employed, into consideration, and it is no wonder that the price of this fabric was always excessive. Of course, a silk plush is even now a rather expensive article, but the power loom has made the silk as well as other kinds of plushes much more reasonable than they used to be. The materials in the make-up of a plush are a very important factor. There is such a rich and liberal pile that the kind of material of which it is made becomes a weighty consideration. Silk is, and probably always will be, the most expensive fibre that is used. Silk plush enters into upholstery of only the finest kind, embroidery materials and dress goods of the richest grades; for common or usual usage it is entirely beyond the range of the market. The ordinary plushes which are employed extensively on car cushions and on cheap furniture are made rather of mohair and cotton, both fibres being adaptable for the formation of a serviceable cloth.

Mohair has come into such common use in other classes of fabrics of the present day that it is not the novelty that it once was. It is a hair rather than a wool, and although it partakes to a marked extent of some of the qualities of the wool fibre, it is totally different in others. The greatest difference lies in the fact that mohair possesses none of the shrinking and felting qualities which are the prime essentials of a wool fibre. Then, too, mohair is stiff and straight and has a very decided amount of resisting ability in its body. When made into a long pile on the face of a cloth each individual fibre will stand up straight, and when pressed or moved out of that position by use or pressure, will return to its original place. A wool fibre would be utterly useless in such a long pile, for it would curl up or lie down and become matted into an unwieldly mass after limited use. Plushes made from silk fibre differ from the mohair in just this particular. The silk pile does not stand up. It lies down flat, and stays there unless roughened or moved by handling.

There are very good qualities of mohair now being grown which well answer most purposes for the cheaper grades of plushes. The Angora goats, from which the hair is taken, have been acclimatised, and are furnishing much, if not really most, of the mohair used in the plushes made there. A much finer grade of mohair is that which is imported from Turkey. There seem to be certain conditions of climate and surroundings in Turkey that cannot be duplicated elsewhere, and hence there is not the same gloss and length and beauty in the mohair raised on the American animals as in that which is the product of the foreign goats. In fact, some kinds of foreign mohair are so fine that the uninitiated could scarcely tell them from silk. Taken generally, the treatment of mohair is much like that which is accorded to a worsted until the process of weaving is reached. But in the weaving of plushes the loom must be specially made, and a plush loom can be used for nothing else. Of course, in the treatment of mohair it is not necessary to guard against any of the difficulties which follow from the felting properties of wool. This removes a great element of difficulty from the process, and all that is required is to bring out the mohair fibre clean, bright, and lustrous, with its own peculiar beauty, and with the stiffness and substantiality which it requires.

Shawl Manufacture in India.

SO late as half-a-century ago the manufacture of shawls still formed one of the principal artistic industries in India, but it has now become almost extinct. It had its origin in Kashmir, apparently in the remotest ages. Under the Mogols the industry grew in extent and magnitude, and acquired an unparalleled vogue. This was the period when Kashmir shawls were greatly esteemed by the nobility in India. Every well-to-do family used to keep a pair or two of these costly shawls at home to be worn by the head of the family on religious and festive ceremonies, and on the occasions of paying visits to the King and State officials. These shawls were the mark of social status and distinction, and formed, therefore, one of the chief household valuables, and were bequeathed from generation to generation. Every member of the family used to value them as a hereditary gift, and took a noble pride in having possession of a number of them, and in trying to add to the number by fresh purchases.

For this reason there was a demand for valuable Kashmir shawls in the old days, and to meet this demand there was a corresponding produce. Throughout the province of Kashmir one could find entire villages—men, women, and children—engaged in this interesting occupation. Thousands of Kashmir families were solely dependent on this produce of their handicraft for their livelihood. And they lived well, too, for they were never thrown out of employment, and each and every member of the family, including even the boys and girls of five years old and upward, joined in the business.

But a great change has taken place. Instead of those happy, crowded villages, says a writer in the "Journal of the Society of Arts," we find a forlorn, desolate-looking collection of huts, and in place of the merry, smiling family groups, we come across a few miserable people struggling for existence. Whole villages have been abandoned, and the inhabitants have gone abroad in search of a livelihood. They would be thankful if they could get employment as labourers on some building or irrigation works in progress, earning three or four pence a day! Sometimes these wretched people are found collecting firewood from the jungle or quarrying stone in the hills. To such a miserable plight have these Kashmiris been reduced! They are a very hard race of people, and all of them profess the Mohammedan religion, and it is piteous to see these useful people ruined.

It is only occasionally that we nowadays come across Kashmir shawls of rare workmanship. And why? Because the workmen have neither the means nor the heart to undertake the preparation of such a costly piece of work. Even if they could afford to get a pair out of their hands (and this is not an easy task, as it would keep a family engaged for several years to do this), they are sure they would not be able to find a market for their article. What avails it if an occasional Indian Prince takes a fancy to a pair and purchases it at "a reasonable price"? What avails it that His Highness the Maharajah of Kashmir keeps up a few shawl tents prepared by his people? It is the *free* sale only of such articles amongst the gentry of the country that can ensure the revival of this historical industry. But the cheap imitations that are in these days being largely manufactured in several other parts of India, especially the Punjab, and the gaudy aniline-dyed, machine-made shawls that are being imported from Europe, attract the attention of the people, and have virtually ousted the old genuine Kashmir shawl from the market.

The process of manufacture followed by the Kashmirs is rough and simple compared with the European way of manufacturing shawls. The downy wool of the Thibetan goats supplies the raw material of this industry. This soft wool is beaten, thoroughly cleansed and washed, and made into yarn by hand spindles. Then comes the most difficult part of the whole operation: the yarn is woven into a wonderfully fine texture by means of mere human hands in a loom, and then the coloured woollen border, etc., is interwoven with the utmost dexterity and exactness. These people, with all their rustic, simple appliances, vie with those aided by all the resources of Western science and art. The workmanship is marvellously fine, rich, and harmonious. The dyes used are all natural and permanent. In order to secure the permanency of the dyes, the shawls are washed in special lakes or streams, the water of which is believed to have the peculiar property of making colours fast.

Now, the question is, whether it is possible to revive the trade, and if so, how. That it is possible to give a new life to this industry there can be no doubt, inasmuch as the workmen, as a class, are not yet extinct. They can be collected together again with very little effort, as a slight promise of emolument will induce those scattered over India to flock back to their native land, and betake themselves to their hereditary profession once more, with renewed energy. But whence can this promise come? Not from India, as she is too much engrossed with her poverty and distress to cherish such happy ideas. It is to England—to the aristocracy of the United Kingdom alone—that we can look for help in the matter. The British millionaires and the gentry in general can easily afford to make purchases of these shawls for the decoration of their houses, while the ladies should replace the cheap imitations of Kashmir shawls by the genuine, which were once so much prized by them. Let us hope that what was once a flourishing Indian manufacture will once again receive every consideration, now that it is almost about to disappear.

To carry this suggestion into practical effect, special agents should be appointed both in England and India, to organise the trade, in direct communication with each other. The agents in England would get the orders from Europe, and the agents in India would have them executed in Kashmir. It would not be necessary for them to accept articles that may not be quite to their taste, inasmuch as special sizes and designs can be made to order, to suit individual requirements. The Kashmiris manufacture shawls usually in pairs, one of which exactly corresponds with the other, so there will be no difficulty in getting shawls exactly to match with another, for use as curtains, screens, tablecloths, chair cushions, mantel covers, etc., as required.

The Purpose of Technical Education.

THE purpose of any technical instruction is not to obviate the necessity of practical experience, but to broaden and render the graduate more useful. It does not increase "handicraftness," nor does it enlarge the mental scope of the pupil, but it organises the powers within one for maintained concentration of effort, and adds to the potentiality by furnishing the methods of learning many things from the experience of others, and enlarges the capabilities by avoiding the useless labour of an untrained mind. Among the elements of personal experience, which each one must master for himself, there is nothing so entirely dependent upon the practice and observation of the individual as the use of the hands. Dexterity is of the hands—handy. What amount of reading and study could inspire one to tie a weaver's knot?

A question which has often been discussed among the friends of technical instruction asks which should come first, the teaching in the school or the practical experience in the mill or shop? The best opinions upon the subject appear to agree that there should be an alternation, and that technical instruction should be prefaced by a sufficient amount of practical experience to give a purpose to the work of the student and to impress upon him the necessity of a further knowledge of the subject to which he proposes to devote himself for an occupation. It is justice to the student and not disparagement to the institution that its functions should be correctly understood. Instructors can teach, but the student must learn for himself. This plant, covering the main points and principles of manufacturing, may well bear as a motto, "Tools to him who can use them." It should instil in its pupils such a grasp of principles and such details of application that its graduates may be enabled to follow careers of increasing usefulness, and, according to their capabilities, become captains of industry. The worth of all knowledge, especially when that knowledge is an element of value in a person's occupation, lies in its availability for ready use when desired.

A physician once told me that every conscious impression on the brain was permanent, and that memory was merely the power of recalling a mental impression. There is such a multitude of demands upon one's memory that it is essential to organise personal experiences and observations, and in this connection reinforcing the memory by systematic notebooks which should obtain a record of items applying to one's occupation is advocated. The method of arrangement would be entirely one of individual judgment, the only suggestion being that it should be an accurate and available record of personal experience and observation. For use in connection with keeping a record of work and study, especially sketches and drawings, it appears that the books containing the day and date at the top of each page, which were originally made for log books, serve a more convenient purpose for the first entry of each day's work and other memoranda than most of the books made for diaries and journals. One of the most important adjuncts to a course of study, particularly one involving laboratory instruction or applied outside practice, is that of maintaining, full and systematic notebooks, beginning in this manner a most useful custom to be continued during the whole of a professional career. The system followed by every business house of keeping a press copy of every letter written should be applied to the personal affairs of individuals, the small roll copying book enabling this to be done without the use of the cumbersome copying press feasible only in an office.

The increased rapidity of production is furnishing the necessities of life with less work, and therefore it requires a smaller amount of labour for the individual to provide for his requisites than under the former conditions; but there is in each of us an inherent propensity to provide for one's self at about the same ratio of expenditure and income. The stimulus of increased purchasing power of one's labour inevitably causes larger purchases. Satisfaction with anything which can be improved is an indication of degeneracy. Ignorance is contended, and it is the divine discontent which has worked out the betterment of humanity. The British growl has been the making of that nation.

One of the chief opportunities of technical schools is to improve the standard of taste in design, and it is to the grace of outline abounding in American machinery that many of the greater improvements are indicated. Standards of beauty and taste are all built upon familiarity with that which we are accustomed to as a part of our race and civilisation. These conventionalities impose such limitations of scope in design that a good designer must also be a good copyist, and show his skill by improvements on the original. The designing-rooms of a celebrated French print-works were in the office building in Paris, until the manager, feeling that the designers were diverted too much by the attractions of the city, moved them to the works in the country. The product of the establishment immediately began to fall away from the standard. The reason was not far to seek. The designers, failing to receive the stimulus and suggestion from the pictures, colours, and scenes of city life, had in like measure been impaired in the fertility of artistic resource. The department was moved back to the city, with favourable results in the restoration of good designs.

Taste asserts itself in raiment, and people will exercise taste in the selection of their clothing to the limit of their means. If foreign goods have the best designs and most pleasing colours, then foreign goods will be imported to meet the demand which will surely ensue. There can be no prohibitory tariff upon what ministers to excellence in taste, and nothing but an embargo can keep goods of foreign manufacture outside of our boundaries, if they are superior in design to our own. A protective tariff will defend wages, but it will not serve the interests of capital, unless its investments are administered with skill in meeting internal competition. If the price of an article be increased through the provisions of a tariff, it can be of little avail, unless the same law also raises the wages of its customers to a purchasing point. Marking up prices is not the equivalent of making a sale.

A paper was read before the New England Cotton Manufacturers' Association, upon "Weaving as a Fine Art," and when a member was asked, in accordance with the custom of that organisation, to discuss the paper, he declined, saying that he proposed to confine his attention to "Weaving as a Profitable Enterprise." Both were right; the function of a mill is to be a profitable enterprise, but if the operation of textile mills during the last few years has not acquired the exercise of all the fine arts known to those in the business, the condition of affairs has been universally misunderstood. There is competition in price and in quality of goods of every grade and variety which calls for the highest type of mental skill. There are two desired elements in the production of goods, either of which will predominate according to the type of goods manufactured. In any line of standard goods competition requires that the cost of production must be reduced to its lowest terms, not always in rates of wages, but in organisation both of mill and help, and in the judicious elimination of machinery which has become superannuated by long service or depreciated by subsequent invention. On the other hand, without detracting from the worth of any possible economy anywhere, in the manufacture of specialities the elements of design and the colour of the fabrics have become live issues.

At an early day the cotton mills were of better construction, with machinery and mechanical organisation superior to the woollen mills, because in those plain cotton mills the problem was largely a mechanical question, while in the woollen mills matters of design and colour in the fabrics were essential to success, and therefore received the greater portion of the attention of the management, who at that time may not have as fully considered the smaller advantages of cost of manufacture. In course of time each branch of the textile business has learned from the other. The later woollen mills and their equipment have represented the best engineering work, while the cotton mills making figured or dyed goods have improved both the design and colour of their product. Far higher skill, with more satisfactory results to the owners, may be applied in the successful commercial production of less expensive goods, and it should be remembered that the millions have more money than the millionaires, and that they spend it more freely.

Most of the textile inventions are entirely in the line of obtaining an increased production, and the result has been beneficial in two directions: a portion of this increase has been applied to the diminution of the cost of the goods, and the remainder to the reduction of the hours of labour. The invested capital still struggles for its existence. An India shawl is the result of many years of handiwork; the manufacture of a Paisley shawl requires about the same number of hours as the original shawl which furnishes the design required years. At the Gobelins in Paris, a weaver makes about a square yard in ten months, and while this product may not be duplicated, it is nevertheless the application of modern machinery to a similar fabric which has alone made the general use of carpets possible.

Vast as is the product of textile mills all over the civilised world, and universal as is the use of cloth, yet the application of machine-made cloth has penetrated but little beyond those people who can be directly reached by railroad or deep water transportation, and the swarming population of Oriental and barbaric nations still wear for the most part hand-spun goods.

The cotton industry has solved some problems of sociology, and raised new ones. It has added to the years of life by furnishing more suitable clothing. It has permitted the development of diversified industries by diminishing the amount of time required by the individual to provide clothing; but the problems arising from the concentration of subdivided labour organised into a unit for the single purpose of supplementing with brawn and brains the action of machinery in the output of goods are still unsolved. How much of the increment between raw material and product shall be distributed for the lifework put into the fabric, and how much shall be left for that surplus of other labour which has crystallised into the capital which builds, operates, and maintains the vast plant?

Whatever may be the individual opinion on the equities of the division of this increment, it is a living fact that the employment furnished by these mills attracts to their service people from other vocations throughout this country. And it is just as true that the profits to the mills have been merely sufficient to preserve financial stability in the conduct of business and the maintenance of plant against its wear and tear, and against depreciation by subsequent invention. They are less than those of any other large investment, and not comparable with the fortunes made in the mercantile marine of the last generation. Wages have

* Abstract of a lecture by C. J. H. Woodbury at Sibley College.

ncreased, the hours of labour have diminished; the quality of goods have been improved, and the price reduced.

The whole trend of affairs, as applied to the textile art of to-day, is towards enlightened consideration in manufacture, excellence in design, and skill in dyeing, and for that purpose it is taking to itself the best in engineering, art, and chemistry; and this change is an example of the direction of the progress of all manufacturing at the present time.

Waste in Spinning Mills.

THE residuum from the various processes of cotton spinning forms a very considerable item in the statistics of the spinner. The loss in waste, even in those mills where the best of cotton is used, takes a large share of the meagre margin between cotton and yarn, and deserves even greater attention than has hitherto been given to it. The textile machinists, ever ready to adopt improvements in their make of machines, seem occasionally to err in their new modes of construction by arranging to take away rather too much of the cotton fibre. Their desire to produce a good effect by means of a clean yarn is very intelligible; but it should be the aim of every machinist, as well as of the heads of departments in spinning mills, to retain in the yarn all the good fibres, equally as much as to throw out all foreign matter.

Between the weight of cotton used and dry yarn spun there is in spinning an average loss of some 10 per cent. This is variable according to the grade of cotton used, and heavier also where Indian and brown Egyptian are used, as compared with Sea Island, Brazilian, Gallini, and Boweds cottons. Where double carding or combing is in vogue, an addition is, of course, made to the waste. In the mixing and blow rooms the largest item of waste, and almost the only item, is what are called "droppings." These are the refuse driven out of the cotton by means of the beaters in the openers and scutchers through the bars or grids. The production of this waste can be regulated by the position of the bars: firstly, by their distance apart, a greater distance of course giving more droppings; and secondly, by the angle at which the bars are set. Should a line drawn at a tangent to the path of the beater pass directly through the space between the bars, the maximum of droppings is obtained; while if the bars are set so that the beater drives the refuse against the bars, the waste is diminished. Rich or "fatty" droppings are greatly to be avoided, and there is a method of setting each machine so that very little good cotton is thrown out, and yet the machines work very efficiently. The droppings from the porcupine feed and grated trunk, where the pneumatic principle is adopted, are often of a richer character than from the scutchers, and it is a question whether the cleansing power of this part of the machinery might not be advantageously minimised and more work left to be done by the scutcher. The fly taken through the air tubes from the blowroom machines to the fan chamber is a very worthless class of waste, and yet is often sold as "fan fly." The bag pickings from the tares of the cotton bales are frequently used among other cottons, but are sometimes sold. Where they are used, pieces of jute fibre from the bagging sometimes appear in the yarn.

In the cardroom, the carding engine is the cause of the greatest amount of refuse, that from under the engine being called "fly," and consisting of the short fibres which are thrown through a grid from the cylinders in their rapid rotation. The weight produced cannot be modified to any great extent, except by using undergrids with smaller apertures. The grid, consisting of a number of triangular bars, seems the favourite at present. Card fly is divided into taker-in fly and cylinder fly, the latter being the better. "Strips" are the other variety of card waste, and are usually the next in quantity to the droppings, fly being third. The setting of the card has an effect on the strips, and should be carefully done; but of course a substantial reduction can only be made in the weight of strips produced by a reduction in the number of times of stripping, or in flat cards by lessening the speed of the flats or setting a stripping plate closer to the cylinder. The flat waste and roller end pickings, together with the sweepings of the room, complete the list of cardroom waste. The sweepings of this room form a very elastic item, and often a stringent system of discipline saves pounds by keeping good cotton off the floor.

In the spinning rooms the sweepings form the leading item, and should be kept free from the top clearer, under-clearer, bobbin, waste and ropes, all of which are of higher value. The top clearers are practically a fixed ratio, and are not of importance. The under-clearer, often called crow or fluker waste, is of the best quality, and the quantity only diminishes as the spinning improves; indeed, the weight per week can be taken as a criterion as to whether the mule minders are overworked or not. The bobbin waste, though, strictly speaking, not waste, should be diminished by the bobbins being left in the creels as long as possible.

These varieties of waste, although numerous, do not account in their total weight for the cotton loss suffered by the spinner: some 3 or 4 per cent. always remains as an invisible loss, and can only be attributed to the watering can of the cotton presser abroad. During the past twelve months the price of waste has been rapidly sinking, and stocks in the hands of waste dealers have been larger than for years back. The prices offered are now so low that spinners hardly find it worth while to bag up the commoner sorts, and thus it behoves them more than ever to keep as much good fibre out of the waste bag as is possible. The point is well worth watching, for on a year's production in many of the larger mills a saving of, say, only 1 per cent. means £1000 more received for yarn, and perhaps £50 less for waste.—"Indian Textile Journal."

Double-faced Felted Fabrics.

FELTED FABRICS, with the exception of those which have been subjected to the after-process of printing, are usually of one colour. If a felt is combined with a woven fabric, this latter being used either as a centre foundation or as a backing to give strength to the felt, it has generally been customary to dye both felted and woven portions to the same shade. As the uses of felt seem to be multiplying, it being now adopted for numerous minor articles of wear or household ornament, it is interesting to note that a Frenchman has recently introduced a process for making double-faced felts—that is, fabrics which have a different shade on the face from that on the back.

The new fabric, like many of those in use, is really a combination of felted and woven cloth, in which the felt constitutes the exterior or right side, and the woven fabric, by reason of its special treatment, forms the back or wrong side and obviates the necessity of a lining. With this object there is employed for the right side or face of the felted material a felt having either a uniform or a mixed shade or colour. At the back or reverse of this felt there is applied during the manufacture milled or melton cloth adapted to replace the lining of light flannel or melton cloth ordinarily required with felted fabrics. The process of manufacture is as follows: After the sliver from the carding machine, intended to form the exterior or right side of the finished fabric, has acquired its proper thickness, it is introduced into the felting mill upon a woven canvas backing formed of materials which allow it to be treated in the manner explained below. At the conclusion of the felting operation the fabric thus obtained is fulled and washed, and then passed through the gig-mill for the purpose of treating the canvas which is to form the wrong side or back of the material. This canvas back is then teaselled and dressed in any appropriate manner, and after the completion of this operation the fabric is dried and finally sheared and calendered on the right side. In dyeing the wool and the canvas separately before weaving, different shades for the right and wrong sides can be obtained, and thus a useful felted fabric with double face is produced. An indefinite variety of combinations of colours or shades for the right and wrong sides may be produced, and the felt on the right side may be printed with any desired designs or patterns.

Insect-repelling Fabric.

FOLLOWING after the waterproofing and fireproofing of fabrics comes the process of making fabrics insect-repellent, a state which is not so common as those earlier mentioned, but is sometimes very necessary, rendering proof against moths and other destructive insects those fabrics which are liable to their attacks. Various chemicals have been used for this purpose, but they have in most cases been offensively inodorous, and their effect has been evanescent. An American has recently discovered a solution with which a flexible fabric may be impregnated, and which not only renders the fabric practically proof against moths and other insects, but also makes immune the destructible substance or material with which the fabric may be brought into contact. Hence the fabric may be employed as an interlining for plush or other furniture, or as a tick for bedding, and may be made into bags for the reception of garments, furs, skins, or other destructible articles, or may be utilised in numerous other ways for preventing the destruction of materials that are now mutilated by insects. The ingredients of the solution are oil of cedar, nicotine, starch, and water.

For about 200yds. of fabric it takes about 16gals. of the solution in the following proportions:—2lb. of cedal oil, 6lb. of starch, 8gals. of the extract of tobacco refuse—such as stems, non-usable leaves, etc.,—and 8gals. of water. Corn starch is preferably employed, and it is boiled before it is added to the other ingredients, it serving to thicken the solution to the proper consistency, as that of thin syrup, and preventing the separation of the oil of cedar. The solution is placed in a vat in which is journalled a moistening roll and a pressing roll. The moistening roll is partially submerged in the solution, and carries the solution on its periphery to the cloth as it is passed between the two rolls. The fabric is drawn through straightening rods, and thence under a submerging rod, located near to the bottom of the tank, to the rolls. After it leaves the rolls it is wound upon a take-up roll. The rolls are all driven by proper gearing, and rotate at the desired speed. After the cloth has been saturated with the solution, the rolls expressing the superfluous solution, it is dried and is ready for the market.

