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TABLE OF CONTENTS.

NOTES OF THE MONTH— PAGE

The Cotton Outlook ... 73
The Belfast Linen Trade ... 73
British Silk Goods ... 74
Fire Extinguishers ... 74
Who Should Hold Stocks? ... 74

ARTICLES—

Printed Silks for Spring ... 75
Jute and Linen Weaving ... 76
Worsted Spinning ... 78
Designs for Cotton Fabrics ... 79
The Mechanism of Spinning ... 80
The Design and Construction of Worsted and Union Coatings ... 81
Designs for Silk Fabrics ... 82
Cotton Fibres in Spinning and Manufacturing ... 83
Fancy Dress Fabrics ... 84

REVIEWS OF BOOKS ... 85

QUERIES AND REPLIES ... 85

THE TEXTILE MACHINIST—

Travelling Grid Lattice ... 86
Improved Carding Engine ... 86
Improved Warping Mill ... 87
Improved Ramie Decorticator ... 88
Air Propellers ... 89
New Cotton Mill in Russian Poland ... 91
Machinery at the Paris Exhibition ... 91
Gas Power for Mill Driving ... 92
Lubrication ... 92
Apgar's Reducing Gear ... 94
Machinery Paragraphs ... 94

RAW MATERIALS, PROCESSES, FABRICS, ETC.—

The Cotton Fields of the World ... 95
Oxford Overcoatings ... 96
Art Nouveau ... 96
Modern German Weaving Schools ... 96
Silk Spinning in Japan ... 96
Degreasing Fibrous Materials ... 97
Lubricating Wool Fibres ... 97
Selvage Creases ... 97
Raffia Fibre ... 97
Japanese Sericulture ... 98
The Silk Trade in France ... 98
Gleanings from Consular Reports ... 98

NEW COMPANIES ... 99

THE GAZETTE ... 99

JOTTINGS ... 99

THE TEXTILE COLOURIST—

New Dyeing Materials ... 100
Sampling Heavy Bleaching Chemicals ... 100
Bleaching Vegetable Fibres ... 102
Dressing Preparations and their Application ... 102
Printing Paranitraniline Red ... 104
Discharging with Hydrosulphites ... 104
Printing Silk Goods ... 105
Notes on Dyeing, Bleaching, Finishing, etc. ... 105

PATENTS ... 106

NOTES OF THE MONTH.

The Cotton Outlook.

THE recent estimate of Mr. Henry Neill is practically a corroboration of his previous estimates, and at the same time he takes the opportunity of sounding the alarm of what he considers an impending scarcity. His estimate of 9,750,000 bales, although repeated, and, we might say, verified—at any rate as regards the statistics of more recent supplies,—is considerably below what the demand was originally expected to be. But, peculiarly enough, each repetition of the estimates has been devoid of any tendency towards raising prices, being rather inclined towards lowering them. Cotton production is a matter comparatively easy to estimate, with the experience, statistics, and information of various kinds which are ready to hand; but consumption is an entirely different matter, and is a factor which no specialist or expert can pretend to gauge with any degree of accuracy. Consumption depends upon stocks, raw and manufactured; upon politics, both home and foreign; upon tariffs and import duties; upon the rates of exchange, the prices of material and labour; in fact, upon factors so numerous and variable that the matters of sowing and weather, which play such important parts in estimates of the raw material, sink into complete insignificance. One thing which will affect the demand for raw cotton is the curtailment of yarn production in the Southern States. The rapid growth of cotton spinning in these States has been repeatedly announced with a flourish of trumpets, and the time was prophesied as being near at hand when all other spinning mills would have to put up their shutters. Undeniably the cotton-growing area appears the best position for locating cotton mills. The raw material is at the door, and transit dues are reduced to a minimum. But there is such a thing as too rapid development; a well-stored brain is a poor machine when carried by a decrepit body, and to be an all-round success every part of the frame must be nourished. The Southern mills have forgotten this: they have forgotten that *any* spinner can spin, but that it is another matter selling the yarn so made, and that markets must be built up along with manufactures to make commerce a practical success. The result is that large stocks of yarn have accumulated, and as this must have been going on for a time, there is a possibility that the scarcity of last September was not so much the lack of cotton as the scarcity of raw material—material that could be worked to the desired form, and not useless stocks already partially manufactured. It is said that the stocks of yarn now held by spinners in the Southern States of America would last for nine weeks if spinners shut down for that time; and that is the lowest estimate, for others judge the stocks as well capable of lasting, at the very least, for four months. The spinners have now seen their mistake, and have made partial arrangements towards rectifying it. These are, however, very inadequate, and consist of the curtailment of production by one-third. This has been done in a very optimistic spirit, for unless there is a great revival of trade, yarn will still continue to be added to the stocks, even with such a reduced output. Many business men are of the opinion that nothing short of a complete stoppage, lasting a few weeks, will suffice to meet the requirements of the situation, some even asserting that the future prosperity of cotton spinning in the South entirely depends upon such action. The elasticity of reserve funds is limited, and the time will come when the spinner must realise to ensure solvency. When that time arrives, there will be a glutted yarn market, accompanied by effects upon the general industry which are usual in such a crisis. Some of the mills have been running in shifts, day and night, so that a curtailment of one-third of the production does not look altogether promising in some quarters. Returning to raw-cotton statistics: in spite of the repetition or corroboration of the Neill estimates, there is still a feeling that planters are holding back a considerable portion of the recent crop. The drooping tendency in prices, and the pressure brought to bear by the banks and similar institutions which finance the planters, will strike home in time, and there is a great probability that even within the next few days large quantities of raw cotton will come to light. It must be remembered that the Wilson estimate was made at from 10,100,000 to 10,250,000 bales so long ago as the early part of January, while the estimate of the United States Bureau, which was issued a few days later, was exactly the same as the lower of these figures. The general opinion of spinners and manufacturers—not speculators—across the Atlantic is that there is a great probability of even these estimates being exceeded.

The Belfast Linen Trade.

A GREAT deal is heard in this country regarding poverty in our sister-isle, but if the energy and perseverance which are characteristic of the Belfast Linen Merchants' Association could be emulated by the greater portion of Ireland, that country would be as prosperous as even its most pessimistic patriots could wish. Last year trade was good in many of the British industries. Englishmen grumbled because it was not better; but our Irish brethren candidly admit a successful year in the linen trade, and hopefully look for a continuance of good trade during the present year. This state of affairs is pleasant, although it must sound somewhat incongruous to the Lancashire cotton spinner and Yorkshire worsted manufacturer, who seldom acknowledge a profit unless they are *losing* money. The linen trade was not phenomenal, but it has repaid in a degree the perseverance of its manufacturers and the energy of those who take an active part in the more public work of the Linen Merchants' Association. The area under flax in Ireland in 1900 was 47,327 acres, and although this shows a substantial increase on either of the two previous years' sowing, it is much below the acreage under flax in any of the years 1886—1896, when it averaged about 100,000 acres. The yield per acre was considerably above the average, and the quality fairly good. The Russian crop was small, and the quality of fibre poor; consequently, coarse and medium flaxes were from 50 to 80 per cent higher in price than a few years ago. Fine qualities of flax are at the present time in good supply at relatively moderate rates. Line yarns advanced in

price last year until the month of April, when, after a steady market for a month or two, they receded, and at the end of the year were slow of sale at firm prices slightly higher than those ruling twelve months previously. Tow yarns had a steadily rising market during the first six months, then fell in price by about 10 per cent., but in the closing months were in very brisk demand at the highest rates of the year, which would mean an increase of 1s. 6d. per bundle, or about 45 per cent. on the low prices prevailing at the beginning of 1899. Brown linens followed to some extent the course of the yarn market, although in the early months the margin of profit to weavers was fairly good, whereas towards the close of the year it had almost, if not entirely, disappeared. Bleached and finished goods had a quiet market, and great difficulty was experienced in obtaining an advance in prices proportionate to the increased cost. The exports of linen piece goods from the United Kingdom to Australasia (now the second largest market) amounted to £386,575, an increase of £40,267 on the figure of 1899, or 11·6 per cent. France and Germany continue to be important customers for linen goods, but the demand from the other Continental markets is decreasing from year to year. The association has long taken an active interest in technical education, and ground has recently been secured for building a new technical school. When this is completed, it is expected that great benefits will result, not immediately, but in a comparatively few years. It is, in fact, hoped that the firm establishment of such a school on an adequate basis will supplement the activity of traders and manufacturers, and be the means of enabling Belfast to definitely retain the pre-eminence in linen manufacture of which it has long and justly been proud. In reference to the wide adoption of khaki in military circles, attempts have been made to introduce linen. There is evidently a prejudice in favour of cotton khaki ; but it is to be hoped the superiority of the flax fabric, which gives treble the wear of the other, and therefore ought to be the more economical, will be recognised.

British Silk Goods.

THE Silk Association of Great Britain and Ireland was formed a few years ago to revive the silk trade of our country, but unfortunately the only success it reports at its annual meeting is an improvement in the financial position of the association itself. As for the silk trade, that seems to be getting less and less every year, at least as regards the class of silk in which the association is interested. No society or association can supply the lack of energy on the part of the manufacturers it represents, and we believe that the work of the Silk Association, and the untiring efforts of its president, have been more than counterbalanced by the indifference of the average silk manufacturer. These remarks, however, apply to what are known as the English silk centres, although even at these places there may be found silk concerns which are up-to-date, and which pay good dividends. But the average silk manufacturer lives behind his time, and instead of counterbalancing the competition of cheap foreign labour by the improved labour-saving machinery he can obtain ready at hand, he bemoans the lack of protective tariffs. This latter protection is scarcely likely to ever come into force again in this country. Apart from the almost general feeling on the Free Trade question, silk forms too small an item amongst our imports to make it worth the while of the Chancellor of the Exchequer looking askance in that direction. At the present time the annual imports of all manufactured silk articles amounts to the value of about £16,000,000, and a small percentage of import duty on this amount—for it could not possibly be large—would scarcely be felt by the Exchequer ; in fact, it would scarcely pay for collecting. There is another way, however, in which our British silk industry may be viewed, and although seeing no tangible results of its efforts, the Silk Association has done a good deal of useful work. Its labour has lain chiefly amongst the Macclesfield type of manufacturer, and it is towards him that it has looked for results. The association has worked to create an interest in British manufactures, and has felt disappointed at the indifferent result seen in the silk districts. On the other hand, its work has had some effect. In Bradford, and the numerous manufacturing villages and towns surrounding that city, there is perhaps the most adaptable set of manufacturers in the world. When the worsted dress trade did not pay, they took up alpaca and mohair ; when those went out of fashion, the worsted coating trade was established ; and since then the manufacturers of that district have put down and taken up materials in large variety, to keep looms running when other things failed. Every known fibre is represented in no small quantity, and during the last four or five years silk has played no unimportant part. At one time the mills at Manningham were the only silk representatives of the district, and they were practically confined to the "spun" variety, the products of their own spindles ; but now, especially in conjunction with mercerised cotton, silk yarns of every description are being used in innumerable weaving sheds, and put into an endless variety of fabrics. Then, again, this branch is comparatively new to the worsted district. A few years ago the idea was prevalent that the use of silk required a lifelong experience and no little skill. All this has now been exploded ; it was found that spun silk had almost the same weaving characteristics as fine cotton, and later it was discovered that tram silk only required a little extra care, and was scarcely more difficult to manipulate than the very fine botany yarns of 120's, 144's, and similar counts, which had been put into some of the finest cashmeres. So, all things considered, our silk industries may not only be considered satisfactory as compared with recent years, but there are also gratifying signs of increased future business in that material.

Fire Extinguishers.

ONE of the chief risks to a mill, especially a cotton one, is that of fire. The inflammable nature of cotton and other materials, the constant liability to spontaneous combustion, and the greasy state of almost all woodwork, especially floors, are causes each of which contributes in no small degree to the rapid changing of a spark into a conflagration. The electric light has greatly relieved the liability of the floating cotton dust to ignition, but that is only one of the many causes which required removal. Spontaneous combustion is now much better understood than in earlier years, but it is a phenomenon which appears when unexpected, and whose artificial prevention is almost an impossibility. There is the risk of sparking—a risk always present where machinery in rapid motion is present, and a risk accentuated where card teeth are operating on, sometimes even tearing, a highly inflammable material. Prevention in such cases can only be carried out to a certain degree, and after this has been done arrangements should be made to have the best remedies at hand. The ordinary and much-despised water bucket has probably put out more fires than all the specialised paraphernalia put together, but that is rather because of its simplicity than its adequacy. The use of chemicals in glass bottles is far from being either advisable or serviceable, and such things are gradually disappearing from use. For emergency cases something more handy than the ordinary portable fire extinguisher is required, as it is most important to get the first blaze under control before it reaches an intensity sufficient to operate the sprinklers. For this purpose it is advisable to have small hose affixed and ready at hand in rooms where mules, cards, openers, and similar dangerous machines are at work. This hose should be so placed that it requires nothing more than drawing out and the cock turning, for any adjustment means a large waste of time, owing to the usual excitement of the operators. A hose of this kind is very serviceable for inserting in places where a bucketful of water could not be thrown. It is a surprise to us that no solid or granular fire extinguishers have come into vogue. In many cases a bucketful of fine sand would be as effective as a pail of water : it would be as easy to carry, and run no fear of evaporation ; in addition, it would do no harm, and have no effect on the adjacent machinery. If some chemist could devise an earthy or sandy compound for fire-extinguishing purposes, he would confer no little benefit on textile and many other industries. The bulk of the compound should be of a loose material, which would act as a suffocator, whilst a small quantity of chemical matter emitting gases antagonistic to combustion might be advantageously added.

Who Should Hold Stocks?

IN the early days of manufacturing, when the hand-loom had been displaced by power, and when established factories first came into prominence, the small manufacturers of the day supplied cloth either direct to the consumer, or their stocks were cleared by the periodical purchases of merchants. In those days there was a very limited number of qualities and designs, and the tendencies of fashion were only slightly recognised, for goods were expected to wear for a very great length of time : and they did wear, some of them through more than one generation. The improvement of machinery, the advance of art and education, and the progress made by the dyer and chemist, made it possible to increase the design, quality, colour, and texture of a fabric to an unlimited degree ; the changes of fashion became more generally recognised as the country increased in wealth, and the recognition caused the changes to occur more frequently and distinctly, so that the wealthier classes could keep ahead of their poorer neighbours. From that period the manufacturer had to make to the fashion, and had not to stock ; and he had to make for each season, or his goods were jobs. Rapid distribution became essential, and made it necessary that middlemen, merchants, or distributors should collect goods in readiness for each season their wide range of design and fabric coming from hundreds of manufacturers, not only in this country, but various parts of the Continent. There was some risk attending the change of the times. The manufacturer had designers bringing out new and tasteful patterns and watching every tendency of the fashionable world, but it remained with the merchant to finally decide which patterns were to be made in bulk in readiness for the season's trade. A manufacturer might have little or no faith in the attractiveness of a design : his duty was to have a wide and assorted variety. His aim was to sell his goods, and naturally he could not refuse to do so because his own taste lay in a different direction from the buying of the merchant. Then the pieces were made and sent to the merchant, who distributed them through his various travellers and agencies, generally reaping a large profit at little expense. To cover this profit he had to accept the risk of goods being left on his hands—a risk which depended largely on his buyer's judgment. Now things have gradually changed. The merchant chooses, and sometimes even suggests, the patterns, but avoids his obligations of risk. The manufacturer goes to the expense of making original patterns, for which he receives no return ; then he makes travellers' patterns, for which he receives only a nominal return ; and he also makes goods in bulk to the merchant's order and particulars. If the pattern takes the public eye, well and good ; if not, let him be a day late in the stipulated delivery time, a hair's-breadth off in any particular, and the goods are cancelled. Generally he is expected to keep the goods in stock until the merchant has sold them, this latter gentleman simply using his warehouse as a clearing-house. Again, the manufacturer gets paid for his goods three, four, six, and sometimes ten months after he has bought the raw material. If the manufacturer had a share in the selection of patterns, this might be reasonable ; if he had a share in the profits of merchanting (which he practically does himself), there would be something to cover his risk. But as it is, he is helpless, and does not know whether the merchant is pushing a competitor's goods in preference to his own

ARTICLES.

Printed Silks for Spring.—II.

PROCEEDING to cloths impressed with two or three colours, Fig. 11 is an *art nouveau* design printed on a Shanghai pongee (plain weave), the illustration being about half the actual size. The warp is organzine silk 150 ends per

FIG. 11.

inch, and tram weft 106 picks per inch. The outline of the figure is printed black, the other coloured portion being a bluish shade.

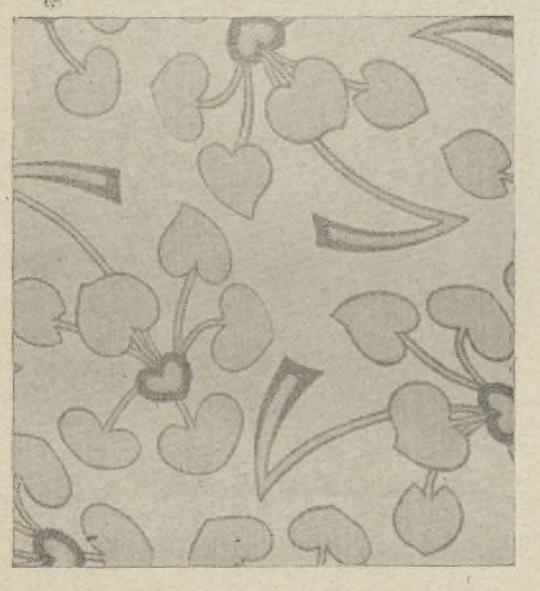


FIG. 12.

Fig. 12 is a design of the same school printed on a similar fabric. The build in this case is 90 ends and 110 picks per inch of organzine warp and tram weft respectively. The pattern is reproduced in its actual size, and the figure is printed red on a white ground, the outline being a deep red.

Fig. 13 is an *art nouveau* design reproduced about half-size. The cloth is a 2-and-2 twill, with

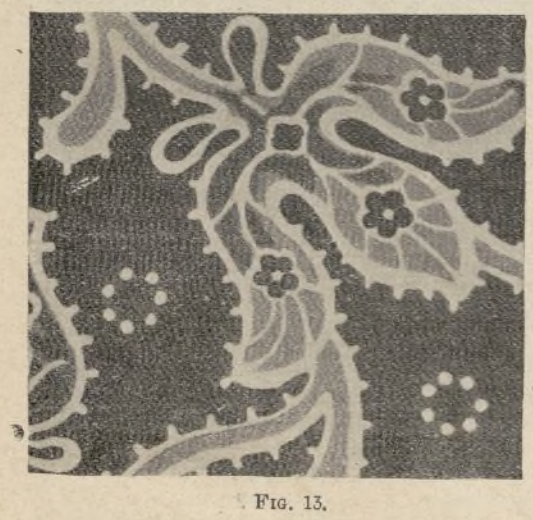


FIG. 13.

152 ends of organzine warp and 124 picks of tram. The scheme of colouring is much on the same lines as prints of ground colour only, but in this case the white figure is relieved by an inner body of neutral tint.

Fig. 14 is a most striking design when seen in the original. It is printed on a Liberty satin having 480 ends per inch of grège silk warp, and 108 picks per inch of cotton weft. The design is *art nouveau*, reproduced half the actual size. The

FIG. 14.

ground is black, and the white figures have a body of heliotrope outlined with the same colour in a darker shade.

Fig. 15 is a five-shaft satin printed in an *art nouveau* design reproduced half-size. The figure is composed of black lines on a ground which is alternately white spots on green, and green spots on

FIG. 15.

white. The warp is grège silk 400 ends per inch, and the weft tram 106 picks per inch.

Fig. 16 is a jacquard cloth printed in *art nouveau*, the illustration showing it in full size. The woven figure is composed of small spots on an

FIG. 16.

eight-shaft satin ground, whilst the printed figure is white and pale blue on a dark-blue ground. The warp is organzine silk 152 ends per inch, and the weft tram 182 picks to the inch.

Fig. 17 is a Japanese style of print design on an eight-shaft satin cloth. It is worked in black, white, and green, and reproduced half-size. The warp is grège silk and the weft schappe, 364 ends and 112 picks per inch respectively.

FIG. 17.

Proceeding to prints employing a wider range of colouring, Fig. 18 is an *art nouveau* design on a Shanghai pongee (plain), having 152 ends and 120 picks per inch of organzine warp and tram weft respectively. The reproduction is about half-size

FIG. 18.

Fig. 19 is an *ancient manner* design printed on a Lyonnaise poplin (plain), and shown actual size.

FIG. 19.

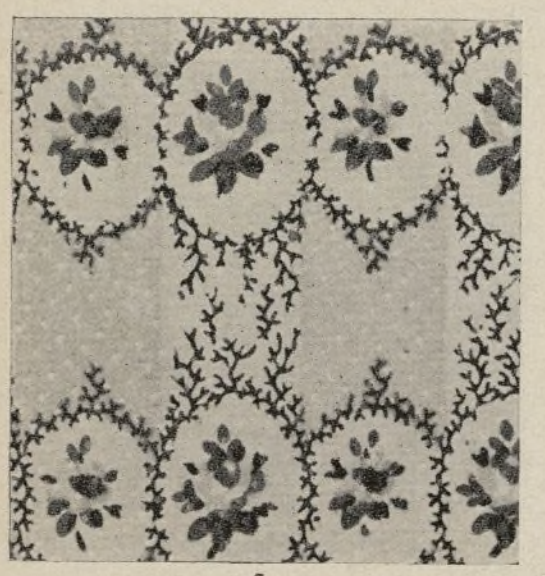
The warp is schappe, and the weft tram silk, 140 ends and 80 picks per inch respectively.

Fig. 20 is a 2-and-2 twill, also printed in the *ancient manner*. The design is reproduced actual

PRINTED SILKS FOR SPRING.—FIG. 20.

size. The grège silk warp has 156 ends per inch, whilst the tram weft has 124 picks to the inch.

Fig. 21 is a somewhat novel print design after the *ancient manner*. The cloth itself has a small jacquard spot design on an eight-shaft satin ground. The warp is grège silk 356 ends per inch, and the



PRINTED SILKS FOR SPRING.—FIG. 21.

weft is schappe 102 picks per inch. The pattern is reproduced actual size.

Fig. 22 is the half-size reproduction of a very pretty lappet effect. The lappet figure is worked in cotton on a fine silk muslin ground, and is printed with an *ancient manner* design.

The next four figures are printed in Cashmere or Persian designs, the first of which (Fig. 23) is on

PRINTED SILKS FOR SPRING.—FIG. 22.

a twelve-shaft satin ground having 300 ends per inch of grège silk warp, and 96 picks per inch of cotton weft. The design is shown actual size.

Fig. 24 is printed on a 2-and-2 twill ground, the reproduction being half-size. The warp is organzine silk, and the weft tram, 140 ends and 96 picks per inch respectively.

Fig. 25 is also reproduced half-size, the printing being on a Shanghai pongee. The organzine warp has 152 ends, and the tram weft 132 picks per inch.

Fig. 26 is a five-satin weave, with 228 ends per inch of grège warp and 122 picks per inch of tram

PRINTED SILKS FOR SPRING.—FIG. 23.

weft. The pattern is represented actual size. The next two patterns are illustrations of

PRINTED SILKS FOR SPRING.—FIG. 24.

metallic printing, which look very attractive when new, but are of a very unservicable nature.

PRINTED SILKS FOR SPRING.—FIG. 25.

Fig. 27 is reproduced half-size, is a silk muslin cloth having a satin stripe, and is composed of grège

PRINTED SILKS FOR SPRING.—FIG. 26.

silk in both warp and weft. In addition to the colour printing, all the outlines are printed in gilt.

Fig. 28 is a 12-shaft satin cloth woven with 300 ends per inch of grège warp and 106 picks of cotton weft. The print design is shown actual size, and consists of green spots and silver lines on a full red groundwork.

PRINTED SILKS FOR SPRING.—FIG. 27.

Figs. 29 and 30 are two different *art nouveau* designs, reproduced half-size and printed on the same cloth. This consists of a plain ground with open leno stripes at intervals, and is a cheap cloth made of cotton warp and schappe weft. This schappe weft, better known as single spun silk, is

PRINTED SILKS FOR SPRING.—FIG. 28.

largely used in the zephyr trade, and is both cheaper and easier to manipulate than tram.

Jute and Linen Weaving.—XV.