Points on Loom Fixing.

THE head motion of the fancy power loom requires some fixing now and then. I have known, says a writer in the "Tradesman," fixers to try to get along without doing very much repair work, with the result that before they know it, the mechanical portion of the head motion of the loom is in such a shattered condition that the work will not go right. One may account for the numerous misspicks, double picks, floats, and kindred imperfections in cloths from this one cause. Fixers will find it far easier to inspect and

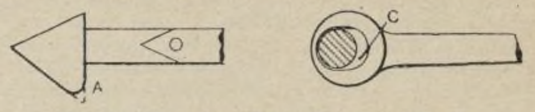


Fig. 1.—Points on Loom Fixing.—Fig. 2.

overhaul the harness motion of the modern fancy loom at least once in three months, than to wait for an actual breakage. I have worked in weave rooms where they have had overseers, or second hands, who would insist upon this periodical inspection of the looms, with the consequence that the product of the looms has been far superior to that furnished from looms which are not regularly examined. For example, in the head motion of the jack loom, we have the fingers of the jacks, which will wear off at the point very frequently. As soon as this occurs, the likelihood of the finger slipping over the bar and producing a miss or double pick, is very great. Often this slipping over of the finger will not occur

Fig. 3.—Points on Loom Fixing.—Fig. 4.

more than a dozen times a day; but if every loom were to make a dozen misspicks a day, the product of the mill would be considered defective. There may be some goods of the shoddy class that are passable with miss and double picks, but the up-to-date mills on standard goods strive to produce only perfect textures. This they can do only when the fixers keep the looms in good running order. I have seen fixers take the mechanism of the looms apart in order to locate a little worn place in a finger such as is seen in the view Fig. 1 at A. The dotted portion marks the original form of the tip until worn off to the rounded part. This rounded part allows the finger to slip over and drip the harness when half-way up, so that the chances are that the point of the shuttle will strike the threads

Fig. 5.—Points on Loom Fixing.—Fig. 6.

in its passage through the shed, and probably break off a number of the threads at each trip. This accounts for so many warp threads breaking off in some of the good warps. The best way to do with a finger of this kind is to remove it and replace it with a new one.

In Fig. 2 is shown the way in which the chain rod often wears at C—at the bearing. This permits considerable loss of motion, and the chances are that the lost motion will allow the pawl to slip over the top ratchet without gripping the teeth at times. The rod can be fixed by ryming out the hole and inserting a sleeve heading in the same or a larger pin can be used: or, better still, a new rod substituted. The plan of tying up parts of the machinery of the head motion of fancy looms is a mistake, and ought not to be allowed in well-regulated weave rooms. In Fig. 3 is shown one way in which fixers do patching work of the sort meant. A pin may be out of order in a stud, and perhaps cause bother by falling out. Instead of putting in a new and properly patterned pin, the fixer ties in the old one with string or yarn, as at D. This makes the loom have an unworkmanlike appearance at that point, and, besides, it is not a practical way of doing the work, as the string will wear or break in a short while. The proper sort of pin to use is shown in Fig. 4.

It is often found that the shifting rod of the chain for the head motion is working irregularly, sometimes to such an extent that the chain balls are caused to miss the fingers. In Fig. 5 is shown one of the principal causes. The stud is bent and the rod is permitted to bend over at E. The result is a wobbly rod. The rod will be shaken

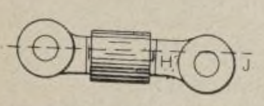
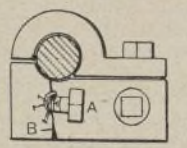



Fig. 7.—Points on Loom Fixing.—Fig. 8.

from one side to the other at every revolution of the chain cylinder, and the probabilities are that there will be numerous miss-picks in the fabric. The best way to rectify this is to remove the stud, heat it and straighten it. Then put it in the lathe and take a few turns of the metal off, so as to make the stud perfectly smooth and true.

Fixers of looms often forget that the threaded portions of bolts and set screws become worn, stripped and corroded in such a way that the mechanical movements of the loom are seriously affected. In Fig. 6, at F, is shown a sample of the sort meant. I have worked among looms where the motion has been rendered so unsteady by set screws in this shape, that misspicks have been frequent. The fact that the material is gone from the set screw, or bolt, of course makes it impossible to recut the threading, and the only way to do is to replace the imperfect screw with a new one. In Fig. 7 is shown the way I saw one fixer patch up a short lever of the head motion, for temporary

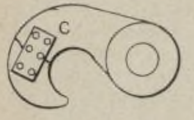
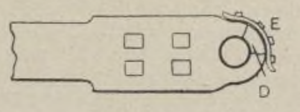
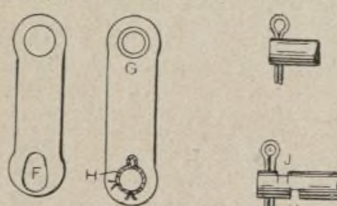



Fig 9.—Points on Loom Fixing.—Fig. 10.

service, and he managed to get good results until some new levers arrived from the loom works. The patch was effected by screwing over the ends of the broken portion of the thimble and soldering the same. This permitted the right end of the lever to drop out of line from H to I, and of course made an imperfect fitting, and one which would not do for any length of time, but served all purposes for a few weeks.

In Fig. 8 is shown how a bearing for a head motion was patched in one weave room, illustrating the inferiority of the class of fixtures employed there. The box was loosened, it seems, and instead of tightening it in the proper manner, the fixer in charge of the section put in a long bolt, and doubled it over as at A. Then he pounded in the pieces of metal near the base, and soon had the box cracked as at B. Of course this made the whole affair very shaky, on the loom, as to harness and shuttle floats, until a new box was substituted.



Points on Loom Fixing.—Figs. 11, 12, 13, and 14.

In Fig. 9 is shown the way in which many fixers patch up a pawl for turning the chain ratchet, and then they wonder why the cloth is being woven imperfectly. When a pawl is thus fixed, by means of a patch at C, the chances are that the thing will run correctly for a few days, until the patching loosens, as it is sure to do, and then the trouble will commence. Loosened patches make unsteady motions, and the weaver is surprised at the number of times she has to "pick out" in order to keep her cloth free from defective picks. Pawls that have the work to do that must be done by these weft or warp chains pawls should be perfect and not patched.

In Fig. 10 is the long arm of the chain cylinder, and on one occasion I noticed that a piece had been broken out of the hole at D, and this was patched in by means of the piece of metal strapping E. The trouble was that the constant jarring of the motion of the loom had caused this part to work loose, and the pick was unsteady. It caused the chain cylinder to move slightly after it had reached its final seat after the turn. This additional motion caused the fingers of the jacks to rattle, and to slip about once in an hour. Had it happened more frequently, the fixer would probably have got hold of the evil. A new arm was finally substituted, and no more trouble was experienced.

In Fig. 11, at F, is shown the way in which a link wears down and causes trouble for the fixer, in that mishaps are produced by reason of the link not hauling the ball bar over soon enough, and often not far enough. In Fig. 12 is shown the way in which some fixers patch up defective links. I have seen little collars inserted as at G. In some cases the fixer will not go to this trouble, but will tie in some pieces of yarn as at H. This yarn wears off in a few weeks, and new yarn must be put on. As in most other instances of the kind, the true way to go to work is to replace the worn material with new. The loom makers of to-day furnish extra parts of their looms at very little higher price than the actual cost of manufacture. Hence some of the prices are not much higher than the cost of the metal. It certainly pays for weavers to have supplies of all kinds pertaining to the head motion in stock and in readiness for immediate use. Chain bars wear like other parts of the head motion, and in Fig. 13 is shown a new bar, unworn and in good form, while below is shown the condition in which the end of the bar gets after a few years of active service in the head motion of a fancy pattern loom. The links cut into the metal at I and K. New bars are required as soon as the old bars reach this stage of imperfection.

Softening Jute.

SOME fibres, by judicious treatment, may be converted into a much softer state and better quality than as supplied by Nature, even after Nature has been aided by modern agricultural methods. The mercerisation of cotton is only one instance, although a very marked one, of what can be done in this direction, and probably a few years will rapidly develop other, even if less notable, processes. A method of softening jute fibres, whether in the raw state or in yarn or fabric, has been recently introduced in Bavaria, and may possibly open up a much wider field of usefulness for that fibre. It is said to make the jute much more flexible, and to give yarns and cloth the appearance of being made from much finer raw material than is really the case, in addition to helping the spinning or other preparatory processes.

To obtain these results, the spun or raw fibres or the woven goods are treated for a certain time as follows—that is to say, they are thoroughly saturated at a temperature of 50·75° C., and in as well divided a state as possible, in a bath consisting of caustic potash or caustic soda lye of from 30 to 45 per cent., and left therein forabout an hour. They are then taken out and exposed to a temperature of from 40 to 45° C. in closed receptacles or sacks for about twenty-four hours, so as to dry them, when the vegetable glue adhering to them is completely dissolved. The fibres thus treated are then lixiviated with water, taken out again, and passed through a concentrated emulsion bath consisting of 100 parts alkali soap dissolved in 200 parts of water, to which 100 parts of olive oil are added slowly while the solution is continuously stirred; then the fibres are slightly wrung out, left at 75° C. for about 24 hours, and subsequently boiled in water for a short time, and afterwards taken out and dried. By means of this treatment with oil and lye the original vegetable glue is replaced by oily and fatty substances which give the fibres a brightness resembling that of silk, and which make them very soft.

The Hosiery Trade of Brazil.

THERE is only one manufactory of ordinary knitted goods and hosiery in Rio de Janeiro, another (under Italian management) in San Paulo making fine and half-fine goods, and a third of less importance in Porto Alegre which makes stockings especially, turning out about 300 dozens daily. Brazilians of the better class wear vests of light woollen flannel, the demand for these being only partially met by native industry. Knitted goods, vests, and cotton shirts are worn to a great extent by the working classes, both in the coast towns and in the interior. These shirts, which are known as "camisolas de meia faicas," form an important article of trade. They are made in natural colours or with a small printed pattern, with or without collars, with watch pocket, a tasselled cord, and a kind of cravat.

In the State of Sao Paulo there is a good demand for ordinary flannel and cotton vests, usually of a dark colour, weighing about 6½lb. per dozen, and costing about 9 francs in Italy, whence they are imported. Better qualities are obtained from Germany, especially those known as "hunting shirts"; these are double-breasted, open at the shoulders, and provided with linen cuffs and a broad linen band at the neck. They are made of very strong materials, although they weigh only 7oz. per dozen, even in the largest sizes. There is very little demand for pants, but they are beginning to be used by cyclists. On the other hand, there is a very good market for foreign hosiery in Brazil; about 400,000 or 500,000 pairs of cotton stockings are imported, almost exclusively from Germany, some coming also from Great Britain and France. Woollen stockings and socks are much less used than cotton, the proportion being about 3 to 100. For silk hosiery the demand is very small, and on account of the high tariff rates only light goods are imported—*i.e.*, weighing from 3½ to 4oz. for children's goods, 13 to 14oz. for men's, and 19 to 21oz. for ladies.

Gleanings from Consular Reports.

PHILADELPHIA.—The manufacture of tapestry of Brussels has received particular attention of late, so that a fine medium grade is now made at prices which enable it to compete with ingrain. Damask and Venetian carpets are a form of ingrain for which there is a great demand, and six large mills in Kensington devote their capacity entirely to this line of manufacture.

Philadelphia has five manufacturing plants utilising hemp and jute materials, including all branches in the business of ropemaking, twine-making, and woven goods, such as bags, hammocks, etc. The raw material for this business is all imported from abroad, very much coming from the East Indies. There are 2000 persons employed, producing about 7,000,000dols. (£1,400,000) worth of goods annually. The principal markets for these goods are in the seaboard cities and ports.

The principal branches of the silk business in Philadelphia are silk throwing or making yarns in raw silk; weaving broad goods, such as dress materials and linings; weaving narrow goods, such as ribbons, bindings, etc.; miscellaneous use of silk, as in hosiery, fringes, chenilles, trimmings, plushes, etc. There are three silk-throwing factories in this city, two that weave broad goods, six that turn out narrow fabrics, and five that use silk and other combinations. The output of silk yarn is valued at over 2,500,000dols. (£500,000), and woven fabrics at 4,000,000dols. (£800,000) per annum. The raw silk is imported from Italy, France, Turkey, China, and Japan. There are six plants for silk dyeing, employing 300 people, and doing 1,000,000dols. (£200,000) work per annum.

Textile dyeing forms an important industry in Philadelphia, one-sixth of all the dyeing done in the United States being done there Ninety per cent. of this work is turned out in the mills of Kensington. In addition to the amount of dyeing done in the regular dyehouses, the majority of carpet and rug manufacturers dye their own yarn.

The bulk of the finer dyes are imported from Europe, East India, and South America. The principal dye business is in cotton yarns from the east and south. These yarns are sent to the dyer in hanks, and are dyed in hanks without disturbing them in any way. Wool and cotton stock also constitute an important feature of this work. Wool stock is sent to be dyed before it is carded or spun. Cotton stock is the raw cotton, which is dyed in the same manner as wool before being spun. Practical dyers make from 10dols. (£2) to 12dols. (£2 8s.) per week, and assistants from 8dols. (£1 12s.) to 9dols. (£1 16s.). A considerable number of children are employed in the dyeworks; the factory law of Pennsylvania prescribes twelve years as the lowest age for child workers, but as a rule there are very few at work under thirteen years of age.

There are at present sixty-four plants in Kensington, employing 3210 people, paying 2,022,877dols. (£400,577 8s.) in wages and 2,744,574dols. (£548,914 16s.) for materials, and turning out 6,098,776dols. (£1,219,755 4s.) worth of work.

Ichang (*China*).—It is noteworthy that whilst English and Indian cotton yarns fell off, the latter from 47,000,000 to 29,500,000lb., Japanese yarn increased from 5,000,000 to over 5,500,000lb.

In cotton piece goods everything fell off with the exception of dyed and figured shirtings.

The remarkable falling-off of Chinese grey shirtings from 3660 pieces in 1899 to only 62 pieces in 1900 would seem to show that the steam mills that turn out this cloth must improve their work considerably before they can hope to compete with the foreign article. It is said that the Chinese-made stuff is not at all approved of on the Chungking market.

Woollens fell from £45,774 to £28,164, the only article that increased being Russian cloth, the import of which improved by 150 pieces.

The export of 276,126lb. of raw cotton in 1900, against 5,002,274lb. in 1899, would seem to show a very large falling-off; but instead, the export was much about the same. The cotton was taken up last year in likin junks because it was cheaper than passing it through the foreign Customs, in whose returns it therefore does not appear.

Swatow (China).—Under cotton goods, shirtings show a considerable decrease, but in the circumstances this was not unexpected. In 1898 and 1899 the import of piece goods had been abnormally large, and at the close of 1899 dealers found themselves with heavy stocks on their hands unsold. Further, the phenomenal rise in the price of cotton in 1900 enhanced values and operated against cheap purchases and increased import. But while operating as a drawback on the one hand, this increased value helped merchants to realise handsomely on their old and surplus stocks lying in their godowns at the beginning of 1900.

Concurrently with the enhanced value in the cost price of raw cotton, yarn has fallen considerably in the quantity imported. The Indian product continues to monopolise the market. The import of yarn for the past three years is :—

—	Quantity.		
	1898.	1899.	1900.
	Cwt.	Cwt.	Cwt.
British	38,678	36,625	25,536
Indian	183,833	167,850	131,895
Japanese	6,835	4,314	1,453
Total	229,346	208,789	158,884

Hamburg.—Contrary to anticipations prevailing at the end of 1899, the prices of sheep's wool, which had been exceptionally high in that year, experienced a considerable decline at the beginning of last year, owing partly to the operations of speculators. A reduction of about 5 to 10 per cent. in quotations for November, 1899, took place in the first months of 1900. In order to prevent loss, importers and dealers thereupon began to withhold their stocks ; but as the effect of this action soon made itself felt in the manufactured goods trade, new orders being no longer given, the raw-wool consumers found themselves obliged to retaliate by declining to buy at the prices asked. The inevitable fall in prices occurred in May, and (on the London market) amounted to from 10 to 15 per cent., a reduction which continued further at the July auction sales. The situation on the Continent, however, became serious when it was decided to omit the sixth auction series last year altogether, and to hold only the fifth in October. The result hereof was that business came to an entire standstill, and the situation in Germany, France, and Austria-Hungary, being accentuated by unsuccessful speculators, became so critical that a general catastrophe was only averted by the intervention of the banks. In November the circumstance that the British textile industry was unable to absorb the available stocks of 360,000 bales encouraged Continental consumers to turn to the London market ; and from that time forward business here also began gradually to recover, until at the close of last year prices stood 10 per cent. higher than at the time of the greatest depression.

The downward tendency of the wool market during the year 1900 is considered here to have been the result of ill-timed and exaggerated attempts to maintain high prices ; but a re-establishment of a more healthy state of things is expected in the near future. The cloth manufactories were and are always steady buyers ; and though the yarn industry is stated to be still suffering from the effects of injurious speculation, it seems likely that the period of depression through which the same has been passing will not be of a permanent nature.

The total importations of raw wool to Germany in 1900 were 21 per cent. smaller than in 1899 ; and while the imports of textile goods showed an increase of 11 per cent. last year, the importations of woollen yarns experienced a decrease of 6·5 per cent. as compared with 1899.

The exportations of raw wool from Germany was about 8 per cent. less than in 1899 ; woollen yarns were exported in about the same quantity, but the exports of woollen textile goods showed a falling-off of about 2 per cent. As was to be expected, trade with Cape Colony suffered severely from the effects of the war in South Africa, and only 80,000 bales of Cape wool were imported to Germany in 1900, as against 155,000 bales in 1899.

Eastern Roumelia.—The United Kingdom has always occupied the first place as an importer of grey yarns, but new and formidable competitors are now in the field. The British spinnery at Varna does a large trade in Nos. 8 to 14, the Yedi Kulé Works at Constantinople produce Nos. 4 to 8, and the factories at Smyrna, Salonica, and various towns in Greece are fast depriving us of our monopoly. Italy is also successful with water twist and extra hard goods of second quality, but the practice of "short reeling" indulged in by many Italian, Austrian, and Belgian firms has in many instances opened the eyes of the peasants, who are learning that it is to their advantage to purchase "full length" British goods at a slightly higher price. The commercial privileges recently granted by the Sultan to Eastern Roumelia and Bulgaria will, in all probability, have an injurious effect on the genuine British trade in cotton yarns, as similar products will enter from Turkey duty free, thus gaining an advantage of at least 14 per cent. over British yarns.

Italian dyed yarns and three-cords in Nos. 8 to 12 have quite replaced British goods, and another feature detrimental to British trade in this branch is the recent establishment by Armenian refugees of dyeworks at Philippopolis, where, owing to the cheapness of labour, the yarns are wrung by hand, and a colour is thus produced which far surpasses that of foreign-dyed yarns both in evenness and brilliancy.

When the mass of the population were better off than is now the case, British-made sewing thread commanded the market, and Continental manufacturers experienced great difficulty in effecting sales, but the imperative necessity of finding lower-priced substitutes has brought about an influx of Belgian, Austrian, and German goods, many of which are made up and packed so as to delude the customer into the belief that he is buying British wares.

For the first time for years past "Tricot's printed trouserings" and similar goods were sold here by travellers representing Russian firms at Lodz, who took advantage of the encouragement offered them by the Imperial Government in the shape of reductions in railway transport and freights, as well as substantial export premiums. Italian competition is active and increasingly successful, but there are indications that in some branches, such as "Oxfords," British trade is recovering lost ground in this respect.

In the jute trade, Scotland did less than ever before, and Calcutta sacking, even when naturalised in the United Kingdom by having been stored in British ports for some time, is at present unpopular with importers, as it has to undergo disinfection on entering Bulgaria. The consequence was that almost all the business done in this line was transacted with Italian, and still more with Austrian, firms, which now produce goods equal in quality to those of British origin, and offer the additional inducement of a discount of from 3 to 5 per cent. at Triest or Bourgas.

Wenchow (China).—The demand for cottons, though below that of 1899 and 1897, was equal to that of 1896 and above that of 1898. It may be mentioned that the place of T-cloths is said to be now largely taken by a cheaper and poorer Indian cloth, 40yds. to the piece and 40in. in width. This is used chiefly to line tea bags.

Indian yarn has steadily fallen since 1896. How great the change has been, a comparison of 1895 and 1900 will show :—

—	Quantity.	
	1895.	1900.
	Piculs.	Piculs.
Indian	1095	480
Japanese	132	519
Chinese	6	3549

These are the figures for steamer-borne yarn alone. If those of the junk trade were available, the displacement of Indian by Chinese yarn would be still more marked.

Woollens have been fairly steady for the last six years, but the import is only half that of the palmy days of 1891-93. The reason seems to be the increasing import of raw cotton from Hankow and Ningpo, and its use as wadding. Woollens are a luxury, and will not be bought until either their price in silver falls again or the opening up of the country sufficiently enriches the natives.

Samshui (China).—Of foreign imports, cotton goods were valued at £80,000, a decline of £124,000, or about 61 per cent. The principal items were grey shirtings, £15,500 (decrease £10,800) ; white shirtings, £21,200 (decrease £11,800) ; T-cloths, £4600 (decrease £4400) ; Japanese cotton flannel, £1800 (decrease £400) ; Japanese cotton cloth and crape, £1600 (decrease £800) ; Indian yarn, £30,100 (decrease £90,100).

These figures present some rather striking contrasts. The value of cotton goods last year was nearly equal to the total amount of foreign imports this year ; Indian yarn alone last year exceeded by 50 per cent. the total value of cotton goods, including yarn, this year. In 1899 cotton goods represented considerably over one-half of the foreign imports, in 1900 they represented only a little over one-third, and account for some 97 per cent. of the total decrease in imports.

The decrease of Indian yarn from over 6,250,000lb. to less than 1,500,000lb. must have caused considerable loss to a great number of families of the labouring class. Since the opening of the port in 1897 the weaving of foreign yarn into cloth in the neighbouring villages and towns has grown into quite a flourishing industry, which has added considerably to the material well-being and prosperity of those engaged in it. The centre of the trade is Sainam, a few miles distant, where a market for the sale of the cloth so woven is held several times a month. A certain amount of this cloth is made into native clothing, and the two together figure in the list of exports to the value of nearly £6000.

The value of woollen goods declined from £10,800 to £4500, the principal item being British camlets, £3200, against £7500 in 1899.

The imports of cotton goods amounted to nearly £25,000, an increase of about one-half. Shirtings and T-cloths made up about 53 per cent. of this total, Indian yarn 25 per cent., and the remainder was mostly Japanese cotton flannel and cloth. It is noteworthy that Kumchuk took over £7000 worth of manufactured cotton goods, against about £300 last year. This was probably due to the removal of the likin barrier between that place and the large neighbouring town of Kowkong towards the end of the summer, since nearly all these goods were imported during the latter half of the year.

Woollens rose from £2700 to over £4800, mostly British camlets.

THE GAZETTE.

ENGLAND.

Partnerships Dissolved.

Walter Frederick Paxman, Charles Edwin Hill, and Lionel James Andrews, dyers, etc., Bristol, as E. E. Paxman and Co.

L. Waite and C. Waite, wool merchants, Bradford, trading as Luke Waite and Co.

Edgar Priestman and Joseph Robertshaw, commission wool combers, Thornton-road, Bradford, as Joseph Robertshaw and Co.

Thomas and Preston, yarn agents and merchants, 46, Arcade Chambers, St. Mary's-gate, Manchester.

Ferdinand Ernst and Gustav Sengstack, shipping merchants, 32, Oxford-street, Manchester, as Riensch am Ende and Co., by the death of F. Ernst.

Thomas Priestley, Arthur Nathaniel Briggs, Lister Smith, George Edward Tetley, and Walter Priestley, stuff merchants, Bradford, as Milligan, Forbes and Co. ; as regards T. Priestley and G. E. Tetley.

Richard Calvert, Henry Calvert, William Parker, Henry Calvert the younger, and Frank Calvert, cotton spinners and manufacturers, Walton-le-Dale, Preston, and elsewhere, as William Calvert and Sons.

Charles Robert Attenborough, Charles Edwin Attenborough, and John Bennett, hosiery manufacturers, Sutton-in-Ashfield, as C. R. Attenborough and Co.

Voluntary Windings-up.

Chardonnet Silk Company Limited ; Mr. E. De Rodakowski, 112, Wood-street, London, liquidator.

Cumberland Hosiery Company Limited ; Mr. M. M'Connel, of Blackyett, Ecclefechan, N.B., liquidator.

The Bankruptcy Acts, 1883 and 1890.

Receiving Order.

William Player (trading as James Player and Son), woollen merchant, 16, Mary-le-Port-street, Bristol.

Adjudications.

William Player (as James Player and Son), woollen merchant, Mary-le-Port-street, Bristol.

George Henry Clarke (as G. H. Clarke and Co.), grey cloth agent and merchant, Fountain-street, Manchester ; formerly in partnership with Frederick Arthur Goodhand, as Goodhand and Clarke

Frederick Arthur Goodhand, grey cloth agent, Fountain-street, Manchester ; formerly in partnership with George Henry Clarke, as Goodhand and Clarke.

NEW COMPANIES.

H. T. Normanton and Co. Limited.

Registered July 19, with a capital of £10,000, in £100 shares, to acquire the business of cotton manufacturers now carried on by H. T. Normanton, R. Normanton, and W. Heap, as H. T. Normanton and Co., at the Throstle Nest Mill, Nelson, to acquire looms and other machinery for the manufacture of cotton and woollen goods, and to carry on the business of cotton manufacturers, cotton and yarn merchants, etc. No initial public issue. The number of directors is not to be less than two nor more than five ; the first are H. T. Normanton, T. Brierley, R. Normanton, W. Heap, and T. Nuttall ; qualification, 10 shares. Registered office, Throstle Nest Mill, Nelson, Lancashire.

Horrocks-lane Dyeing and Printing Company Limited.

Registered July 29, with a capital of £35,000, in £1 shares, to acquire the business of dyers, printers and finishers now carried on by Messrs. J. Welsh and J. Dunlop, as the Horrocks-lane Dyeing and Printing Company, and Percy Lee in partnership, under the style of the City Raising Company, to adopt with J. Welsh and J. Dunlop, and to carry on the business of bleachers, dyers, calico printers, calenderers, embossers, engravers, designers, raisers, finishers, spinners, doublers, manufacturers, merchants, brokers, shippers, agents, dealers (both wholesale and retail) in calico, cotton, silk, linen, worsted, woollen, velvet, glass, wood and indiarubber, etc. Minimum cash subscription, £100. The first directors (to number not less than two nor more than five) are H. Kupferberg, F Cunningham, J. Leaurisch, and G. W. Chadwick ; remuneration, as fixed by the company. Registered by G. Trenam, 7, New-court, London, W.C.

Crossley Automatic Loom Shuttling and Manufacturing Syndicate Limited.

Registered July 27, with a capital of £10,000, in £1 shares, to adopt an agreement made by R. Marsden and others for the acquisition of certain patents relating to an improved shuttle-changing motion for looms, and generally to carry on the business of ironfounders, mechanical engineers, manufacturers of agricultural implements, toolmakers, brassfounders, metalworkers, cotton spinners, general textile manufacturers, manufacturers of bleaching materials, etc. No initial public issue. The number of directors is not to be less than three nor more than five; the first are R. Marsden, C. Williams, A. Taylor, and two others to be appointed at the first statutory meeting; remuneration, as fixed by the company. Registered by Waterlow Brothers and Layton Limited, Birchin-lane, London, E.C.

Holland and Webb Limited.

Registered July 25, with a capital of £150,000, in £1 shares (50,000 preferred), to adopt an agreement with W. F. M. Webb, H. L. Lippold, and J. H. Shaw, for the acquisition of the business of silk and yarn agents and general merchants, carried on by W. F. M. Webb, in partnership with H. L. Lippold and J. H. Shaw, at Weekday-cross, Nottingham, and elsewhere, and to carry on the business of silk mercers, silk weavers, cotton spinners, wool merchants, yarn merchants, cloth manufacturers, furriers, haberdashers, lace manufacturers, hosiers, feather dressers, manufacturers of and dealers in veilings, cloth, cambric, dress and other goods, fabrics, furniture and fancy goods, etc. The number of directors is not to be less than two nor more than five; the first are W. F. M. Webb (chairman), H. L. Lippold, and J. H. Shaw; each of the two first named may retain office so long as he holds 500 shares; remuneration of W. F. M. Webb and H. L. Lippold, £750 each per annum; of J. H. Shaw, £400 per annum; and of others, £100 each per annum. Registered office, Weekday-cross, Nottingham.

John and Henry Bleackley Limited.

Registered July 27, with a capital of £100, in £1 shares, to acquire the goodwill and trade marks of the business of J. and H. Bleackley, of Myrtle Grove Bleachworks, Prestwich, to adopt two agreements with the Bleachers' Association Limited, and to carry on the business of bleachers, dyers, finishers, chemical manufacturers, textile manufacturers, etc. No initial public issue. The general manager or general managers shall be the director or directors of the company. Registered by Patersons and Co., 25, Lincoln's Inn Fields, London, W.C.

Planen Lace Company Limited.

Registered July 26, with a capital of £2000, in £1 shares, to carry on the business of makers-up, manufacturers, makers, finishers, and merchants of lace, embroidery, and other textile materials used or likely to be used in made-up articles for ladies' and children's wear. No initial public issue. Table A mainly applies. The number of directors is not to be less than three nor more than five; the first are to be appointed by the subscribers; qualification, £50. Registered office, 16, Castle-gate, Nottingham.

M. C. Thomson and Co. Limited.

Registered at Edinburgh, July 24, with a capital of £120,000, in £1 shares, to acquire the business carried on by M. C. Thomson and Co., flax and hemp spinners, sailcloth manufacturers, and general merchants, in Glasgow and Arbroath, and to carry on the same. The number of directors is not to be less than three nor more than seven; the first are J. Macfarlane, J. Wylie, M. B. Thomson, W. Crockett, and W. Carswell; qualification, £250; remuneration, as fixed by the company. Registered office, 25, Hope-street, Glasgow.

Peter Scott and Co. Limited.

Registered at Edinburgh, July 23, with a capital of £25,000, in £10 shares, to acquire the business of Peter Scott and Co., of 11, Buccleuch-street, Hawick, and to carry on the business of hosiery manufacturers, etc. The number of directors is not to be less than two nor more than five; the first are P. Scott, T. Scott, J. Glenny, and C. Wilson. Registered office, 11, Buccleuch-street, Hawick.

Andrew Greenhalgh Limited.

Registered July 6, with a capital of £100, in £1 shares, to acquire the goodwill and trade marks of the business of Andrew Greenhalgh, of Clough Bleachworks, Radcliffe, to adopt two agreements with the Bleachers' Association Limited, and to carry on the business of bleachers, dyers, finishers, dressers, textile manufacturers, etc. The general manager or general managers shall be the director or directors of the company. Registered by Patersons, Snow and Co., 25, Lincoln's Inn Fields, London, W.C.

James Hardcastle and Co. Limited.

Registered July 6, with a capital of £100, in £1 shares, to acquire the goodwill and trade marks of the business of James Hardcastle, of Bradshaw Works, Bolton, to adopt two agreements with the Bleachers' Association Limited, and to carry on the business of bleachers, dyers, finishers, dressers, textile manufacturers, etc. The general manager or general managers shall be the director or directors of the company. Registered by Patersons, Snow and Co., 25, Lincoln's Inn Fields, London, W.C.

William Calvert and Sons Limited.

Registered July 3, with a capital of £250,000, in £10 shares (12,500 preference), to acquire the business carried on at Walton-le-Dale, near Preston, Lancashire, and in Manchester and elsewhere, as William Calvert and Sons, to adopt an agreement with R. Calvert, and to carry on the business of preparers, spinners, doublers, and manufacturers of cotton and other fibrous products and materials, dyers, printers, and finishers of cotton and other goods and fabrics, etc. No initial public issue. The number of directors is not to be less than two nor more than seven; the first are R. Calvert, Henry Calvert, W. Parker, Henry Calvert, jun., and F. Calvert; qualification, 100 shares; remuneration, as fixed by the company. Registered office, Flats Mills, Walton-le-Dale, Preston, Lancashire.

Brearley Brothers Limited.

Registered July 13, with a capital of £9000, in £5 shares, to adopt an agreement with T. Brearley and W. Brearley for the acquisition of the business of silk spinners and weavers carried on by them as Brearley Brothers, at Hey Mills, Heywood, Lancashire, together with the premises in which the same is carried on, and to carry on the business of spinners, waste dealers, weavers, bleachers, dyers, etc. No initial public issue. The first directors are T. Brearley and W. Brearley (managing directors), J. Brearley, S. Brearley, and R. Brearley; remuneration, as fixed by the company. Registered office, Hey Mills, Mount-street, Heywood, Lancashire.

Leigh Dyeing Company Limited.

Registered July 11, with a capital of £5000, in £1 shares, to adopt an agreement with J. Berry, and to carry on the business of dyers, bleachers, calico printers, finishers, cloth merchants, cotton spinners and doublers, flax, hemp and jute merchants, makers of bleaching, dyeing, printing and finishing materials, etc. No initial public issue. The number of directors is not to be less than two nor more than seven; the first are to be appointed by the subscribers; qualification, £1; remuneration, £50 each per annum. Registered by Jordan and Sons Limited, 120, Chancery-lane, London, W.C. Registered office, Brewery-lane Mill, Leigh, Lancashire.

JOTTINGS.

THE directors of the Bradford Dyers' Association have decided to pay an interim dividend at the rate of 7 per cent. per annum on the ordinary shares of the association for the half-year ended June 30.

PUSCHER, a German chemist, has met with great success in using glycerine mixed with glue to increase the adhesive power of glue. If mixed in the proportion of one part glycerine to three parts of glue, all brittleness will disappear. This mixture is also made use of for lining leather, etc.

THE official return of the United States Consul for Bradford shows total exports for July of £91,835, as compared with £133,850 in the corresponding month of last year. The chief decreases are £23,819 in dress stuffs and linings, £7464 in cotton cloths, £7628 in wool, and £3745 in machinery. The returns are an improvement on last month, when the exports were £89,226.

THE Secretary of State for Foreign Affairs has arranged that during the temporary extension of the period of the appointment of British commercial agents in various countries abroad, the fees hitherto levied for answering inquiries, etc., shall be remitted, except in so far as the cost of journeys undertaken by them for private firms has to be met.

THE first forecast of the jute crop in Bengal, issued by the Department of Land Records and Agriculture in that province, has been received from the India Office. Owing to a slight deficiency in the rainfall during the early months of the year, the area of cultivation is still below the normal, though in excess of that of last season. The whole out-turn of the crop, however, is likely to fall below that of last season, being estimated at 62½ lakhs of bales, against 64 lakhs of last year, and 65 lakhs the normal crop. The total area under cultivation amounts to 2,216,500 acres, which is little short of the 2,240,000 which constitutes the normal area under jute in Bengal.

MANY of the American felt manufacturers are experimenting with a new fabric called, for want of a better name in the trade, mohair felt. As the name implies, mohair tops, and in some instances noils and waste, are the chief ingredients, giving to the fabric when finished that lustrous hairy-like quality so distinctive of mohair fabrics. The new fabric is being largely used at present by wholesale milliners and manufacturers of women's felt hats. Lustrous, silky hairs from 1 to 2in. long stick out at all points of the fabric and appear quite numerous in the finished hat. The material possesses the charm of novelty, and in addition has that distinctive feature or style which is so desirable in a new fabric.

THE Board of Trade returns for July and the seven months ended July 31 show that the declared value of goods imported during the month amounted to £43,028,822, against £40,264,167 in 1900, and £39,935,372 in 1899; and during the seven months to £305,506,327, against £295,899,033 in 1900, and £276,659,107 in 1899. Of foreign and colonial merchandise exported in the month, the value was £5,526,083, against £4,782,314 in 1900, and £5,441,488 in 1899; and in the seven months £39,608,709, against £38,203,335 in 1900, and £38,948,805 in 1899. The value of British and Irish produce and manufactures exported in the month was £24,385,771, against £24,550,557 in 1900, and £23,195,958 in 1899; and in the seven months £163,182,169, against £168,927,321 in 1900, and £149,717,852 in 1899.

ORDINARY naphthalene, alias albo-carbon, is by far the best substance either to ward off or actually to kill wool moths. Naphthalene has a disagreeable odour, but it can be removed from any fabric by twelve hours' "airing," and it will not injure the most delicate material. Sprinkle a teaspoonful of the powder among the woollen articles, and when possible wrap them up in sound paper, to economise and concentrate the smell. It is, however, most important to remember that naphthalene and other similar substances are only fatal to the adult moths; they are absolutely harmless to the eggs and larvæ. These latter can only be killed by steam or dry heat. There are various preparations on the market called "moth-balls" just now, but the results of a moth campaign show that plain naphthalene without camphor, pepper, or other ingredients, is by far the best.

THE report of their committee presented at the annual meeting of the Federation of the Master Cotton Spinners' Associations, held on the 30th ult. at Manchester, showed that during the year ended June 30 last there had been an increase both in the membership and in the number of spindles held by the members. The spindles number 20,068,658, an increase for the year of 1,720,763. Two new local associations have been formed, one in Farnworth and one in Rawtenstall. There has been an increase of opinion in favour of the various employers' associations in the county joining together as one body in labour and other questions. The committee stated that they "learn with satisfaction that definite steps are in progress for the formation of a raw-cotton market in Manchester. That this will be for the best interests of the trade generally there can be no two opinions."

THE square cotton bale has of late been making an unenviable record as an incendiary. The statistics of disastrous losses resulting therefrom have a grim significance. From fire data collected by the New York Commercial, the somewhat startling fact is brought out that in Brooklyn alone during a period from July 1, 1899, to January 8, 1901, warehouse fires caused by old-style cotton bales aggregated £451,400, and this, in addition to the property loss of the Hoboken fire of a year ago, swells the loss to £1,520,000 in the region of New York harbour. Instances of loss elsewhere are given amounting to £44,500. These are big figures, and it would seem that the square bale of cotton will sooner or later have to make way for a bale that is not so great a fire risk.

THE statistics of textile machinery in the United States for 1901, as compared with the figures for 1900, show a great extension of the industry. Looms show a slightly smaller percentage of increase than do spindles, being 7 per cent. for the former and 7½ per cent. for the latter. There are 1,578,049 more cotton spindles reported for the whole of the country in 1901 than in 1900. The grand total of cotton spindles is 22,601,072. Over 61 per cent. of these new spindles are located in the South. Compared with this increase for the whole country, the percentage of increase in the looms and spindles of the South is all the more noteworthy. During the past year there have been installed in the Southern States 965,166 cotton spindles and 18,375 cotton looms, or an increase of 16·7 per cent. in the cotton spindles of that section, as compared with 7½ per cent. increase for the whole country. As regards looms, there were 483,398 in 1900; now there are 522,482, an increase of 34,084.

THE quarterly meeting of the Cotton Buying Company Limited (Oldham, Manchester, and Liverpool) was held at Oldham on the 20th ult. Mr. Thomas Coates (Central Mill, Oldham), who presided, said that was the eightieth quarterly meeting, and during the whole of that twenty years the company had never missed one year paying a bonus. He urged members to use their influence in increasing the business of the company. If they got the amount of business they ought to get, they would soon be in a position to alter the conditions of buying and selling cotton in Manchester and Liverpool. There was a movement in favour of a "spot" cotton market in Manchester. He considered that the users of the article ought to be in a position to say where they would buy the cotton. The report and accounts were adopted, and a bonus of 5s. per cent. on purchases was declared. The balance gain on trade account was £676. There are ninety-two firms in membership with the company, representing 5,750,000 spindles.

AN artificial silk has been introduced into Germany which, although claimed to be new, is very much on old lines. Copper, ammonia, and cotton waste are mixed in a large vat. In about six hours a liquid of dark-blue colour is formed, which passes into a large filter press, and then out through small glass tubes through a mild sulphuric-acid bath. It is then of a gelatinous consistency, and is caught by a small glass rod in the hand of a boy or girl, and reeled on to a large glass spool as it passes through the bath. The copper and ammonia, together with other chemicals, are deposited as a sediment and are used again. As the threads are reeled, they receive a bath of cold water from a syphon. The numerous spools centre on one large spool, and are then reeled on to another, and so on, always under cold water, until all chemicals and acids are removed. This stage of the process takes four hours. The thread is then taken to a drying room. A corporation has been formed to work the process, with a paid-up capital of £100,000, called "Vereinigte Glanzstoff Fabriken"; it has now in operation a factory employing 400 hands, in the village of Dremen, ten miles from Aix-la-Chapelle, and a factory employing an equal number of hands at Mulhausen, Alsace, Germany.

A CHEAP and effective dressing for a belt is tallow. When a belt is pliable and only dry and husky, the application of blood-warm tallow, thoroughly dried in the heat of the sun or fire, will tend to keep the belt in good working condition. The oil of the tallow passes into the leather, serving to soften it, and the stearin is left on the outside to fill the pores, and leaves a smooth surface. The addition of resin to the tallow for belts, if used in wet or damp places, will be of service and help to preserve their strength. Belts which have become dry and hard should have an application of neatsfoot or liver oil mixed with a small quantity of resin. This prevents the oil injuring the belt and helps to preserve it. There should not be so much resin as to leave the belt sticky. Belts should not be soaked in water before oiling, and penetrating oils should but seldom be used, except occasionally when a belt becomes very dry and hard. It may then be moistened a little and have neatsfoot oil applied. For new belts a composition of tallow and oil, with a little resin or beeswax, should be used. Prepared castor-oil dressing is good, and may be applied with a brush or rag while the belt is running. Belt dressings of any kind must not be applied too liberally in the case of a new belt, otherwise it is apt to stretch, making it very liable to run out of line.

THE directors of the Yorkshire Indigo, Scarlet, and Colour Dyers, in their second annual report and balance-sheet, state that after providing for depreciation of dyehouses, leases, plant, and machinery, and all other charges, the trading for the past year has resulted in a profit of £28,164. To this the balance brought from last year's account requires to be added, making £30,675. Out of this there has been paid interest on debenture stock to 30th June, 1901, £6655; dividend on preference shares, £8134; and interim dividend on ordinary shares, £5187. There remains a balance of £10,699, which the directors recommend should be appropriated as follows:—Transfer to a reserve fund, £2500; in payment of a dividend on the ordinary shares at the rate of 9 per cent. per annum for the half-year ended 30th June, 1901, making, with the interim dividend already paid, 8 per cent. for the year, £6641; to carry to next year's account, £1557. During the past year the high price of coal has materially affected the company's profits, and the directors are glad to note the return to lower rates. Exceptionally heavy expenditure has been charged against revenue in respect of repairs, renewals, and maintenance of the company's dyehouses and plant, and considerable extensions and improvements have been carried out during the year.

THE TEXTILE COLOURIST:

DEVOTED TO

Practical Dyeing, Calico Printing, Bleaching, Finishing, Etc.

Bleaching Vegetable Fibres.

BY E. TASSEL.

(Continued from page 211.)

THE soda lye should also remove all the fatty acids liberated during the preceding operations but not dissolved; with these it forms actual soaps, which in turn dissolve, and thus facilitate the removal of the remainder of the fatty acids present. So far as the pectin principles are concerned, these are displaced by the soda from their compounds with cellulose, pectates being formed, which are succeeded by highly-coloured soluble metapectates. It should be noted that this conversion of the pectin principles into salts is not an instantaneous process, but requires four or five lixiviations. It has been, and still is, thought that the substances constituting the bulk of the colouring matter of the fibre do not become soluble until they have been oxidised by grassing or chemicking. Nothing, however, is more erroneous than this view, the fact being that the pectin principles are entirely and totally converted into soluble compounds by the soda, and can be completely eliminated without either grassing or bleaching.

By the first lye-boiling—which is generally performed under a high pressure—the inner parts of the fibre, hitherto inaccessible owing to the low solubility of lime, are reached, and the attack on the pectin principles is complete. The lignocelluloses are gradually dissolved; but as regards the adipocelluloses, the result obtained differs totally, according to the sodium salt employed. We have already found, in the case of flax, that experiment proves:

1. That neutral sodium carbonate has no action on the adipocelluloses in the flax fibre.
2. That causticised sodium carbonate ("soda salt"), containing 20 per cent. of caustic soda, is rather more active than the neutral salt, although still very slow in action.
3. That pure caustic soda completely dissolves the adipocelluloses in flax, provided they have not already undergone premature oxidation either by grassing or by the action of hypochlorites.

Caustic Soda Lyes.—To obtain a full white bleach it is therefore necessary to use caustic soda, though in France this practice is not yet general for linen bleaching, owing to the prevalence of the erroneous idea that caustic soda attacks or attenuates the fabric. As a matter of fact, caustic soda is incapable of such corrosive action unless employed in excessive quantity and with admission of air. For this reason the use of special forms of apparatus is necessary, and when these are employed nothing but good will result from the use of caustic soda.