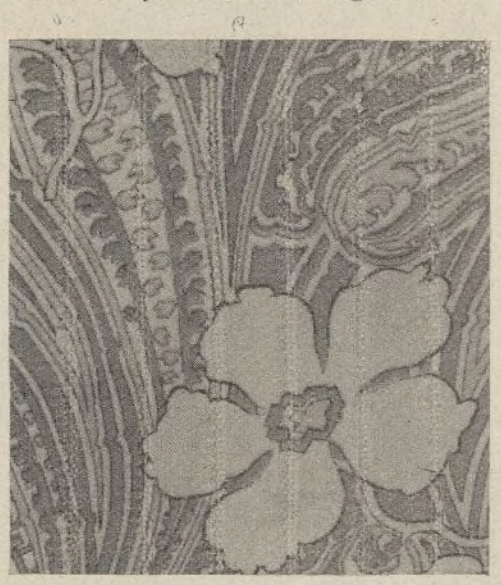
BY THOMAS WOODHOUSE AND THOMAS MILNE
(Head and Assistant Textile Masters, Dundee Technical Institute).

FIG. 88 shows a weave pegged for 16 shafts, 8 picks to the round, complete on 4 lags; but since the barrel is octagonal, 8 lags would be necessary to complete a chain. The second 4 lags would be

PRINTED SILKS FOR SPRING.—FIG. 29.

similar in every respect to those shown. The pegs on the barrel L (beginning with that peg under lever O) represent the first thread of the weave—picks A to H twice over. The arrangement of pegging as shown in Fig. 88 is, however, suitable for a left-hand loom only. When pegging for a

right-hand loom it is necessary to commence from the opposite side—*i.e.*, the right-hand side. But in some dobbies—as, for instance, Parker's centre-shed dobby, Figs. 80 to 84—the cards for a right-hand dobby are at the right side; therefore the cutting must be commenced at the left. Then, again, some dobbies have two sets of cards or lags, one set on each side, in which case one set of lags commences from the right-hand side and the other set from the left. The different positions of the lags are such as



PRINTED SILKS FOR SPRING.—FIG. 30.

to cause confusion, but a simple rule to observe in pegging is to notice on which side of the dobby any set of lags hang, and to commence pegging from the opposite hand. Thus, if lags hang at the right side of the dobby, commence pegging from the left-hand side; if lags hang at the left side of the dobby, commence pegging from the right-hand side; or, what is equivalent, commence at the left side with the last lag instead of the first.

As already stated, dobbies of the type of that described above are very suitable for most classes of light and medium work, but in many cases, and for all heavy fabrics, it is advisable, if not essential, that the shedding be of a positive nature. Figs. 89 and 90 are illustrative of the positive open-shedding dobby made by Messrs. George Hattersley and Sons Limited, Keighley. In general the principle is the same as in the original dobby, while the main differences in detail are due to the changes necessary for a positive tread. Motion, as before, is imparted by a crank on the bottom or wyper shaft through a suitable rod to the ⊣ lever

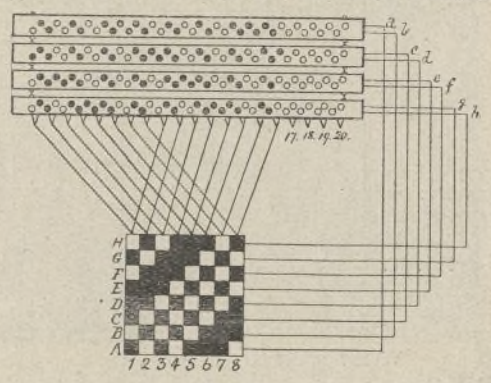


FIG. 88.

extremities to permit of a graduated shed) are connected at P to the swing baulk or beam lever Q, on the arms of which drawing knives R and R¹ are connected. Each arm of Q has its corresponding fulcrum S and S¹. The weighted levers T and T' act as already described to lower the drawing hooks R and R¹ over the knives E and E¹, which serve as pulling or lifting knives; whereas F and F¹ serve as pushing or depressing blades. It will be observed that both hooks R and R¹ are raised clear of the pulling knives, which in the figure are shown at the extremity of their stroke. Assuming that the hook R is dropped for the next outward movement of the knife E, the lower arm of Q will move outwards, and the lever N will thus be raised at U, and lowered at V. ince the latter point of N is connected by wires and levers, or jacks, to the underside of the camb shaft, and the former point to the upper side, it follows that the shaft connected will rise. The blades E and F being connected together by a rigid bar G (Fig. 89), always retain their relative positions, and at the outward extremity of the assumed stroke F will still be in close proximity to the lower end of the lever Q. If the shaft in question, now raised, requires to be lowered for the next succeeding pick, the blade F will press upon and positively return the lower arm of the lever Q to its former position—that shown in Fig. 90,—and the shaft attached will be depressed. If, on the other hand, the shaft was required to be up instead of down for the following pick, the hook R¹ would have been allowed to drop over the knife E¹, and lever Q would simply swing about P as a centre (this point being practically stationary during the stroke), and the shaft would be retained in its raised position. In order to ensure the blades F and F¹ keeping in close proximity to the extremities of the arms of Q when the latter are removed from their respective fulcra S and S¹, but more particularly to reduce friction to a minimum, they are arranged

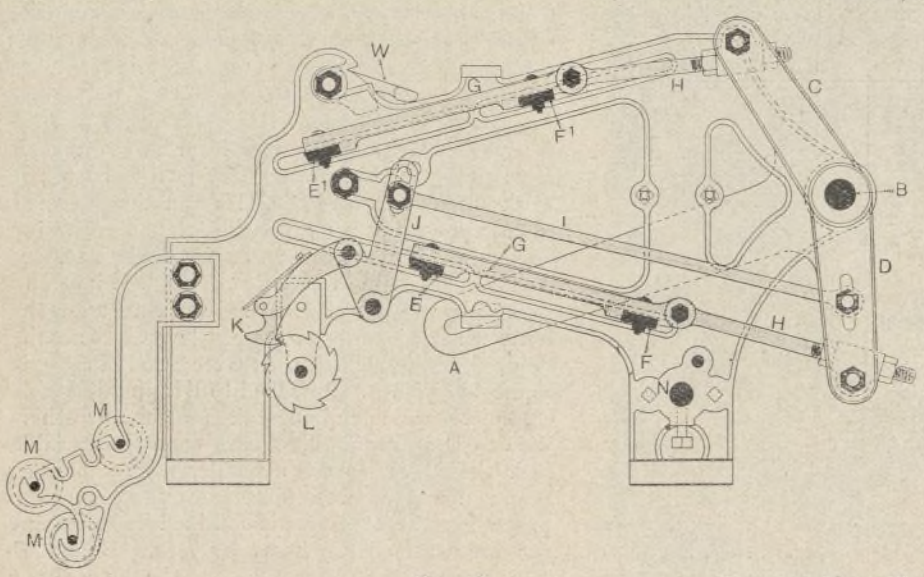


FIG. 89.

A fulcrumed at B, each arm C and D of this lever being connected near its extremity to two blades or knives E F, E¹ F¹, by means of the connecting rods G and the eye-bolts H. From the arm D, rod I, lever J, and pulling catch K, the octagonal lag barrel L is rotated as before: the rollers M serve to guide the lags clear of the arms of the levers which connect with the underside of the camb shafts, these levers (N, Fig. 90) being double bell cranked and fulcrumed at O. As in the negative dobby, these levers (usually notched at their

to move practically in the same radius as the lever Q. Weights W rest upon and therefore keep the hooks R and R¹ in contact with their respective lifting knives. For wide looms suitable connections are made to ensure a vertical and graduated lift.

The lag or pattern cylinders in the Keighley dobbies represented in Figs. 85 to 90 are shown as being driven negatively, but arrangements may be made in both cases for a positive drive if necessary. Figs. 91 and 92 show the arrangement for a positive drive to the lag cylinder adopted by Messrs. G. Hattersley and Sons Limited. Keyed to the crankshaft A is a spur pinion B of twenty-two teeth, gearing with a spur wheel C of forty-four teeth, supported on a suitable stud D. Compounded with C is a bevel pinion E of twenty-eight teeth, gearing with the bevel pinion F of equal teeth, supported at the lower end of the vertical shaft G, about which it may revolve freely. It is, however, prevented from so doing when in action by a ∧-shaped projection from its upper side taking into a corresponding groove in

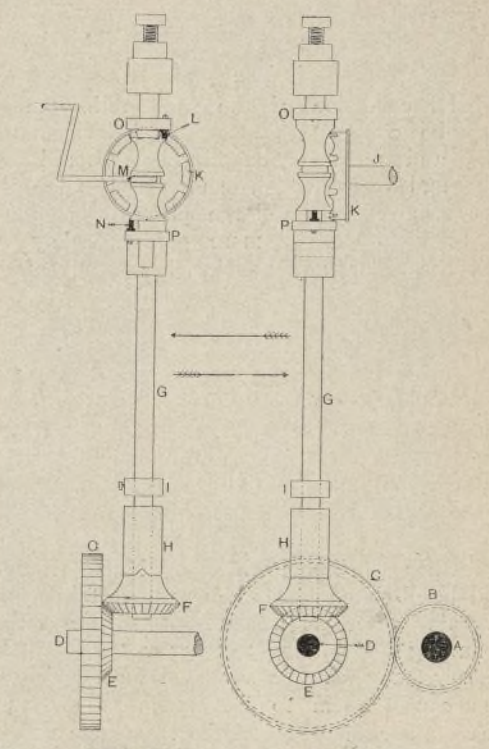


FIG. 91. FIG. 92.

the under side of the part H. In the event of the lag chain becoming locked, the projection from F forces H clear of the pinion, and permits the latter to revolve without imparting motion to the shaft G. A helical spring between the collar I and the part H serves to keep the latter in contact with F, and yet allow, when necessary, the disconnection mentioned. On the end of the lag cylinder shaft J a crown star wheel K is set-screwed, which is turned one-eighth of a revolution by the pin L every revolution of the shaft G. In order to reverse the direction of motion of the shaft J, the pin L (by means of suitable levers and the fork M) is lifted out of gear with K, and at the same time the pin N is lifted into gear—as shown in Fig. 92,—causing K, and therefore J, to move in the opposite direction. Due to the relative values of B and C, it is evident that the shaft G revolves only once for two picks, and that therefore one lag

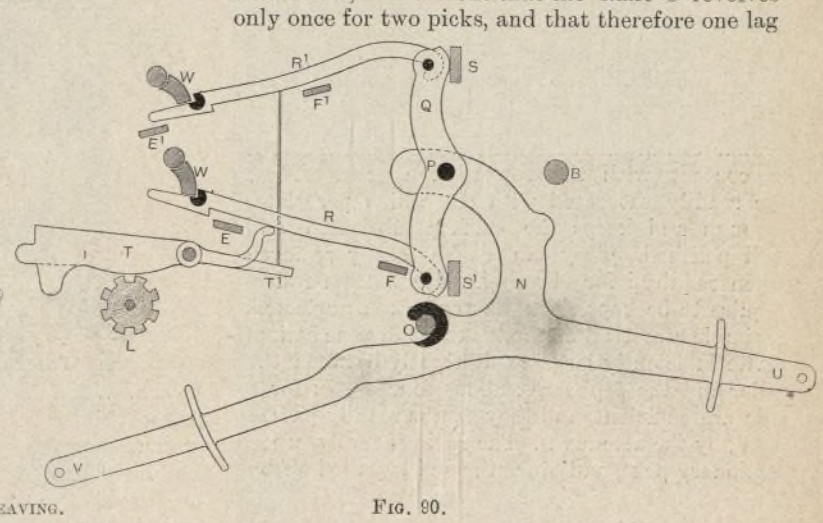


FIG. 90.

on the lag cylinder must also serve the same number. Occasionally lags are introduced which only serve for one pick, in which case each disc O and P contains two pins set diametrically opposite each other. The shaft J will thus be moved every pick.

When this arrangement of positive driving obtains it is usual to drive the ⊣ lever of the dobby from a crank on the end of stud D, or from a pin or stud near the periphery of the wheel C, the former being the more modern method. The

positive cylinder motion supplied by Messrs. Ward Brothers consists of a somewhat similar star wheel actuated by a pin and disc on a short horizontal shaft. This shaft is driven from the crankshaft by means of a pitch chain and pinions, the relative value of the latter being as two to one. Positive driving of the lag cylinder assists in keeping the box and pattern chains in unison with each other.

(To be continued.)

Worsted Spinning.

By M. M. Buckley
(Lecturer on Worsted Spinning at Halifax Technical School).

(Continued from page 44.)

THE condition of the front rollers must be constantly watched. A systematic and frequent examination should be made, and any which show the slightest defect removed. In a large place it is advisable to keep one or more persons solely to watch the rollers and bobbins, because it often happens that a "nicked" roller may run for some time and spoil a number of bobbins before it is found, as the end only reaches the bad place at each traverse. Upon this depends another point which seldom receives attention. In most cases the top front rollers are covered with leather, either hard or soft. The end is moved across a certain portion of the face by the traverse motion, and the constant movement of the end, combined with the pressure put upon the rollers, causes the leather to become hollow. Much trouble would be obviated if the rollers were taken out at regular intervals and tested in the lathe by running a skimming tool across the face. If necessary, they can be skimmed and polished, which causes them to last much longer and increases their efficiency. A short time ago a composite cork roller was introduced, for which many advantages are claimed, but from observation and trials we can scarcely recommend it for spinning frames. Being placed upon a small iron boss, it is urged that it can be repeatedly skimmed almost down to the iron. This is undesirable; the smaller the roller the less its drafting capacity, and any defects which may develop are brought more frequently in contact with the end. Then, again, it is claimed that it does not take up the lap like leather This is a weak point, because if the broken end is allowed to accumulate on the top board, it generally gets blown among the other ends and causes additional breakages. We think that the best roller for a spinning frame is a good, soft, leather-covered wood or iron boss. In order to lubricate the bearings of the bottom roller it is customary to place on them pieces of tallow or a mixture of tallow and oil. This is not only a wasteful and dirty method, but also injures the bearings. The fly and dirt collect on it, and frequently the joint gets heated, owing to its impaired properties. A cleaner and more effective plan is to get pieces of thick sponge wadding, similar to that used for the spindles, and secure it in contact with the top of the neck. These are readily saturated with oil, which percolates through and keeps the surface lubricated and well polished. They can also be easily removed when required for cleaning. The bottom rollers require to be kept clean, but are often neglected. A simple, practical method is to make some balls of waste sufficiently large to fit tightly between the roller and the topboard; about four or six for a side are sufficient, and they can be readily passed along by the attendant. The rovings revolve upon stationary pegs, and since the end is pulled off by the back rollers it is necessary that the bobbin should be perfectly easy. As it only passes through one nip any retardation of the bobbin will cause irregular drafting. Many attempts have been made to secure a reliable and positive delivery, but we are not aware that any have been widely adopted. Under the present method, what is required is to see that the pegs are kept free from waste and short roving ends; a small hook with its inner edge sharpened affords a ready means of doing this, and it is also useful for taking waste from between the carriers and other rollers.

The lifter motion has to control the building of the bobbin, and is one of the most important parts of the machine, and perhaps the least understood. It can be adapted to make several kinds of bobbin, foremost among which must be placed the spool, the ordinary size of which is 5 by 1¼in. The purpose for which it is used renders it necessary to observe certain conditions—viz., a proper head, or otherwise considerable difficulty is experienced in weaving all the yarn off; a suitable speed for the traverse, to prevent "sloughing" when in the shuttle; and a true-shaped bobbin. This kind of bobbin is built with a short traverse upon a gradually lowering lifter, which may be separated into two distinct stages, in

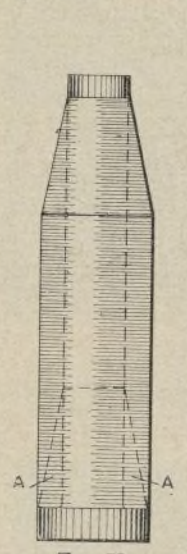
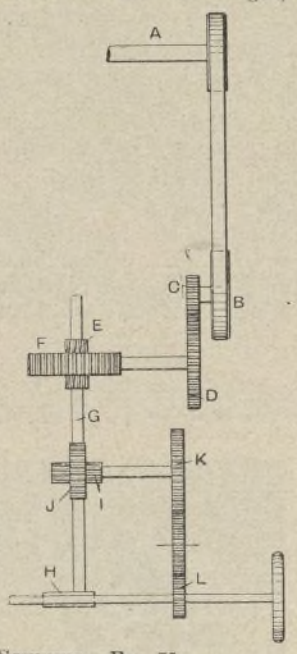
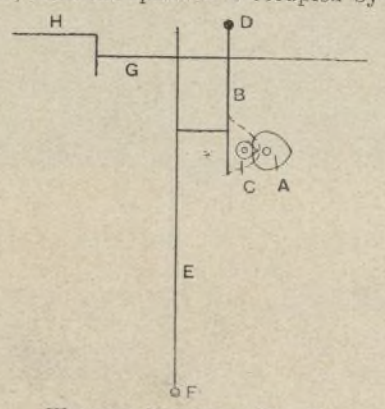


FIG. 72.



WORSTED SPINNING.—FIG. 73.

which all parts of the motion are employed: First, there is the formation of the head upon which the remainder of the bobbin is built; and second, the alteration in the level of the lifter plate to fill the other part of the barrel. The head is made at the commencement by neutralising the influence of the heart by means of the rack and scroll. As the building proceeds they are gradually taken out of action. A peculiar feature is that while the traverse is slowly lengthened up the barrel, it should always reach the flange until the head is complete. A reference to Fig. 72 will explain this. The bobbin is indicated by the thick lines. The first coils are wrapped just at the junction of the flange and barrel, so that when properly adjusted there is a very short traverse. The unwinding of the rack increases the influence of the heart, until the space A is occupied by a cone



WORSTED SPINNING.—FIG. 74.

of yarn. When this is accomplished, if correctly set, the rack will be out of gear and only the heart and scroll acting. The velocity at which the lifter plate must be lowered will depend upon the thickness of the thread, and this we have seen (page 305, vol. xxvi.) is governed by its weight and the amount of twist put in. There are five places where alterations can be made. Fig. 73 shows a plan view of the gearing employed. A is the cylinder shaft, on which is fixed a small driving pulley usually about 6in. diameter (this is not used for double-ended bobbins), driving by a belt the lifter pulley B, which carries the change wheel C, by means of which the speed of the traverse is regulated. This gears with the stud pinion D, to whose shaft is fixed the worm E. If a wide alteration of speed is necessary, such as when changing from thick counts to fine, it is advisable to effect such by means of E instead of by the pulley wheel. Thus, for fine yarns it is best to use a single worm, and for coarse yarns a double one, which obviates running D at an excessive speed. The wheel E gears with the wheel F, actuating the shaft G, upon which the heart H is fixed for regulating the length of the traverse. The heart H often requires to be adjusted so as to lengthen or shorten the picks. This can be done in two or three ways, the easiest being to pack it so as to place the shaft nearer to or farther from the centre, according to the result required. A worm I drives the wheels which regulate the lowering of the plate—viz., the wheels J and K and the scroll wheel L,—K being the change wheel. It will be obvious that any alteration to C will slightly affect L, because the purpose of the whole train is to yield a slow movement. The object of K is to assist C, and the general axiom of most managers is that C should be as small as possible and K as large as is convenient.

A quick traverse, with a slow depression, gives the best results, because the coarse pitched coils produce a better crossing of the yarn. Whatever me hod is adopted, it will be evident that the relation existing between bobbin capacity and roller delivery must be observed so as to get a correctly formed head. The bobbin can only hold a certain quantity of yarn, therefore both length and thickness must be considered. In addition there is another factor which has a certain amount of influence—viz., the drag. This, however, is practically impossible to accurately estimate, because of its variability and the fact that some spinners drag harder than others. If excessive, the bobbins will hold a greater length owing to the coils being wrapped very tightly, and consequently the speed of the lifter must be reduced. Apart from this, a result sufficient for all practical purposes may be obtained by taking the following case:—In an ordinary spool, 5in. over all, 1¼in. head, and ⅜in. barrel, the available filling space will be ¼in., and obviously only a certain number of layers can be built in this space. What is required is to first ascertain how many traverses it will hold. The diameter of the yarn must be found, and this may be obtained for any counts by extracting the square root of the number of yards in a pound; this is then divided into the filling space. The answer will be the number of traverses or picks. The next point is to determine how soon these traverses must be made so that sufficient yarn is available to fill the head; hence it depends upon the roller delivery. Before entering into the details of this relation it will be profitable to consider the principle of the mechanism and its parts. Unless these are understood, much difficulty will be experienced in adjusting the lifter to the counts. Fig. 74 is a diagrammatic illustration. A is the heart or cam, giving a pick of about 1¼in. for spools; B is a short swing lever having a small loose pulley C which runs against the heart; B works upon the centre D, and is sometimes termed the compensating lever because it enables the influence of the heart to be controlled when a short pick is required, as in making the head. E is second swing lever, longer than B, and working upon the centre F; this is termed the screw lever, because the screw G, against which the traverse rod H rests, is connected with it. Attached to E is an adjustable crosspiece, which may be taken nearer or otherwise to D as required. Apart from the variable pick, these levers enable a smaller heart to be used than is necessary in the simple heart motion. The proper length of traverse is obtained by increasing the influence of the heart by levers B and E. The nearer the approach to the centre on which a lever works, the less effect any given movement has, and *vice versâ*; hence by increasing the length of E, a longer traverse may be obtained, a method adopted in the case of the large ring bobbins. If the crosspiece were placed on a level with the centre D, the action of the heart would be neutralised, while if placed below the centre of A it is augmented. By this means the variable picks for building the head are obtained. At the commencement of the bobbin the lifter is adjusted, and the crosspiece placed a short distance below D; as building proceeds it is

gradually lowered, extending the action of A until the full traverse is reached. In making the head the question is the speed at which the crosspiece must be wound down. In Fig. 73 is shown the gearing. As stated, there are five change points where alteration can be made; but for ordinary purposes only two are used, C and K. C determines the speed at which the traverse shall be made, and K the rate at which the lifter plate is lowered. The head is formed during one revolution of the screw, so that the question resolves itself into finding the number of traverses the bobbin will hold of any counts, and then ascertaining how soon these must be completed.

(To be continued.)

Designs for Cotton Fabrics.

SPECIALLY CONTRIBUTED.

PATTERN No. 177* is a novel type of fabric composed chiefly of mercerised cotton, but having an appearance almost equal to an all-silk cloth. The ground is plain, woven with mercerised cotton warp and dyed grège silk weft, whilst the lappet design is worked by two sets of needles in thick mercerised cotton yarn. The pattern is intended to simplify the prevailing fashion of laying a solid coloured fabric behind a covering of lace, in this case the lappet effect aiming to represent guipure lace, whilst the background is supplied by the body of the fabric.

COTTON DESIGNS.—FIG. 3.

Pattern No. 178* is a better-class Oxford shirting of the figured class which seems to be gradually gaining in favour. The hopsack weave which forms the ground has a very effective appearance, but is liable, unfortunately, to take a too stiff finish in the laundry. This, however, can be obviated with care. These are fast weaving goods, for although the warp is fine, taking four ends to the hopsack, the weft is thicker, and only requires two picks to make the design square. The result is of quite as good if not better appearance as if twice the number of fine picks were used.

FIG. 1.

COTTON DESIGNS.—FIG. 2.

Fig. 1 is a design for cotton damask made in about an 80-reed and shot 90 picks to the inch. The black figure should be weft with grey warp, and on a tabby ground, or the design could be made with the figure entirely from weft, getting the effects with shadings and bindings, and on a 4-and-1 warp satin ground.

Fig. 2 is a design introducing a mock leno effect, and can be made in a 96-reed with about 84 picks to the inch. The black figure should be warp with grey weft, whilst the ground is tabby.

Fig. 3 is a sketch for a cloth made in a 76-reed, cotton warp and shot 96 picks of mercerised cotton for weft. The figure is made from the weft, except for the dropping effect, which should be three ends of warp caught straight across with weft. The stripes should be made with a thick cord of warp covered with weft, and inside might be 3-and-1 weft twill. The ground should be plain.

Fig. 4 is a design for cotton brocade made in a 96-reed and shot 120 picks to the inch. The black figure should be warp floated as much as possible; the grey should also be warp, but bound with 4-and-1 satin; the ground should be 4 and-1 weft satin.

FIG. 5.

Fig. 5 is an idea for a low class of goods made in about a 64-reed and shot 66 picks to the inch. The black should be weft with grey figure 3-and-1 weft twill. The ground where weft twill is on should be tabby, but in the stripe 4-and-1 warp satin.