The first of these appliances in point of time is the Mather and Platt kier. This consists of an ordinary cylindrical wrought-iron kier arranged horizontally so as to appear like a large pipe laid on the ground, with one end closed. The open end may be closed by a sliding door that can be raised vertically by means of an ingeniously-arranged steam piston. Inside the kier are two rails, communicating with the rail track of the works, and on which run the trucks containing the goods to be treated. These trucks form water-tight tanks, provided with only a single outlet at the bottom, for the circulation of the lye.

The latter is aspirated by a centrifugal pump through a double pipe, either by way of the aforesaid orifice in the truck or in the kier itself, the liquid being returned through an external pipe at the top of the kier. The lye is thus poured into the loaded truck, which it fits completely, and is then drawn off again by the pump, the excess overflowing into the kier, where it is heated up by means of a steam coil in the bottom, and whence it is drawn away by the pump and returned to the circulation.

The great advantage of this method is that the necessity for entirely filling the kier with lye is obviated, it being sufficient to keep the trucks filled and the goods covered, to ensure the safety of the operation; the outer kier merely receives the overflow. The communications between the kier and the pump may be cut off, and the latter connected by a three-way cock, with a beck wherein fresh lye is prepared, or with a hot-water tank, or, again, with the cold-water service.

The *modus operandi* is as follows:—In order to expel air from the fabric, the latter is saturated with soda liquor in a machine similar to that described in the lime-bowking process. On leaving this solution the goods are piled up closely in the truck, which is then run into the kier. The door being shut, the lye circulation is started, and the air in the kier is expelled by a jet of steam blown in at the bottom and displacing the air, the result being that at the end of about three-quarters of an hour no trace of air will be left in the kier. This done (and not earlier) the steam is turned on full, so as to bring the pressure up to between 12 and 15lb. per square inch.

The lye-boiling will be complete in about six hours. The unexhausted lye is then drawn off and replaced by water, the lye being removed through a pipe which coveys the greater part into a reservoir at a higher level than the kier.

Thanks to the circulation of the lye in the truck it will be apparent that all the excess in the kier can be removed, leaving only just so much as is required to keep up the circulation; hence there is no fear that the goods will be left exposed to the steam, even for a moment. By the aid of an injector the kier can be almost entirely filled with hot water, which dilutes the lye—though the recovery of the latter will still pay for the trouble involved,—and gradually replaces it so that the admission of air will no longer be dangerous, and cold water may be run into the kier, the suction pipes from the truck and kier being closed and the pump connected up with the cold water service. The discharge tap is then opened for removing the dirty water, and the goods can be washed as much as is necessary in the kier. The door is then opened and the truck withdrawn for removal to the washing machine.

Under these conditions the operation of lye-boiling is effected in a very economical manner, and, unless as the result of error, it is impossible for the goods, boiled at between 105 and 110° C., to come in contact with the air for even an instant.

This very ingenious and popular kier is nevertheless attended with certain drawbacks, the horizontal arrangement necessitating a complicated closing device and increasing the cost. Moreover, in order to economise space in the kier, the makers have given the trucks a special shape, with which staunchness is difficult of attainment. For these reasons, the author has been endeavouring to devise a new pattern of kier which shall offer the same advantages as that already described, but more simple in construction, and therefore lower in price. His kier, which is made by F. Dehaitre, of Paris, is an ordinary wrought-iron kier with a large cover and mounted on three cast-iron feet; in fact, analogous to the Irish pot. Within this kier is loosely fitted a second, of slightly smaller diameter (4in. at least), which forms the essential part of the apparatus, and is perfectly staunch, there being only (in the bottom) a conical cast-iron tubulus, which fits into a cast-iron ajutage riveted on the bottom of the outer kier. This ajutage forms the connection between the inner kier and the circulation pump. This portable kier takes the place of the truck of the Mather and Platt kier; like the latter it may—if mounted on a four-wheel truck—be conveyed to the saturators or washers, but is superior through being more simple; its conical shape ensures perfect staunchness, and the ajutage is a connection that cannot leak. The circulation is maintained by a rotary pump of special pattern, capable of drawing from the inner kier (by way of the conical ajutage), the outer kier, the cold-water tank, and the lye tank, either together or separately. It discharges either into the inner kier, through an elbow pipe delivering into the upper part of the lid, or into the lower part of the inner kier, or again into a tank for the reception of the old lye. A vacuum can be produced by means of an exhaust, whilst an injector forces hot water into the kier when required.

The method of working this kier is as follows:—In the case of piece goods, these are saturated with a boiling hot solution of soap, the object of this treatment being to expel the air. The rolled-up pieces are then piled in the inner kier and transferred to the apparatus. This being covered up, a vacuum is produced within the kier, and the tap leading to the lye tank is turned on, the lye entering and completely saturating the contained fabric by reason of the vacuum, thus ensuring an entire absence of air in the folds of cloth. For greater security steam is blown in through a perforated coil at the bottom of the kier, and allowed to escape through the top during three-quarters of an hour, so as to entirely preclude the possibility of atmospheric oxidation. During the operation of lye-boiling the pump draws the liquor from the inner kier and returns it through the cover, the excess from the inner kier overflowing into the outer one, where it is reheated by a steam coil before being returned to the circulation. At the end of four or five hours the operation is concluded, whereupon the liquor is drawn off either by displacement with hot water from the injector or by means of a tap in the return pipe, which enables the liquor in the outer kier to be discharged into the collecting tank. The goods are washed by means of an injector, which draws, either together or separately, on the kier for removing the liquor, or on a hot-water tank, and discharges either into the collecting tank or into the outer kier for the purpose of washing. The feed water being at a temperature of 80°, and raised 17° by the injector, thus enters the kier at a temperature of 97° C.—*i.e.*, quite free from air. Owing to the disposition of the apparatus it is sufficient to wash the goods with 330gals. of hot water to fit them for the admission of the cold water (which contains air).

Although it is possible with any form of apparatus to lixiviate with any other kind of solution, the use of caustic soda is practically restricted to these special types of kier; but with the latter the operation can be performed with just as much lye as is required to keep the pumps going, and therefore 30cwt. of goods can be treated with 330gals. of liquor, whereas in the ordinary form of apparatus 110gals. of lye will only treat 2cwt. of goods. Another result of this saving of liquor is that more highly concentrated lyes (from 1 to 2 per cent.) may be used without increasing the consumption of caustic soda, though the activity of the lye is greater. With ordinary apparatus the use of such strong lyes is prohibited on account of the expense involved. The same applies to the hot washing. It will be understood that in the case of goods immersed in lye the only way to ensure proper washing is to run off the bulk of the liquor and replace it with hot water, a proceeding attended with the grave drawback that the goods are left exposed for a longer or shorter period to the direct contact of steam, the result of which is the rapid corrosion of the cellulose. In such cases, therefore, the only thing to do is to add enough water to reduce the lye to a harmless strength before commencing to draw it off. On the other hand, with the special double kier it is easy to withdraw nearly the whole of the liquid from the outer kier, since the goods are still kept covered by the circulating liquor, the vessel being then filled completely with hot water, the small remaining quantity of lye being thereby diluted to such an extent that the introduction of cold water is unattended with danger.

The first lye-boiling, to be really efficacious, should be followed by souring. *A priori*, it is not easy to see what is the effect of the acid bath at this stage, and it would appear (theoretically) useless, since the soda forms with the pectin bodies soluble salts that can be removed by washing. As a matter of fact, however, this souring is an indispensable operation, and greatly facilitates the bleaching. The reason of this is that the soda has formed, with the resinous bodies, and even with the adipocelluloses present, a series of more or less soluble salts which rest closely fixed on the fibre. The acid, in neutralising the soda, liberates the fatty acids, which, though sometimes insoluble, are not so when combined with cellulose; and consequently, though they may remain mechanically adherent to the goods, they will be readily removed during the following lye-boiling.

Moreover, the action of an acid is effective, even on the pectin compounds. If, for instance, a small sample of lye be collected in a test tube at the close of the lye-boiling process, it will be found somewhat dark in colour; however, on the addition of a little acid, almost complete decoloration will ensue, for the soda having been neutralised, the almost colourless metapectic acid is dissolved. The same reaction occurs in the goods. It is certain that even the most thorough washing does not remove the whole of the sodium metapectates formed, but that a large proportion of these remains fixed upon and colours the fibre; the acid attacks and decolorises them by saturating the base.

The two acids used for this first souring are sulphuric acid and hydrochloric acid. In contact with soda, the first forms a sulphate and the second a chloride; and as the difference in solubility between these two salts is small, the choice would seem to be a matter of indifference so far as ease of washing is concerned. Hydrochloric acid is, however, preferable, especially if the waste waters of the works are discharged into a public water-course.

(*To be continued.*)

Colours Fast to Milling and Washing.*

WOOL.—Hardly a quarter of a century has passed since the artificial or so-called coal-tar colours began to gain a footing in the woollen trade. At first, only the basic colours, such as magenta or methyl violet, and the small number of acid colours then known, like alkali and soluble blue, picric acid and naphthalene yellow, were used in woollen dyeing. Towards the end of the 'seventies the azo scarlet began the battle against cochineal, and a few years later naphthol black followed suit against log-wood. At that time, however, the artificial colours were still looked upon with a great amount of distrust, and were considered applicable to piece goods only in place of such loose colours as log-wood blue or purple, indigo carmine, Brazil wood, turmeric, etc. For dyeing fast colours on loose wool, the methods which had stood the test of centuries, and frequently were passed from father to son as a precious heirloom, still kept the field, and thus indigo and the best natural mordant dyestuffs alone had to be considered.

It was quite natural that dyers of fast colours kept aloof from the new dyestuffs, most of which until then had proved very fugitive. Indeed, it was quite a task to introduce alizarins for the dyeing of loose wool, although they are, beyond a doubt, far superior to logwood, fustic, red sanders and cochi-neal in fastness to light, acids or alkalies and stoving, besides possessing the great advantage of being always furnished in uniform quality. Since, however, the wood colours had been satisfactory for so many centuries in regard to fastness, they might possibly not have been superseded by the alizarins, unless the latter had recommended them-selves to dyers and manufacturers by the further advantage of better preserving the fibres for the spinning process, and thus producing a much softer handle of the goods. Two decades ago, spinners and spinning machines were covered with wood dust, and the spinning of dyed wool was the hardest and unhealthiest occupation in the whole textile industry. The dyeing of loose wool with ground dyewoods is now gradually dying out, and in many centres it is already a thing of the past. However, in spite of the great advantages which the alizarins offered, they were taken up very slowly for wool dyeing. Not that dyers clung in rigid conservatism to their traditional recipes, and were averse to progress in their art, but these new dye-stuffs require very careful working in order to produce level shades and prevent the wool from felting by the prolonged processes of mordanting and dyeing at boiling temperature, apart from the necessity of having to scour the wool very thoroughly before dyeing, the colours being always disposed to rub and smut badly. I need not mention that all difficulties have gradually been overcome, and the alizarins have acquired the greatest importance in the dyeing of all kinds of wool and woollen materials, especially for colours fast to milling.

But simpler processes of dyeing remained desir-able, and were continually searched for. As early as 1885, Dr. Knecht endeavoured to shorten the dyeing methods by mixing the alizarins with the mordants in *one* bath before entering the material and working the wool in this mixture, gradually heating to the boil. The process, indeed, yielded fairly good results with some colours—for instance, with ordinary alizarin and some azo-colouring matters like Cloth Red and Alizarin Yellow G G,—and possibly it might have acquired some import-ance if, at that time, a blue or green dyestuff had been known which could have been dyed by the same method for the production of compound shades. But, even apart from this deficiency, the process was not yet entirely satisfactory, as the colour lakes were formed too rapidly in the bath, and therefore the colours did not penetrate the material sufficiently well, and consequently rubbed off more or less in milling and wearing.

A new process of dyeing has found much favour during the last few years. It was first successfully introduced ten years ago in connection with Anthracene Yellow C and Diamine Fast Red F, in combination with Anthracite Black B, and later on was taken up for other colouring matters, such as Alizarin Red W S and Diamond Black. This process is generally called the after-chroming or one-bath method, and may be considered as a modification of the old stuffing and saddening method, and also of the one-bath method of Dr. Knecht mentioned before. It has come into very general use since the colour list was supplemented to such an extent as to obtain a full range of shades thereby, and more especially since the introduction of the anthracene acid colours, all of which are dyed by the same method of after-chroming, and which enable the dyer to produce all the most important shades in any degree of fastness.

The process of dyeing the anthracene acid colours by the after-chroming method is extremely simple, and does not require much practice. The matching, especially, is no more difficult than with the alizarin or wood colours, as the anthracene acid colours are not altered much in shade by the after-chroming. The wool is dyed at first exactly as with the acid colours in a slightly acid or neutral bath, which is prepared with the necessary quan-tity of dyestuff, 10 per cent. Glauber's salt, and from 2 to 5 per cent. acetic acid. The bath should be just lukewarm when the material is entered, and should then be heated to the boil within twenty or thirty minutes. After half-an-hour's boiling, between 2 and 5 per cent. more acetic acid is added, and the boiling is continued for half-an-hour longer, until the bath is well exhausted. Subsequently ½ to 3 per cent. of bichrome is added, and the boiling is continued for half-an-hour longer to fix the colour thoroughly. After this process a sample is taken for matching, and if the right shade should not have been obtained, the colour is brought to shade by adding the necessary quantity of anthracene acid colours, or any other colour which is not affected by the very small amount of chrome remaining in the bath, and which is sufficiently fast to milling. For instance, Brilliant Milling Green, Cyanole Green, Formyl Blue, Formyl Violet, Wool Red, Milling Red, Diamine Fast Red, Dia-mine Scarlet or Milling Yellow.

The after-chroming is generally done, as already described, in the dyebath itself, because this is the simplest method of working. The small quantity of chrome which usually remains in the bath does not interfere with its further use. It is sufficient that the wool of the next operation is boiled in the old liquor for a quarter of an hour before fresh colour is added, and thus the remaining chrome will be absorbed and prevented from disturbing the dyeing process. After-chroming in a separate bath is only resorted to in special cases—that is, when excessive quantities of chrome are used, as is sometimes done in dyeing extract wools in order to strip the old colour. As the process requires only from 1½ to 2 hours altogether, whereas in dyeing with alizarins the mordanting alone takes 1½ hour's boiling, and the dyeing itself sometimes 2½ hours more, the softness and spinning properties of the fibre must be preserved much better by the one-bath process than in the longer two-baths method. By the shortening of the process a greater output is possible, apart from the saving in labour and steam; in addition, the expenses of tartar, oxalic acid, lactic acid and the like, and also those of acetate and ammonia, used for levelling, are economised. Since the colours come out very clean, prolonged washing, such as is required for wood or alizarin dyestuffs, can be dispensed with. In addition to these very considerable economies the anthracene acid colours dye level and well through, and yield shades not inferior to those obtained by the best mordant colours on chromed wool, and it is therefore not surprising that they find an ever increasing application, and have replaced the alizarins in many large and small dyehouses.

The oldest of this group of colours is Anthracene Yellow C, which has been well known for many years as one of the best fustic substitutes on account of its unsurpassed fastness to light, mill-ing, acids, alkalies, and all other influences. This colouring matter is now found in almost every woollen dyehouse, and for many purposes it can hardly be replaced by any other product. On account of its superior fastness it has also been successfully introduced in the place of fustic yellow for dyeing military cloth used for trimmings by the Austrian-Hungarian army. The rich bloomy shade of Anthracene Chrome Black is of unsur-passed beauty—even finer than that of logwood black; and this not only in daylight, but also in artificial light. Anthracene Chrome Black pos-sesses an excellent fastness to light, milling, rubbing, steaming, potting, stoving, acids and alkalies, and it dyes level and well through, and covers even kempy fibres very well, without leaving the ends reddish. Anthracene Chrome Black F is chiefly used for dyeing rich bloomy shades on wool, whereas the brand F E dyes very deep blacks; and the more greenish brand 5 B is specially employed in hat dyeing. On account of its great fastness to wear and tear, Anthracene Chrome Black has been admitted for dyeing military cloth of the German and Austrian-Hungarian armies. A dyestuff which combines well with the foregoing colouring matters, and serves for the production of bright greens and olives, is Brilliant Milling Green B. It can be dyed in any way desired, acid or neutral, direct or on chrone-mordanted wool, or by the after-chroming method, with acetic or sulphuric acid, and is distinguished by its fine bluish-green shade, which is very fast to milling, and satisfactory in fastness to light. For shading towards the red side in addition to the Anthracene Acid Browns, Wool Red B and the well-known Diamine Fast Red F may be used.

Frequently no absolute fastness to milling is required, and it is often not essential that the colours should not bleed on to cotton. In such cases the dyeing can be considerably simplified by the application of the diamine colours which do not bleed into white wool, nor change in tone, and therefore are quite fast enough to milling, and in addition very fast to light, acids, alkalies, and stoving. They are fixed by about one hour's boil-ing in a neutral or slightly acid bath, and thus all the valuable properties of the wool are preserved by applying these colours. The diamines are, therefore, very useful for dyeing worsted yarns for flannels, and a special feature is that the dyeing of such yarns with diamine colours is successfully done in mechanical apparatus, which usually can be employed for loose wool only. The yarns are thus dyed perfectly even, both in self-colours and compound shades, with the least cost of labour, steam and time. Loose wool and slubbing for milling goods are also frequently dyed with the diamine colours. The process is simplicity itself: The bath is prepared with from 10 to 15 per cent. Glauber's salt for light shades, or double the quantity for dark ones; hard water is corrected with a little acetic acid, without being made dis-tinctly acid. The material is entered at between 120 and 140°, and the bath is heated to the boil within 15 to 20 minutes, and boiled half-an-hour. To exhaust the bath well, in dyeing dark shades from 3 to 5 per cent. acetic acid may be added in two or three por-tions, after the greater part of the colouring matter has gone on to the fibre. Care, however, has to be taken that the acid is not added too early, or else the colour will come out irregular.

A great number of diamine colours are suitable for wool dyeing—for instance, Diaminogene, Dia-mine Steel Blue, Diamine Sky Blue, Diamine Green, Diamine and Oxydiamine Violet, Diamine Fast Red, Diamine Scarlet, Diamine Bordeaux, Diamine Rose, Diamine Brown, Diamine Cate-chine, Diamine Gold, and Diamine Fast Yellow. Some of these colours are greatly improved in fastness by an after-treatment with metallic salts. By an after-treatment with blue vitriol the fastness to light of some diamine colours is greatly en-hanced, and Diamine Sky Blue F F and Diamine Blue R W, for instance, treated in this way yield blues which are hardly inferior to vat-blue in fast-ness to light. A green which is very fast to light and milling is obtained by treating Diamine Green G with chromium fluoride.

The diamine colour which has acquired the greatest importance in wool dyeing, however, is Diamine Fast Red F. It is certainly not inferior to madder red in fastness, and compared with alizarin red on alumina mordant it possesses the great advantage of not rubbing. When shaded with a little Anthracene Blue C and after-chromed with chromium fluoride or bichrome it yields the exact madder shade, and as the colour is absolutely fast to light, milling, acids, etc., and in addition is very clean, and the dyed wool has a very soft feel, it has lately been introduced for dyeing the red trousers and caps worn by the Austrian-Hungarian cavalry. It is also employed for many other purposes in the dyeing of fast colours on loose wool and woollen and worsted yarns. A special com-bination, frequently used for dyeing mode colours of absolute fastness on worsted yarns, is to dye Diamine Fast Red F and Anthracene Yellow C on a bottom of vat-blue, and to fix with fluoride of chrome or bichrome.

The foregoing colours are all distinguished by a very satisfactory fastness to light and milling, and other influences. For some classes of milling goods, however, these properties are not the only desiderata, and brightness of shade is required in the first place, whereas the milling is done with neutral soap only, without any soda. For such goods a number of acid colours are quite satis-factory—in the first place, Brilliant Milling Green, which is distinguished by its very brilliant bluish-green shade and its excellent fastness to milling. As stated before, it can be dyed direct or by the single-bath or two-bath methods. When used by itself or in combination with other acid colours, it is dyed with Glauber's salt and sulphuric acid. The same degree of fastness can be attributed to Formyl Blue and Formyl Violet, which yield blue and violet shades. Scarlets are dyed with Milling Red, and yellows with the extremely fast Milling Yellow, which is also very suitable for shading Brilliant Milling Green. I may mention that Milling Yellow is employed in the place of flavine for dyeing yellow cloth used for trimmings in the army. A black of extreme fastness to light, equal, if not superior, to any other black known, and very fast to a moderate milling, also fast to washing, steaming, acids and alkalies, is Naphthyl Blue Black, dyed with acetic acid and blue vitriol. This black is used in large quantities for milling goods and fancy knit goods. To the older brand,

* Abstract from a lecture by R. Loewenthal, Ph.D., before the Foremen Dyers' Guild.

Naphthyl Blue Black N, have recently been added Naphthyl Blue Black F B and F B B, which surpass the N brand in fastness to washing and withstand a fairly strong milling.

Anthracite Black B must also be noted, the colour offering a historical interest as being the first colour of bluish hue which was used for the after-chroming process. It was recommended about ten years ago, in combination with Diamine Fast Red F and Anthracene Yellow C, to be dyed in a slightly acid bath and treated with chromium fluoride, and this combination has frequently found favour for the production of fast mode shades. There are some milling articles which must be produced at a very low price, and can consequently be dyed with the cheapest colours only. For these the ordinary acid dyestuffs only are used, and especially the azo scarlets find extensive application. The goods, not standing soap, are milled in water only with fuller's earth, or with acid, and the patterns come out very nicely.

(*To be continued.*)

Silk Finishing.

IN the silk industry the finish is in many cases applied to the yarn and not to the woven goods. This is the case not only with coloured and uncoloured silk yarn such as sewing lace and embroidery silk, but also with many varieties of yarn intended for weaving into ribbon or other silk fabrics. In the latter case the finish given to the yarn may be considered as a preparatory process for the finish which is given to the woven goods. The lustre which the silk has lost in dyeing is restored by a lustring process consisting of the application of preparations which are varied according as the manufacturer desires to give the material a soft handle, or what is called "scroop."

Black dyed silk yarn can be softened and at the same time given this scroop by treating the material in a solution of citric acid, olive oil, water and soda or potash; for boiled off silk from 1 to 2 per cent. of olive oil (reckoned by weight of yarn), for soupled silk from 5 to 15 per cent., and for fringe silk from 5 to 20 per cent. of olive oil, is used. The proportion of oil should be varied according to the nature of the silk and the use to which it is to be applied—*i.e.*, whether warp or weft. For satin taffeta or other woven fabrics the olive oil is emulsified in double the quantity of water with a 65 per cent. soda solution. If the scroop effect is desired, from 20 to 25 per cent. of citric acid is added, and the mixture cooled to 35° C. The silk is immersed in this solution, and afterwards extracted and dried. In place of citric acid, which is best adapted for giving a soft handle of silk, there may be used either 10 per cent. of acetic, 9 per cent. of hydrochloric acid, or a dilute sulphuric-acid solution. A certain proportion of glue or gelatine is sometimes added to the emulsion to improve the handle of the goods.