Fig. 6 is a design for piece goods made in an 80-reed and shot 76 picks of weft. The black figures should be weft, with the grey diagonal stripes 4-and-1 warp satin, and the ground tabby. The grey effect under the weft figures should be a small warp and weft oatmeal, and the small spots warp.

FIG. 4.

COTTON DESIGNS.

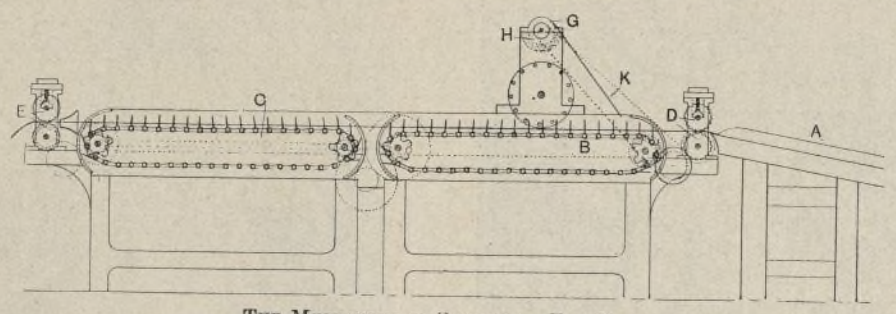
FIG. 6.

* See facing page 100.

The Mechanism of Spinning.—XI.

By H. R. Carter.

MACHINERY FOR SPINNING VEGETABLE STALK AND LEAF FIBRES.—Of vegetable fibres, those of the cotton plant, after being detached from the seed, are practically the only ones which are given to us by nature in a state suitable for spinning. Other vegetable fibres form part of either the stalk or the leaves of plants, are imbedded in pulpy or woody substances, and are generally bound together and



THE MECHANISM OF SPINNING.—FIG. 26.

covered with a gummy substance which must be removed to permit the individual fibres to be separated. Flax and jute, ramie, rhea or china-grass, and European hemp, are found in the stem of the plant, while aloe, argave or sisal, New Zealand flax or hemp, and Mauritius and Manila hemps, are produced from the leaves of the plants of these names. (For further information as to the above-mentioned plants the reader is referred to Article I. of this series, and to page 24 *ante*). The separation of the fibre from the stems or leaves is effected either by hand or machine, both methods being usually aided by natural or hastened fermentation, or by chemical treatment. The best flax, for instance, is produced by steeping the stems for ten or more days in still or running water, when fermentation sets in and renders soluble the gum which binds the fibre to the boon or woody part of the stem. After being dried the stems are passed through what is known as a "breaker," which consists of a series of pairs of fluted rollers which crush the straw and break up the boon into small pieces, which, if the stems have been sufficiently retted, are easily separated from the fibre by the strokes of a beater. The best flax breakers have six or seven pairs of comparatively small rollers, fluted rather finely to different pitches, so that they may break the boon into as small pieces as possible. The efficiency of the machine is further increased by turning the rollers backward and forward alternately by means of cranks, connecting rods, ratchet wheels, and detents. The crank producing the forward motion has the longer stroke, so that the straw passes through the machine. According to the most common method of flax scutching, the broken straw is held in a notch in an upright plank or "stock," while revolving beaters or "handles" of wood or light iron strike it repeatedly and knock out the shove. A scutching machine of recent construction, which gives good results, has two quickly-revolving wooden rollers upon which cast-iron blades with scalloped edges are attached. The blades intersect one another, and the broken straw being passed between the rollers is effectively cleaned.

The stems of the ordinary hemp plant are retted in a similar manner to flax, and may be cleaned in the same way. The majority of European hemp is, however, cleaned by the peasants in their own homes in a more primitive manner.

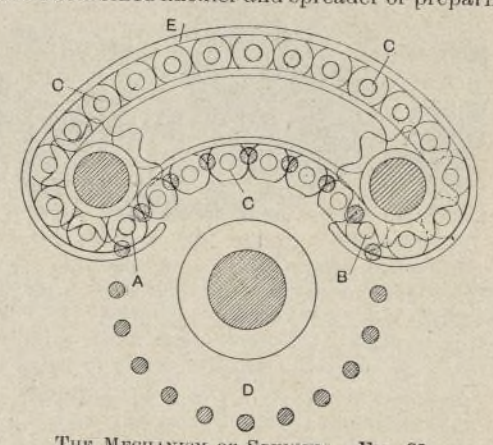
Ramie is perhaps the most difficult to separate of all the stalk fibres, since the actual filaments are covered by several cortical layers which must first be mechanically removed before the gummy matter which binds the fibre to the core can be attacked. Despite the offer of large rewards by Colonial Governments for satisfactory decorticating or delignating machines, we are not aware of any being on the market which can produce fibre equal to that produced by the manual labour of the Chinese. Of the two classes of machine, delignators separate the boon from the fibre and cortical layers, and decorticators produce the same effect while making an attempt at the same time to remove the cortical layers. The strips of fibre produced by the former machine must be subjected to severe chemical action, consisting of repeated boilings in soda lye, alternated with acid steeps or "sours" to dissolve the cortical layers and gum, before the fibre is in a fit state to commence the spinning process. The ordinary hand-cleaned china-grass and the best mechanically-decorticated fibre also require this chemical treatment in a modified degree, sometimes combined with fermentation, to dissolve the large percentage of gum which cannot be completely scraped from the fibre.

The long flat leaves of the New Zealand flax or hemp are cut down and subjected to the action of a stripper similar to the flax scutcher's handles, which detaches much of the bark. The partially cleaned fibre is then put into a trough through which water circulates, and is washed and scraped with a flat piece of wood. The fibre is then "grassed" and partially bleached by the action of the sun and air, after which it undergoes a further scutching process, which softens, cleans, and renders it a saleable article.

Manila hemp fibre is contained in the leaf stalks of a plant belonging to the banana family, and often grows to a length of 8ft. The natives first cut down the plant and scrape the pulp from the fibre, which they hang out to bleach and dry. There is not, so far as we are aware, any machine which can show such satisfactory results as does hand labour. This material, which is exported in large quantities, is generally classed as C or "current," "fair current," and "brown," while there is an almost white variety of superior quality.

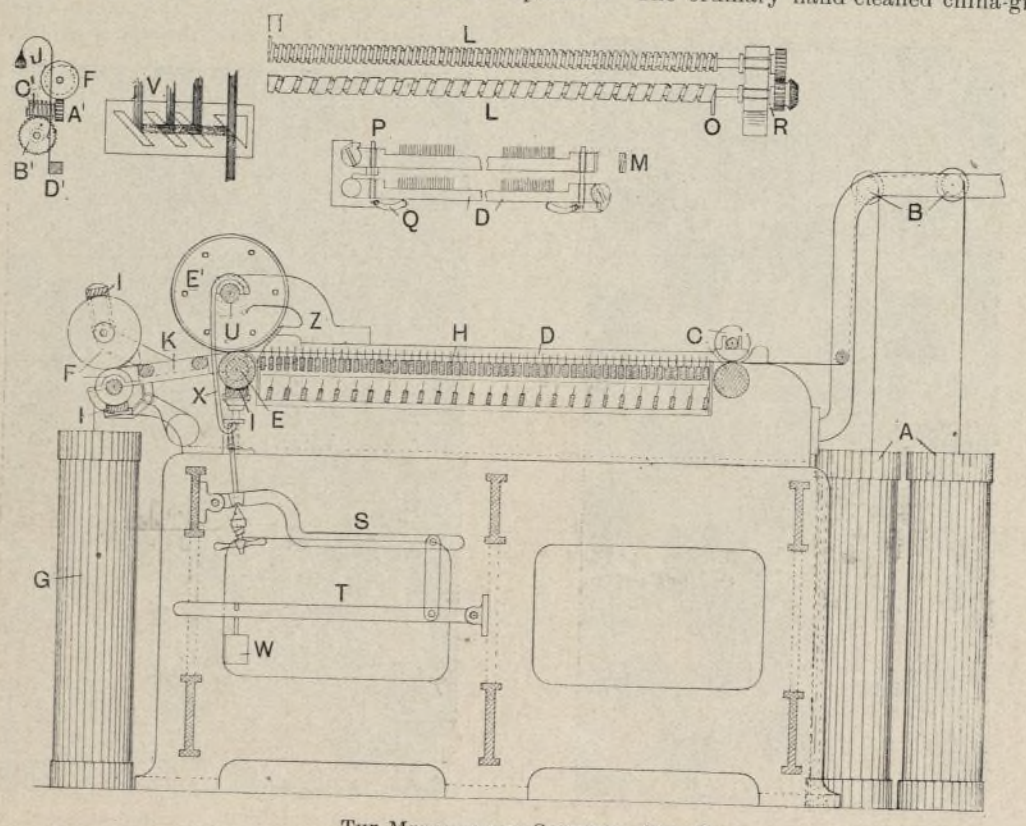
Manila hemp is one of those fibres among which we may also class aloe, sisal, New Zealand and Mauritius hemps, which, although very strong, cannot be advantageously split up to spin fine yarns, and which are consequently used for rope yarns, etc., just as they are imported into the country.

When the bales are opened the fibre is spread directly upon a feed table A of a machine similar to that in Fig. 26. This machine is known as Good's combined hackler and spreader or preparing



THE MECHANISM OF SPINNING.—FIG. 28.

machine. The idea originated in America, and the machine was specially designed for Manila hemp. It has two chain sheets B and C of gill bars, the former of which is carried round at a speed slightly greater than the surface speed of the feed rollers D, which are fluted and pressed together by means of springs. The sheet C, however, has five to eleven times the surface speed of the sheet B, so that while the hemp is held by the rollers D and the teeth of the sheet B, it is combed or hackled and the fibres rendered straighter and more parallel by the teeth of the sheet C. The material is then caught by the heavily-weighted rollers E, which have a greater surface speed than the quick sheet, the fibres being consequently drawn through the teeth of the quick sheet C and still further parallelised, being at the same time condensed into a sliver which is deposited in a large can or coiled by hand into a large heap upon the floor. Hard fibre of this nature becomes much softer and more pliable and works better through the gills if it is slightly lubricated. Colour being of no consequence when working brown Manila or New Zealand, it is usual to use a cheap mineral oil of fair body which may be applied to the material with a rose-headed can before spreading, or by using the apparatus as shown in the figure, which is much superior to hand application in that it is perfectly regular and may be varied in quantity as desired. G is a plain oil roller, say 24in. wide, or rather wider than the row of gills, which is often 23in. in breadth. The roller is partly submerged in a trough of oil H, which should be kept filled up to as nearly as possible the same level. Upon the end of the oil roller is a rope pulley driven from another pulley compounded with the intermediate wheel between the feed roller and the slow-sheet back roller. The oil roller, being thus turned, carries round with it a thin film of oil which is scraped off by an edge pressed against the surface of the roller, and runs down an inclined and channelled sheet K, dropping upon the hemp in the



THE MECHANISM OF SPINNING.—FIG. 27.

teeth of the slow sheet, as shown. The feed of oil is thus regularly distributed, and stops and starts with the machine. We should mention that the oil is much more effective as a softener if it be heated. If it is not hot it will not sink into the fibre in the same way, and will very likely ooze out of the goods for which the yarn is being spun. The quantity of oil used may be varied by changing the pulley on the oil roller. The gill bars have "dogs" on their ends, which, running on guides on the sides of the framing, hold the teeth perpendicular, or give them a slight backward rake as required. The dogs consist of elbow cranks, from one arm of which a stud projects outwards. On the outer face of the arm is a transverse groove which works upon a rib which forms part of the guide. The "dogs" are alternately upon opposite ends of the bars. In this way, by increasing the thickness of the guides above or below, the foremost bars of the slow sheet may be turned so as to give their teeth a backward rake, while in the same way the rear bars and teeth of the quick sheet are given a forward rake, so that, the fibre not being able to slip over their points, they comb the material more effectually. As the bars of the quick sheet approach the drawing rollers, their teeth should be inclined backwards for the same reason. The machine should have a stop motion to cause the stoppage of the machine should the material lap round the sheet, as it sometimes does. An arrangement of this sort has a lever underneath the sheet, which lever, when depressed by such an accumulation, releases the belt fork, which shifts the belt on to the slack pulley. To obtain the best results from manila, three machines of this description should be employed. Only the first, however, is provided with a feed table and oil roller. The other two have the ordinary sliver pulleys, as shown in connection with the machine in Fig. 27. These three patent preparers should progress gradually in fineness, the following being the particulars :—

——	Spreader.	Second.	Third.
Pitch of gill bars	4½in.	3⅜in.	3⅜in.
Width of gill	23in.	22½in.	19½in.
Teeth in the row	28	36	39
Length of tooth out of the bar	5in.	4in.	3½in.
Suitable drafts	10 to 20	10 to 20	10 to 20
Speed of the slow sheet in feet per minute	16 to 32	16 to 32	16 to 32
Speed of the quick sheet in feet per minute	175	175	175
Rate of delivery in feet per minute	200	200	200

In these machines the chain sheets are generally used to communicate motion from the boss roller to the feed rollers, and the gearing is arranged in the following way :—The boss roller has a wheel of 28 teeth keyed upon it, which drives a wheel of 50 teeth on the front carrying roller of the quick sheet as shown. The back roller of the quick sheet is then driven at the same speed by a side shaft through two pairs of mitre bevels of 26 teeth each. Upon the quick-sheet back roller is a wheel of 20 teeth driving a stud wheel of 80 teeth as shown. Compounded with this wheel is a stud pinion of 30 teeth driving the wheel of 80 teeth on the front roller of the slow sheet. There are chain sprockets of five teeth on this roller, and similar sprocket wheels on the back sheet roller, so that this latter moves at the same speed. The back sheet roller has a wheel of 40 teeth upon it, and drives, through an intermediate, another wheel of 40 teeth on the feed roller. The boss or drawing roller and the feed roller are of the same size—namely, 6in.—so that, starting with the feed rollers, the relative speed of feed and delivery or the draft is equal to

$$\frac{40 \times 5 \times 80 \times 80 \times 26 \times 26 \times 50 \times 6}{40 \times 5 \times 30 \times 20 \times 26 \times 26 \times 28 \times 6} = 19.$$

After leaving the third preparing machine, the slivers should be drafted and doubled over two or three screw gill drawing frames, as shown in Fig. 27. A, A are the cans from the third preparing machine, B the sliver guide pulleys, C the feed rollers, D the gill bars or "fallers," E the drawing rollers, F the delivery rollers, and G the can which will be taken to the next drawing frame. The gill bars on the upper slide H have approximately the same surface speed as the feed rollers C. The rollers E have a surface speed about eight times as great, giving a draft of 8. The delivery rollers F have a slight "lead" on the drawing rollers, in order to keep the sliver tight on the doubling plate K. The faller bars are moved by the screws shown in detail at L. The ends are cut as shown at M, to fit into the screw threads, while the gills remain vertical when on the top slide. The upper screw, of comparatively fine pitch, moves the fallers forward, upon the top slide, until they fall or are knocked down into the threads of the lower screw by the tappet N. The bottom screw is of coarse pitch, so that fewer fallers are required. It turns at the same speed as the top screw, and the tappet O raises one faller every revolution into the threads of the upper screw and on to the top slide. There are pieces P, back and front, at the ends of the slides, to guide the fallers in their up-and-down movement. The front guides fit into grooves in the faller ends as shown. In order that heavy fallers may not wear the bottom slide in consequence of their constant dropping, faller lowerers Q are provided, which being moved up and down at the right moment by an eccentric R, on the rear end of the bottom screw, catch the faller and lower it gently on to the bottom slide. The lower drawing roller E is of steel and scored to give it more gripping power. The pressing roller E^1 may be of wood, but is much better if made of pieces of leather, on edge, bolted between two steel flanges. The pressure is applied by means of compound levers S and T, the weight W, and the hanger X. The pull of the levers should be as nearly as possible in a straight line, passing through the centres of the two rollers. The centre line of the groove in the bracket Z should also correspond, so that as little power as possible may be lost in friction against the groove. In coarse hemp drawing frames of this class the drawing and pressing rollers E may be replaced by "Lawson's drawing head," as shown in Fig. 28. Here an extended interlocking holding surface A to B is formed by means of a series of loose-driven holding bars C interlocking with the bars of a lantern wheel D, such loose bars being guided in their course by an endless race E. The material lies between the loose bars and those of the lantern wheel, where it is so tightly interlocked that the mechanism forms a very efficient drawing arrangement, and one which will wear for a long time if due care be exercised to prevent the bars being bent by lumps, etc. Returning to Fig. 27, the doubling plate K is shown in detail at V. It should be as smooth and well polished as possible, so that the slivers may not lurk behind. The slots are at an angle of 45°, and if the proper tension be maintained between the boss and delivery rollers, the slivers will double nicely in, the one on the top of the other. The first from the right-hand side in the figure will always be the tightest, since the effective diameter of the delivery roller upon which it is working is the bare diameter plus twice the thickness of the other slivers. The second from the right will always be the slackest, since it lies against the bare diameter of the delivery roller.

The bell mechanism is shown separately at J. F is the double-threaded worm on the end of the delivery roller. A^1 is a worm wheel of 20 teeth. C^1 is another double-threaded worm driving the bell wheel B^1 of 30 teeth. J is the bell hung on the end of a limber piece of steel, fixed at D^1, and having a projection in the path of the pin in the bell wheel as shown. As the bell wheel turns, the pin pushes back the bell spring until it passes the end of the projection, when the spring rebounds smartly, ringing the bell. If the diameter of the delivery roller be 8in, the length of the "bell," or of sliver deposited in the can, in the intervals between two consecutive ringings of the bell, will be $\frac{20 \times 30 \times 8 \times 3{\cdot}1416}{36 \times 2 \times 2} = 105$yds. We divide by 2 twice because the worms, being both double-threaded, pass two teeth at each revolution. Some of the rollers are provided with rubbers I to prevent the slivers from lapping around them. The appended table gives particulars of a set of three drawing frames suitable for Manila or New Zealand hemp.

In coarse and strong machinery of this sort the gill pins are inserted right through the bars D, no 'stock" being required in consequence. The cans from the bell frame are made into sets of a given

——	Bell Frame.	Set Frame.	Third Draw.
Rows of gills per delivery	4	6	6
Deliveries per frame	4	6	6
Breadth of gills	7½in.	4⅜in.	4in.
Pins in the row	13	14	15
Length of the pin out of the bar.	2⅜in.	2½in.	2¼in.
Pitch of the screw	1½in.	1¼in.	1in.
Drafts	10	10	10

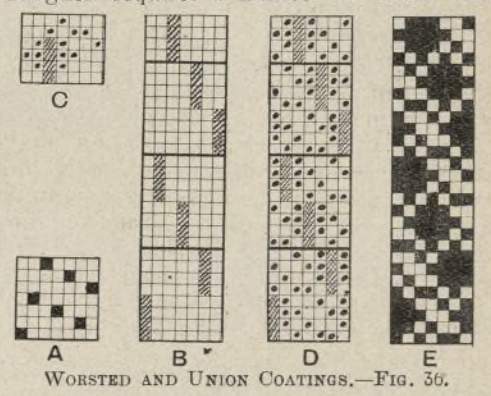
weight and then passed over the set frame. After these repeated draftings and doublings a fine level sliver is obtained.

(To be continued.)

The Design and Construction of Worsted and Union Coatings.—X.

[ALL RIGHTS RESERVED.]

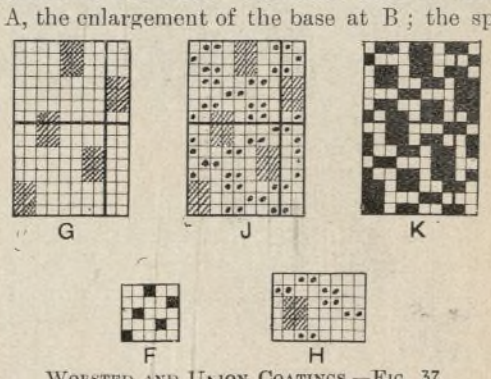
GROUND WEAVES (*Continued*).—The satin base on which weave effects may be built need not necessarily be enlarged equally in the direction of both warp and weft. The best results are obtained by such procedure, but useful weaves may frequently be obtained by enlarging the satin base in one direction only, or by enlarging more in one direction than the other. Such a system, if not prolific in useful weaves, serves at any rate to increase the scope of a limited number of shafts. For instance, a designer requires a number of small weave



WORSTED AND UNION COATINGS.—FIG. 36.

effects, and is anxious to try them in a certain quality of cloth. There is a warp weaving that quality in standard goods, and time does not allow of a special warping or retwisting into different healds. The present draft is, say, on ten shafts, so there is more than one base open to build upon. He may first use ordinary five, and ten satin bases, then a double five-satin base, and then, by the system just mentioned, a ten-satin base enlarged longitudinally. It would also be possible to try a five-satin base, doubled in the direction of the weft, and trebled or quadrupled warpways.

Fig. 36 is an example of a small weave effect built in a seven-satin base, which is quadrupled in the direction of the warp, but unaltered in the direction of the weft. The satin base is shown at A, the enlargement of the base at B ; the spot



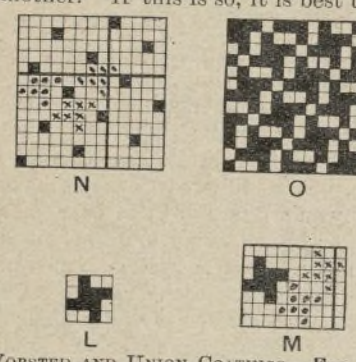
WORSTED AND UNION COATINGS.—FIG. 37.

applied is shown alone at C, its application to the enlarged satin base at D, whilst the complete design is given at E. This design shows a strong diagonal tendency, a failing which is usually marked in designs built on this method, and is the chief disadvantage of their use. Sometimes, however, a twilling effect is desired, and then such weaves come in useful.

Fig. 37 shows another type of base unequally enlarged. The five-satin shown at F is doubled in the direction of the weft (transversely), and trebled longitudinally. This gives the base shown at G,

upon which the effect H is built, as shown at J. The resultant design shown at K gives a neat weave effect, which, although showing a tendency towards twilling, is not so marked in this respect as the previous example ; in fact, it can scarcely be said to be more faulty in this direction than some of the designs built on regular satins or regular enlargements.

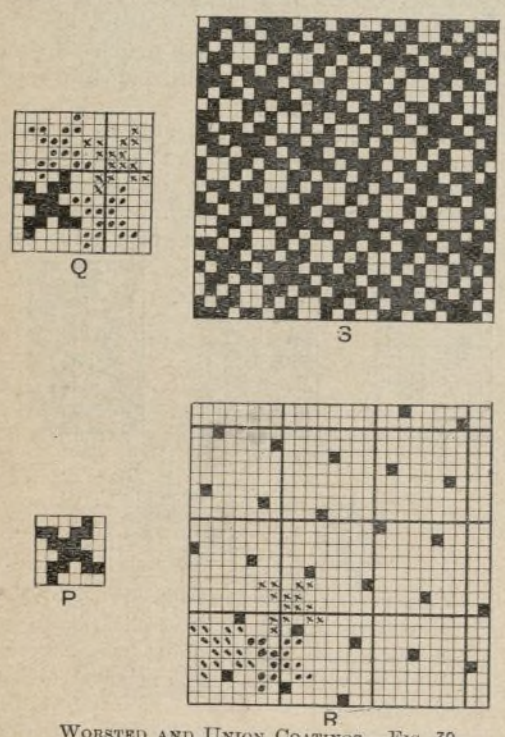
By the methods already shown, it is possible to know, before commencing the design, the exact number of ends and picks upon which it will be complete. Sometimes, however, the designer has some idea of the kind of spot, effect, or outline which he requires, and the only thing necessary is to put this into practical form. He probably also has some idea as to the way in which the various parts are to be distributed, or the manner in which they should be placed in relation to one another. If this is so, it is best to paint in



Worsted and Union Coatings.—Fig. 38.

two or three repetitions of the spot, each bearing the proper relation to one another ; then to take one square in the same part of each spot as a basis for the continuation of the scheme of arrangement.

As an instance, it may be supposed that the designer desires to obtain a weave composed of a number of spots like that shown at L in Fig. 38. He may have seen the same spot arranged in stripe form, or as playing a part in some diagonal ; or, on the other hand, the spot may be his own conception. The next step is to make some form of arrangement, placing each spot so that it does not overlap its neighbour, and yet it is necessary to see that the weft space (considering the spots as warp floats) is limited, or that it forms a spot effect of itself. It is quite possible to arrange a very effective spot design so that the result is an utter failure, simply because the intervening weft floats, being ungainly in appearance, and covering too much space, quite overshadow the effects of the warp, which appears lost in a wilderness of wayward threads.



Worsted and Union Coatings.—Fig. 39.

Proceeding with the spot L, the arrangement desired is worked out at M, three spots being quite sufficient in this case to determine the running positions. The three spots are marked in the same parts of each, say the topmost square, these three squares giving the starting position for finding the satin or other arrangement which the complete design will possess. The relation of each marked square to the other will make it possible to arrange the remainder of the squares, and when a repetition comes, the base is shown complete. Taking the present example, the defining squares are continued or repeated at N, showing, when complete, that the basis of arrangement is in thirteen-shaft satin order. The design is then completed by building the original spot on each of the remaining satin marks, giving the weave as shown at O. If it is not possible to make use of such a design on the healds which are available, very little time has been lost, and the design can be put away in an envelope containing other thirteen shaft designs, until such time as it may be required. Of course, the four phases of the design given in Fig. 38 are quite unnecessary in practice when one working will suffice for all. They are given here to better illustrate the different stages of the operations.

Fig. 39 gives another example of weaves obtained in this manner. The spot effect originally conceived is shown at P ; the relation of the spots to each other is shown at Q ; and the extension of the order, by marking and continuing the top squares of each spot, is shown at R. The arrangement is determined as being on a 26-shaft satin base, and the completed design is shown at S. This method of obtaining weaves may be called a "spare-time" method. It cannot be recommended when there is an urgent demand for weaves which must fit on some definite number of shafts ; but a large number of useful designs may be built up between seasons, when no designs of special character are in requisition, and a collection of such will greatly relieve the rush during the pattern season. The base may not necessarily come out to be a regular satin, but in any case the procedure is the same.

A use of the different methods described will suggest other variations on similar lines, all of which will give the designer a wider field to work in, and result in a greater variety of design. There are many designs, and many very useful ones, which cannot be classed under any regular method of build, and the defined rules should form no more than a neucleus for both ideas and results.

(To be continued.)

Designs for Silk Fabrics.

Specially Contributed.

Fig. 1 is a design for a lady's scarf with a straight end and fringe. It should be made with an 1800/2 spun or net silk warp, and shot about 100 picks of tram. The black figure should be weft, nicely floated with the grey figure warp on a 3-and-1 warp twill ground. The figured bars might be shot in a different colour from the ground, the black in them being 8-shaft weft satin, and the white figure 4-and-1 warp satin. The grey lines should also be in a different colour, and made 7-and-1 weft twill.

Fig. 2.

Fig. 2 is a design for the same class of goods as above, but with the pointed end. The figure, where black, should be weft, and where grey, warp, and bound with cuttings where possible ; the black lines at the end of the scarf should be weft, about

Silk Designs.—Fig. 1.

7's or 9's thick. The grey ground is intended for a fine storm or oatmeal effect, the pattern to be on a 3-and-1 warp twill ground. Scarves on the above lines are in demand at present, and certainly look very well when made in delicate colours.

Fig. 3 is a pattern suitable for silk piece goods, and should be made with a 2000/2 spun warp, and shot 96 picks of tram. The black should be bright weft with grey 3-and 1 weft twill, and on a 3-and-1 warp twill ground. The portion inside the black lines

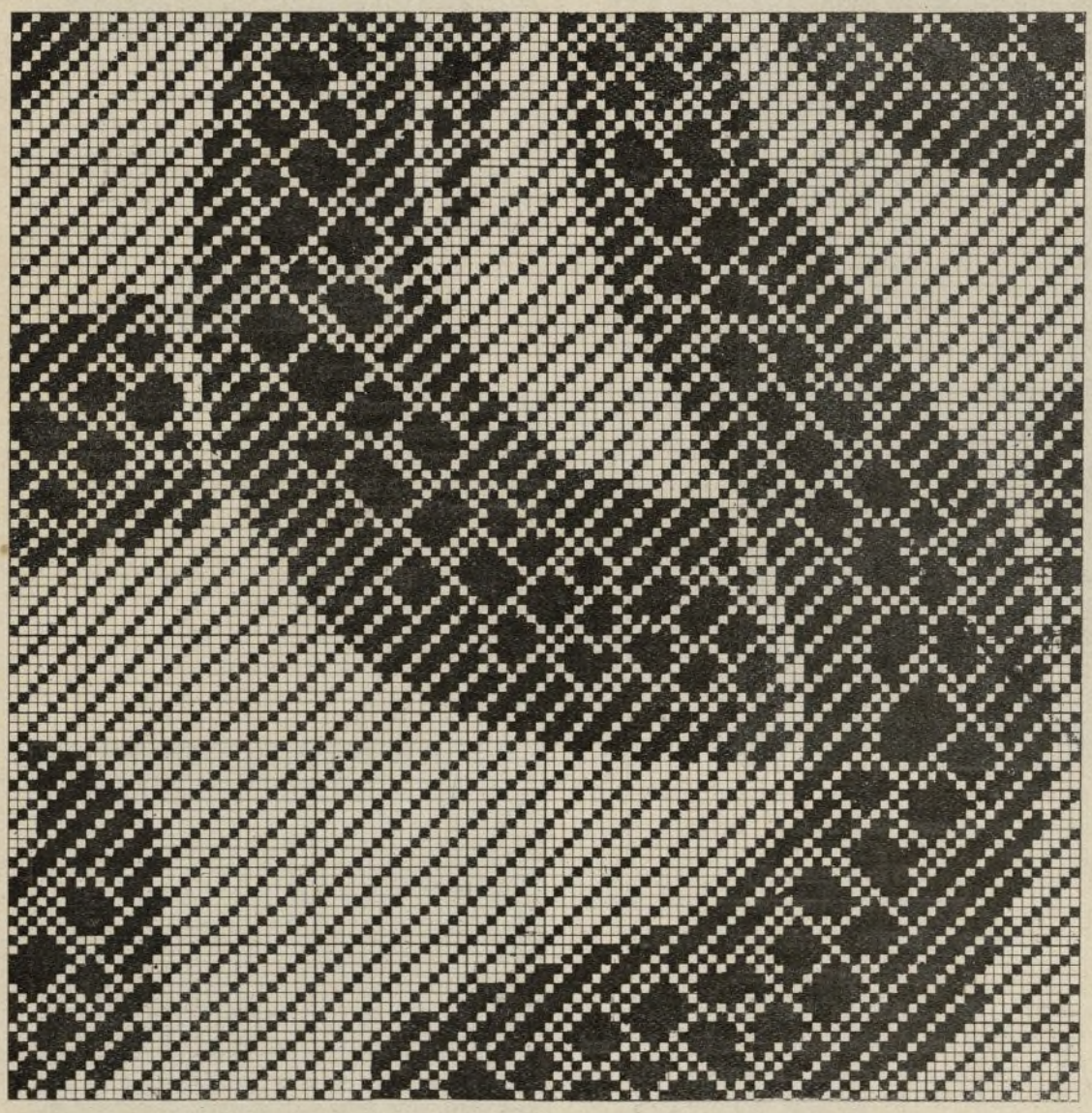
Silk Designs. Fig. 3.

is shown worked out in Fig. 4. Designs of this character are very effective, the weft showing up well, and the 3-and-1 weft twill giving a pretty chêne effect.

Fig. 5 is a design for a blouse cloth, and will require a good net silk warp, about a 2000/4, and shot 100 picks of tram. The black figure should be weft, well floated, the grey tabby or two pick, and the ground 7-and-1 warp satin.

Fig. 6 is a very suitable design for a gent's tie cloth, and is intended to be tissued all through. The warp should be an 1800/4 net silk, and shot about 80 picks of each colour net silk. The black should be the tissue shuttle, and the grey the ground one, on a 4-warp and 2-weft twill ground. The grey storm effect should be an oatmeal made with the ground shuttle. Shadows of 7-and-1 warp satin might be introduced with advantage round some of the ground weft figure.

Fig. 7 is a design for a handkerchief. The warp should be an 1800/2 spun, shot with 110 picks to the inch of tram. The figure should be worked up



Silk D s.—Fig. 4.

chiefly from weft, with a little warp introduced (white in the figure). The ground outside the figure should be a fancy weave. Figs. 8 and 9 are good designs for this purpose, but the white ground inside the figure should be 3-and-1 warp twill. The lines in the border should be warp in the upright, and weft in the cross portions ; and 7-and-1 twill with a body fancy effect like the design in Fig. 10, which can be made from 24 hooks. Patterns on this style are very effective when made in a shot effect, and make a nice cheap class of handkerchief.

Cotton Fibres in Spinning and Manufacturing.—III.

By W. I. Hannan.

STAINED COTTON FIBRES.—In examining samples of cotton for spinning purposes, taken from different bales, there is often a marked difference in colour, although the country of origin is the same. In American cottons the colour varies between snow-white and cream, or golden. The presence of a creamy colour in American is not a bad sign, neither does it detract from the market value of the cotton samples. Creaminess is a sign of extra strength, being an internal colour developed from the vital material of the fibre cell; it is related to the brown colour met with in the long-stapled Egyptian fibres known under the name of endochrome. The absence of this brown colour in Egyptian reduces its selling price and strength, also its silkiness in lustre, and it is an indication that the plant has not been rich in its secretions, or behaved well to the soil in which it has been grown.

In some American samples a small quantity of green-coloured fibres are met with occasionally; this colour results from the integument of the seed, and has been styled the "Mexican" or green-seeded cotton In some cases it has been traced to new seeds or those that have only matured during one season, being sown again in the next. It is probably a sign of degeneration where the chlorophyll cells of the integument do not become changed to a harder tissue. The staples containing green fibres, although rare, are not as a rule much sought after; the colour is uncommon and out of the run of highly-coloured cotton staples. "Bole-stained" is a term used to distinguish brown-coloured layers or semi-layers of cotton that ap r in American and East Indian bales. This bo e-stained cotton is mainly caused by the seed cotton remaining in the unopened pod until it has become saturated by the rain entering at the partly-opened sutures. This saturation of the fibres by moisture causes the colouring matter from the inner membrane of the pod to permeate the fibres. The colouring is of a red or brown shade, and being transferred to the seed cotton gives rise to the name of bole or brown-stained. The colouring is unnatural, and does not add to the strength of, or increase the value of, the cotton. Some cotton pods have only one or two of the cavity locks of seed cotton stained, while the third, fourth, or fifth cavity is unstained or white; but in the ginning the two kinds get mixed up together, the brown disfigures the white, and the bulk of such cotton is then styled bole-stained. It may be taken as an axiom that cotton fibres can only be strengthened in a natural state by colouring matters that originate in the internal part of the growing fibres, from the plastic vital material of the fibre cell, and that those from other organs of the pod are not factors of strength.

For weft yarns bole-stained cotton is unsuitable unless the cloth into which the yarn is woven is intended to be bleached; in the latter case the bleaching gets rid of the staining. For twist yarns it may be mixed moderately with cottons of a more bony staple, and the colour is diffused or lost in the size box.

Silk Designs.—Fig. 5.

Hoop-stained fibres are those which have become brown owing to the hoops of the bales having become rusty; this colouring is only temporary, and may be got rid of in the blending and opening processes.

The cotton pods of some countries—notably those of India—are often perforated by a small worm or weevil, which bores its way into the cotton seeds and feeds on the kernel. It leaves behind it a reddish colouring matter of a darker hue than wet bole staining, and disfigures the seed cotton at the

Silk Designs.—Fig. 6.

time of picking. The name of "army worm" or "cotton caterpillar" has been given to one of these larvæ. It is no easy matter to distinguish between insect-stained and bole-stained when judging samples, but as a rule the fibres of insect-stained cotton have a rougher feel, owing to particles of the inner wall of the pod and seed being attached to the fibres, and these when seen under the microscope have

some resemblance to the yolk on the woolly fibres of the sheep.

Silk Designs.—Fig. 7.

"Drake's eye" or "red spot" is a term used to distinguish cotton staples of good white colour that have shown here and there a dark red spot of colouring in the samples. In some cases it has been sought after and bought up readily, but there is a mist surrounding its origin. It may be due to the work of some insect, but hardly due to the plant's development.

Oil-stained fibres are mostly due to the seeds of cotton being crushed in the ginning, when the oil of the kernel glands oozes out and contaminates the attached fibres, causing them to have a faint yellow colour. This oil-staining is also caused by seeds being crushed in the opener, giving rise to bearded motes. Oil-staining is a bad feature, and causes laps to lick, and the fibres of slivers to be repulsive and curl up in the fly frames and mule.

Fungoid stains are really mildewed fibres in which the cellulose walls have become a pabulum for the growth of the mycelia of fungus, the cells of which multiply rapidly and give off spores for new bodies of plants. The dispersion of the spores gives rise to a scent or musty odour, which is

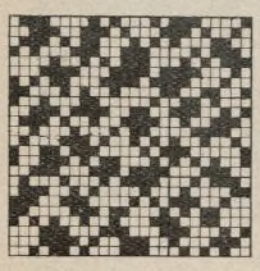


Fig. 8.

Fig. 9.

Silk Designs.

blown about in the air; the mildew of yarn and cloth, and also that of fibres generally, are probably varieties of the genus Penicillium.

Kaki cotton or golden-tinted fibres are related to those which develop endochrome as a strengthening and lustring factor. They must not be confused with either bole or insect stained cotton, but belong to creamy and brown Egyptian staples generally.

(To be continued.)

Fancy Dress Fabrics.—XV.

By G. Washington.

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A FINE cord fabric is shown in Figs. 147 and 148, two weft cords alternating with two cords of fine twill on both sides of the fabric.

Warp.
40's worsted.
102 ends per inch.

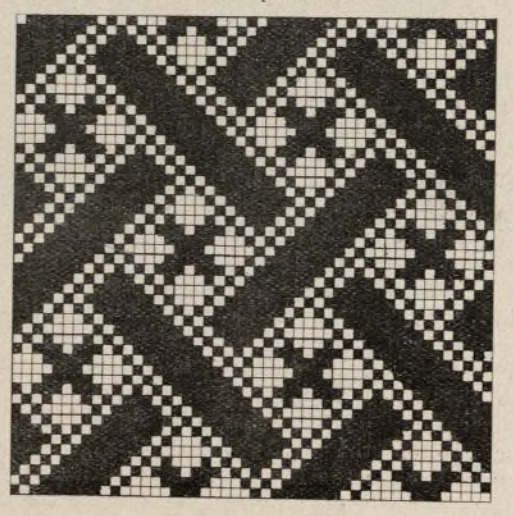
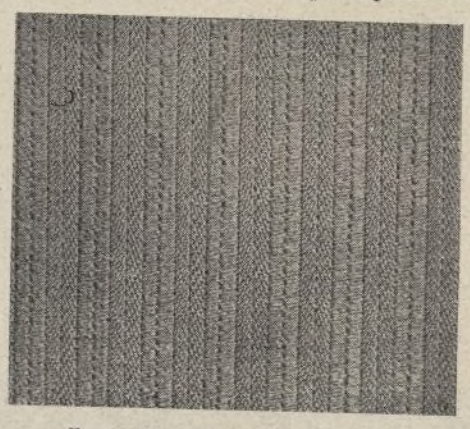


Fig. 10.

Weft.
70's worsted.
156 picks per inch.

Figs. 149 and 150 are taken from a black silk fabric which contains three kinds of weave effect. The warp weaves in pairs, and each square in Fig. 150 represents two threads. The difference in setting and counts of yarn in warp and weft is far greater than in Fig. 145; therefore large, smooth, clear cords are formed by the plain weave.



Fancy Dress Fabrics.—Fig. 147.

The running figures and stripes are warp sateen, interspersed with bold detached figures of a cord character, with alternate pairs of threads floating on face and back. Character is given to the design by the straight stripes of sateen, which contrast well with the all-over effect of the curved

Fancy Dress Fabrics.—Fig. 148.

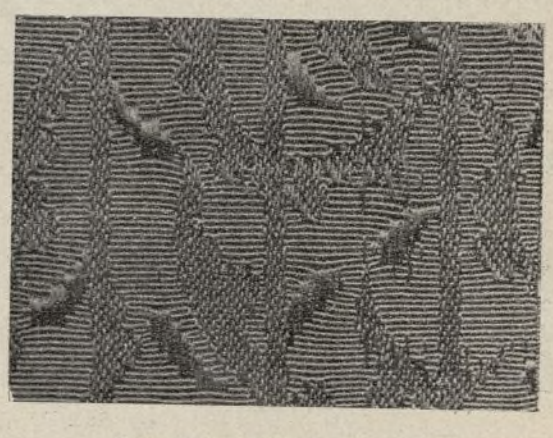
figures. The smooth surface of the detached figures is very lustrous, and also stands out prominently from the surface, thus enabling these comparatively small figures to balance the larger area of cord and sateen and relieve it from monotony.

Warp.

Silk, 7000yds. per ounce.
288 ends per inch.

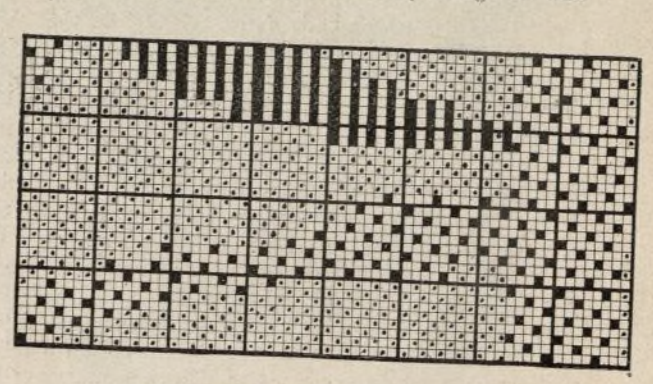
Weft.

4/28's worsted.
40 picks per inch.



Fancy Dress Fabrics.—Fig. 149.

The stripe pattern, Fig. 151, presents several features of interest. Fig. 152 is the weave for the open stripe, which is woven in groups of 4 threads separated by an empty reed; each of these groups contains two thick lustre threads passing over and



Fancy Dress Fabrics.—Fig. 150.

under 3 picks alternately, with a fine thread at each side binding them firmly in position and keeping the groups as far apart as possible. The plain ground and the twilled stripe are woven 3 in the reed, but the lustre warp for the detached

figures in the centre is extra, passing through to the back when not required to show on the face, and therefore 6 in the reed. Fig. 153 is the design for the fancy stripe. Two sizes of twills are employed in the outside stripes. This gives a little variety, and also causes one twill to split the 2

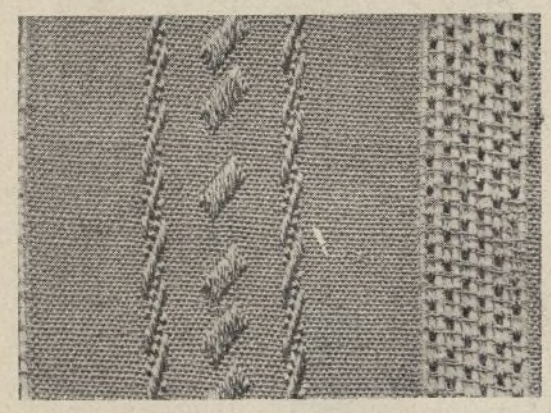


FIG. 151. FANCY DRESS FABRICS. FIG. 154.

picks that are combined in the cord of the next twill. The arrangement of the central figures in groups of four and one alternately is very good, and gives character to the whole design.

Warp.

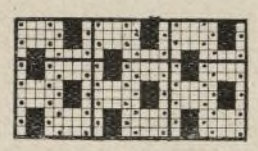
6 times	1 end	2/60's worsted.
	2 „	2/30's lustre worsted.
	1 „	2/60's worsted.
	39 „	2/60's worsted (plain).
	6 „	2/30's lustre worsted.
	13 „	2/60's worsted (plain).
11 times	1 „	2/30's lustre worsted.
	1 „	2/60's worsted.
	1 „	2/30's lustre worsted.
	13 „	2/60's worsted (plain).
	6 „	2/30's lustre worsted.
	39 „	2/60's worsted (plain).

30 reeds per inch.

Weft.

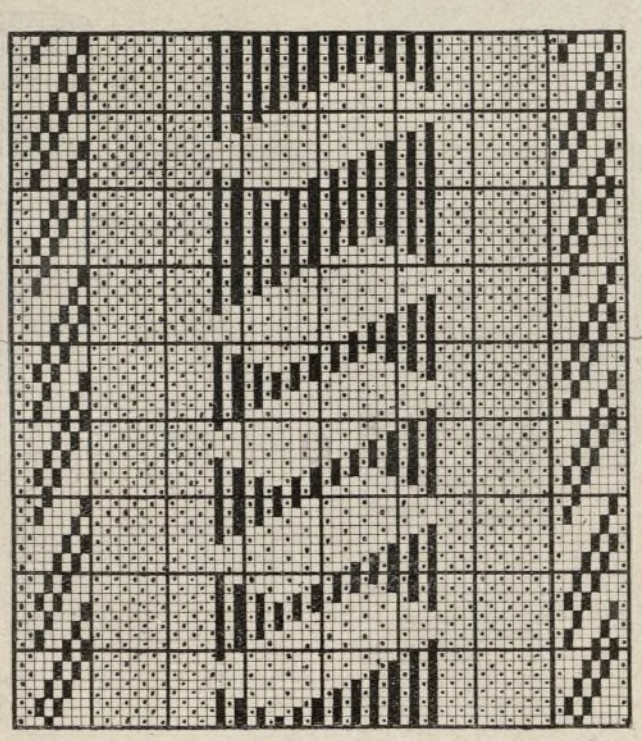
35's worsted.
54 picks per inch.

A simple but effective design is shown in Fig. 154. The ground is woven plain and



FANCY DRESS FABRICS.—FIG. 152.

ornamented with weft figures floating over 9 threads. The length of the zig-zags in the figures



FANCY DRESS FABRICS.—FIG. 153.

is so proportioned to the width of the twills that each twill is opposite to the centre of one at right angles to it. One repeat of the pattern contains five figures arranged on a sateen basis. The manner in which the long zig-zags connect the figures together gives a diagonal character to the design, which contrasts well with the cord effect produced by the thick cotton threads.

Warp.

1 end 3/12's cotton soft twisted.
6 „ 2/100's cotton.
60 ends per inch.

Weft.

28's lustre worsted.
56 picks per inch.

(To be continued.)

REVIEWS OF BOOKS.

COTTON SPINNING. Vol. II. By W. S. TAGGART. London: Macmillan and Co. Limited. 4s. net.

THIS is the second edition of the second of the three volumes with the above title, the combination forming what is now generally admitted as one of the standard works on cotton-spinning machinery. The volume, which has been reprinted, takes the processes from drawing to the fly-frame, and has been slightly revised since its first appearance.

DOCKHAM'S AMERICAN REPORT AND TEXTILE DIRECTORY. Boston, U.S.A.: C. A. Dockham and Co. 25s.

WE believe that this directory is by far the most exhaustive of its type, embracing as it does every kind and every class of textile manufacture throughout the United States. The entire list is first taken as a whole and arranged in alphabetical order, after which the names are rearranged according to the different states and towns. The advertisements at either end of the book are of no slight value, giving as they do a complete catalogue of textile machinery and products. Amongst other varied information the publishers give a census of textile machines, which, summarised, shows that at present there are running in the States 22,152,926 cotton spindles, 8141 sets of wool cards, 1451 worsted combs, 509,183 cotton looms, 82,351 woollen looms, and 43,490 silk looms; a total of 635,024 looms.

THE STANDARD A B C ADVERTISEMENT PRESS DIRECTORY. London: T. B. Brown Limited, 163, Queen Victoria-street, E.C. 10s. 6d.

THIS is a directory, for 1901, of the various papers and magazines published in the British Isles, arranged chiefly to give advertisers some authentic information as to the best means of making public their manufactures or wares. When it is remembered that these isles produce 4668 different types of magazines and papers, and that in addition to these the principal papers of the world are described, it will be admitted that the task of compilation is no light one, and has been carried out in a manner which makes reference convenient and easy. The work contains much general information, and many practical hints on the art and business side of advertising. Its eleven hundred pages are handsomely and strongly bound, whilst the vari-coloured leaves, with particulars printed outside, facilitate reference.

GUIA PRACTIC PERA LA FIL ATURA DEL COTÓ. By EMILI RIERA. Barcelona: Tip "L'Avenc," 20, Ronda de l'Universitat.