When the yarn is intended for goods which are to receive a moiré or watered finish, it is treated in a sulphonated olive oil well diluted with water, and dried without being extracted. This serves to soften the silk. Another process consists in handling the silk half-an-hour in a soap solution consisting of from 20 to 30 per cent. of white soap at a temperature of 30° C. A method which is well adapted for sewing silk consists in handling the yarn for half-an-hour in a solution of water and fuller's earth. Recently silk has been weighed with various materials, such as acetate of lead, then dried and impregnated with olive oil without the addition of acid. From a hygienic standpoint this process is very objectionable.

The mechanical part of the finishing process consists chiefly in stretching the yarn. The wet skeins are hung on horizontal rods in an upright position, the workman pushes a stick through the lower part of the skein, and by jerking the skeins with this stick brings the threads parallel with each other, and stretches the silk from 2 to 3 per cent. This operation is also carried on by machines, of which there are various makes. By drawing the skein sideways as well as lengthways the threads are made to rub against each other, which serves to give the silk a lustre. This process is very important for sewing silk and silk twine. A much higher lustre is given to silk by means of machines in which the silk is drawn over metal cylinders, and steamed in closed vessels.

Fabrics made of pure silk require no finishing applications. The finish of such goods consists in hot-pressing, mangling or light calendering with or without friction. The finish of light silk fabrics is usually given to one side only of the goods by the application of easily-dissolved substances such as glue, gelatine, dextrine, tragacanth, gum arabic, resin, and other soaps, resin dissolved in alcohol, paraffin wax, and similar substances. Generally the finishing material is applied to the back side of the goods and while the cloth is stretched on the tenter bars. In this condition the finishing material is applied by hand. This dressing can be applied by machinery; the goods are then dried on a cylinder dryer, calendered or run through engraved cylinders to decorate the fabric. Silk and cotton goods are finished on one or both sides.

Silk fabrics made of pure unweighted silk yarn require the application of no finishing materials, but are simply hot-pressed; but suitable means must be employed in the case of cheaper qualities of silk to give the goods the requisite stiffness, solidity and scroop. The application of finishing materials to silk goods should be made only on one side, and in most cases this should be the back side. The best results are obtained not by saturating the goods with the preparation, but by applying the solution to the surface of the fabric while stretched on the tenter bars.

Various materials are used for finishing silk goods, such as rice water, gum solutions, ox gall, sugar water, isinglass, gelatine, poppy oil, and tragacanth. Other preparations are used for giving lustre to silk goods. These consist of metallic oxide solutions, such as sulphate of copper, lead, and bismuth oxides. After treating with either of these materials the goods are submitted to the action of sulphuretted hydrogen. Basic acetate of lead oxide may be employed in a similar way, and greatly heightens the lustre of black silk. For other varieties of finish resinous substances may be employed, such as amber, copal, rosin, and pyroxylic spirit. Resinous soaps made by boiling resin in alkali give a more durable finish than the gums, and are employed as waterproofing materials; water does not cause a spot when dropped on goods finished with this mixture. The following are a number of recipes for silk-finishing mixtures:—

1. 22lb. rice and 13gals. water. The rice water is strained through a sieve, and 110lb. of white fish glue is added. Albumen and dextrin may be used.

2. Silk is treated in a very weak solution of shellac dissolved in spirit, which imparts a stiffness and high lustre to the fabric; this method cannot be recommended, as it makes the silk very stiff and brittle. Another method consists in treating the silk simply with a solution of gum arabic or tragacanth and chloride of tin, or with rosin and amyl-alcohol.

3. This preparation is made by dissolving tragacanth in rain water, adding glue, and stirring the mixture thoroughly. It is then brought to the consistency of syrup by adding brown beer and brandy.

4. The warp is sized with gelatine. The weft is wound dry on the bobbin. A wet sponge is fastened in the shuttle; the weft thread passes over the sponge, and is moistened as it is woven in the cloth. The woven goods are then dipped in a hot gelatine solution, half-dried, wrung out, and then dried on the tenter bars.

5. Material for finishing silk on one side: ½lb. gelatine, 5gals. water, 3½lb. paraffin, 1lb. white wax, 2½lb. castor oil, and 2lb. soap.

6. Full finish for silk: 33lb. glue, 25gals. water, 1 pint tragacanth mucilage, 1 pint soap, and 1 pint cocoanut oil. If the goods possess too high a polish when calendered, it can be reduced by steaming over a steam jet or on rolls.—"Friedrich Polleyn Die Appreturmittel."

The Discharge of Indigo.

BY E. CLAYTON.

AMONG the numerous discharge styles in the printing trade, there is one which has always been in demand, to a greater or less extent, and that is the well-known indigo discharge style. Although there has been a great amount of literature on this subject, there are nevertheless many difficulties connected with its application, which can only be overcome by a thoroughly practical acquaintance with the different processes and reactions involved. My object, therefore, is to give, from a practical and theoretical standpoint, an outline of the method used to effect the destruction of the indigo on certain portions of the fabric, and the production of white and variously-coloured patterns thereon. The discharging agent almost universally used is chromic acid, although, within the past two years, the steam discharge has made a little progress.

The chromic acid is produced, as it were, directly in and on the fibre, by first printing the material with a soluble chromate, together with a suitable thickening, and then passing the fabric through dilute sulphuric acid. In the case of coloured discharges, pigments are employed which are able to stand the action of the acid; these being used either singly or mixed together in suitable proportions to obtain the desired shades.

The particular bichromate employed is merely a matter of choice, but the sodium salt $Na_2Cr_2O_7 \cdot 2H_2O$ is usually preferred, as against the potassium salt $K_2Cr_2O_7$, because of its greater solubility; and although the potassium salt contains no water of crystallisation, the difference in the atomic weights of Na and K balances this difference, both of them containing practically the same percentage of the active constituent, chromium trioxide. As regards the thickening to be employed, many writers on this subject state that for a white discharge British gum is used, and for coloured patterns blood albumen alone. Practical experience shows, however, that blood albumen, when mixed with the particular pigments employed, does not possess sufficient "body" to give anything like a clear and sharp outline, especially in the case of deep engravings, unless, indeed, the albumen is made up of such a strength as 8lb. or more per gallon, which is very exceptional. Of course albumen is required in all cases where coloured lakes are used; a mixture of egg and blood albumen being generally employed. The thickening adopted in conjunction with albumen is, almost without exception, gum tragacanth, more commonly known as gum dragon, for coloured discharges; but for whites, flour is the usual thickening.

As the depth of the dyed indigo ground varies according to the particular shade required, it is quite evident that a dark shade will require a much stronger discharge paste than a lighter shade, such as a sky blue. The latter shades require from 6 to 20oz. of $Na_2Cr_2O_7$ per gallon to effect a suitable discharge, while the dark shades require almost treble this amount.

In printing with the pigment colours there is always a great liability for the thickened substances to partly remain in the engraving of the roller, hence the printed parts have a bare and unpleasant appearance. This defect is generally known as "sticking in." Among the remedies for this are the following:—(1) To be careful in the selection of the pigments and to see that they are brought into as fine and smooth a state as possible, which may be done by grinding in a mill with a small amount of glycerine; (2) to have a small stud wheel on the end of the brush furnisher, and to revolve it in the opposite direction to the printing roller; (3) to add to the colour a small proportion of turpentine, or some such body as olive oil, Turkey-red oil, etc. But even after the above precautions have been taken it often happens that the colour, after being in use a short time, commences "sticking in" again, and as printed colours on indigo grounds are rather difficult to see, many hundreds of yards may be printed without the printer observing this defect; in many cases the pieces being completely spoiled. The only remedy in this case is to make up a fresh colour very carefully, taking note of the remedies given above.

The following proportions of the various ingredients employed for the production of white and coloured discharges may be taken as typical examples:—

White on Dark Indigo Ground.—4lb. flour; beat up into a smooth paste with 6 quarts water. Boil; cool to 37° C., and add 4lb. $Na_2Cr_2O_7 \cdot 2H_2O$, dissolved in 2 quarts water, 1½ gills NH_4OH. For lighter shades decrease the bichromate and NH_4OH. Instead of the NH_4OH, 1lb. of NaOH may be used.

Discharge Paste for Colours.—¾gal. gum dragon thickening, 8lb. $Na_2Cr_2O_7$, 3 gills of ammonia or 2⅛lb. caustic soda. Dissolve, and add to ½gal. blood albumen (4lb. to the gallon), ½gal. egg albumen (4lb. to the gallon), and ⅛gal. turpentine.

Yellow Discharge on Indigo.—1gal. pigment yellow ($PbCrO_4$), 1½gal. gum dragon, 2½gals. discharge paste, and $\frac{1}{16}$gal. olive oil.

Discharge Green.—1gal. pigment green (Guignet's), 1½gal. gum dragon thickening, 2½gals. discharge paste, and ⅛gal. olive oil.

Discharge Olive.—1gal. pigment orange, 1gal. pigment green, 3gals. gum dragon thickening, 5gals. discharge paste, and $\frac{3}{16}$gal. olive oil. A much lighter and yellower shade of green may be made from 1gal. pigment green, ¼gal. pigment lemon, 1¼gal. gum dragon, 2½gals. discharge paste, and $\frac{1}{16}$gal. olive oil. For a brown shade use one of the various brown lakes that withstand the action of the cutting bath.

Discharge Red.—20lb. vermilion and ¼gal. egg albumen. Beat up into as fine a paste as possible and add 1⅛gal. discharge paste, ½gal. gum dragon thickening, and $\frac{1}{16}$gal. turpentine. As the reds obtained with vermilion are very expensive, it is the practice with most printers to incorporate with this substance a proportion of one of the various red lakes (which must of course withstand the action of the cutting bath), and thus decrease the amount of the former required, though the brightest reds are obtained by the use of vermilion alone.

The proportions given in the above colours are for discharging dark shades, and must be reduced with gum dragon, albumen, and coloured pigment for light shades. It should also be noticed that whereas the percentage of chromate is reduced for light shades, the percentage of coloured pigment, and consequently of albumen, must remain the same in all cases. A light blue discharge may be obtained by using a weak discharge white, or Prussian blue along with albumen may be used.

Black on Indigo Ground.—This may be obtained by using either an ordinary copper or vanadium aniline black, such as the following :—(1.) 1gal. water, 14oz. chlorate of soda, 1lb. starch, and ½lb. dextrine. (2.) 1gal. water, 1¾lb. aniline salts, and 1½lb. starch. Boil ; cool a little, and add 5 grains reduced ammonium vanadate. When required for use, take 1 part of No. 1 and 1 part of No. 2. A pretty effect is obtained by adding to the chromate discharge paste sufficient sodium acetate to resist a subsequent cover of aniline black.

It is, of course, only used in the case of light shades of blue, as its effect would be scarcely perceived if printed on a dark indigo ground. After the pieces are printed they are dried on the cylinders, those containing aniline black as a part of the pattern being either hung in a warm room to age, or given a short passage through the Mather and Platt steamer.

After this operation the pieces are ready for the developing, or, as it is usually called, the "cutting" process. This consists in passing the pieces in the open width through a mixture of dilute sulphuric and oxalic acids, which is contained in a lead-lined tank, fitted with copper rollers at the top and bottom. The liquor is made by adding 5gals. sulphuric acid, 168° Tw., to 40gals. H_2O and 20lb. oxalic acid. It is kept at a temperature of about 60° C., and the pieces pass through the liquor at such a rate that they remain in the bath from one to two minutes according to some writers, but more usually from fifteen to thirty seconds. After leaving the cutting liquor the pieces are passed immediately between suitable rollers to squeeze out the excess of liquor, and are then passed into a long series of tanks, containing cold water, in order to remove every trace of acid.

The cutting process cannot be conducted with too much care, but the exact method of carrying it out, of course, depends to a certain extent on the percentage of chromate contained on the cloth, and the necessary quantity required to destroy the indigo. If too much chromate has been printed on, and the pieces are passed through the liquor at the ordinary speed, defects are almost sure to be produced. If, on the other hand, just sufficient chromate has been printed on to give good results when passed through the liquor at the usual speed, it will be found that if this speed is slackened the same defects occur. These defects are generally known as the "tailing" of the colours, and take the form of streaks, branching off from the edges of the printed colour.

According to some authorities this "tailing" is due to capillarity ; it is probable that the chromic acid, at the moment of liberation, immediately oxidises the indigo, and if the proportion of chromic acid produced is more than is required for this oxidation, it is possible that the fibres of the cotton adjacent to the printed places exert a capillary attraction on this excess, thereby producing the "tailing" of the colour.

From the above it is evident that sufficient chromate must be printed on the cloth to discharge the particular shade of indigo when passed through the cutting bath at a certain speed, in order that a clear cut pattern may be obtained. These results can only be assured by long experience, noting in all cases the strength of chromate paste used and the time taken in passing through the cutting bath.

Tendering is also liable to take place if (1) the discharge is too strong, or (2) if the cutting liquor is not thoroughly removed from the cloth. In the first case pieces are sometimes met with which will allow the finger to be pushed through the discharged places with very little resistance ; whereas in the second case it will be seen that not only the discharged places but practically the whole piece will be tendered. This latter case, however, rarely happens.

The addition of oxalic acid to the cutting bath is supposed to a certain extent to prevent the tendering action of the discharge, but its action in this respect has probably never been thoroughly substantiated. It is also said to prevent the deposition of the Cr_2O_3 in the fibre, which, if it did occur, would give very bad whites, and other colours would be dulled in proportion.

As regards the theory of the process : First, there is the action of ammonia on the bichromate ; the latter may be regarded as consisting of one molecule of normal chromate and one molecule of the anhydride of chromic acid, as $Na_2CrO_4.CrO_3$, and the CrO_3 reacts with ammonia to form ammonium chromate, there being always excess of NH_4OH present, as—

$$Na_2CrO_4.CrO_3 + 2NH_4OH = Na_2CrO_4 + (NH_4)_2CrO_4 + H_2O.$$

The excess of NH_4OH probably forms a compound, with the albumen, which prevents to a great extent the coagulation of the latter until it reaches the acid bath, for it is well known that alkaline solutions of albumen coagulate at a much higher temperature than aqueous solutions. As a result of this the colours are not coagulated, and, as a rule, are easy to work, frothing very little, and will keep for a very long time.

During the drying of the pieces most of the ammonia is driven off, but the albumen is not completely coagulated until the pieces are passed through the acid bath, when the formation of chromic acid, coagulation of the albumen, and consequently the firm fixation on the fibre of the coloured pigments takes place simultaneously. The chromic acid liberated immediately reacts with the indigo blue, oxidising it to isatin, which latter either combines with the H_2SO_4 to form sulphisatic acid, or is washed away.

$$2CrO_3 = Cr_2O_3 + O_3$$
$$C_{16}H_{10}N_2O_2 + O_2 = 2C_8H_5NO_2.$$

The Cr_2O_3 produced has practically no effect on the colours, or the whites of the pieces, as is the case with the wool fibre, and probably remains in the cutting liquor as sulphate or oxalate. — "Journal of the Society of Dyers and Colourists."

Mercerised Foulards.

FOR a long time the paranitraniline red reserve style has been very important to most colour printers, and it is particularly effective with mercerised goods. The process, however, offers certain difficulties, and, as literature on the subject is scarce, the following remarks will probably be welcome :—The sateen, after bleaching and mercerisation, is padded on the hot flue with the following mixture :—Beta-naphthol, 1500grms. ; soda lye of 22° Bé., 3375cc. ; soda and Turkey-red oil, 2500grms. ; boiling water, 10 litres ; gum tragacanth (60grms. to the litre), 5 litres ; cold distilled water to 50 litres. The naphthol is made into a paste with the soda lye, the Turkey-red oil is then added, and then the hot water. After solution has taken place the boiled tragacanth mucilage is added diluted with the distilled water. The padding is best done on a three-roller machine, using great pressure so that the goods only absorb about one litre per kilogramme of the above preparation. The goods must come to the foulard in a perfectly dry state, and care must be taken that they run through without creases. Too much heat must not be used. The goods must, however, leave the foulard dry. They are then first printed with toluidine pure colour, kept cold. This colour is made as follows :—168grms. of toluidine base in powder are rubbed up with 638cc. of hydrochloric acid of 18° Bé., and then added in portions to a litre of boiling water. The resulting white paste, when perfectly cool, is mixed with 4800grms. of starch thickening and 800grms. of broken ice ; 840grms. of sodium nitrite solution (145grms. to the litre) are then gradually added during ten or fifteen minutes. Just before use add 320grms. of acetate of soda. The starch thickening is prepared according to the following recipe :—Best wheat flour, 4200grms. ; cold water, 2 litres ; boiled tragacanth mucilage (60grms. to the litre), 6 litres ; acetic acid of from 6 to 7° Bé., 9 litres. The whole is boiled up and stirred till cold. The following are the recipes for reserve colours to be printed on next :—

Reserve Yellow.—Acridine Yellow G (Mühlheim), 140grms. ; Acridine Orange N O (Mühlheim), 14grms. ; boiling water, 200cc. ; acetic acid (7° Bé.), 600cc. ; stock reserve, 1875grms. ; glycerine (28° Bé.), 175cc. ; tartaric acid, 175grms. ; solution of tannin in acetic acid (1 in 1), 432½cc. ; tin-salt, 375grms. ; stannous acetate (18° Bé.), 375cc. The last six ingredients are mixed separately, and the solution of the dyes in the acetic acid and water is then stirred in.

The following is the recipe for the stock reserve :—Best wheat starch, 450grms. ; best yellow dextrine, 225grms. ; cold water, 350cc. ; stannous acetate (18° Bé.), 1½ litre ; acetic acid (7° Bé.), 250cc. Boil all up together. The tannin solution is made by dissolving 1kilo. of tannin in a litre of acetic acid of 7° Bé., and making up to 2 litres with more of the acid.

Reserve Green. — Light Green N (Mühlheim), 100grms. ; tartaric acid, 100grms. ; boiling water, 500cc. ; acetic acid (7° Bé.), 375cc. ; stock reserve, 2500grms. ; tannin acetic acid solution, 375cc. ; tin salt, 250grms. ; stannous acetate (18° Bé.), 375cc. Dissolve the dye in the acids, and then add the solution to the other ingredients, mixed separately.

Reserve Olive. — Brilliant Green (Mühlheim), 75grms. ; Acridine Orange NO (Mühlheim), 50grms. ; Acridine Yellow G (Mühlheim), 260grms. ; tartaric acid, 200grms. ; boiling water, 1 litre ; acetic acid (7° Bé.), 750cc. ; cold stock reserve, 5000grms. ; tannin acetic acid solution, 750cc. ; tin-salt, 50½grms. ; stannous acetate (18° Bé.), 750cc.

Dissolve the dyes in the acids and the water, and then add the solution to the others, mixed separately. The stannous acetate solution (18° Bé.) is made by dissolving 1200grms. of tin-salt in 800cc. of acetate acid of 7° Bé., and then mixing the solution with one of 1200grms. of sugar of lead dissolved in 800cc. of acetic acid of 7° Bé., diluted with 1 litre of boiling water. The mixture is filtered, and the filtrate diluted to 18° Bé.

After printing and drying, the goods have a short passage of from one and a half to two minutes' run through a small Mather and Platt. They are then developed on a two-cylinder foulard, in such a way that the developer comes on to the reverse side of the stuff. After leaving the wringing rolls the piece runs through the air for ten or twelve seconds, to complete the coupling, and is then at once thoroughly rinsed. It is then taken through a tartar-emetic bath (10grms. to the litre) at from 60 to 65° C., rinsed, soaped lightly at from 25 to 30° C. in a bath containing from 2 to 3grms. of Marseilles soap to the litre, rinsed, and dried on a frame. The following is the scarlet developing liquid :—1kilo. of paranitraniline red is made into a paste with a litre and a half of boiling water. It is then mixed with 4585cc. and a solution of sodium nitrate (145grms. to the litre) and allowed to cool. Fifteen litres of ice water and 6kilos. of broken ice are next added, and 2317grms of hydrochloric acid of 18° Bé. are gradually stirred in. Just before use 2144grms. of acetate of soda are added, and the whole is made up to 50 litres. The results are fairly fast to soap, says the "Boston Journal of Commerce," the gain in fastness being probably due to the greater affinity for dyes gained by mercerising the cotton.

Alizarin Turkey-red Dyeing.

THE many attempts which have been made during recent years to perfect a process by which alizarin in solution (that is, without deposits) may be employed in Turkey-red dyeing have usually failed because the solvents used had the effect of slightly deadening the bright fiery colour so much admired in the genuine Turkey red. On the other hand, with the addition of lime a deposit of insoluble alizarin lime was formed, which prevented the fibres being properly impregnated with the dye. A new method promises to overcome these difficulties, having as its chief feature the adding of the lime necessary in alizarin baths for developing the colour as calcium saccharate, after the preliminary oil and alumina bath usually used. The following are the quantities for yielding the best results:—In from 1000 to 1200 litres of water there are stirred 4300grms. 20 per cent. alizarin, and then the solutions of 230grms. calcined carbonate soda and 860grms. calcium saccharate, and, if desired, 80grms. tannin is added.

This alizarin bath is calculated for 35kilos. cotton, which is passed into the bath for from 10 to 15 minutes ; the bath may either be employed cold, or cold and then suitably rising in temperature. After the bath the material is steamed for between 1 and 2 hours at a pressure of from 1 to 1½ atmosphere. The action of the addition of this calcium saccharate to the alizarin bath is astonishing, as in at most 10 or 15 minutes the entire alizarin of the bath is evenly absorbed by the cotton, thus producing an actual dyeing. The capability of absorbing the lime possessed by the sugar overcomes the insolubility of the alizarin lime and forms with the latter a perfectly clear solution, which, however, is soluble enough to give up the alizarin to the mordanted cotton, and to form the much more insoluble compound of the sebate of alumina with alizarin. The fibre is saturated, and at the same time penetrated, after the dyeing, with the insoluble Turkey dye lack formed in the same, which dye lack is then developed to full effect in the ordinary way by clearing. Calcium saccharate is at present the most suitable lime compound in the group of the saccharates.

In the same manner as genuine Turkey red by the use of calcium saccharate, genuine Turkey rose may also be dyed by merely diminishing to a quarter or an eighth part the quantity of alizarin and the other above-mentioned additions to the dyebath according to the desired shade of colour ; and genuine Turkey violet may be dyed by employing an iron salt in the mordanting bath in place of alumina. In a similar manner, by the use of calcium saccharate, dyeing may be effected with all alizarin dyes.