THIS is a little work devoted mainly to the calculations required in connection with cotton spinning and the various machines used in the process. It is written in Spanish, but the illustrations are English — that is, their parts are defined by English words. The book is set out in a neat and distinct manner, and the headings to each separate calculation are clear and easy for reference. To an English reader the most valuable portion is the dictionary at the end, which gives the equivalents of textile trade and machinery terms in English, Spanish, and French. Many words are thus given which cannot be found in an ordinary dictionary.

WE have also received:—The sixth edition of the descriptive Catalogue of Turbines as issued by Messrs. W. Günther and Sons, Oldham. This book contains well-illustrated descriptions of Girard, Pelton, Jonval, and other turbines, and the accessories connected with their use. A large amount of useful information is to be found in the tables, calculations, and formulæ given.

QUERIES AND REPLIES.

*** Names and addresses must in all cases accompany inquiries. A stamped addressed envelope must be enclosed if a reply by post is desired.

R. W. AND CO. (Liverpool).—Messrs. Whiteley and Sons Limited, Lockwood, Huddersfield.

W. K. (Belfast).—Jacquard cards such as you require are made by Messrs. H. Green and Sons Limited, Moses Gate, near Bolton.

R. S. Co. (Coalisland).—We think you will get just what you want from Messrs. John Oldfield and Co., City Tannery, Bradford, Yorkshire.

F. G. E. AND Co. (Mittheilung).—There is no regular demand yet for such reeds, but any ordinary reed-maker should be able to supply you at a price.

B. W. Co. (Drogheda).—There is no such apparatus made, but the system used in winding from beetling machines might be adopted for what you desire.

D. AND Co. (Mittheilung).—The firm mentioned in the article would probably be only too glad to send you a sample. It can be worked or spun by any hemp or jute spinner.

G. A. (Paisley).—There is no book devoted to the subject, but you will probably get all you require from "The Elements of Cotton Spinning," by Morris and Wilkinson (7s. 6d. net).

B. S. (Halifax).—No two tests for indigo can be practically called conclusive, and the series would be too lengthy for this column. See page 340 in vol. i. of Knecht, Rawson and Loewenthal's "Manual of Dyeing."

J. J. C., L. P. (Coventry).—There is not such a journal published in England, and the American one is chiefly devoted to local news. THE TEXTILE MANUFACTURER gives all the latest silk news, but price lists are deemed out of place in a monthly journal.

A. E. S. (Wittenberge).—There is no book devoted to the subject, none even treating it more than superficially. A series of articles on the production of looped and other fancy yarns appeared on pages 254, 294, 333, 373, and 419 of THE TEXTILE MANUFACTURER, from July to November, 1898.

J. R. AND Co. (Calton).—We do not know the name you mention, and think you must mean the centre stop weft fork described in THE TEXTILE MANUFACTURER of March, 1895. The inventor is Mr. R. Brown, Kilwuddie House, Strathaven, Lanark. Centre weft fork motions are, however, made by nearly all builders of circular or drop-box looms.

A. S. (Macclesfield).—No book in English is devoted to silk spinning, and the dormant attitude of those in the trade would not make it worth while publishing such. Much information will be found in back and recent numbers of THE TEXTILE MANUFACTURER, and short chapters are given in "Yarns and Textile Fabrics," by Herzfeld, 10s. 6d., and "Structure of Fibres," by Posselt, 63s. The small amount each of the latter devotes to the subject, however, scarcely makes it worth paying such prices.

THE TEXTILE MACHINIST:

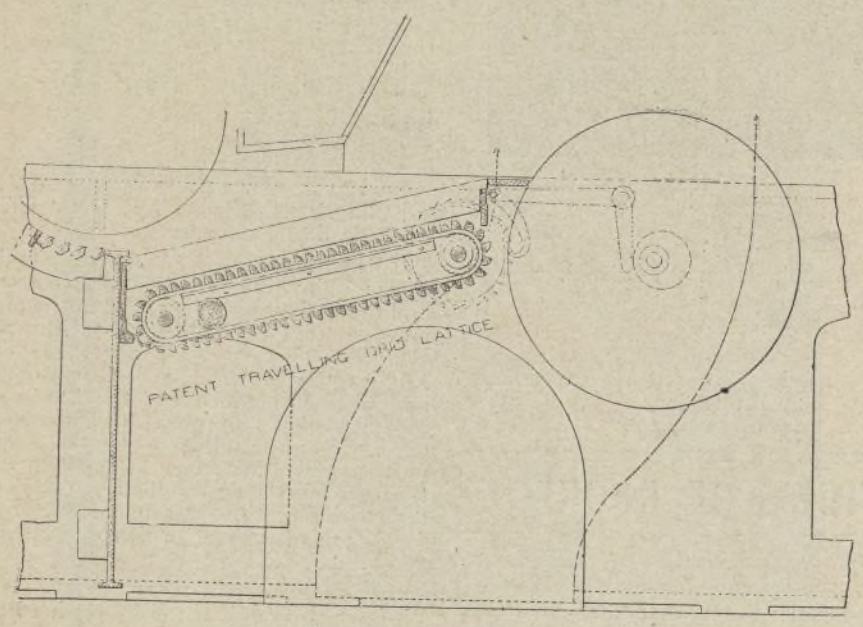
Devoted to Machinery, Apparatus, Tools, Etc.

Travelling Grid Lattice.

MESSRS. HOWARD AND BULLOUGH LIMITED, GLOBE WORKS, ACCRINGTON.

ELABORATE arrangements are frequently made to remove all dirt possible from the cotton fibres in their passage through the scutchers and lap machines, but as a rule less care is taken to prevent portions of this dirt being carried back among the fibres. This frequently happens, to a certain degree, if the machines are not regularly cleaned of their accumulated dirt, for the grid gets choked, and the surplus dirt, unable to fall down, is carried forward with the fibre. Dirty streaks, or "cat tails," are often found in the lap, which are attributable to this cause.

The new travelling grid lattice, however, obviates these disadvantages by carrying away all dirt as it falls through the longitudinal grids, thus preventing any liability to choke up the bars. The arrangement consists of a very simple device, whose main feature, as may be seen in the accompanying illustration, is a travelling lattice. This lattice or apron, which has spaces between its ribs, is slowly rotated by means of the cam, lever, pawl, and ratchet shown in dotted lines, and the dirt which falls through the longitudinal grids is carried away before it has time to accumulate. To prevent the dirt being drawn back into the machine by the forced draught, flexible leather flaps are arranged at each end of the lattice, which allow of its movement, but prevent the admission of air.



TRAVELLING GRID LATTICE.

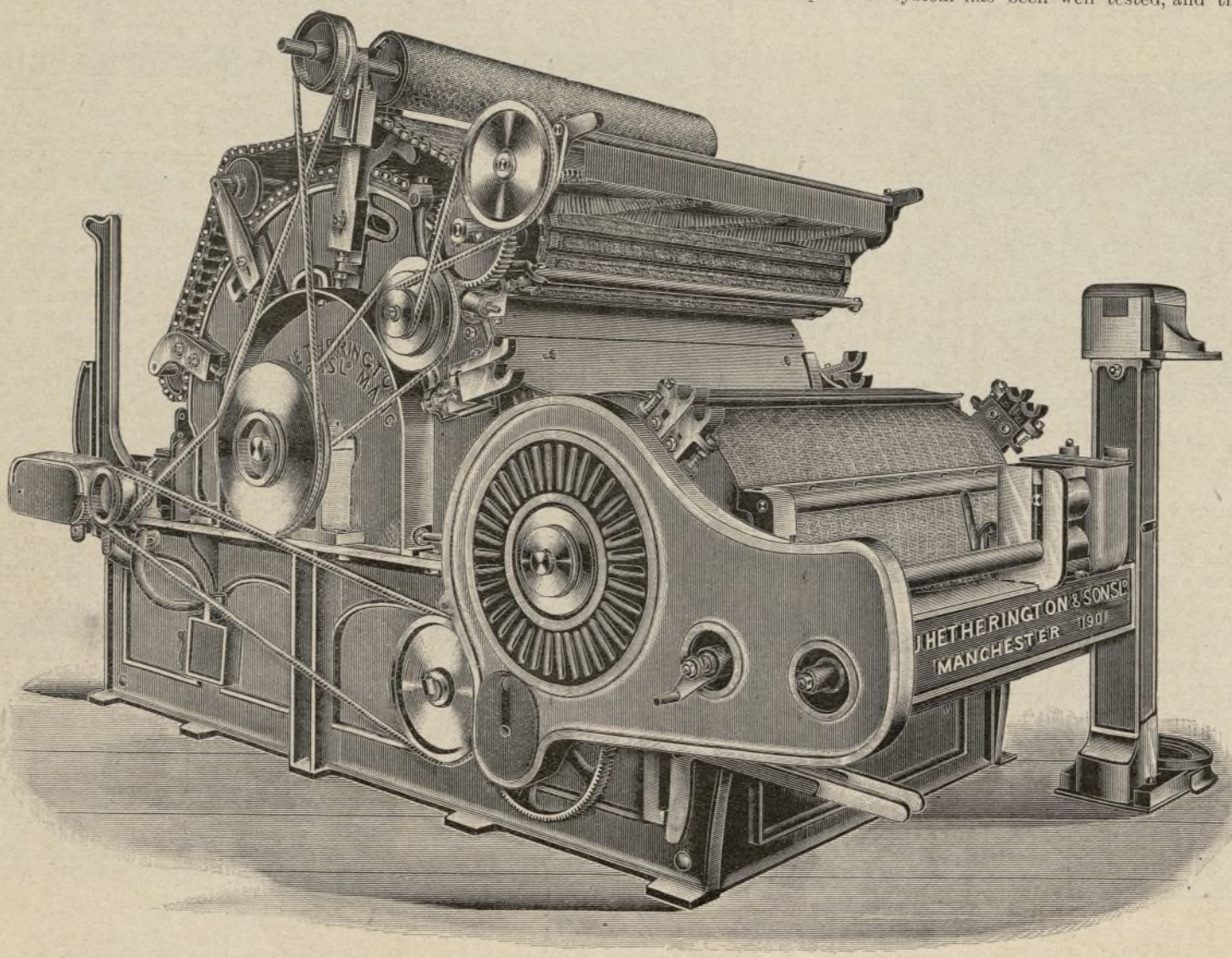
Improved Carding Engine.

MESSRS. JOHN HETHERINGTON AND SONS LIMITED, POLLARD-STREET, ANCOATS, MANCHESTER.

A NEW carding engine, holding the applicable designation of the "New Century," was completed early this year, and is now on view at the above address. It shows a distinct variation, in more than one part, from the usual type of carding engine, perhaps the most noticeable feature being its reduced height. The reduction amounts to 4in., which, although slight, gives the machine a much more compact appearance and leaves every part within reach. In spite of this reduction of height, the space between the chain of flats has been greatly increased, as will be seen by reference to Figs. 1 and 2, which illustrate the machine from both sides. This increase of space makes it much easier for setting and cleaning operations, as will be readily understood.

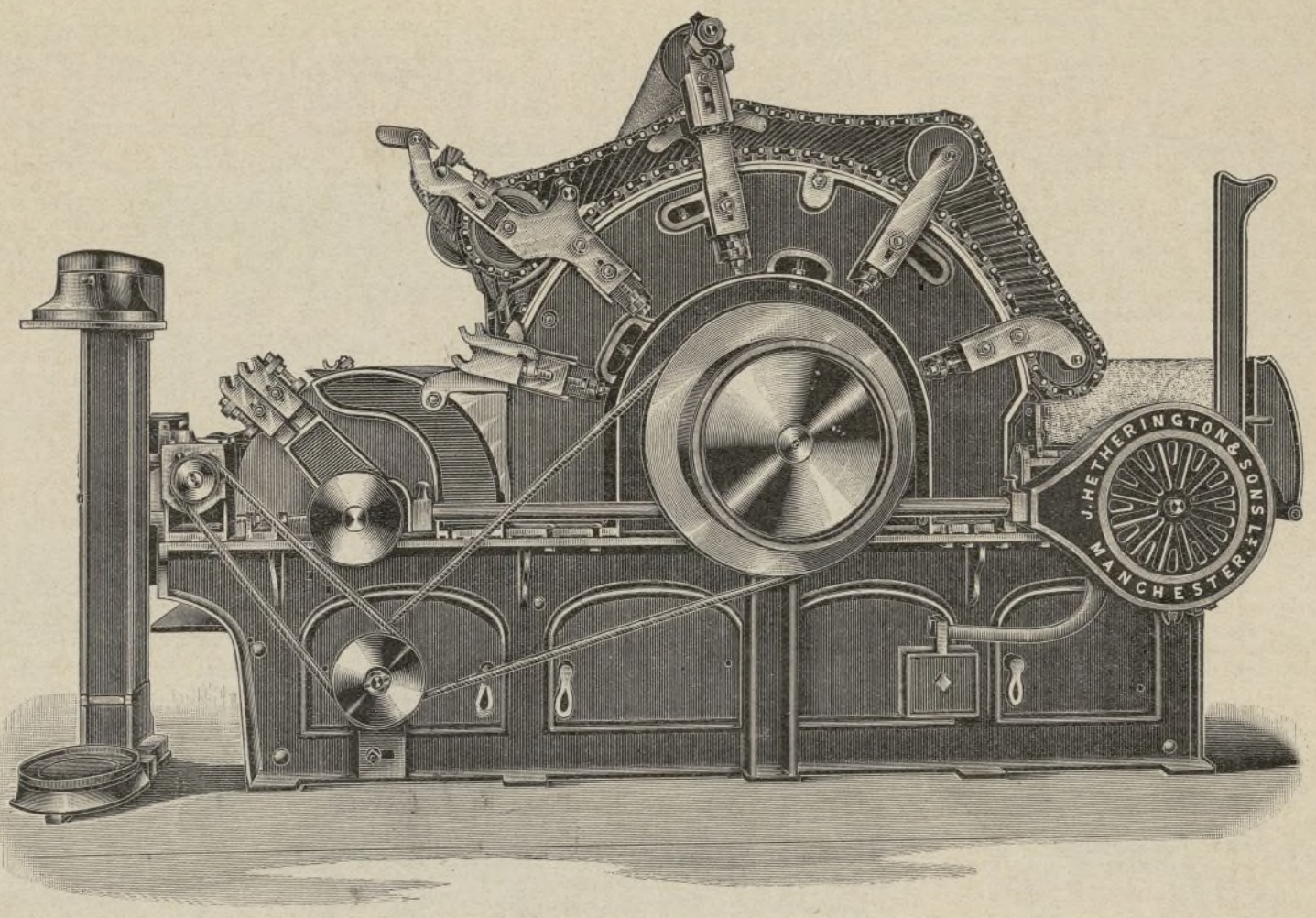
The flexible bends are placed inside the framing close to the cylinder, which is clothed quite up to the edge. It is therefore only necessary for the flat to exceed the width on the wire by about 2in., which is just about the space taken by the bearing surfaces. This ensures the selvages being perfect. The flexible bend is provided with five setting points in the new machine, an increase of two over the older machine of the same makers. These have been supplied more to meet the usual arrangement and practice in such a case than because an increase is at all necessary, for the flexible bends are ground to the cylinder by milling cutters which, fixed on the cylinder, pass over the bends from one end to the other, milling them from and concentric to the cylinder. The flats are 108 in number, but the machine is so arranged that up to 112 may be used if desired.

The card is adaptable for two methods of grinding. There is a new arrangement supplied for grinding off an inclined frame, or the usual well-known method may be applied. This latter system has been well tested, and the method of grinding the flats from their working surfaces ensures the height of each wire on every flat being the same, whatever the wear either on the



IMPROVED CARDING ENGINE.—FIG. 1.

flat or wire. The doffer pedestal carries the grinding and stripping brackets, so that any adjustment of the doffer takes the bracket with it, obviating the possibility of disarrangement, and rendering it impossible to get the grinding roller out of line with the doffer and to grind hollow. The ends of the flats are so designed that the pressure of the chain is brought directly over the flexibles.



IMPROVED CARDING ENGINE.—FIG. 2.

The taker-in and doffer are driven by rope gearing, which, being in one band, prevents much of the slipping which is present when separate ropes or belts are used. The one-band method also obviates any risk of the doffer stopping before or starting after the cylinder has got up speed. Such an arrangement also makes it unnecessary for the operative to have to help the fleece through the trumpet to prevent the sliver breaking each time the card is started. This system of continuous rope driving also saves a few inches in the total width of the machine.

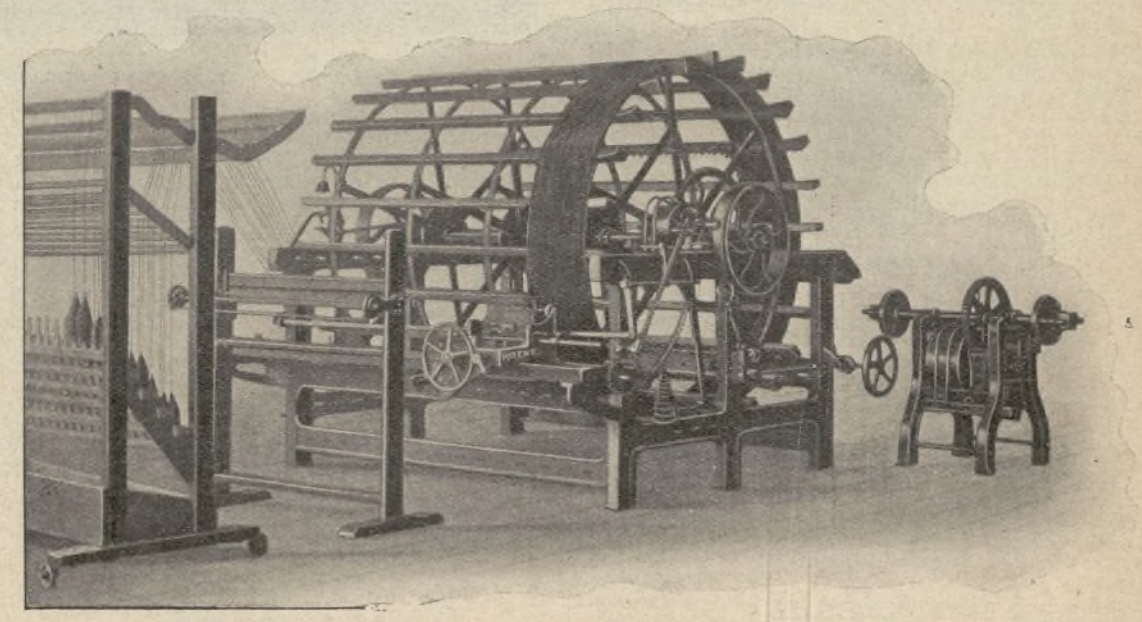
The form of the lap-stand behind the machine has been slightly altered, and by the new arrangement it is possible to put on two full laps without them coming into contact with one another. The division plate and feed plates have been modified, and in their new form present a notable improvement. They are arranged so that no good fibre can be thrown down, and so that the short fly is kept separate from and cannot become intermixed with the heavier dirt below the taker-in. A stiff mote knife of double steel is used, supplied with a setting arrangement which allows the knives to be easily and accurately adjusted closely to the taker in. The comb box is also made strong enough to prevent any vibration. The doffer cover, as before, is of polished steel, but it has been slightly altered. The edge of the cover is made so as to form a smooth piece, perfectly filling up the space between the bend and the doffer. This makes it impossible for dirt or loose fly to get down on to the doffer. Other improvements have been adopted —in fact, the machine has been thoroughly revised throughout, and can justly be called a new type of carding engine. There is an automatic system of weighting the feed rollers, which is self-adjusting and prevents snatching ; a double-speed motion for the doffer, and numerous other features.

The guarding of the machine is an item which has been carried out in full. Every moving part and toothed wheel is covered in a complete manner, making accidents practically impossible. One noticeable addition in this respect is a method of locking the front cylinder cover. It is so arranged that it is impossible to open this cover when the machine is running, and impossible to start the machine with the cover open. This guard is also made to work automatically, so that the same movements which stop the card open the cover, and *vice versâ*.

Improved Warping Mill.

MESSRS. CLIFFE AND CO. LIMITED, LONGROYD BRIDGE IRONWORKS, HUDDERSFIELD.

AN automatic appliance of any description requires two important items to make its adoption a success. The first is simplicity, and the other accuracy, this latter feature being one of special importance. Both these advantages are possessed by the sectional dividing head of the warping mill under discussion ; and as such warping mills are well known, this dividing head becomes, in the present instance, the most interesting part of the machine. The aim is to build the various sections of the warp in a perfectly uniform manner, every section occupying exactly the same space on the mill, and this is achieved by a very simple apparatus which, doing the dividing automatically, takes all responsibility from the warper, and makes it practically impossible to have uneven sections. Fortunately, also, the dividing head does not require either skill or care to adjust or operate.

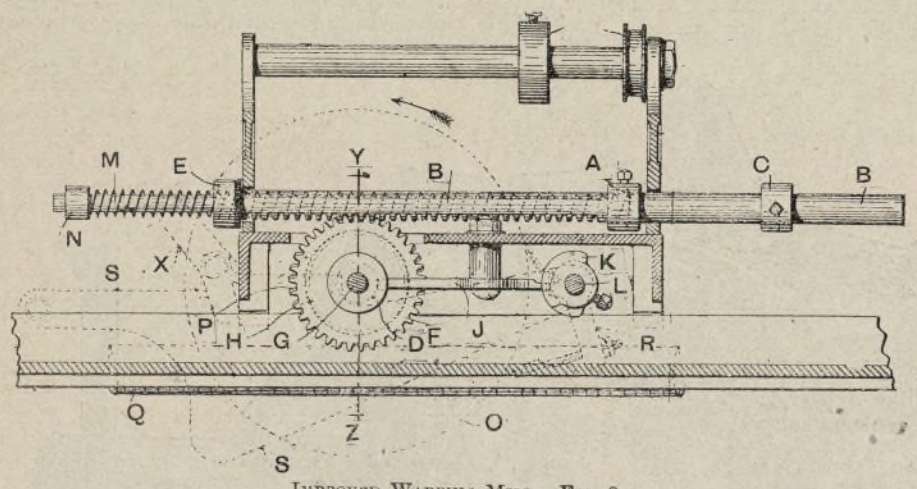


IMPROVED WARPING MILL.—FIG. 1.

The warping mill is shown in Fig. 1, along with its creel, lease stand, and beaming frame, and the sectional dividing head is also distinctly shown. This, however, will be better understood from Figs. 2 and 3, which are sectional elevation and plan respectively, whilst to better illustrate some of the parts, Fig. 4 is given, being a section taken across the line Y, Z in Fig. 2. Extending right through the builder is a rod B, arranged so as to be free to slide in either direction, such sliding motion being limited each way by the collars C and E. The collar E is a fixture, but C is adjustable by means of a set screw, and can be set to take different lengths of section. The collar E is packed with an india-rubber washer so as to prevent jarring when it comes in contact with the body of the builder, for this return is done by spring action and is necessarily somewhat sudden. The rod B has teeth cut on its underside, forming a rack into which gears the pinion F, which is loosely mounted on the same shaft (G) as the brake wheel O. This pinion F is arranged so as to slide in or out of gear with the friction clutch H, the movement being made by the lever J, whose one end engages into the groove D cut in the boss of pinion F, the other end working in the cam-shaped groove K which is formed in a boss fixed on the brake lever shaft L. A partial rotation of this shaft is sufficient to oscillate the lever J, and thus throw the pinion F either in or out of gear with the friction clutch H.

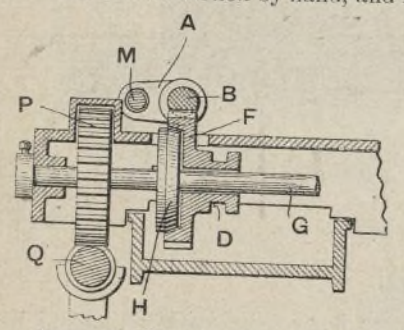
Just behind the rod B is a fixed spindle M, supporting a spiral spring which, surrounding the spindle, is confined at either end between the collar N and the bracket A, this latter being fixed on the rod B, but capable of sliding up and down the spindle M. On the outer end of the shaft G is the usual brake wheel O, whilst at the other end is

the worm-wheel P gearing into the screw Q, which causes the traverse of the whole of the section builder. On the shaft L is arranged the lever R, which operates the brake strap encircling the brake-wheel O, and a hand lever S for operating the lever and strap is fixed on the same shaft.



Improved Warping Mill.—Fig. 2.

When building-up a warp to the required section, the dividing head or builder is moved to the right by the screw Q acting upon the teeth of the worm-wheel P, for this wheel is held stationary by the steel brake strap on the pulley O, and acts more like a nut or rack when held fixed in that position. When one section has been warped, the lever S (which held the brake on its pulley) is raised and locked by its locking lever X in the position shown by the dotted lines in Fig. 2, this motion slackening the brake strap, and leaving the wheel O loose. This latter can now be turned by hand, and is thus

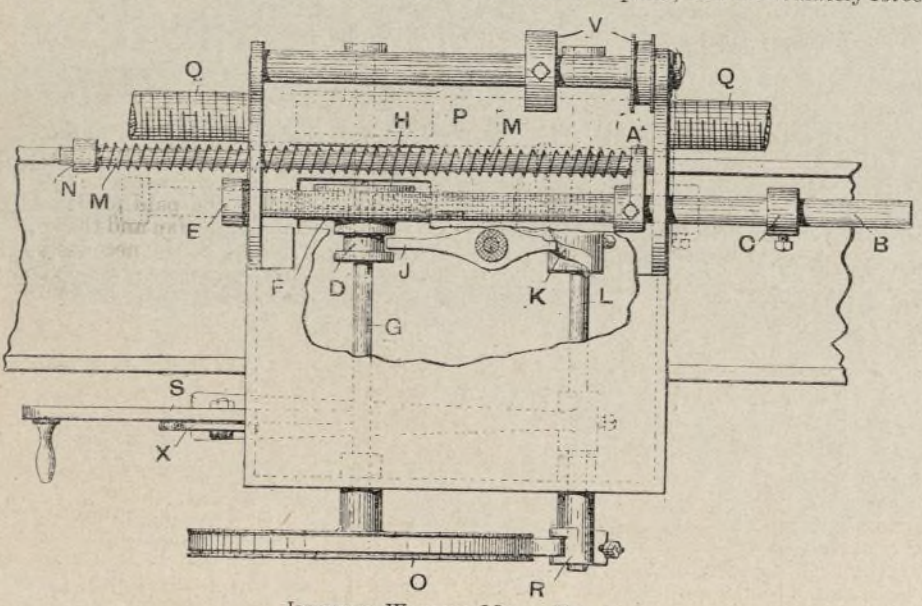


Improved Warping Mill.—Fig. 4.

rotated in the direction shown by the arrow in Fig. 2. The movement also rotates the worm-wheel P, which in this case performs the functions of a wheel, travelling over the threads of the screw Q, which does temporary service as a stationary rack. The movement causes the sectional dividing head to travel bodily along its slide towards the left until in position for commencing the next section of the warp.

The first time this is done in making a warp having different particulars from its predecessor, the collar C is adjusted to the position on the rod B so as to mark the limits of each section, and when once so adjusted every succeeding section covers, throughout the whole warp or warps of similar particulars, exactly the same space. The automatic movements accomplishing this are as follows:—When the brake lever S is raised so as to allow the section builder to be moved to the left, it necessarily gives a partial turn to its shaft L, in doing which the cam groove K is moved sufficiently to actuate the lever J, putting the pinion F into gear with the friction clutch H. Then when the shaft G is rotated by means of the hand-wheel O, this pinion F is rotated and moves the bar B to the left, the spring on the spindle M being compressed by the action. This goes on until the collar C comes into contact with the frame of the dividing head, and if this collar has been adjusted as just explained, the winding will be checked at the exact position in which the next section should be commenced.

This position being thus obtained, it is only necessary to restart the warping frame. To do this, the brake strap is tightened in its wheel O, the descent of the lever operating this also actuating the cam groove K, the lever J, and throwing the pinion F out of gear with the friction clutch H. The compressed spring on the spindle M is left free to expand, and immediately forces out the rod B into the position for repeating its functions at the end of the next section, the impact being cushioned by the washer on the inner face of the collar E. The driving belt is then shifted, and the mill commences its revolutions. In addition to this automatic divider, the general features of the warping mill show the result of careful design and the adoption of good, practical accessory motions. A stop motion is devised for stopping the mill either at the end of each cut (for putting in lease bands) or at the end of each section warp. When the mill stops, a bell rings, and this at once calls the attention of the minder. The beaming frame is designed with a view to the economy of both space and machinery, one frame being adapted to beam for four warping mills, if these are arranged back to back in pairs alongside each other.



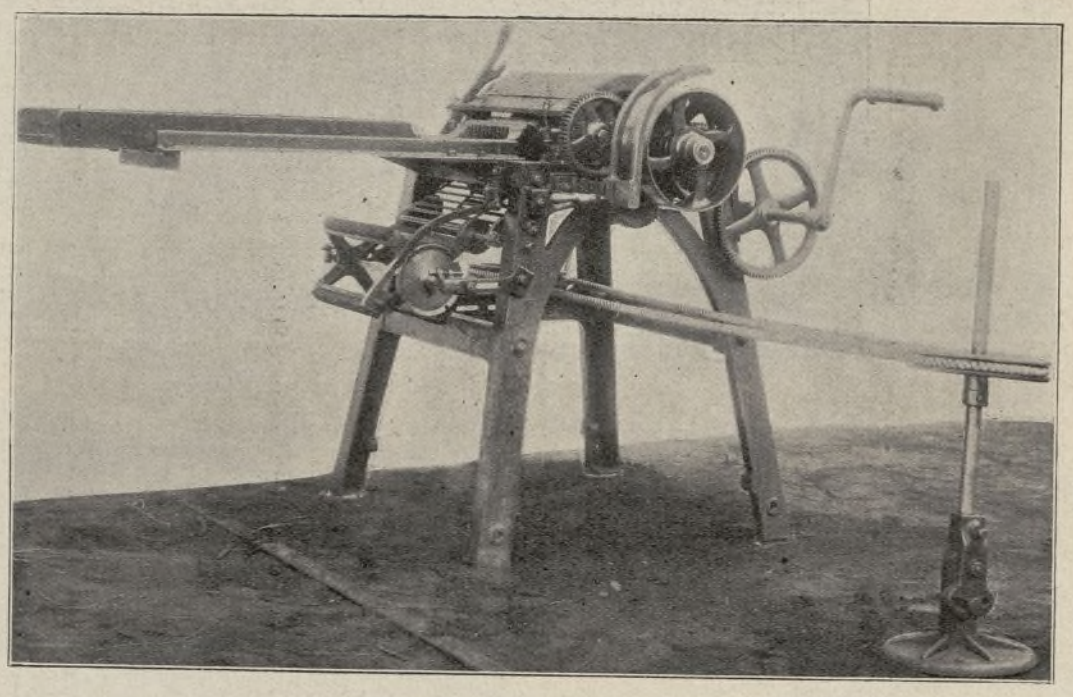
Improved Warping Mill.—Fig. 3.

Improved Ramie Decorticator.

MESSRS. GREENWOOD AND BATLEY LIMITED, ALBION WORKS, LEEDS.

During the last few years no little interest has been taken in ramie, which produces a fibre of strength, length, and lustre. Unfortunately, however, the production of the fibre in a commercial state has been found a difficult and expensive matter, and although numerous machines and processes have been devised for decorticating the plant, a large number of these have been proved impracticable when put to a working test, or they have been attended with an expenditure which made the fibre too expensive to sell.

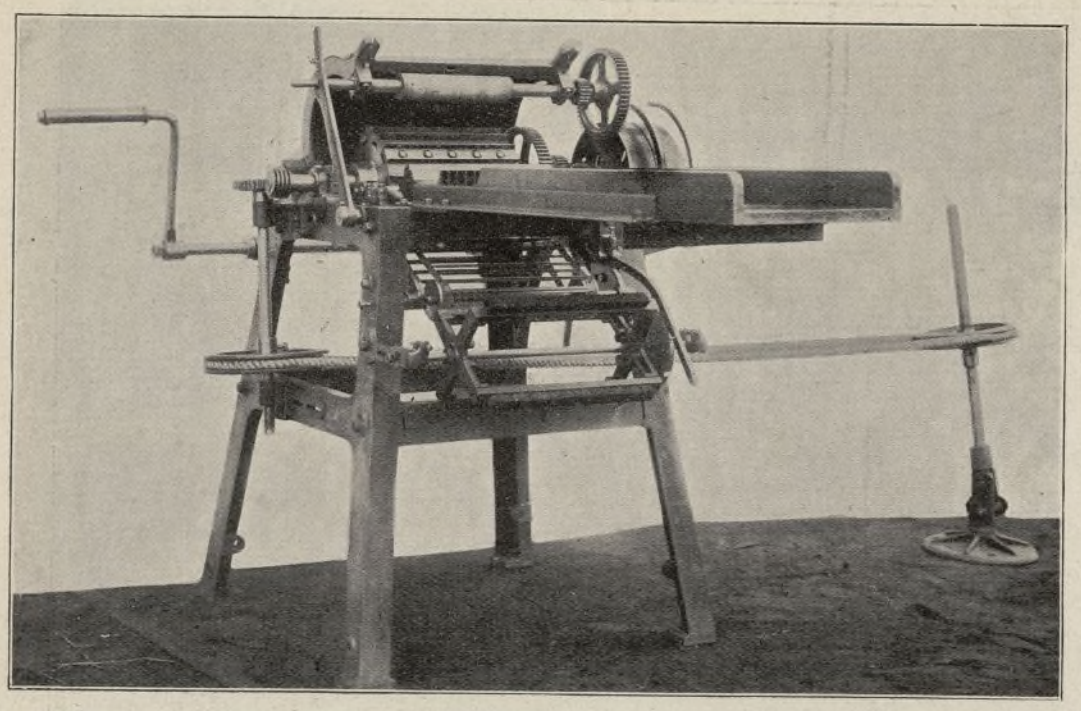
Amongst the successful machines—and such are very few in number,—one of the most promising is "La Gauloise" machine, the invention of M. Estienne, which in some recent tests made in London and Leeds was found capable of treating from 400 to 500lb. of Algerian green stem per hour. It is adapted for all kinds of ramie or china-grass, and gained a gold medal at the recent Paris Exhibition. As may be seen from Figs. 1 and 2, the apparatus consists of a very compact and portable form of machine. It may be driven by steam or other power, in which case it is best to have a small portable engine driving a group of from four to six machines, or the winch handle may be used for manual power. In this case four men, in relays of two, are required for each machine.



Improved Ramie Decorticator.—Fig. 1.

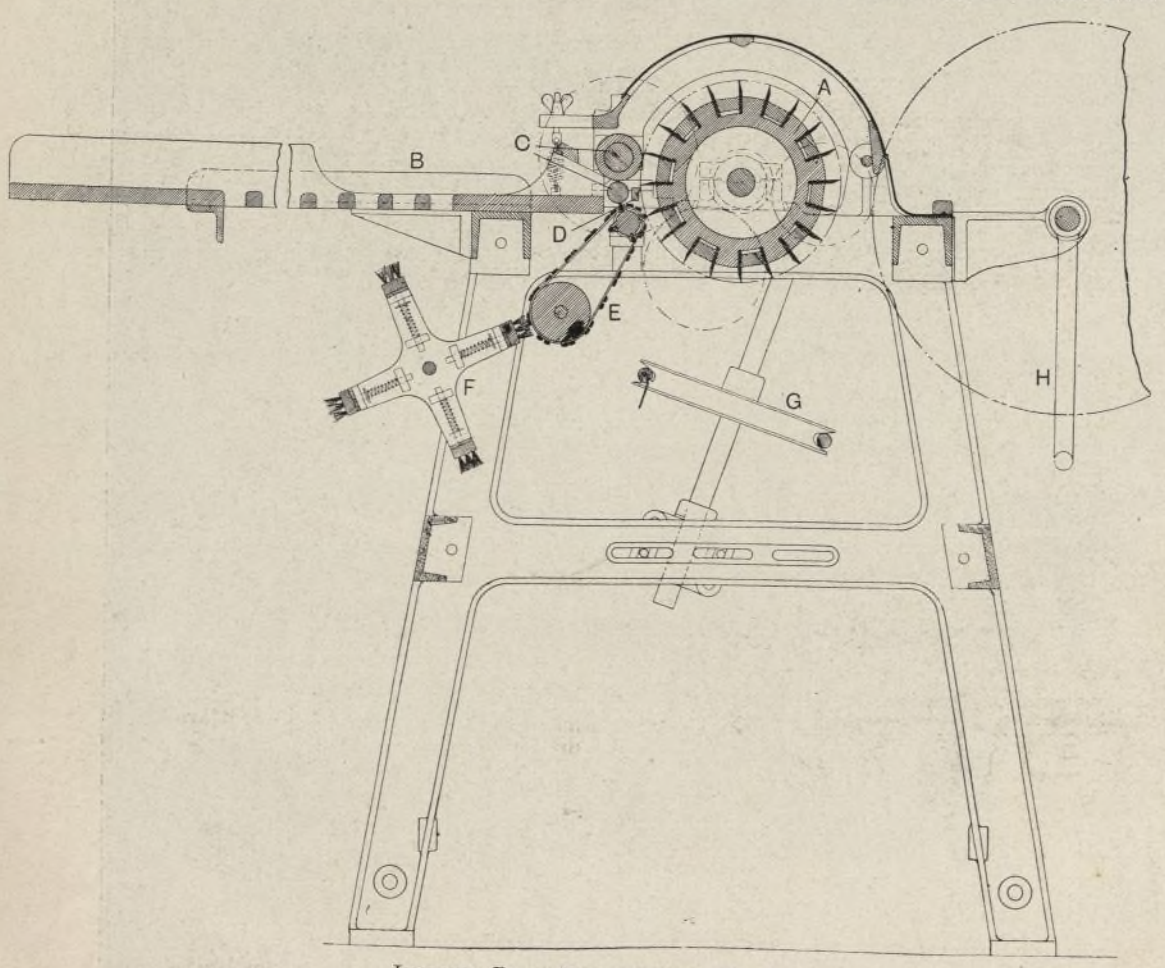
The working of the apparatus will be better seen by reference to Fig. 3. The stalks are fed to the machine over the feed table B, are nipped and drawn in by the rollers C, pass over an anvil D, and then come under the action of the striking blades of the cylinder A. The rollers C feed the stalks at the rate of 14in. a second, so that every portion of each stalk, with the exception of about 4in. at the finishing end (the distance between the grip of the rollers C and the edge of the anvil D), is thoroughly crushed, the blades beating out the woody tissue and bark, leaving the fibres clear. As the beating progresses the stalks pass down, driven by the action of the blades and drawn by the lattice E, and when completed fall upon one side of the rope passing around the wheel G, and are carried by it away from the machine. The wheel G is driven by the worm gearing shown in Fig. 2, and a standard—which may be placed at any distance from the machine—supports a duplicate to the wheel G for carrying the outer loop of the rope. The lattice E is kept clean by the radial brush arms F, the brushes of which are kept up to their proper position by the springs shown. The winch handle is shown at H, and the requisite

speed is obtained by gearing up, but in case of driving by power the belt pulleys are arranged directly on the blade shaft. The photograph in Fig. 2 shows the cover of the machine raised and held up by a catch designed for the purpose (used when cleaning the machine), and in this position the blade cylinder and the top feed roller C are seen.



Improved Ramie Decorticator.—Fig. 2.

The machines are made in a size which leaves them of a convenient weight for transportation, for it is found that when the ramie stems are treated whilst green they are easier to manipulate, and the resultant fibres are more perfect. Thus, to get the best results the work should be done on the spot, the machines being transplanted from district to district as the stems are cut. If the plants are kept, fermentation sets in almost immediately, to the detriment of both the decorticating process and the quality of the fibre. We should mention that the three or four inches of stalk which is left at the tail end of each piece, and does not come under the repeated action of the beating blades, is rubbed clean by hand. It must be remembered that this unbeaten end has been well crushed and shaken, and the attendant easily pulls off the woody tissue remaining as he removes the decorticated fibre from the delivery rope.



Improved Ramie Decorticator.—Fig. 3.

Air Propellers.

THE movement of large volumes of air is a very common requirement in various branches of work, including refrigeration, drying, ventilation, etc., and the propeller, as opposed to the centrifugal type of fan, is frequently used for the purpose. It often happens, however, that its mode of action and the principles which should govern its application are not thoroughly understood, and are not fully taken advantage of.

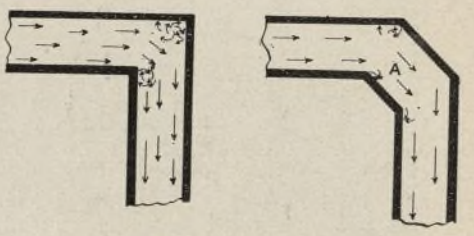
In the first place it should be understood that the air propeller is a screw, just as is the better-understood ship's propeller, and acts upon the air as a screw. The screw being fixed, the nut (in this case the air) is caused to move in the opposite direction from that in which the fan would move if free to slide upon the shaft unchecked. The blades of the propeller have each a certain pitch and if it were not for slip, a column of air of a length equal to the pitch would be screwed forward at each revolution of the fan. This, of course, never occurs in practice, as the slip is always high. But it is nevertheless the real mode of action of this type of fan, in spite of the wide departure from true screw forms to be found in the blades of existing air propellers. Each blade is a portion of a screw thread—very imperfect in form, it is true,—and acts as such, and not as a scoop, taking a lump of air and passing it forward. The fan wheel as a whole is equivalent to a short length of screw with a number of threads of equal pitch, and if there was no such thing as slip or other disturbing causes, the results obtained by fans of four, six, or eight blades would be exactly the same as with one blade alone. In practice it is found that up to a certain point an increase in the number of blades results in a decrease of the slip, and consequently fans are always made with blades varying in number from three to eight. Above a certain number, varying with size and shape, the volumetric efficiency again falls off, probably owing to the excessive disturbance produced in the air.

Regarding the fan in the above light it is evident that the volume of air displaced should be proportional to the speed of the fan, and experiment shows that this relation holds good in practice when the discharge takes place through a constant area. There are fans in existence whose output ceases to increase proportionally after a certain point, and in which the percentage of slip is abnormally high at the top speeds; but in all reasonably good fans of this type the percentage of slip is constant at all practicable working speeds. We may take it, then, that if

V = volume of air displaced,
N = revolutions per minute,
C = a constant, varying in value with different makes of fans, then

$$V = C N.$$

The next point of importance is the relation between the air delivered and the power required, and it is here necessary to premise that the area of the ducts employed is nowhere less than the area of the fan, or that the velocity of the air is always taken at its highest.



Air Propellers.

Experiment shows that although very low in comparison with some other machines, the mechanical efficiency of a fan is fairly constant, and the power required to drive it may be considered to be proportional to the kinetic energy of the air after passing through the fan. For air, equally with any other substance, the kinetic energy of the moving body is obtained from the expression

$$KE = \frac{W v^2}{2g}.$$

We have further the fact that in this particular case the weight W is proportional to the velocity v, so that W may be expressed in terms of v. Then

$$KE = \frac{k v}{2g} \times v^2,$$

or

$$KE = K v^3.$$

We have seen already that the volume, and therefore the velocity, of the air is proportional to the speed of the fan, and it is therefore evident that the power absorbed varies as the third power of the speed. If it is desired to double the output of the fan by doubling its speed of revolution, an expenditure of eight times the power will be necessary.

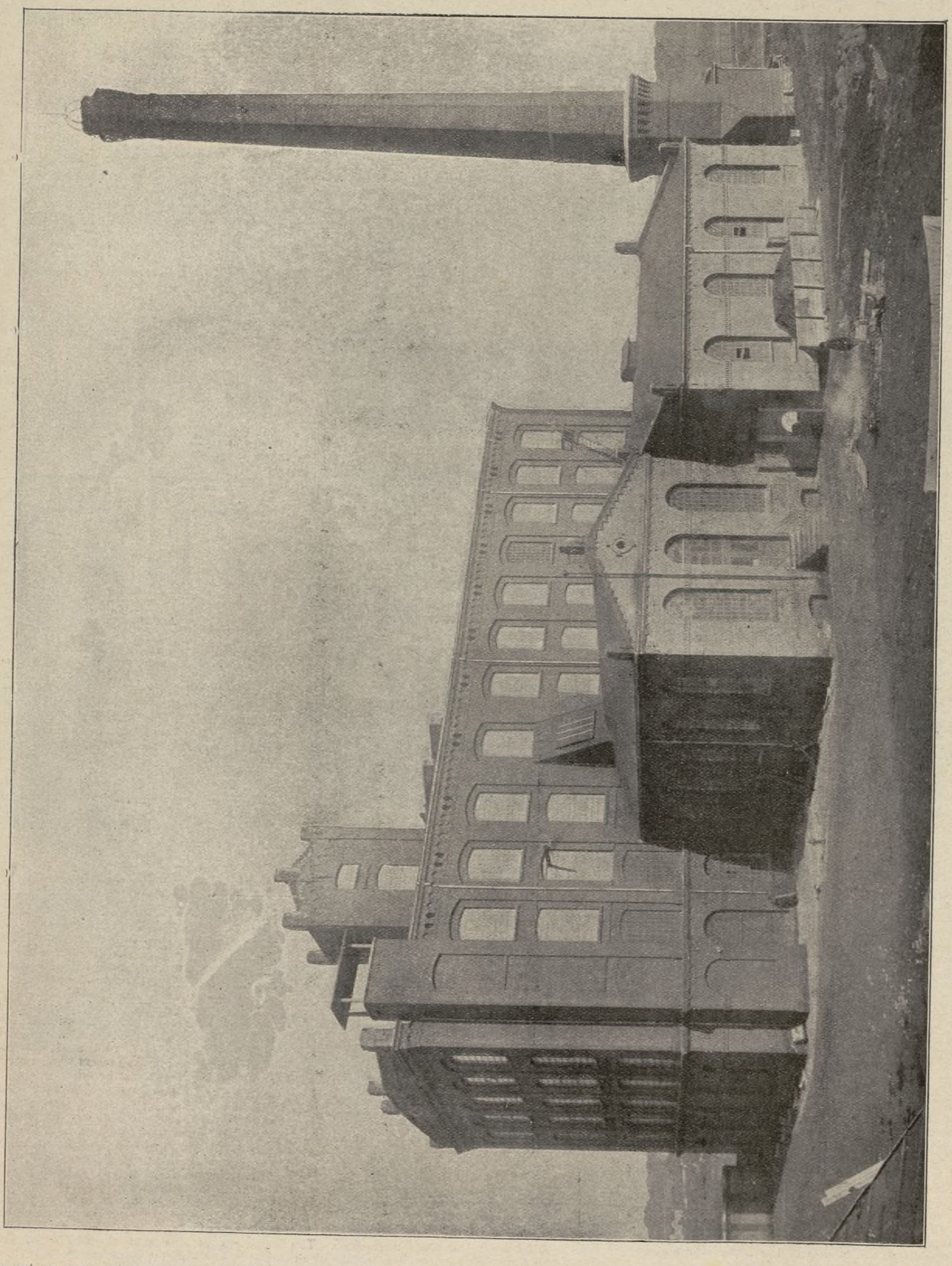
This shows at a glance the importance of keeping the speed of the air as low as possible if it is desired that the expenditure of power be as small as it can be made. The price to be paid for it consists of the extra cost of the larger fan and the larger air ducts and openings, and it is necessary to arrange matters so as to compromise between the conflicting interests of the smaller expenditure of power and the increased space occupied by the ducts. From consideration of power alone, a large fan run slowly is to be preferred to a small fan run quickly, but the large fan must be accompanied by the use of correspondingly large ducts.

The use of suitable ducts is of the highest importance for the successful employment of fans of the propeller type, and the airways should not only be of ample area in cross section, but all changes of direction should be as gradual as possible. Where it is necessary to turn a corner, both the internal and the external angles should be cut away, as shown at A in the figure, or an eddy will be set up which will very materially reduce the effective area of the duct. It is further desirable, whenever possible, to increase the duct area wherever a change of direction occurs, but this change of area

must not be accomplished by a sudden increase, or the same defect will result. By the aid of an anemometer the existence of these eddies and the reduction of effective area can very readily be discovered, and their importance is brought into evidence in a manner at once convincing and surprising.

occurs with water, and that the same precautions as to easy bends and smooth changes of section should be taken with air as with water.

The space occupied by the air ducts is often a matter of considerable importance, and in this connection it is worth noticing that the volume of air delivered is not reduced in direct



New Cotton Mill in Russian Poland.