Albumen Printing.

ALBUMEN steamed printing gives colours approaching madder in fastness, and far superior results to madder as regards beauty and lustre ; and the processes are extremely simple. The egg albumen is dried for sale to calico printers at a temperature not exceeding 50° C., to avoid coagulation, which renders albumen insoluble and useless. It is a good plan to prepare one's own albumen by drying the white of egg over warm water in shallow tin dishes ; the white of egg must be perfectly fresh to begin with. The dried product should be in pale yellow scales, entirely soluble in water. Blood-albumen is made from ox-blood, and is practically as good as the other. It only dissolves rather more slowly.

The albumen solution printing colour is made by soaking albumen in twice its weight of warm water (not above 90° F.) till it has swollen up, and then stirring till solution is complete. The solution is then passed through a rather fine hair-sieve. It soon goes bad, but can be kept a short time, if necessary, by mixing it with a little oil and turpentine. Since the discovery of the aniline dyes, they alone have been used for printing colours. The printing colour must be made a shade darker than pattern, because the fixing with steam makes it a shade lighter. The following are some approved recipes. In many cases, however, says "Der Färber und Wäscher," only practice can decide the exact proportion.

Blue.—Good brilliant ultramarine is rubbed up fine with a little albumen solution and a little water. To prevent frothing during the rubbing, a little olive oil is also added, and increases the warmth of the colour. The proportions will be about 1 part of dye to 3 or 4 of albumen solution.

Brown.—Mix together 1lb of cinnabar and 2lb. of black-lake (or soot), rubbing very fine. Then add 16lb. of caput mortuum, and rub up the whole with 24lb. of albumen solution. Everything must be as finely ground and mixed as possible. It is best to add the albumen solution in two or three lots, grinding each lot thoroughly before adding the next. The colour can of course be modified by altering the proportions.

Black.—Black-lake is mixed with about one-tenth of its weight of ultramarine, and mixed with albumen solution.

Grey.—This is simply the black diluted.

Violet.—The proportions are about 10oz. aniline violet, 1oz. ultramarine, and 2½lb. albumen solution. The ultramarine is rubbed up with one part of the albumen, and the dye with the rest, and the two are then mixed. A little oil of turpentine is used to prevent the ultramarine from frothing.

Red.—Rub up ultra red with albumen solution. Pink the same, but with less dye.

Body Blue.—Dissolve 8oz. tin-salt in 13lb. of water and 6oz. potassium ferricyanide in 2lb. of water. Mix and filter. While the precipitate is draining, boil 1lb of starch with 6lb of water to a paste and mix that with 1½lb. of cyanide of potassium. The next thing is to add 22oz. of finely-ground tartaric acid. Then let the paste cool, and add 4oz. of oxalic acid, and finally mix it with the precipitate off the filter.

Body Green.—7lb. of buckthorn berries are boiled in three lots of water, so as to make 64lb. of liquid in all. To this add 4lb. of starch and 16lb. tragacanth mucilage, and boil to a uniform mass. The yellow paste obtained is halved. One-half is mixed with 2lb. of powdered alum, and when cold with 18oz. of tin-salt. The other half is cooled till only warm, and then mixed with 4lb. of ferrocyanide and 1lb. of ferricyanide of potassium, 10oz. saccharic acid, and, finally, when quite cold, with 1½lb. of acetic acid. The two halves are then mixed together again.

Body Violet.—8lb. of tragacanth mucilage are mixed with 40oz. of logwood decoction of 5° Bé. Then add 10oz. of a 17 per cent. solution of sulphate of copper, and 12oz. of a solution of tin-salt in its own weight of water. This printing colour must always be made fresh, as it will not keep more than a few hours.

Body Grey.—Mix together 12lb. tragacanth mucilage, 3lb logwood decoction of 5° Bé., and 2lb. of acetate of iron.

Body Chamois.—Mix together 6lb. of acetate of iron, 10lb. of tragacanth mucilage and 3oz. of tin-salt. This mixture will not keep.

Tragacanth mucilage is made by soaking the gum in twenty-three times its weight in cold water for several days, and then boiling for one hour. Acetate of iron is prepared by dissolving 36oz. of ferrous sulphate in 6lb. of water, and (separately) 33oz. of lead in 5lb. of water. The two solutions are then mixed. The white precipitate of lead sulphate is filtered off and thrown away, and the solution of acetate of iron is kept for use.

NOTES ON DYEING, BLEACHING, FINISHING, &c.

Specially compiled for THE TEXTILE MANUFACTURER.

Winter Shades.—A range of shades suitable for the coming winter season's dress trade has been issued by Messrs. Bayer and Co. It contains a wide range of colourings, with particulars and quantities of dyestuffs necessary for each combination. The self shades are given separately on the last page, and are marked according to their fastness to light.

Acid Violet 7 B.—This new dyestuff (Bayer) is dyed in a strongly acid bath in a similar manner to the other acid violets. It produces a very bluish violet shade, and has the same properties as the other brands of the same denomination. With respect to its application for wool and half-wool dyeing, this new quality can be employed in the same way as the other well-known acid violets. Owing to its clearness in shade it is, apart from its other applications, said to be especially valuable for the dyeing of shoddy. It is also very well adapted for the printing of woollen material and slubbing, and is further suited for the printing of silk and wool-silk. In combination with tin, it can be employed for the production of colour discharges. The colour can be discharged white with zinc powder.

Brilliant Wool Blue B Extra.—This dyestuff (Bayer) gives a clear bright shade, is said to be possessed of good level dyeing properties, and is dyed in the same manner as the older N and R extra brands. The makers lay particular stress upon its fastness to rubbing, which is claimed to be superior to that of other colours which possess the same clearness of shade. This superior fastness to rubbing, however, is only obtained by dyeing the goods severely at the boil for a sufficient length of time, as when dyed for a long time under the boil a fine crystalline precipitate is liable to form in the bath, and the colour does not then fix sufficiently well on the fibre (a resinous precipitate, however, not forming).

Discharging Fast Oranges and Scarlets.—Although these dyestuffs are fast to acid, they have not been hitherto largely used for calico printing, owing to some difficulty experienced in discharging. Tin crystals or acetate of tin merely discharge the colour a pink, and whereas zinc powder discharges it at first a pure white, it afterwards turns into a dirty yellow within three to four days. This existing difficulty, however, can be surmounted by employing stannous lactate as a reducing agent, which discharges a very good white, and the discharged styles do not alter when stored. Instead of stannous lactate, stannous sulphocyanide can eventually be employed. Pluto Orange G (afterwards treated with benzo-nitrol) has up to now been the only one amongst all the difficult dischargeable benzidine colours that could be discharged a good white with lactate of tin. The following is an example :—Mix 2¾lb. or 280grms. stannous lactate, 75 per cent.; 3½lb. or 400grms. thickening (neutral starch tragacanth thickening); 4¼oz. or 30grms. tin crystals ; then stir in 2½ pints or 290grms. water. Steam for ¼ to ½ hour, acidulate with hydrochloric acid (13½cc. per gallon water), rinse and dry.

Wool Blue S R Extra.—This is a new dyestuff (Bayer) similar in many respects to Brilliant Wool Blue B extra, but more adapted for cheap dark navy blue shades. Like the older brands, when dyed in a boiling neutral bath containing Glauber's salt, the colour has very great affinity to the wool fibre, and is therefore very well adapted for the half-wool one-bath dye process. It is well suited for the printing of woollen fabrics and slubbing. The colours can be discharged with zinc powder, and in combination with tin crystals they can be employed for colour discharging.

Bronziness of Aniline Blacks.—When dyeing aniline black prints with basic dyestuffs, the black frequently assumes a very undesirable bronzy appearance. Though other causes may contribute, this is to a great extent due to the superficial fixation of the tannin mordant, which is prevented by the covering aniline black from penetrating into the fibre. As practical remedies the Berlin "Färber Zeitung" suggests the following steps :—The tannin solution used should be well acidulated with acetic acid. After squeezing and fixing with tartar emetic, wash thoroughly. Dye quite cold, adding the dyestuff, previously dissolved in acetic acid, gradually and in the measure in which it is absorbed. Towards the end raise slowly to 38° C., when the bath should become exhausted. In this manner the dyestuff is as far as possible deposited on the plain part of the fabric only. Finally add to the exhausted bath some acetic acid, rinse to the boil, give 4—3 ends, and wash off. Dyestuffs which incline to bronzing, such as magenta, crystal violet, Victoria blue, brilliant green, and methyl violet, should be avoided : methylene blue, Carpi blue, Nile blue, and various brands of saffranine, also Methylene Violet 3 R A X (Höchst), are far preferable.

Acid Chrome Black B and G.—These are two of a new series of black wool dyestuffs (Bayer) which are easily soluble, and dyed in a strongly acid bath with the addition of Glauber's salt and sulphuric acid. Dyed direct the colours can be employed in a similar manner to Naphtole Black 2 B, but when afterwards treated with bichrome their value and properties are said to be considerably enhanced, the shades then being very fast to alkalies and acids, as well as resisting the action of stoving and milling, and the after-chromed shades are also distinguished for their excellent fastness to light. They are useful for the dyeing of slubbing in machines, as well as for the dyeing of loose wool and pieces, and the colours can be employed to advantage for the dyeing of yarns where no particular fastness is required. They are not so well adapted for acid cross dyeing as Diamond Black F. They are said to be very well suited for the printing of woollen fabrics, as well as for the printing of slubbing (with a slight addition of chlorate of soda).

Reduction of Indigo.—In the process of preparing a soluble paste of indigo white of high strength by reducing the indigo by means of finely-divided metals and ammonia, there exists the great drawback that the reduction proceeds very energetically, the mass rising to a high temperature, whereby a portion of the indigo employed, probably owing to the reduction proceeding too far, is decomposed and becomes lost to profitable use. It has been found by some German chemists that this loss can be avoided if care be taken that the temperature prevailing during the reduction never rises beyond 5° C., and the present process is based on that observation. The temperature needed is maintained by the addition of the necessary quantities of ice, or, better still, by effecting the cooling from the outside, all depending upon whether a solution directly to be used in the vat or a soluble paste of indigo white is to be prepared. The process is carried out thus :—In a covered pot, provided with double walls and with an agitator, 10kilos. of pure indigo are intimately mixed with from 4 to 5kilos. of zinc dust. After the mixture has become uniform and homogeneous, it is cooled down by introducing ice or a cool liquid into the jacket of the pot As soon as the mixture has been cooled below 5° C., about 20 litres of 25 per cent. ammonia liquor are added very slowly and gradually, the agitating being continued all the while, and care being taken that the temperature never rises beyond the critical point—*i.e.*, 5° C. When all the ammonia has been added, the agitator is worked for some two hours longer, the pot remaining firmly closed. After that time the process of reduction is finished. If a solution directly to be used in the vat should be prepared, the ice employed for cooling may be directly introduced into the mixture of indigo, zinc dust, and ammonia. Of course, care must also be taken in this case that the temperature during the reduction never rises beyond 5° C.

Benzo Fast Scarlet 8 B S.—The success of earlier red substantive cotton dyestuffs has led Messrs. Bayer and Co. to make this additional brand, which has a more bluish tone than its predecessors, but the method of dyeing and the properties of the dyed material are the same as with the other benzo fast scarlets. The colour can be discharged fairly well with sulphocyanide of tin, and discharges well with lactate of tin (tin crystals do not produce any useful results) ; the colour can be discharged white with zinc powder, but when the discharged parts are exposed to the atmosphere they turn yellow. It is also very well suited for slop padding purposes, as well as for topping aniline black.

Wool Bleaching.—When wool is bleached with a solution of sulphurous acid or of sodium bisulphite the same process goes on as in the sulphuring. The action is, however, usually preceded by a treatment with permanganate of potash. Many dyers prefer to use sulphurous acid in solution to employing it in the gaseous state, and the advantages are especially got with piece goods. It admits of much more constant supervision than is possible with gas bleaching, and more rapid stopping in case of need. There is also much less risk of inhaling the fumes of sulphurous acid. The process is simplicity itself. All that has to be done is to soak in the solution for at most twenty-four hours, and then to rinse. The bisulphite is used of a strength of about 20° B., and after soaking in this for from ten to fifteen hours the goods are passed through a bath of sulphuric acid at 4° B. For bleaching wool with permanganate and sulphurous acid, it is best to use three baths, which can be fairly strong and be used over and over again. The first contains about one-tenth per cent of permanganate and a trace of soda, to make it just alkaline. After two hours or so in this the wool is left exposed to the air for a short time, and then, without rinsing, goes to the second bath, which contains 2 to 3 per cent. of sulphurous acid, or is a solution of bisulphite of from 2 to 3° B. strength. Both these baths are used cold. On rinsing after the second bath the goods still have a brownish shade, and that is removed in the third bath, which is a repetition of No. 2. Sodium bisulphite is better than sulphurous acid, as it dissolves the brown oxide and manganese off the fibre better. Thorough final rinsing is essential. For the permanganate bath metal rollers are better than wood. A very good plan is to replace the third bath given above by a nearly boiling bath of oxalic acid. This bath is made with from 2 to 3 per cent. of oxalic and 1 per cent. of sulphuric acid, reckoning on the weight of the wool. The process is exactly the same. It is difficult to get rid of the smell of the sulphurous acid even with the most complete rinsing. It is therefore advisable to deodorise the goods with a very weak bath of peroxide of hydrogen or sodium. The sulphurous acid will be oxidised to sulphuric, which has no smell and can easily be rinsed out.

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THE TEXTILE MANUFACTURER PATENT GAZETTE.

Manuscript Specifications of patents can be examined at the Patent Office, London, after the Complete Specification has been accepted, on payment of One Shilling. The printed Specifications are usually published in about one month after acceptance of the Complete Specification, and any single copy may be obtained by remitting 8d. in stamps (or by special postcards sold at the Post Offices at 8d. each) to the Comptroller General, Patent Office, 25, Southampton Buildings, Chancery-lane, London. When a number of specifications are required, remittances may be made by P.O.O.

Applications for Patents.

(Where complete specification accompanies application an asterisk is affixed.)

1901.

8th July.

13,828 P. BAILEY, Huddersfield. Combined machine for steaming and cooling or exhausting the steam and moisture from piece goods for imparting a lustre and finish to same.

13,839 R. H. NEILL, Belfast. Apparatus for drying wet yarns.

13,860 R. W. MONCRIEFF, Newport Pagnell, Bucks. Apparatus for spinning and doubling.

13,861 R. W. MONCRIEFF, Newport Pagnell, Bucks. Apparatus for spinning and doubling.

13,863 C. D. ABEL, London. Mordant dyeing mono-azo dyestuffs. *(Actien-Gesellschaft für Anilin-Fabrikation, Germany.)*

13,894 H. J. HADDAN, London. Apparatus for dyeing slivers and the like from combing machines.* *(F. Desurmont, France.)*

9th July.

13,914 E. HOLLINGWORTH, Dobcross. Shuttle-box motions for looms.

13,915 J. D. WHYTE and H. S. GOLLAND, Manchester. Spinning mules.

13,921 S. HALL and T. GREGSON, Manchester. Self-actor mules for spinning.

13,922 T. GREGSON, Manchester. Winding catch or click for a self-acting mule.

13,941 W. F. DRAPER and C. F. ROPER, London. Automatically operating or controlling the operation of organised looms.*

13,975 C. D. ABEL, London. Machinery for the production of goffered and other raised patterns on fabrics. *(The firm of J. Kleinewefers Söhne Maschinen-fabrik, Germany.)*

13,976 C. D. ABEL, London. Calendering machine for producing different impressed or embossed patterns on woven fabrics. *(The firm of J. Kleinewefers Söhne Maschinen-fabrik, Germany.)*

14,001 C. W. RUSSELL, London. Machines for drying cloth.

14,016 L. I KRUMING, London. Machines for the manufacture of rope and string.*

10th July.

14,028 W. H. WHITBY and OTHERS, Manchester. Hopper bale breakers or openers.

14,033 G. F. and W. H. GREGSON, Preston. Automatic shuttle-changing motion for looms.

14,042 A. LUND, Keighley. Cleaning device for combing machines used in the treatment of fibrous substances.

14,057 E. PARKINSON and OTHERS, London. "Under-clearers" for drawing, slubbing, intermediate, roving, and other frames.

14,060 H. CLARKE, London. Knitting machines.

14,081 O. IMRAY, London. Blue dyestuff from para-amido-para-oxydiphenylamine. *(Farbwerke vormals Meister, Lucius and Brüning, Germany.)*

14,090 H. L. LAKE, London. The drying of fibrous and other material.* *(F. Hiorth, Norway.)*

14,106 H. J. HADDAN, London. Process for rendering fabrics and other products impermeable. *(G. Dutilleul, France.)*

11th July.

14,114 ASA LEES AND CO. LIMITED and J. CLEGG, Manchester. Mules for spinning fibrous materials.

14,123 I. HEY, Bolton. Machines for combing wool and other fibrous substances.

14,127 E. HOLLINGWORTH, Dobcross. Shuttle-box operating mechanism for looms. *(H. Bardsley, United States.)*

14,129 I. LEVINSTEIN and OTHERS, Manchester. New blue colouring matter directly dyeing cotton.

14,130 I. LEVINSTEIN and OTHERS, Manchester. New colouring matters containing sulphur.

12th July.

14,187 W. MCCAUSLAND, Belfast. Scutching machine for flax, hemp, jute, and other fibres.

14,197 R. BOWER and S. MITCHELL, Huddersfield. Drum winding machines.

14,198 R. BOWER and S. MITCHELL, Huddersfield. Stop and reversing motion for sectional warping machines.

14,215 A. HAMER, London. Tubes of spinning and twisting machinery.

14,243 J. HORNER and W. HEAP, London. Hackling machines.

13th July.

14,299 G. BLACKBURN AND SONS LIMITED and W. M. ATTEWELL, London. Straight-bar knitting machines.

14,332 G. WAGNER, SEN., London. Device for threading the weft yarn into the eye of a weaving shuttle.

15th July.

14,355 A. WOOD and E. NIGHTINGALE, Manchester. Straightening, opening out, and guiding woven fabrics.

14,413 C. SCHELLER, London. Spindle brake for spinning machinery.*

14,420 J. PHILIPPS and OTHERS, London. Fabric or material.*

14,422 H. ALBERSMANN, London. Reversing apparatus for the card cylinder in looms provided with shuttle-changing devices.*

16th July.

14,430 J. H. GARTSIDE and W. G. BUCKLEY, Manchester. Kiers for bleaching textile and other materials.

14,437 E. N. BAINES and OTHERS, Manchester. Thread-spooling machinery.

14,453 W. E. HEYS, Manchester. Apparatus for treating textile materials with liquids.* *(E. Plantrou, France.)*

14,458 H. WILDT, London. Knitting machines.

14,478 H. H. LAKE, London. Machines for winding thread, yarn, and the like upon bobbins or other supports.* *(J. O. McKean, United States.)*

14,495 R. F. CAREY and OTHERS, London. Lace curtains.

14,509 W. H. BAKER and F. E. KIP, Liverpool. Weft or filling controlling mechanisms for looms.*

14,515 L. W. and M. CAMPBELL, London. "Top rolls" for textile rolling mills.*

14,516 L. DOLLFUS and GANSSER, London. Combined dyeing and tanning baths.

17th July.

14,563 F. ZAPATA, London. Looms.

14,575 C. D. ABEL, London. Mordant-dyeing monoazo dyestuffs. *(Actien-Gesellschaft für Anilin-Fabrikation, Germany.)*

18th July.

14,616 R. TYACK and HOWARD AND BULLOUGH LIMITED, Accrington. Feed roller and dish of carding engines.

14,618 THE MAJOR WOOD SYNDICATE LIMITED and J. MAJOR, Manchester. Apparatus for dyeing, bleaching, or otherwise treating cops of spun yarn.

14,619 W. E. HEYS, Manchester. Apparatus for dyeing, sizing, and slashing warps.* *(A. Masseron and others, France.)*

14,669 J. Y. JOHNSON, London. Production of colouring matter containing sulphur. *(The Badische Anilin and Soda Fabrik, Germany.)*

19th July.

14,711 J. TATTERSALL, Birmingham. Roller bearing for yarn-guiding cylinders.*

14,712 J. W. BURY, Burnley. Loose reed looms.

14,725 H. WENDT and A. JUNIGE, London. Slat-weaving loom.*

14,734 R. B. RANSFORD, London. Blue cotton dyestuffs. *(L. Cassella and Co., Germany.)*

14,735 R. B. RANSFORD, London. Blue cotton dyestuffs. *(L. Cassella and Co., Germany.)*

14,745 E. R. SATTLER, London. Self-acting spinning mules.*

14,760 H. H. LAKE, London. The manufacture of yarn, thread, twine, and the like. *(F. W. Sawyer, United States.)*

20th July.

14,777 E. N. BAINES and OTHERS, Manchester. Machinery for spooling sewing cotton or other fibrous material.

14,789 T. GREGSON, Manchester. Winding catch or click of self-acting mules for spinning and doubling fibrous substances.

14,830 H. FERGUSON, London. Apparatus for scutching and preparing hemp and like fibres.

22nd July.

14,840 H. HAGGIS, Manchester. Guard or cover for use in connection with ironing or calendering machines.

23rd July.

14,934 E. N. BAINES and J. W. SCHMIDT, Manchester. Balling machinery for thread or other fibrous material.

14,939 A. HITCHON, Accrington. Improvements in spinning and twisting spidles for the better lubrication of the same.

15,010 C. HAMIG, London. Stop motions for looms.*

15,015 W. WOODHEAD, London. The treatment of fibrous substances.

24th July.

15,026 H. S. GOLLAND, Manchester. Yarn-winding machines.

15,038 R. W. GODDARD, Bradford. Apparatus for dyeing warps for weaving.*

15,062 O. IMRAY, London. Manufacture of a black produced by oxidation or steaming. *(The Farbenfabriken vormals Meister, Lucius and Brüning, Germany.)*

15,064 R. B. RANSFORD, London. New dyestuffs of the acridine group. *(L. Cassella and Co., Germany.)*

25th July.

15,101 J. T. PEARSON, Burnley. Method of treating, packing, despatching, and delivering wool, silk, cotton, and other fibrous substances.

15,102 A. SEELEY, Manchester. Lifting motion of winding frames.

15,103 W. G. BYWATER and T. B. BEANLAND, Leeds. Band walk twisting and laying machines.

15,106 J. B. BARTON, Manchester. Apparatus for opening out and pressing down cloth seams.

15,109 D. ANDERSON, Glasgow. Appliance for use in beaming yarns or threads.

26th July.

15,177 H. JONES, Manchester. Rings for spinning.

15,197 B. J. B. MILLS, London. Machine for manufacturing metallic leashes used in weaving. *(E. Guinet, France.)*

27th July.