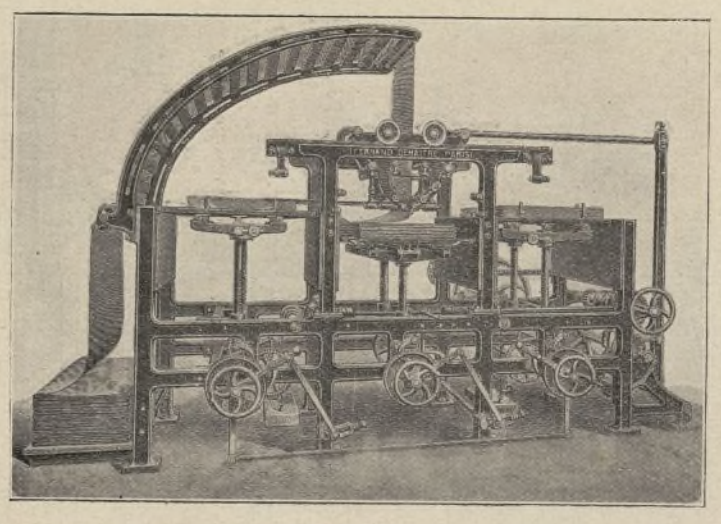
It is not an easy matter to trace out with any degree of certainty the exact path traversed by the air or the various eddies, etc., which occur even when no duct is in use, and the difficulty is greatly increased by the invisibility of the medium in question; but it seems fairly safe to assume that the action of the air is very much the same as

proportion to the reduction of area of the airway. If the area of cross section be reduced by successive stages, it will be found that at first the reduction of air volume is less rapid than the reduction of area, and the reverse during the last stages of reduction. A reduction of area of, say, 50 per cent. may be accompanied by a reduction of air to the

amount of perhaps 30 per cent. The exact proportions vary with different fans. The point is, however, worth noticing in general terms, as occasions often arise in which it is convenient to reduce the ducts by perhaps 20 or 25 per cent., even at a cost of reduction of volume of 10 to 15 per cent. of air for the same speed of fan, and the consequent necessity for running the fan faster with the more than proportionate increase in power required for driving.

It is worth while to call attention to a very misleading method of stating the performance of fans adopted by more than one maker. The duty of the fans is sometimes quoted as being a certain number

of cubic feet of air per horse-power, and the natural inference among users who have not studied the question is that for each horse-power expended this amount of air will be moved per minute. The truth is, as we have already shown, that the power will vary as the cube of the output, and that while 1H.P. might move 20,000 cub. ft. of air, an additional expenditure of 7H.P. would be necessary to raise the output from 20,000 to 40,000 cub. ft. per minute.



MACHINERY AT THE PARIS EXHIBITION.—FIG. 47.

New Cotton Mill in Russian Poland.

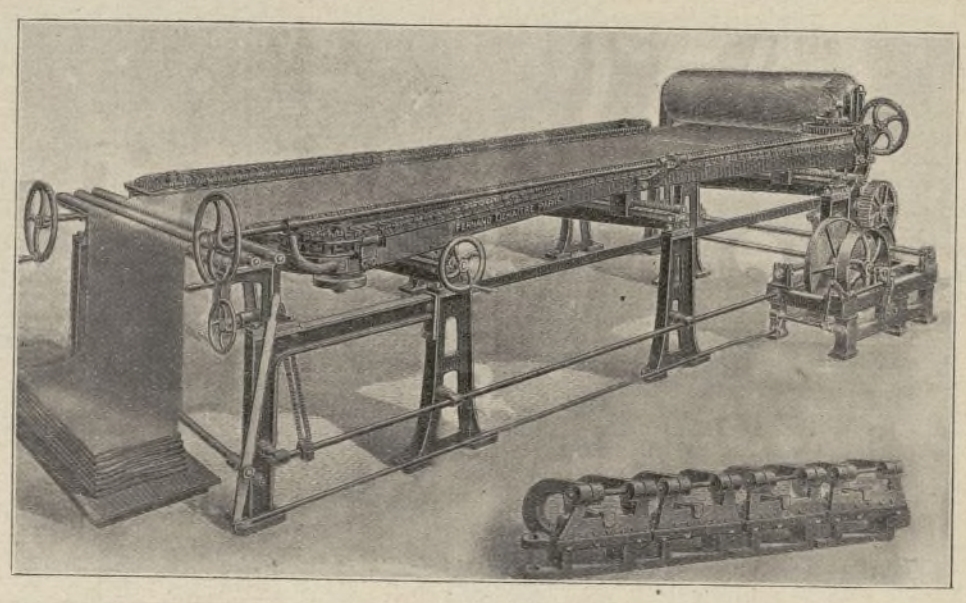
WE have constantly remarked on the rapid progress which is being made by Russia and its provinces in the textile industry. This is again emphasised by the completion of another new mill, which is shown in the accompanying illustration. The mill is situated at Lodz, in Russian Poland, and has been built for Mr. Theodor Steigert. The mill contains about 10,000 ring spindles for twist and 2500 for weft. There are also about 2000 ring doubling spindles. These have been supplied by Messrs. Dobson and Barlow Limited, of Bolton, as has also the preparing machinery. This latter consists of bale breaker, mixing lattices, single-cylinder soft-waste opener, large size double cotton opener, "Simplex" automatic hopper feeder, revolving flat-carding engines, and drawing, slubbing, intermediate, and roving frames. Then come the different spindles previously mentioned, followed by quick-traverse drum winding frames, yarn-bundling presses, cop reels, and tubular spindle banding machine.

Machinery at the Paris Exhibition.—IX.

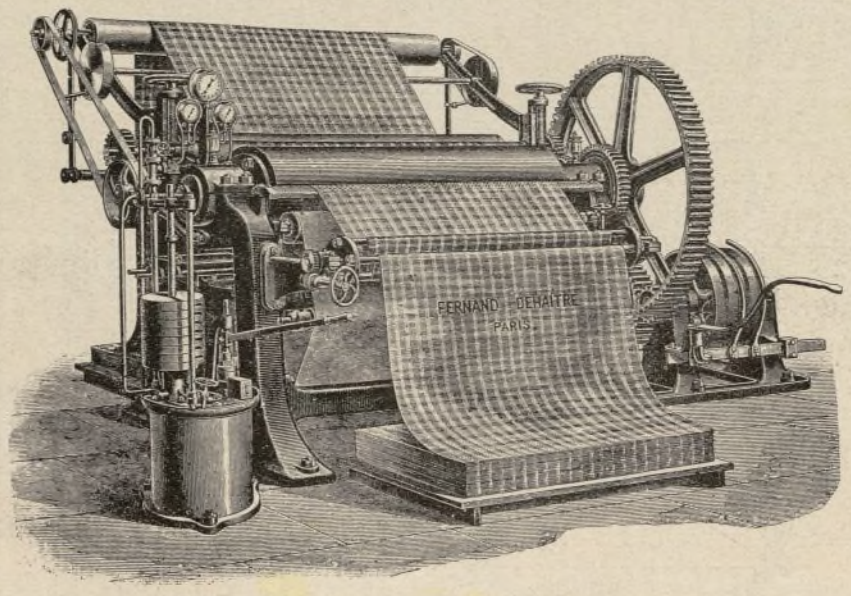
AN interesting collection of bleaching, dyeing, printing, and finishing machinery was shown by Mr. Fernand Dehaitre, of Paris, a collection too large and varied to describe in detail, so that only the more interesting machines will be illustrated. A combined continuous finishing machine was shown, with a sizing mangle having two rollers, the lower one covered with copper and the upper one with indiarubber. A copper trough with a steam jacket was mounted so as to be vertically movable by means of a rack motion, the steam keeping the size at the necessary temperature for applying the finish. A drying machine with three copper cylinders fixed in front of the mangle. A tension regulator with brass rollers, one movable in a slide, was arranged at the back of the mangle. Between the three-cylinder drying machine and the Palmer stretcher a bench was placed on which the attendants sat who looked after the engagement of the selvages in the chains of the machine. A series of brass guide rollers fixed to this bench assured the passage of the fabric below, to the entry of the stretcher. At the end of the machine there was a folding and a lapping apparatus.

Fig. 45 shows the continuous stretching and tentering machine exhibited, which serves to stretch and straighten the threads of fabrics that have been more or less shrunk and deformed during the operations of bleaching, dyeing, and finishing. The use of automatic flap clips has the advantage of a very regular gripping of the selvages, economy of labour and great production, as, the gripping not being done by hand, can be effected at increased speeds. The arrangement is suitable for widening all qualities of tissues, especially those in which the threads must be laid parallel; but it is specially useful for fabrics requiring to be rolled up before they are printed, for the repeat of the patterns is maintained better and the designs are not deformed during the operations following printing. The squaring is effected by means of a motion which enables the workman, by turning a hand-wheel, to retard or advance one of the chains with regard to the other as may be required. The machine is provided at the front with a guide and tension apparatus, and sometimes a brushing or a vaporising or a heating apparatus is attached to it. At the back it is completed by a lapping or folding apparatus.

Fig. 46 shows the continuous hydraulic hot press, with movable trough and widening apparatus in front. This press is suitable for treating woollen cloths, felts, etc., as well as for imitations of these in cotton or mixtures. The maximum hydraulic pressure is 22,050lb., and is controlled by a pressure gauge and regulated with the greatest facility by means of an accumulator maintaining the given pressure. In consequence of special arrangements, combined with very solid construction, the pressure is uniform over the entire width of the cloth. The steam-heating of the cylinder is independent of that of the trough. The trough is clothed with a sheet of German silver, mounted so that it can freely expand. The trough is movable in a lateral sense, and by its movement regulates the width of a special stretcher supplied with pins which serve to widen and equalise the fabric and to hold the selvages outside the action of the press. The machine is completed by a movable tension apparatus in front and a folding apparatus at the back.



MACHINERY AT THE PARIS EXHIBITION.—FIG. 45.



MACHINERY AT THE PARIS EXHIBITION.—FIG. 46.

Fig. 47 shows the new machine for laying press papers, which fills a veritable void by performing mechanically and very quickly a costly operation which has always been done by hand, and, owing to the ingenious mechanical arrangements it contains, formed one of the most interesting machines at the Exhibition. It contains a motion for folding the fabric, carrying at each side a series of pneumatic suckers. By the to-and-fro motion of the folding carriage the suckers are made to seize one after another of the press papers piled upon a lateral table, and insert them into each fold of the fabric being papered. A special valve arrangement admits air to the suckers so that they leave hold of the paper as soon as it arrives at the end of the fold. The descent of the receiving table can be regulated to any thickness of fabric, as well as the rise of the paper table to the thickness of the sheets. The receiving table is mounted on rails to facilitate the removal of papered fabrics. The service of this machine requires only one workman, who thus easily performs the work of four persons laying the cards by hand. As a supplement to this machine the firm also build a paper-withdrawing machine, of which the designs were also exhibited.

(To be continued)

THE Barker cotton mill, situated on a spur of the Mobile and Ohio Railroad, U.S.A., about three miles from the city, is approaching completion, and will shortly be in operation. The mill will manufacture both cloth and yarns. There will be 20,000 spindles and 600 looms, and the number of hands will be from 500 to 700.

Gas Power for Mill Driving.

MESSRS. FIELDING AND PLATT LIMITED, GLOUCESTER.

AMONG motive-power projects during the last few years, probably none has attracted so large a share of attention as the utilisation of fuel or producer gas in gas engines. The subject is one which has aroused particular interest on the Continent, and in some installations engines of such large dimensions as to develop 1000 I.H.P. have been employed with both satisfaction and marked economy. For many years gas producers of the Dowson type have been extensively used in this country for small installations, but the advances made during the last few years, not only in the construction, but also in the means for starting large gas engines, have paved the way for a wide extension of the limits within which fuel gas offers a suitable source of motive power.

Although the fuel gas power has not been extensively used in the textile industries, there are quite a number of such installations in operation in various parts of the country, the power ranging from 400 I.H.P. downwards. It is only recently, however, that such a plant has been laid down in the heart of such a weaving district as Burnley, and as the departure is arousing considerable interest in textile circles, we have prepared the accompanying drawings of the installation referred to, and which has been erected at the Pentridge Mill, Burnley.

Of the illustrations herewith, Figs. 1, 2 and 3—which furnish a plan and two elevations of the producer gas plant—will enable the arrangement to be readily followed. The plant consists of a small boiler for raising steam, which, together with the required volume of air, passes into the generating furnace through an injector pipe, and up through an incandescent fire. Briefly, it may be said that the steam and air are here split up into various gases and pass off through an outlet pipe into a washer, in which the gas is washed, and which also acts as a seal, preventing the return of the gas into the generator, while the depth of water can be regulated to give the required pressure. The gas then passes through the coolers, consisting of a series of pipes provided with the necessary cleaning doors, and then, after passing a hydraulic box, enters the coke and sawdust scrubbers, which thoroughly cleanse the gas, removing any impurities and leaving it ready for use..

The engine — of which a plan and elevation are given in Figs. 4 and 5—is of 150 I.H.P. Two heavy fly-wheels, each 8ft. 3in. in diameter, are provided in order to secure the desired regularity of running, while in general design the engine is of massive proportions, being thus well qualified to withstand the shock which inevitably occurs in all types of gas engines.

As we have already mentioned, the starting of large gas engines is a subject which has received much attention, and need no longer be considered an objectionable feature. In this case a wrought-iron tank is coupled-up to the engine, in which air is compressed up to 80 or 90lb. When the attendant requires to start the engine, he admits a mixture of gas into the cylinder and allows the compressed air to enter the cylinder from the starting tank. An explosion takes place, and on the next cycle of the engine the gas is admitted in the ordinary manner, and in two or three explosions the engine runs up to full speed.

Regarding the economy of this method of power development, we find that the makers guarantee the consumption of coal used in the generators not to exceed 1lb. per I H.P. per hour—a result which, with such a comparatively small plant, must be considered exceptionally good. Compared with the results obtained from high-class steam engines, the producer gas plant shows an economy of at least 50 per cent. in coal consumption, while as regards labour and other items, the makers state that the wages of an attendant and the cost for repairs are approximately the same as for a steam plant. Messrs. Fielding and Platt claim that any man of ordinary intelligence can be taught his duties within a fortnight. Other incidental advantages which are worth enumerating are the avoidance of costly boiler settings and flues, the absence of a high chimney, the fact that considerably less coal requires handling, and finally the small amount of ash left from the good anthracite coal used.

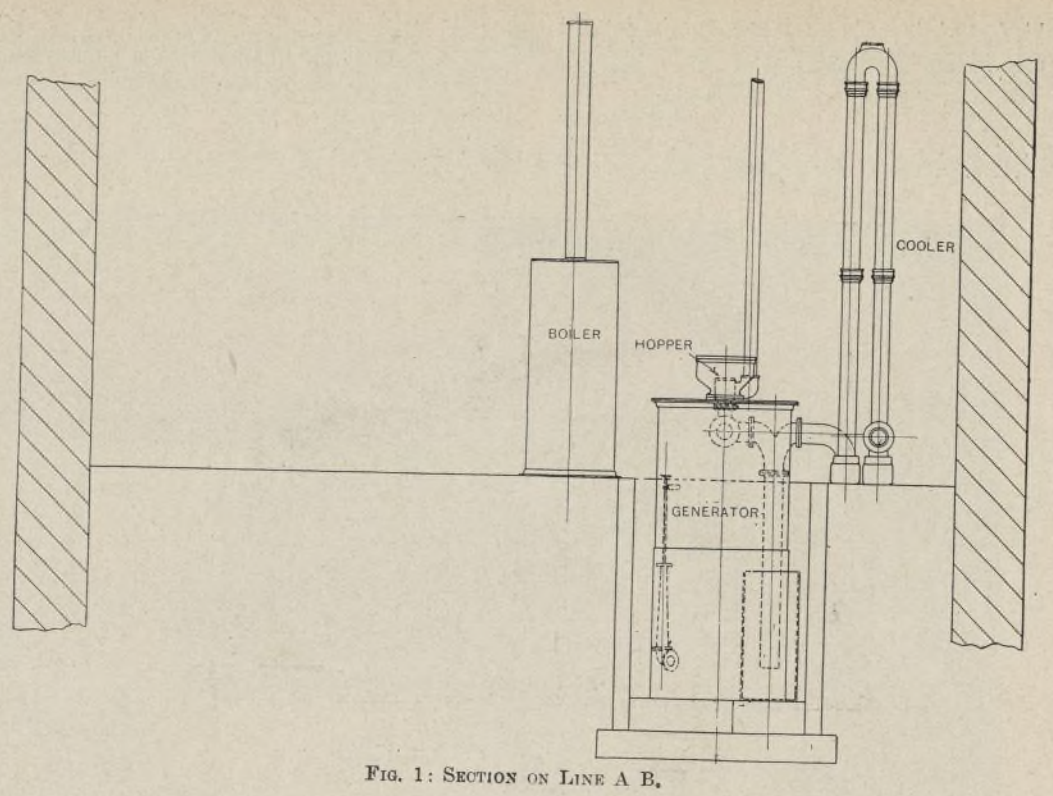


FIG. 1: SECTION ON LINE A B.

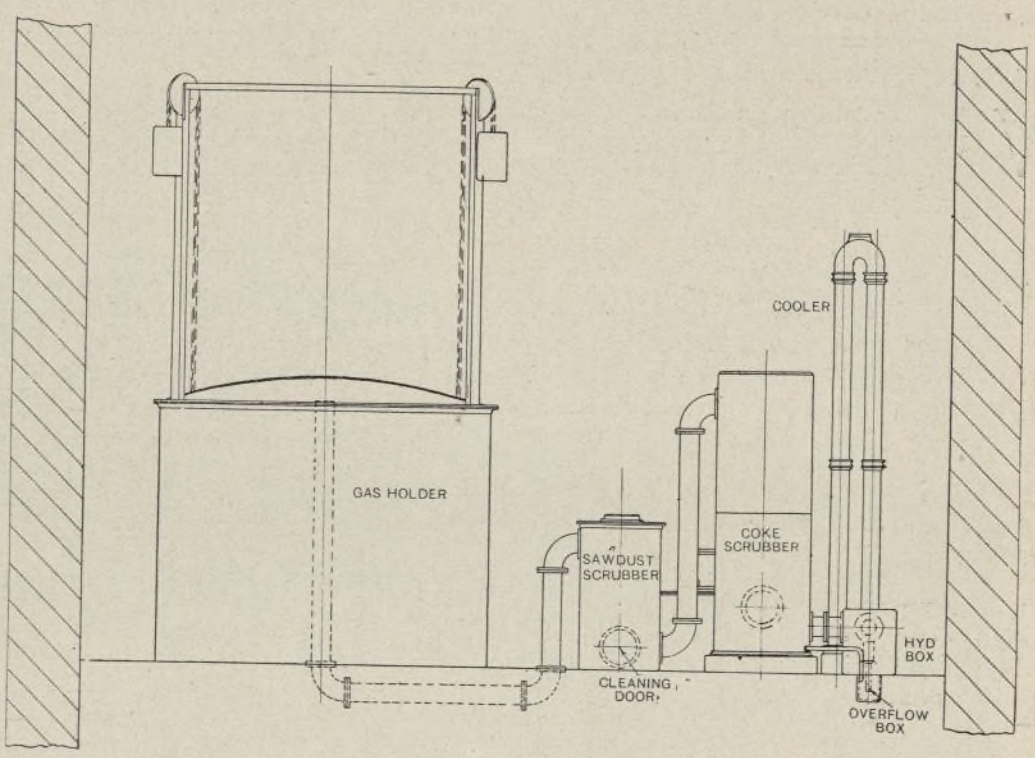
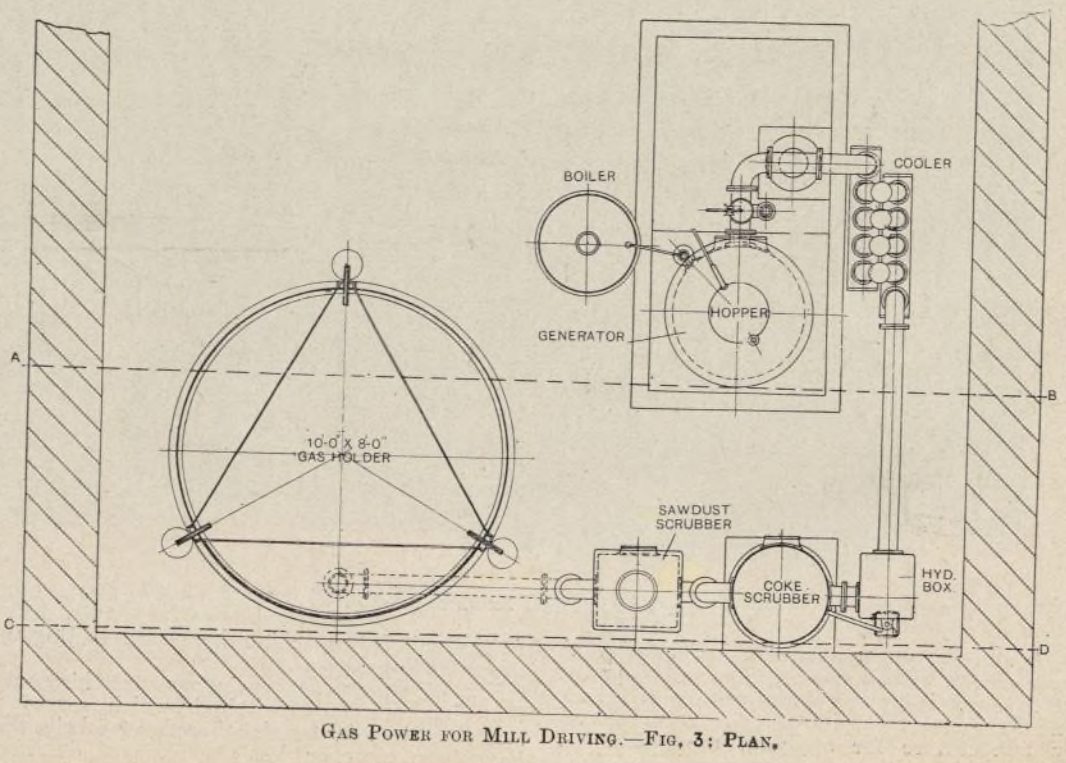


FIG. 2: SECTION ON LINE C D.



GAS POWER FOR MILL DRIVING.—FIG. 3: PLAN.

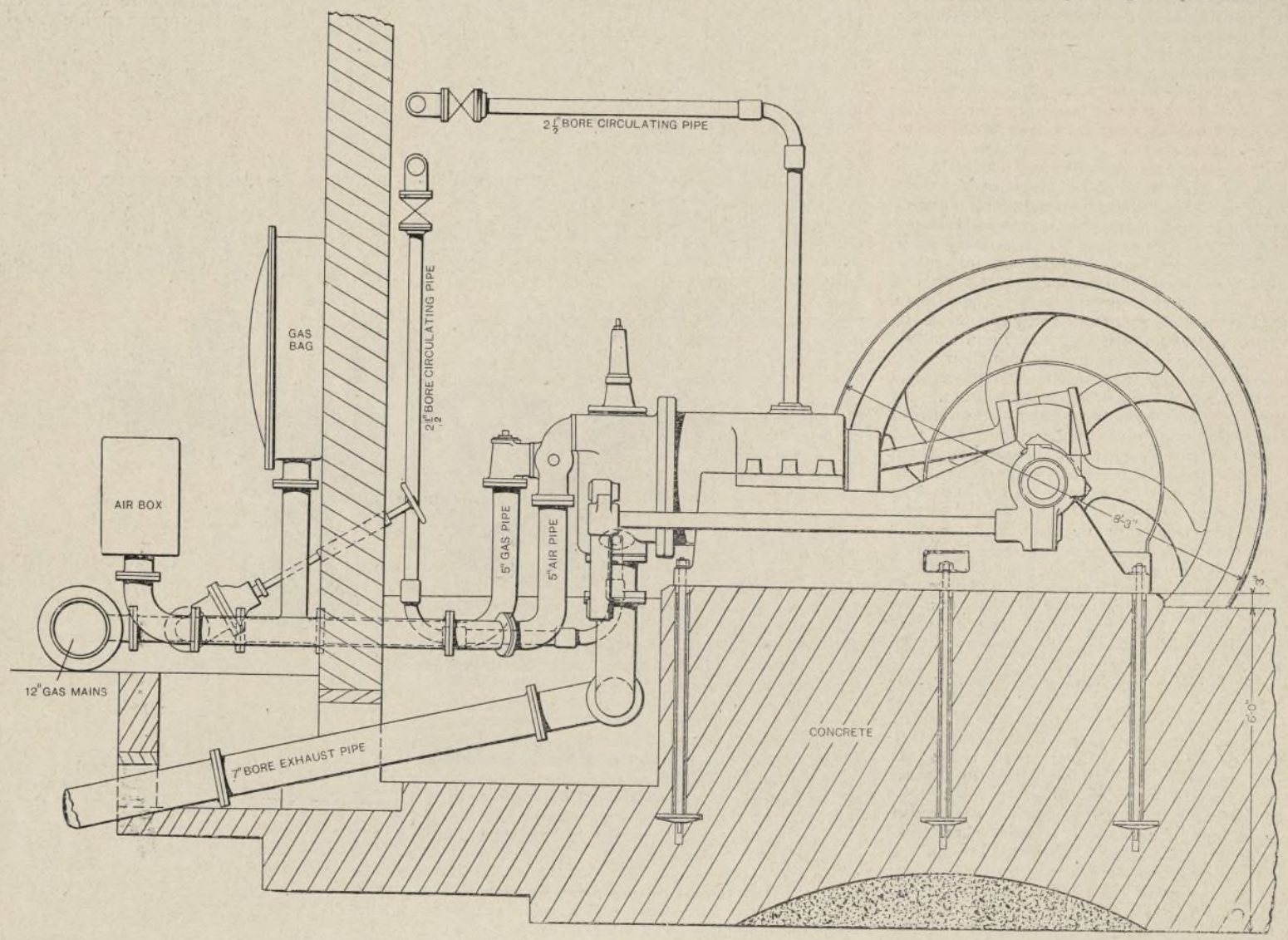
Lubrication.