15,264 B. and P. GROSSLAUB, London. Weaving shuttles for use in the manufacture of fabrics with horse-hair weft.*

29th July.

15,292 S. S. WILSON and HOWARD and BULLOUGH LIMITED, Accrington. Underclearers for drawing and roving frames.

15,307 READ HOLLIDAY AND SONS LIMITED and OTHERS, London. Dyestuffs containing sulphur.

15,326 F. NEWELL and OTHERS, Kingston-on-Thames. Apparatus for cutting fabric into bias-woven lengths.

15,357 PLATT BROTHERS AND CO. LIMITED and F. W. CHADDERTON, Manchester. Combing machines for combing cotton, wool, and other fibrous materials.

15,358 H. H. MIDDLEDITCH and C. A. GREGORY, London. Knitted pants.

15,363 J. DOLDER, London. Mercerising machines.*

30th July.

15,379 J. HETHERINGTON AND SONS LIMITED and J. CONNELLY, Manchester. Self-acting mules and twiners.

15,405 G. WIGNALL, London. Knitted fabrics.

15,406 J. LAW, Rochdale. Apparatus in loom shuttle motions for weaving tapes or coloured borders on textile fabrics.

15,436 G. H. DORNIG, London. Figured woven fabrics.

15,446 E. A. TRISSELL, London. Weft-supplying mechanism for looms.*

31st July.

15,484 T. N. GRANT, Manchester. Clips for stentering machines for finishing cloth.

15,486 R. HARLING and OTHERS, Manchester. Automatic shuttle motions of looms.

1st August.

15,562 W. B. LEE and W. FISHER, Bradford. Drawing-off mechanism of combing machines.

15,608 A. V. GROUPE, Liverpool. Braiding machines.*

2nd August.

15,636 R. MANSFIELD, Nottingham. Lever go-through lace machine.

15,678 J. Y. JOHNSON, London. New disazo colouring matters and intermediate products relating thereto. *(The Badische Anilin and Soda Fabrik, Germany.)*

3rd August.

15,698 J. FIELDEN, Rochdale. Machinery for drying wool and other fibrous material.

15,699 J. EASTWOOD, Oldham. Faller stop guard.

15,702 A. LOCKWOOD, Halifax. Reed motions of looms.

15,708 R. J. URQUHART, Manchester. Process for manufacturing permanent dyestuffs containing sulphur. *(The Chemische Fabriken vorm. Weiler-ter Meer, Germany.)*

15,712 J. HALL, Manchester. Machine for braiding and embroidering.

15,719 J. BRAND, Glasgow. Folding or crisping of cotton cloth.

15,736 F. RUSHWORTH, London. Apparatus for waterproofing textile fabrics.

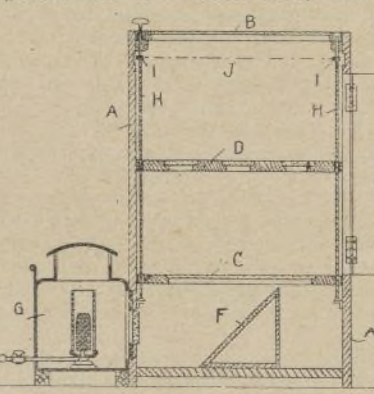
15,739 P. HERTZOG, London. Machines for cutting pile fabrics.*

Recent Textile Patents.

The following are abridgments of patents recently published. The date given at the beginning of each is that of application, whilst that at the end is the date of acceptance of the complete specification. The period of opposition expires within two months of the latter date:—

1900.

4796. Diagrams for weaving. March 13. H. Mackintosh, 14, Victoria Park, Shipley. Relates to a method of and apparatus for making textile diagrams for weaving. In order to test the appearance of repeat designs, a single repeat is made on a transparency and arranged in a sort of camera obscura having nine lenses, so as to repeat the design nine times. The accompanying drawing illustrates this arrangement in vertical section. In this A is a box, cupboard, or frame, carrying a viewing screen B, which may be of ground glass. Within the box A there is arranged a design carrier, such as a plate of glass C, on which any transparent, translucent, or opaque article, object, drawing, or painting forming the design or unit of design is placed. D is an image multiplier, consisting of nine lenses arranged in three rows of three each, and interposed between the design carrier C and the viewing screen B. When the single repeat is square, the lenses are arranged an equal distance apart, but if an oblong repeat is used, the lenses are placed farther apart in one direction than the other, in proportion to the extent that the oblong varies from the square. The sides of the single repeat design are masked on the carrier C, or the transparent portion is the same size as the repeat design, so as to prevent light passing at the sides. It will be seen that by illuminating the



design on the carrier C in any suitable way, but preferably by transmitted light from below, such as by inclined mirror F receiving light from a suitable source, such as a lantern G, the design will be projected in the desired number of repeats by the image multiplier D on to the viewing screen B, and by so adjusting the relative distances between the carrier C, multiplier D, and screen B, as to make the several images uniformly meet, the general effect of the repeat can be ascertained.—June 13, 1901.

9280. Doubling or gassing machines. May 19. H. B. Arundel and J. Higginson, Sovereign Works, Stockport. Relates to the reciprocating traverse bars or guide rails for the distribution of yarn or thread on the spools of "cheese" winding or gassing machines, but is also applicable for use upon other types of winding or doubling machine in which a high speed of reciprocation of the traverse bar is required. The object is to provide an improved construction of traverse bar or guide rail in which the weight of the bar is reduced to a minimum, and which at the same time rigidly supports the guides, thereby enabling the traversing motion to be effected at considerably higher speeds than are possible with the forms of guide rails at present in use. The guide rail is constructed of two or more parallel wires or rods of suitable section placed at a suitable distance apart and extending across the winding frame, said wires supporting the yarn guides, which may be fastened to one of the wires only—namely, that which receives the traversing motion,—while the remaining wires or rods serve as stationary supports for the guides; or the yarn guides may be clamped to all the wires, which are then moved as a whole across the frame. In each case the guides are provided with suitable adjustable clamps so that they may be displaced longitudinally on the guide rail wires and clamped in their proper positions for guiding the yarn on to the winding bobbins.—May 18, 1901.

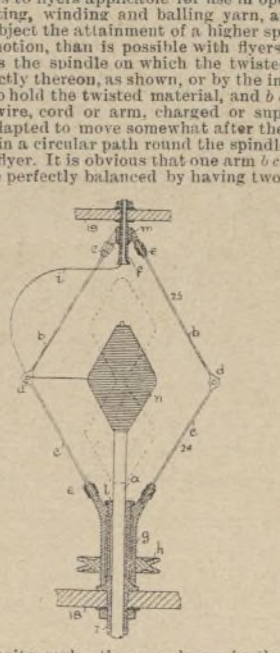
9667. Diagrams for weaving. May 25. H. Mackintosh, 14, Victoria Park, Shipley. Relates to improvements on Specification No. 4796. of 1900.—June 13, 1901.

9926. Warping. May 30. A. Leach, Hamer Hall, Rochdale. Relates to a machine forming yarns or threads into warps or other analogous forms in sections or forming yarns or threads in the form of warps or other analogous forms into balls, the combination with a shaft or roller upon which a ball or a pair or set of balls is or are to be formed of a worm or other device arranged to transmit motion to a worm-wheel or other appliance which is formed or arranged to receive motion from such worm or device, although such worm or device changes its position and is arranged to transmit motion by any suitable mechanism to the said shaft, so as to move it away from the drum or roller by which it is revolved.—May 30, 1901.

10,230. Double-lift jacquards. June 5. S. Dracup, Lane Close Mill, Great Horton, Bradford, and I. Thomis. Described on page 347, October, 1900, of THE TEXTILE MANUFACTURER.—June 5, 1901.

10,600. Testing textile materials. June 8. H. Grandage, Low Royd Dyeworks, Bradford. Relates to apparatus for testing the strength, elasticity, etc., of textile materials. It is applicable for testing single or twisted threads, hanks, woven cloth and the like.—June 8, 1901.

11,147. Flyers. June 20. C. S. McConnan, 305, Edge-lane, Liverpool. Relates to flyers applicable for use in operations such as spinning, twisting, winding and balling yarn, and has more especially for its object the attainment of a higher speed, together with a steadier motion, than is possible with flyers of the usual construction. *a* is the spindle on which the twisted material is wound, either directly thereon, as shown, or by the intervention of a bobbin or tube to hold the twisted material, and *b c* a flexible or laterally springy wire, cord or arm, charged or supplied with a weight or bob *d* adapted to move somewhat after the manner of a conical pendulum in a circular path round the spindle *a*. The arm *b c* forms a closed flyer. It is obvious that one arm *b c* may be used, or the flyer may be perfectly balanced by having two arms placed



diametrically opposite each other as shown in the figure, each charged with a weight or bob, so as to perfectly balance the flyer, or even three or more such wires or arms *b c* might be evenly spaced with relation to each other so as to form a balanced flyer; also that the weight need not necessarily be at the mid-length of the arm *b c*, but at any convenient point on its length. There may be more than one such weight placed anywhere on the arm *b c*. One extremity of the wires or arms may be loose on the axis, and the other extremity fixed rigidly on to the axis or part surrounding the axis, so that it can be driven by a whorl or other suitable device. This axis is rotated at a high speed, which causes said weights or bobs by the centrifugal force developed in them by such high speed to spread or fly outward to their extreme limit and describe a circular path round the spindle and put a tension on the arms or cords which keeps the weights *d* revolving in a circle of given radius, as any tendency to spread farther apart is prevented by the arms and cords. The arms, together with the weights, will thus form a balloon flyer, kept sufficiently rigid by the centrifugal force of the weights. The material being twisted is introduced through the centre of the loose extremity of the wires or arms, and is then conducted through the weight to the spindle, or to the bobbin or the like thereon. As the flyer is rotated, the material being twisted is pulled round by the weight, through which it is passed and held on its way to the spindle or bobbin at a given distance from the said spindle, so as to enable the winding to be effected.—June 15, 1901.

12,899. Azo colouring matters. July 17. H. E. Newton, London (communicated by Friedrich Bayer and Co., Elberfeld, Germany). Mixed urea and thio-urea compounds of amido-naphthol derivatives are adapted to be combined with one or with two molecules of diazo compounds, valuable azo dyestuffs being thus obtained, which possess similar properties to those obtained from the symmetrically-substituted urea and thio-urea compounds. They are also distinguished by the valuable property of dyeing unmordanted cotton clear shades of a remarkable fastness against acids and light. The process of production of the said mixed urea and thio-urea compounds consists in causing phosgene ($COCl_2$), thio phosgene ($CSCl_2$), or carbon bisulphide (CS_2) to act on a mixture of two different molecules of the above-defined amidonaphthols or amidonaphthol derivatives.—June 29, 1901.

13,638. Compressing cops. July 30. A. G. Bloxam, London (communicated by La Société Anonyme Tissage de Coton, 14, Rue de la Coriandre, Gand, Belgium). Relates to an improvement in preparing bobbins for shuttles and in fixing them in the shuttles. Hitherto the weaver has had to place the cop on the shuttle spindle and to support the latter against his person in order to compress the cop on the spindle in the direction of its axis with all his available force, the object being to have a bobbin as compact as possible so that it may unwind regularly and the shuttle may contain as much thread as possible. The pressure exerted by the weaver is not only liable to injure him but is irregular in amount, so that faulty unwinding, with the consequent breakage of the weft, is not avoided, and the maximum quantity of thread is not contained in the shuttle. Fig. 1 is a side elevation of the lower end of the bobbin; Figs. 2 and 3 are longitudinal sections of the shuttle showing how the bobbin is fixed in place; Fig. 4 is a side elevation of the apparatus for compressing the cop; Fig. 5 is a front elevation of the same; while Fig. 6 is a special form of spindle. The shuttle is made in two pieces—that is to say, the spindle is independent of the shuttle, —and in order that the former may readily be placed in and removed from the latter it has a notch *a* at its lower end which, in inserting the bobbin into the shuttle, takes over a pin *d*, so that the extreme end *b* of the spindle can be introduced between

FIG. 1. FIG. 2. FIG. 3.

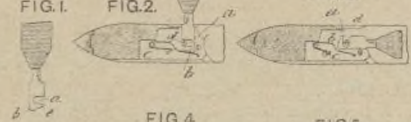
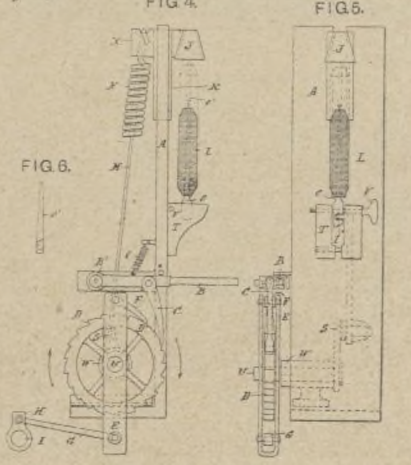


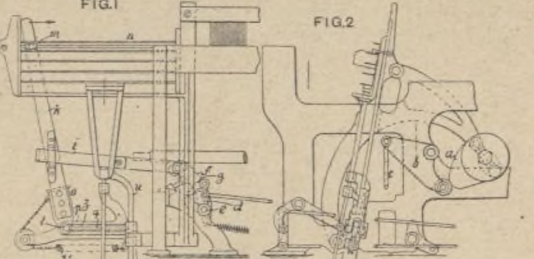
FIG. 4. FIG. 5. FIG. 6.



this pin and the spring *c*; the bobbin is then turned on the pin *d* until it lies in the shuttle, as is commonly the case. To facilitate the introduction of the end *b* the base of the spindle is sloped as shown at *e*, Fig. 1. A is the frame, B is the starting lever carrying the pawl C and centred at B^1; D is a ratchet wheel keyed to the shaft U and having a part D^1 without teeth; E is a lever centred on U and carrying at one end the pawl F, and connected at the other end by a link G with a crank H on a shaft I which is intermittently or continuously revolved; J is a hollow cone lined with coarse felt or cloth, and of an internal angle corresponding with that of the head of the bobbin on to which it is to be placed in order to compress the cop L on the spindle O; K is a sliding piece, and carries the cone J and an arm X; M is a rod attached at its lower end to a crank S on the shaft U, and at its upper end to the arm X through the spring N; Q is a spring which serves to raise the lever B; T is a support for the spindle O, and is preferably in the form of a clamp in which the end of the spindle can be held by the screw V; W is the bearing of the shaft U.—May 25, 1901.

13,944. Picking devices. Aug. 3. J. Hiebel, 59, Krugenofen, Aix-la-Chapelle. Relates to picking devices for mechanical looms, and has for its object to lessen liability to fracture in the picking device in the event of the box taking a false position. The movement of the picking device is effected by means of a cam *a*, Fig. 2, which at each revolution sets in motion a bell-crank lever *b*, and, by means of a connecting rod *c*, the driving sector *d*. The striking levers *f* are mounted loosely on studs *e* and carry pawls or trips *g* and *h*, Fig. 1, which engage the sectors *d* and cause the latter to move the striking levers *f* as required. The striking levers *f* are connected by links *i* with the picking arms *k*. Each picking arm is fulcrumed on two lateral studs carried by a pin

FIG. 1 FIG. 2

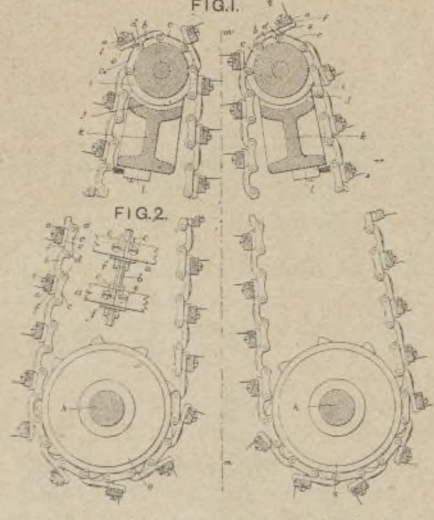


which is mounted in a slot *z*, Fig. 1, in a guiding arm. When the picking arm *k* is actuated by the link *i* it swings on its fulcrum *l* and imparts to the picker or driver *m* the necessary picking movement, whereby the picking arm *k* is moved forward in the direction indicated by the arrow in Fig. 1. The picking arm *k* is fastened in a shoe or socket *o* which engages over the guiding arm *p* at each side and fulcrums on the lateral studs *l* of the sliding pin or bolt *q* aforesaid. This bolt lies horizontally in a slot *z* in the guiding arm *p*, as before mentioned, and lies with its opposite end *t* against a slide *u* which is connected with the shuttle box, so that it is raised and lowered therewith. When the picking arm *k* is moved forward by means of the link or draw bar *i* in the direction indicated by the arrow in order to drive the shuttle out of the box, the sliding pin or bolt *q* comes against the slide *u*, and if the shuttle box is in its right position, said pin is prevented from sliding out —June 15, 1901.

13,979. Hackling machinery. Aug. 3. J. Horner and W. Heap, Clonard Foundry, Falls-road, Belfast. Relates to an improvement in machines for hackling flax, hemp, jute, and other fibrous material, and has for its object to dispense with the leather bands or "sheets" which carry the hackles, and also to dispense with the angle iron bars to which (or to projections thereon) the hackle stocks or "tools" are fastened. The hackle stocks *a* are screwed directly to chains composed of links formed of steel or other castings or forgings, the lengths of the links being preferably equal to half the pitch

FIG. 1.

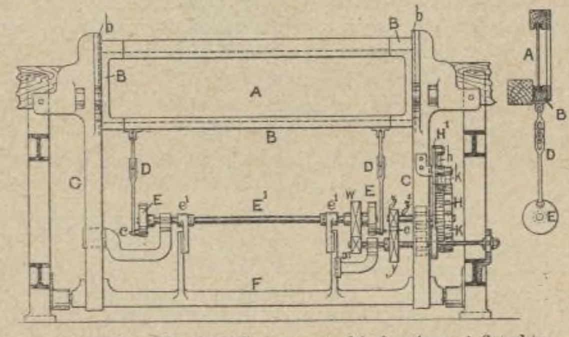
FIG. 2.



of the hackles, the hackle stocks being fixed to alternate links *b*, and connected by intermediate links *c* formed of pairs of plain plates. The links *b* are prolonged beyond the joints *d*, by which they are connected to the links *c*, the prolongation being in the form of a plate *e*, which lies in front of the link *c* and is formed with a flange *f* and extends a sufficient distance laterally to enable the abutting ends of two adjacent hackle stocks *a* to be screwed to it as shown. In consequence of this portion of the link extending beyond the joint *d* connecting the link *b* to the next following link *c*, the required "strike-in" motion of the hackle bars is obtained in passing round the upper pulleys, as will be seen by the drawings. —June 8, 1901.

14,220. Dyestuffs. Aug. 8. R. B. Ransford, Upper Norwood (communicated by Leopold Cassella and Co., Frankfort-on-Main, Germany). Valuable dyestuffs can be obtained by the condensation of alkylated or alphylated amido-oxybenzoyl-benzoic acids with pyrogallol, gallic acid, tannin or gallamine acid. These colours dye mordanted wool and mordanted cotton very deep violet and reddish-blue shades, which are distinguished by their exceptional fastness to milling and light.—June 29, 1901.

14,276. Movable reeds. Aug. 9. J. H. Southworth, Longsight Villa, Clitheroe. Is designed to provide an effective motion or mechanism for imparting a rising-and-falling movement to the reed of a loom for the purpose of weaving special classes of goods with moiré or wavy effects. The reed A is mounted in a reed-holder B, which is fitted into slides *b* on the slays words C, so that it is capable of being moved up and down therein. To the lower frame of the reed-holder B are pivoted connecting rods D connected with the pins *e* of crank discs E or with cams or eccentrics



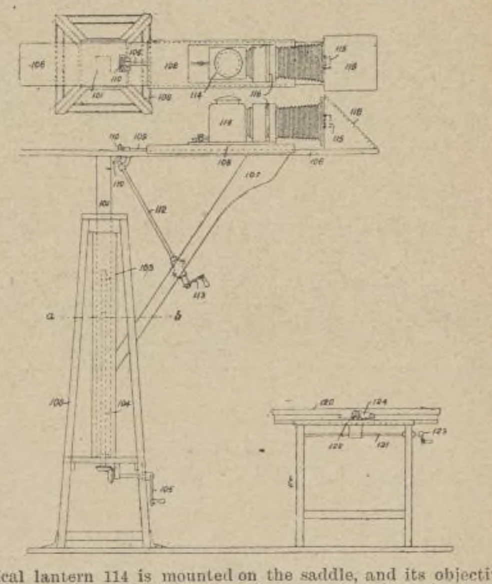
on the shaft E^1. The shaft E^1 is mounted in bearings e^1 fitted to the swing rail F of the slay, and is rotated by the train of wheels *w*, *x*, *y*, *z*, mounted in bearings carried by the slay sword C and swing rail F so as to oscillate to and fro with the slay. On the shaft z^1 on the outside of the slay sword one or two ratchet wheels H, K, are affixed. A pawl *h* pivoted on the lever H^1 on the loom side engages with the ratchet wheel H and moves it part of a revolution at each beat of the slay. The pawl *k* on the wheel K prevents any backward movement of the wheel H.—June 15, 1901.

14,351. Stentering machines. Aug. 10. A. A. Whitley, 2, Malvern Villas, Bury. Has for its object to improve the working of swissing machines, in which a longitudinal movement is given to the rails and chains or clips upon the rails. This longitudinal movement is usually imparted to the rails by means of a shaft oscillated upon a centre between the rails by means of an eccentric and connecting rod, the centre of oscillation of the shaft being also the part at which rotation is conveyed to the oscillating shaft by gearing from the main driving shaft, and overcome by means of a ball and socket or universal coupling device.—June 15, 1901.

14,725. Disazo colouring matters. Aug. 16. H. H. Lake, London (communicated by K. Oehler, Offenbach-on-Main, Germany). From the reaction of acetyl-amido-naphthol-sulphonic acids upon those intermediate products which are derived from para-diamines and oxy-carboxylic acids of the benzene or of the naphthalene series, disazo dyes result, such dyes having the characteristic of dyeing unmordanted cotton in yellowish red to violet shades, and are distinguished by the fact that they are "fast" to the action of light.—June 29, 1901.

14,830. New disazo colouring matters. Aug. 18. J. Y. Johnson, London (communicated by the Badische Anilin and Soda Fabrik, Ludwigshafen-on-Rhine). In the Specification of the lapsed German Patent No. 74,111 is described, *inter alia*, the production of an amido-phenol-sulpho acid, therein designated amido-phenol-sulpho acid III, and produced by sulphonating amido-benzene-meta-sulpho acid and treating the resultant di-sulpho acid in the well-known way in the alkaline melt. It is now discovered that the said amido-phenol-sulpho acid III is eminently suited for use as a middle component in the manufacture of secondary disazo colouring matters. Secondary disazo dyes containing this middle component dye wool red, reddish-brown, red-violet, and similar shades, and, on treating the goods so dyed with chromic acid or chromates, the shade changes to violet, blue, or green-blue, which may be as deep as to be practically black, and the colourations so obtained are fast against the action of washing, milling, and of soap to a degree satisfying all practical requirements.—June 29, 1901.

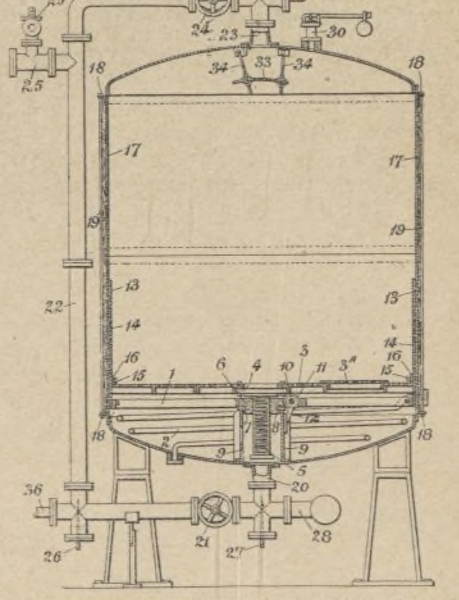
14,785. Enlarging designs. Aug. 17. H. Mackintosh, 14, Victoria Park, Shipley. The object is to facilitate the enlargement of textile designs and other designs to exact scale required. The invention forms one of a series—namely, Nos. 4796, 9667, and 14,785, of 1900, and 1220, of 1901. The standard 100 is secured to the floor at its base, and is fitted with a central slide 101 arranged to be vertically adjusted in the guide 103 by the screw 104, turned by the bevel wheels and winch handle 105. A platform 106 is fixed on the top of the slide 101, and its outer end is supported by the strut 107 fixed between the underside of the platform 106 and the side of the slide 101. A sliding saddle 108 is mounted on the platform 106, and is adjusted longitudinally thereon by means of the screw 109, bevel wheels 110, shaft 112, and its winch handle 113. An



optical lantern 114 is mounted on the saddle, and its objective 115 is fixed in a stationary position opposite the mirror 116, inclined at an angle of 45° on the platform 106. The design to be projected is placed on a slide 118 in the lantern, and it is focussed on to point paper stretched upon the horizontal table 120 below by adjusting the saddle 108 until the projected image is in focus. The image is reduced or enlarged to the size required by adjusting the slide 101. In order to bring the image on to the exact position required upon the point paper the top of the table is mounted on two cross slides at right angles to each other, capable of being adjusted horizontally by the screws 121 and 122 fitted with winch handles 123 and 124.—June 13, 1901.

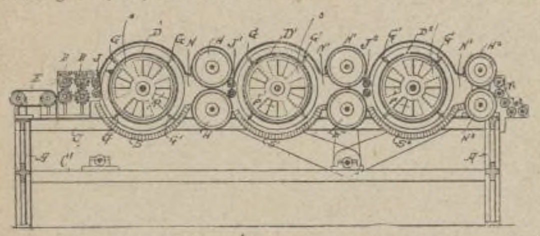
15,222. Removing burrs. Aug. 27. H. L. Offermann, 21, Bismarckstrasse, Leipzig. Relates to a device for removing burrs and the like from wool and like fibres, in which device bars arranged in the form of a grid lie in the annular spaces around a doffing cylinder or roller provided with separate toothed rings, which bars, at the place where the wool or other fibres are taken off from the preceding cylinder or drum, lie deeper than the teeth, and then extend in front of an arresting bar or blade so far beyond the teeth that the burrs contained in the spaces in the doffing cylinder or roller are brought out of reach of the teeth so that they are held back by the arresting bar or blade and can be removed by a rotating beater-drum.—July 6, 1901.

15,486. Kiers. Aug. 31. W. W. L. Lishman, Glen Dyeworks, Cornholme; T. W. Haughton, J. J. Kirkpatrick, and The Lishman Process Bleaching Company Limited. Relates to improvements in the construction of boiling, bleaching, and dyeing kiers as used by dyers and bleachers, the object being to construct such kiers that the boiling, bleaching, and dye liquors in the kier can be thoroughly circulated, and the liquid for boiling or dyeing can be more quickly brought to boiling point than heretofore. The kier is provided with the usual false bottom 1, consisting of an open grating bolted or otherwise secured at a suitable height inside the same, and beneath which is the steam heating coil 2 having the necessary inlet and outlet. In addition to this bottom 1, the kier has an adjustable bottom 3 on which the goods to be treated are placed, such bottom 3 being situated above the bottom 1. The bottom 3 may be formed of perforated plates, as shown, which preferably have a manhole 3a therein, and is carried by the head 4 of a screw 5 surrounded by a worm-wheel 6, the interior opening of which is threaded to correspond with the screw so as to form a nut for it. Such worm-wheel 6 has a groove which forms a collar beneath it, the groove being engaged by the heads 8, 8 of brackets 9, 9, of which there may be two, three, or more secured to the actual bottom of the kier, and forming supports and bearings in which the wheel may revolve. A worm 10 engages the worm-wheel. It is carried by a suitable shaft 11, which is supported in a bearing on an arm 12 carried by one of the brackets 9, said shaft being operated as required from outside the kier by a suitable hand wheel, so that the worm-wheel may be revolved and



the bottom 3 raised or lowered as required for the goods being treated. It will be obvious that a rack and pinion could be employed in place of the worm and wheel and the screw. To hold the bottom 3 securely in the position in which it is placed, the kier is provided on its inside with plates 13, 13 secured to the same, and having a series of holes 14 with which the plain end of the screws 15, 15 can engage, said screws being carried by flanges 16 of the bottom 3. By inserting these pins in the desired holes the bottom is retained in the position in which it has been set. In place of this arrangement, the bottom can be locked by means of levers engaging with catches or projections in the side of the kier. The kier is provided outside with a jacketing, which may consist of lagging 17 of wood or other suitable material held between angle-iron rings 18, 18 secured to the sides of the kier; and to further retain same in place, as some of the kiers may be of a great height, bolts 19 are employed to connect the angle irons 18 outside of such lagging, which prevents the latter from falling outwardly. The angle-iron rings enclose the lagging sufficiently at top and bottom to prevent water finding its way between the vessel and the lagging. At the bottom of the kier is an inlet pipe 20 controlled by a valve 21, and communicating by a circulating pipe 22 with another inlet pipe 23 at the top of the kier. In the pipe 22 is a valve 24 and a connection 25 with a supply tank for the liquors, and also a pipe 26 for steam injecting, while in the inlet pipe 20 is a similar pipe 27 for steam injecting and a connection 28 forming a vomit pipe for returning the liquor to the supply tank.—June 15, 1901.

21,306. Preparing flax and the like. Nov. 24. L. H. Schneider, John Hancock Building, Boston, Mass., U S.A. The object is to furnish a machine for preparing flax, which from having been thrashed in a machine to separate the seed, or from other causes, is too short to be hackled or combed for carding and spinning on common cotton or woollen machinery. The main object to be accomplished is to free the flax from the shives and dust, and form it into lap rolls ready for the carding machine. The construction and operation are as follows:—A, A are two frames which are connected together on each side by an upper and lower girt C, C[1], the first of which holds the bearings of the



mechanism. At the left end of the machine where the flax first enters is arranged an endless apron E, which runs on rolls held in bearings on the top side girts C. Next come sets of fluted rolls B, B, only two pairs of which are shown in the drawing on account of limited space, but of which several pairs are used, each succeeding pair from the first set having its flutes made finer than those of the preceding pair. These fluted rolls B also have their bearings made fast on the top girts C. Next to the fluted rolls come a pair of smaller feed rolls J, which feed and hold the flax fibre for the action of the beater cylinder D. This cylinder D consists of a set of flanged spiders, held on a shaft running in bearings on the top girts. The spiders are covered with a sheet of wire netting F, and on the outside of the netting F a set of flat radial bars G, G[1] are placed lengthwise of the cylinder and secured to the end spiders. These bars are made alternately plain and toothed, the bars G being plain, and the intermediate bars G[1] having strips of metal with fine teeth *a* on their outer edges, and fastened to the outer edges of the bars, to catch the flax fibre as it comes through the feed rolls and tear it apart. This cylinder revolves at a great speed, and by means of the flat bars G, G[1] creates a centrifugal current of air, drawing it in through openings P in the ends of the cylinder and through the netting on it. This current carries the fibres of flax into a chamber N, in which are two condensing rolls or cylinders H, H, also covered with wire netting *a*, the openings in which allow the current of air that brings the flax into the chamber to escape. The bottom of the chamber in which the cylinder D runs, and also the bottom of the chamber N, are of slabs or bars with open spaces between them, through which the shives and dust pass out, assisted by a part of the current of air created by the revolving cylinder.—June 15, 1901.

1901.

1220. Repeat patterns. Jan. 18. H Mackintosh, Moorhead House, Shipley. Relates to improvements in the process and on that species of apparatus set forth in Specifications Nos. 4796, 9667, 14,785, of 1900, and is designed to enable the operator to have greater liberty of and scope for manipulation, and to enable the apparatus to be put to more varied use —June 13, 1901.

2697. Mercerising. Feb. 7. J. Dolder, 3, Bahnhofstrasse Andernach. Relates to a rotary machine for stretching and drying yarns in the process of mercerisation, in which at the same time the rollers carrying the yarn are rotated constantly. *a* is an axle to which are keyed two star-shaped discs *b* and *c*, each of which carries on its circumference a ring *d* and *e* respectively. The latter are rigidly connected to each other by distance pieces *f*, *g*, *h*, and *i*. The two discs *b* and *c* carry twelve interior rollers R for carrying the yarn, and the rings *d* and *e* support outer rollers R[1] for carrying the yarn. These rollers protrude at both sides of the discs and rings respectively in order to receive the yarn. The

FIG. I.

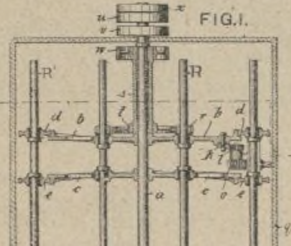
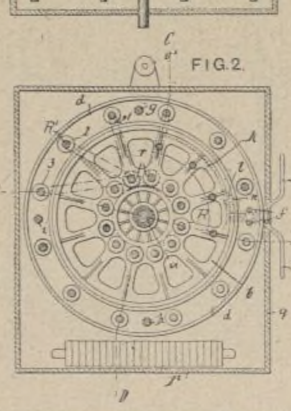


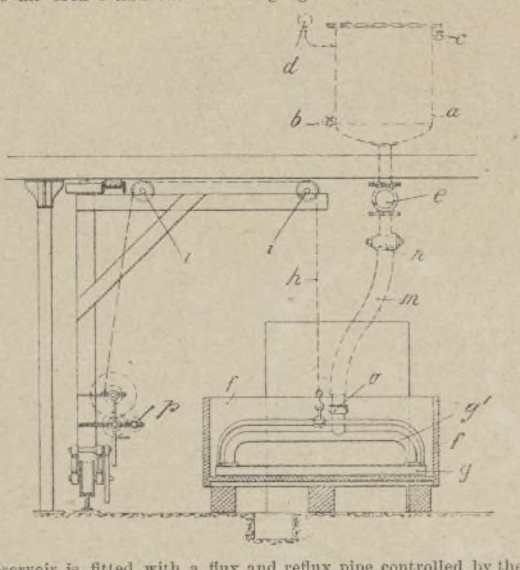
FIG. 2.



yarn is placed in a continuous hank over the tops of an inner and outer roller R and R[1], which are situated radially to one another. For the purpose of stretching the hanks of yarn a toothed segment *k* is provided on one of the discs *b*, a cogwheel *l* engaging with the toothed segment *k*. The cogwheel rests on the distance pieces *f*, and its axle carries at its opposite end a worm-wheel *n*, with which engages a worm *o*, which is also carried by the distance pieces *f*. The end of the axle of the worm *o* is formed rectangularly, so that the worm when brought opposite to a hole provided in the case can be rotated by a removable key or bar *z* shown only in Fig. 2 in position. This motion is transmitted to the wheel *l*, so that the latter operates the segment *k*. In consequence the rings *d*, *e* with the outer rollers R[1] for carrying the yarn are moved relatively to the inner rings *b*, *c* with rollers R, so that these rollers R R[1] are transported from the original relatively radial position 1, when the hanks of yarn are put on, to a position 2 and 3, dragging the hanks more or less tangentially to the inner ring of rollers R, by which the hanks of yarn are stretched.—June 15, 1901.

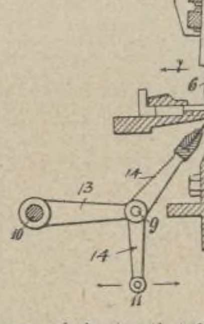
3574. Folding fabrics. Feb. 19. H. H. Lake, London (communicated by C. B. Cottrell and Sons Co., Stonington, Connecticut, U.S.A.). Relates to apparatus for folding fabrics. The principal elements are a support upon which the sheet to be folded is placed, and in which is an opening for the passage of the sheet as it is folded, a stationary blade presented endwise opposite the opening, and reciprocating gripping jaws operating through the opening to first crease the sheet over the edge of the blade in the intended line of fold, and to afterwards complete the folding of the so creased sheet by drawing it from the blade and through the opening.—March 23, 1901.

6591. Improvements in the method of and apparatus for dyeing cotton. March 29. W. E. Heys, Manchester (communicated by J. Schmitt, 19, Rue Cambon, Paris). Relates to an improved method of and apparatus for dyeing cotton on roving and slubbing bobbins or tubes. The reservoir *a* can be put into connection with a vacuum-producing apparatus—which for the sake of clearness is not shown—through the nozzle and cock *b*. In the upper part of the reservoir there are the air cock *c* and the vacuum gauge *d*. The bottom of the



reservoir is fitted with a flux and reflux pipe controlled by the valve *e*, which is situated above the vat *f*. From *e* there are as many branch pipes as there are vats, each being controlled by a separate valve *n*. The chamber *g* is hermetically closed except for the holes in its upper plate (in which the bobbins or tubes *k* are fitted when the apparatus is in use) and for the breeches pipe g^1 in communication with the valve *e* —June 8, 1901.

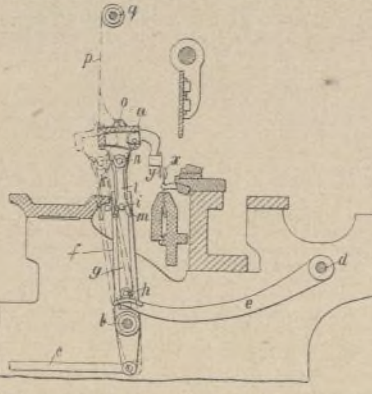
6736. Straight-bar knitting machines. March 30. B. Salzer and G. Galther, Neefestrasse 28, Chemnitz. Relates to improvements in straight-bar knitting machines for producing smooth strips of openwork fabric. The needles 1 take up the loops from the machine needles 3. However, when a press-needle 2 enters the groove of a needle 1 and presses it backward in the direction of the arrow 7, the openwork needle cannot take up any



loops, and by reason of the fact that the press needles bear upon the said openwork needles from below, the observation of the operation is in no way prevented or rendered difficult. The press needles 2 are so guided by two levers 13 and 14 that the shaft 10, which rotates in stationary bearings, imparts a vertical oscillating movement to the lever 13, whilst the lever 14, oscillating on the pivot 9 at the end of the lever 13, receives a horizontal reciprocating movement by means of any suitable operating device.—June 8, 1901.

6916. Card clothing. April 2. W. B. Lake, London. Communicated by Saco and Pettee Machine Shops, Newton, Mass., U.S.A. Relates to the improvement in card clothing for the flats of carding engines, comprising the use in connection with the ordinary clothing of a metallic stretching and backing plate, which is provided with means for engaging the edges of the card clothing from its back side, and is also adapted to be changed in structure or shape, so that the said points of attachment to the edges of the card clothing shall be separted from each other more, and the card clothing stretched by the said change in structure or shape of the plate.—July 6, 1901.

7048. Straight-bar knitting machines. April 3. B. Salzer and G. Walther, Neefestrasse 28, Chemnitz. Consists in completely removing the pattern apparatus from mechanical connection with the machine, and placing it in such an elevated position that it will be entirely beyond reach of the adjacent mechanism, so that the working process and the observation thereof can in no way be disturbed or interfered with. Assuming that the machine needles *x* produce plain ware from black woollen thread, and the thread guide *y* lays a yellow silk thread, there will be upon the black background a continuous longitudinal row of



loops in yellow silk, since each time the row of needles *x* operates the thread guide *y* places the yellow thread round the machine needles in front of it. In order that the movement required for this operation can be imparted to the thread guides *y*, the bar *a* to which the latter are fastened rests upon several levers *f*, and can oscillate horizontally on the stationary shaft *b*, and also be raised and lowered vertically by means of the lever *e* fixed to the shaft *d*. The bar *a* is not rigidly connected with the levers *f* oscillating on shaft *b*, but rests upon bars *g* which slide in prismatic guides in the levers *f*. The said bars *g* are provided with lifting rollers *h*, with which they rest upon the convex ends of the levers *e*. While, therefore, an eccentric imparts an oscillating movement to the lever *f g*, by means of the connecting rod *c*, another eccentric imparts to the lever *e* an oscillating movement, and thus raises the system *g a*. —May 4, 1901.

7049. Warp stop motion. April 3. H. J. Haddan, London (communicated by Jaime Biosca y Dalman and Juan Biosca y Dalman, Calle Obispo No. 2, Barcelona). Relates to improvements in mechanism for automatically stopping power looms on the breakage of one or more warp threads, consisting of an oscillating apparatus carrying a series of needles provided with eyes, hooks or the like through which the warp threads are passed, the latter in consequence of their tension supporting the said needles, which on the breakage of one or several of the said warp threads drop and come into contact with a device which during the operation of the loom executes a to and fro movement in such a manner that owing to said device striking against one or more of said needles, said oscillating apparatus is caused to rock, thus operating a lever or other suitable device which actuates a mechanism adapted to immediately stop the loom.—July 6, 1901.

7318. Shuttles. April 9. S. A. Dudley, 148, Dean-street, Taunton, Mass., U S A. Is an improvement in loom shuttles having split spindles on which the cop of filling yarn is supported, and consists in the peculiar construction and combination of the spindle base and the spring support, whereby the cop may be

FIG. I.

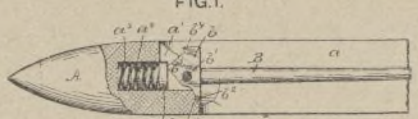
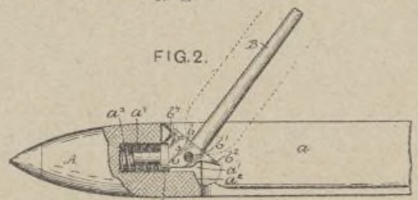


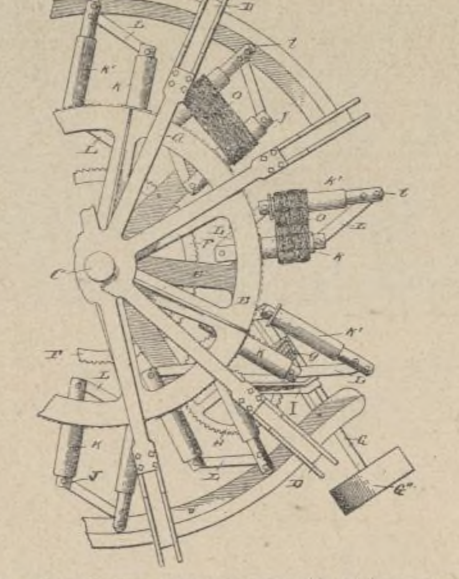
FIG. 2.



placed over the spindle close to the base. In the drawings, A indicates the head of the shuttle in which the base of the spindle is pivotally secured. The shuttle has the usual cavity *a* for the reception of the filling. The upper part of the cavity *a* is extended to a point beyond the pivot of the spindle, so that the cop can be placed on the spindle against or close to the base, as is indicated in broken lines in Fig. 2 B indicates the spindle, the base *b* of which is inserted into the vertical groove a^1 and pivoted on the pin b^1, extending transversely through the shuttle body. The base *b* has the downward-extending toe b^2 which, when the spindle is in the normal operative position shown in Fig. 1, bears against the shoulder a^2. The heel b^3 of the base is formed by two intersecting planes to form a practically rectangular point The lower of the two planes connects by a curve with the toe b^2, while the other plane extends from the point of the heel to the shoulder b^4. In the cylindrical cavity a^3 the coiled spring a^4 is placed. The button or disc a^5, provided with a post, bears on the coiled spring. When the spindle is in the raised position shown in Fig. 2, the shoulder b^4 of the base of the spindle bears on the peripheral surface of the disc a^5, which is forced by the coiled spring against the now vertical plane of the heel, and holds the spindle firmly in the raised position. The cop may be placed on the spindle with one end against the base, as is indicated in broken lines.—June 1, 1901.

7319. Plaiting machines. April 9. H. H. Lake, London (communicated by G. J. Burns, Ayer, Mass , U.S.A.). Relates to plaiting machines for forming a web of cloth or other fabric into a series of plaits or folds.—May 11, 1901.

7480. Mercerisation of yarn. April 11. H. H. Lake, London (communicated by K. Weldon, Amsterdam, Montgomery, U.S.A.). Relates to apparatus for mercerising cotton continuously and in large quantities, and embodies means for subjecting the yarn in skeins to great tension and without injury to either the apparatus or the yarn. Mounted on the upper face of the rim of the lower wheel E[1], a short distance from the periphery, and equally spaced apart, are a series of brackets *i* supporting the spindles J carrying the sleeves K provided with the pinions *k*, in mesh with the rack *b* on the upper wheel E. The spindles J extend through the brackets and are held stationary. The spindles are provided with bifurcated ends in which narrow bars L, L are pivoted, which bars extend horizontally to the right and have their ends pivoted in the bifurcated ends of the swinging spindles, which are parallel with the stationary spindles, but separable more or less from the latter. The cam rail M is L-shaped in cross



section, and a roller bears upon the inner side of the vertical rim above the horizontal rim. The cam-rail lies in a horizontal plane, extends nearly around the machine, is only open in front where the operator stands, so that at this point the tension on the skeins will be relaxed for their removal and the application of fresh skeins, and is curved outwardly at its receiving end so that the tension upon the skeins O will be gradually applied, or so that the rollers will be accommodated at the beginning of the stretching operation.—May 11, 1901.

7854. Circular knitting machines. April 16. B. Salzer and G. Walther, Neefestrasse 28, Chemnitz. Relates to a method of producing longitudinal coloured stripes in the so-called "ring goods" made by means of circular knitting machines.—June 29, 1901.