PERHAPS there is no subject of greater importance in the mechanics of machinery than that of lubrication. Whenever two surfaces are rubbed together friction is produced and heat results. In earlier times a very common form of producing fire or light was through the agency of friction; smooth pieces of soft pine rubbed together at a rapid rate and under pressure were in common use as a means of producing flame. In

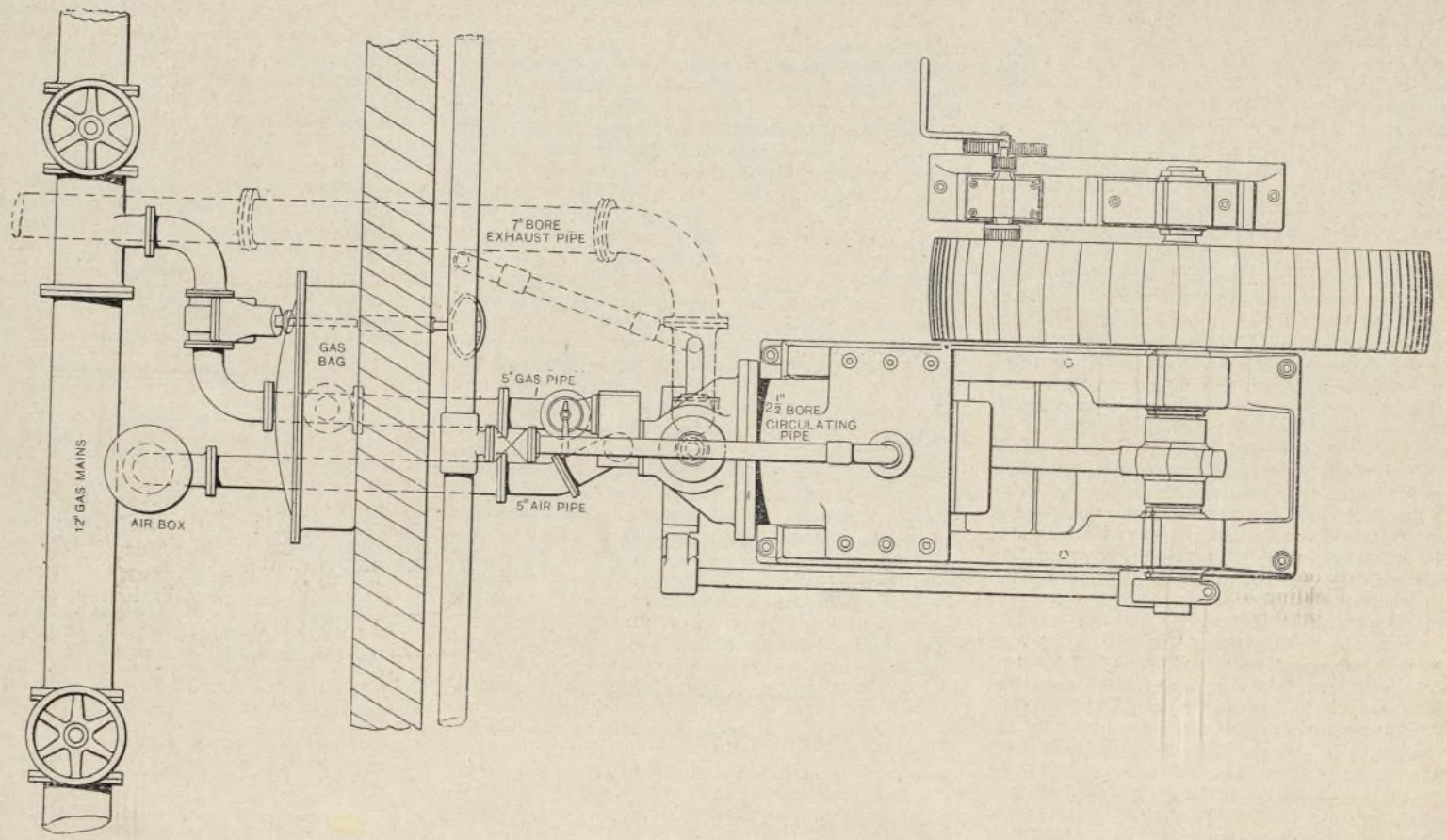
the operation of machinery, however, friction is a very dangerous element, and is the direct result of a larger number of breakdowns than perhaps any other factor. Well designed journals under heavy pressure, poorly-fitted bearings, or bearings lacking proper lubrication, produce at once friction and heat; and these combined factors, if not given immediate attention, often lead to cutting and at times to the entire destruction of the moving parts.

It is not only necessary that the moving parts of any well-designed piece of machinery should be accurately fitted to each other, but that they should be supplied with oil or other lubricant adapted to their use. The purpose of the lubricant is to maintain the surfaces of the moving parts at a slight distance from each other, in order that the roughnesses of these surfaces may not oppose each other's motion by coming in absolute contact. However well the surfaces of moving parts may be planed and polished, the fact still remains that there is sufficient unevenness to create much opposition when these parts move upon each other in close contact. This is more especially true as the pressure holding the parts together is increased. In all cases the lubricant should be selected with distinct reference to its particular use, the nature of the surfaces it is to lubricate, and the speed and pressure of the moving parts.

Oils are derived from three different sources, any are accordingly distinguished, as to their general character, as mineral, animal, and vegetable oils. The mineral oils are largely represented by petroleum and its various products of distillation, and are obtained from mineral sources, principally by boring. The specific gravity of this class of oil is much higher than that of the fatty oils, either animal or vegetable; they also present less viscosity The various products arising from the distillation of petroleum, which is the principal mineral oil, are numerous. Among the principal distillates, however, may be mentioned benzene, various grades of illuminating oils, giving finally a coal oil of 300°



IG. 5 : ELEVATION OF ENGINE



GAS POWER FOR MILL DRIVING.—FIG. 4: PLAN OF ENGINE.

fire test, and neutral or non-acid oils. The last two products mentioned are much used in the manufacture of lubricating oils.

The fatty oils, or those derived from animal and vegetable sources, always present a lower specific gravity than oils derived from mineral sources. This fact often furnishes an important means of determining the amount of adulteration in lubricating oils. These oils do not evaporate at as low a temperature as the mineral oils. They present greater viscosity and power to resist heat, but combine also with their good qualities the ill effects arising from a tendency to gum and harden. Among the important animal oils may be mentioned lard oil, sperm oil, tallow oil, and fish oil; while representing the vegetable oils are resin oil, linseed oil, cotton seed oil, olive oil, palm oil, castor oil, etc. One of the distinguishing characteristics of all fatty oils is their peculiar odour or taste, by which it is possible to detect with considerable certainty their presence in a mixture of other oils.

The best results for lubricating purposes are obtained when the heavier products of petroleum are suitably mixed with the fatty principle of animal and vegetable oils. All fatty oils contain the fatty principle in an acid state, which renders them more susceptible to the action of the atmosphere, and increases their tendency to gum. In the manufacture of the better grades of lubricating oils, which comprise cylinder oils, engine oils, and machinery oils, the fatty oils contained in them are first subjected to a process of saponification by which their fatty acids are made to combine with a base, which renders them neutral oils, and destroys their tendency to gum, and thereby greatly increases their value as lubricants. When this product is combined with the later products of petroleum distillation, a lubricating oil is obtained that possesses the highest power to withstand the action of heat, combined with the required fluidity and viscosity which are essential in all lubricants.

The selection of a lubricating oil for any particular purpose is often a matter of much concern. No two oils will be found to lubricate exactly alike; one will present a greater viscosity than another; others will resist the action of heat due to high velocities and other causes; while still others offer greater resistance to the disintegrating influence of steam in the cylinders, valves, etc., of an engine. Some oils present less tendency to emulsion under the influence of hard water; some feed more rapidly than others, which often increases the cost of lubrication per horse-power. A good oil rightly used retains its character and is valuable for lubricating purposes after it has been in continuous use or until wholly absorbed or evaporated. The best lubricating oils may be filtered as they drain from the journal boxes and used over and over again as long as a drop remains, their value as lubricants being retained to the last. All of these characteristics and properties of the different oils should be carefully observed in the selection of a lubricant.

Much could be written as to the composition of different oils, but after all the true test of any lubricant is had in its application, in the engine room or workshop, to the purpose for which it is intended. This is the only test that will prove of value. Many laboratory tests are often given, the values of which are more or less doubtful. The practice of dropping different oils upon the cylinder chest and noting the time which they require for evaporation is not a comparative test, inasmuch as the oils so treated are subjected to a dry heat very different from the moist conditions in the cylinder. Among those laboratory tests which may be considered as having some value are: (*a*) The oils to be tested are placed side by side upon a clean glass plate protected from dust, and their tendency to gum or harden carefully noted. They may if desired be subjected to a uniform degree of heat to determine the time of evaporation, but this is of little value. (*b*) The comparative viscosity of the oils is noted by dropping each from a glass tube, the end of which is drawn to a narrow neck; the number of drops in a given time is carefully noted for each oil, which shows their comparative viscosity or fluidity; or the glass plate in (*a*) is inclined, and the time noted for the oils to flow down the plate. (*c*) The specific gravities of the oils are determined by the hydrometer. The test indicates more or less closely the amount of adulteration of the fatty oils with mineral oil, although the accuracy of this test may be modified to a considerable extent if there has been an addition of resin oil for the purpose of reducing the gravity caused by the large proportion of mineral oil in the mixture. The addition of the resin oil is often difficult to detect on account of its having been carefully deodorised. A test of considerable value in the laboratory is that known as the *ignition and temperature test*. A small sample of the oil is placed in a dish over a lamp flame and the thermometer suspended in it. The temperature of the thermometer is noted as it rises, and from time to time a match is applied to test the ignition of the vapour arising from the oil. Mineral oils vaporise and the vapour ignites at a temperature varying from 110 to 300° F., while fatty oils require double this temperature for their vaporisation. The amount of adulteration in applying the ignition test is determined by comparing the temperature at which the oil in question ignites with the ignition of samples of known mixtures of mineral and fatty oils. Those expert in the handling and testing of oils can detect the quality of the oil, and to a considerable extent the quantity of the ingredients present, by the *taste* and the *smell*. In detecting oils from their odour a few drops are placed in the palm of one hand and briskly rubbed with the palm of the other hand, so as to develop some heat from the friction of rubbing. The oils give off their characteristic odour under this operation, and may be readily detected by an expert in the process. The test of pouring oil upon a blotter and noting the rapidity with which it spreads and evaporates, is of more or less questionable value in practice.

Aside from these laboratory tests the selection of a lubricating oil should be guided by the results obtained by a practical test of the power required to perform a given work in a given time in its use. If a cylinder oil is desired, the different grades of oils for this purpose must be tried in the cylinder in question, and the actual performance of the engine during their use carefully observed. If an oil is desired for the lubrication of the journals of an engine, or any heavy bearings, running at high speed, transmitting great power or subject to heavy pressure, a selection must be made with these ends in view, and the oils selected put to the practical test, while the consumption of power in their use, to accomplish the same results, is carefully observed and recorded. The quantity of oil used in the generation of a given power during a given time will furnish the data for calculating the cost of lubrication per horse-power per hour; and this will determine the value of the oil for the purpose for which it is employed. The highest type of oil is that which furnishes the best lubrication at a minimum cost. The fact that any given oil accomplishes efficient and economical lubrication of the cylinders or the journals of a particular engine is not an absolute guarantee that it will accomplish the same results in *any* engine working under different conditions. The only reliable test (says a foreign contemporary) is that obtained in the actual use of the oil in the engine for which it is designed.

Apgar's Reducing Gear.

MESSRS. T. S. M'INNES AND CO. LIMITED, 41, CLYDE-PLACE, GLASGOW.

THAT form of indicator gear known as the reducing wheel has much to be said in its favour, particularly on account of its wide range of adaptability, coupled with its general convenience of attachment and manipulation. Some objection to the older forms, when used for high-speed work, arose from the tendency of the wheel to overrun, owing to its momentum. The later forms, being made of aluminium, are free from this objectionable feature, while as they are of lighter construction generally they form a very convenient gear for the travelling inspector. The illustration shows a somewhat more elaborate gear than is usually met with, but which offers one or two important advantages over those of more simple construction. As will be seen, the reduction of motion depends upon the relative diameters of the compound pulley, of which the smaller diameter H can be varied in accordance with the reduction required. The cord from the engine crosshead is led *in a direction parallel to the line of stroke* to the guide pulley carried by the stand A, the position of which can be varied by adjusting the drum B, the latter being fixed in position by the nut D. The cord from H passes around the adjustable guide pulley G to the indicator drum, passing in its course the detent F, by means of which the movement of the drum cord can be readily stopped when desired. In order to prevent the cord leaving the pulley H when the detent is placed in action, the cord from that pulley is also attached to the spring-controlled pulley E, and this maintains the required tension on the main cord. Further, to prevent the cord leaving the pulley G, the latter is enclosed with a guard run as shown in Fig. 2. The return movement of the reducing wheel is effected in the usual manner, the spring for the purpose being carried in the drum C. It will be evident that with this gear the detent is in a more convenient position than when it is attached to the base of the indicator drum; also, that the means adopted for preventing the cord leaving the pulleys when the drum is stopped avoid an annoying feature of some of the older arrangements. The moving parts are light and carefully balanced, and as it is made of aluminium throughout, the gear forms a durable, portable, and convenient reducing attachment, which users of the indicator will doubtless appreciate.

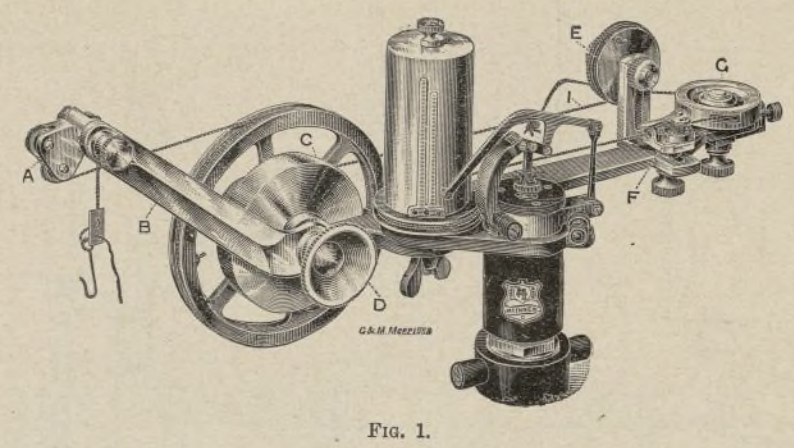
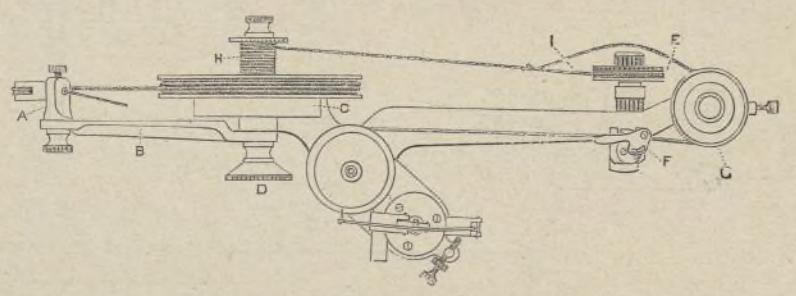


FIG. 1.



APGAR'S REDUCING GEAR.—FIG. 2.

MESSRS. TURNER BROTHERS LIMITED, Spotland, Rochdale, have again secured the contract for the supply of asbestos goods for His Majesty's Navy during the present year.

THE directors of the Duke Spinning Company, Shaw, have placed an order for seventy new revolving flat carding engines with Messrs. Howard and Bullough Limited, of Accrington.

THE Mobile cotton mill, located on the Mobile Bay shore railroad, U.S.A., a branch of the Mobile and Ohio railroad, four miles from the city, in May last increased its capital stock from £20,000 to £40,000, and doubled the capacity of the machinery. The mill has 10,000 spindles, 450H.P., employs 150 hands, and is engaged in the manufacture of yarns.

AN electrical transmission power plant has recently been constructed by Messrs. Ernest Scott and Mountain Limited, of Newcastle-on-Tyne, for the Broughton and Plas Power Coal Company Limited, and which is a notable example of the modern industrial adaptation of electrical energy in this country. It consists of two horizontal compound engines, each developing 350 I.H.P.; two 200-unit four-pole generators driven by ropes; one main switchboard, with measuring instruments and switches; the necessary main and underground cables; two 150H.P. electric motors for driving haulage gear; one endless rope haulage gear for operating three roads; one 60H.P. electric motor for pump driving; one three-throw pump, to deliver 150gals. per minute to a height of 800ft.; one electrically-driven three-throw pump, to deliver 50gals. per minute to a height of 125ft.; and one 5H.P. electric motor, driving a single-barrel pump through worm gear.

RAW MATERIALS, PROCESSES, FABRICS, &c.

The Cotton Fields of the World.

SINCE the early part of the century, and with the single exception of the period of the Civil War, the United States have been by far the greatest cotton producers of the globe, producing since 1834 considerably more than half of the cotton of the world. There are a great many countries, however, especially between the thirty-fifth and fortieth degrees of latitude, both north and south, which are adapted to the culture of cotton. Of the total production of the cotton of the world the United States has produced during the present decade five-eighths, or 62·5 per cent. The crop of the United States, however, has increased with remarkable rapidity since the beginning of the decade, and now forms over two-thirds of the production of the world. According to a recent report issued by the United States Bureau of Statistics (Treasury Department) of the total crop during the decade, 30·5 per cent. was raised in India, China, and Egypt, the production of India being 15·3 per cent., that of China 7·9 per cent., and that of Egypt 7·3 per cent. of the world; the production of the United States, India, China, and Egypt being 93 per cent. of the total crop of the world. The crop of India is thus greater than that of any two other countries except the United States, and two-thirds as great as the production of the rest of the world except the United States. The history of this cotton is intimately connected with that of the States, and the competition between the American and Indian cotton has been fought out under different conditions and in varying circumstances. Shortly after the war of 1812, and during the continuance of the Civil War, the Indian cotton found secure lodgment in the British mills, and although since driven from there, it has obtained a foothold in some of the Continental mills, the greater portion of the importations of several Continental countries coming from India. The area devoted to the culture of cotton in India is less than that devoted to America cotton, this area amounting to 15,800,000 acres in 1896-97 as compared with 23,500,000 in the United States, and 14,100,000 acres in 1898-99 as compared with 22,500,000 acres in the United States; or, in other words, to less than two-thirds of the area devoted to the culture of cotton in the United States. The production per acre, moreover, is considerably less in India than in the United States, the crop of 1896-97 amounting to only 2,800,000 bales, or 1,100,000,000lb., which was only one-fourth the production of the United States, on an area less than 50 per cent. greater. The Indian cotton is, as is well known, shorter stapled and generally less valuable than that of the United States.

PRODUCTION.

India.—The development of the production of Indian cotton has been very remarkable. From the period 1874-1878 to the period 1879-1883 the area under cultivation increased 2,000,000 acres, or 18·6 per cent., and from the latter period down to 1884-1889 the increase was still greater, and amounted to 2,900,000 acres, or 23·1 per cent., making a total increase of 46 per cent. for this whole period. The crop also increased rapidly, though at a less rate than the area, the production increasing from 1873-1877 to 1878-1882 by 152,000 bales, or 8·3 per cent.; and to 1883-1887 by 427,000 bales, or 20·3 per cent., an increase of 30 per cent. for the whole period. The year 1889-1890 witnessed another great increase of the area, which attained the unprecedented amount of 16,000,000 acres, and of the crop, which amounted to three and a-third million bales in this year. During the present decade, however, there has been a slight decrease both in the area and in the crop raised, the average crop during the period 1892-1895 amounting to 2,765,000 bales, and being only 9·5 per cent. greater than the average crop during the period 1883-1887; while in the United States the area under cultivation during the period 1890-1896 exceeded the area under cultivation during the period 1880-1889 by 15 per cent., and the average crops of the former period exceeded those of the latter period by 31 per cent. One of the chief difficulties in the way of the development of Indian cotton is the division of land among the small native landholders, and the unintelligent labour and lack of the spirit of enterprise of the latter. In this case the low wages of the persons employed do not result in a real economy, especially as they prevent the cultivation of cotton on a large scale, directed in an intelligent manner, as in the United States. The cotton area of India is divided among the various provinces and native States, over one-third of the whole area being found in Bombay and Sind, while Berar has 17·5 per cent., these three States having over half of the total area. The chief point of collection is Bombay, which in the year 1895-96 received 77·8 per cent. of the known crop, though other cities, such as Calcutta and Madras, etc., also participated in the reception of the crop. The receipts at Bombay during the last decade show no considerable increase, especially when compared with receipts at such a typical American port as Galveston. In India only 4·2 per cent. of the cultivated area is devoted to cotton; in the United States but 6 per cent., while in Egypt 18 per cent., of the cultivated area is devoted to this crop.

Egypt.—The increase in both the area and crop of Egypt has been remarkably rapid, the average area devoted to cotton increasing from an average of 919,000 acres in 1886-1890 to 1,130,000 acres in 1891-1897, an increase of 23 per cent. This increase has been rendered possible by the irrigation adopted, which has also resulted in a great enhancement in the productivity of the soil, the crop increasing from an annual average of 298,000,000lb. in 1881-1890 to an average of 523,000,000lb. from 1891-1897, an increase of 75 per cent., or three times as great as the increase in the area. The productivity of the soil is considerably greater than in either the United States or India, the production per acre amounting to 450lb., as compared to 200lb. in the United States and 69lb. in India, although this estimate for India is perhaps too low. The area devoted to cultivation, however, is very small in Egypt, owing to the small amount of irrigated land available, there being in 1897-98 but 1,400,000 acres cultivated in cotton in that country, as compared with 14,200,000 acres, or ten times as much, in India, and 24,300,000 acres, or seventeen times as much, in the United States. The future competition of Egypt will be very much restricted by the limited amount of land capable of being planted in cotton. The differences in varieties, moreover, and the fact that Egyptian cotton is only used for special kinds of goods, prevent any very active competition between the cotton of these two countries.

Greece and Italy.—In Europe the only States producing this article are Greece and Italy. The former country, according to official statistics, had 14,800 acres devoted to cotton in the year 1893. According to an estimate of Ellison, the total production of the country amounts to about 10,000,000lb. The consumption of the country is considerably greater, however, and Greece is of no great importance in the world's cotton market. The same is true of Italy, the cotton production of which was at one time considerably greater. At the time of the cotton famine there were about 88,000 hectares, or about 220,000 acres, planted in cotton, and the production amounted to about 55,000,000lb. At the cessation of the war, however, neither Italy nor Greece could compete with the Southern States, and the production sank to about 15,000,000lb. in 1873, while by 1886 the area planted in cotton was only about 5000 acres, or less than one-fortieth of that of 1864, while the production sank to less than 1,500,000lb. in 1892, and to 1,100,000lb. in 1893. This small production is chiefly to be found on the south coast of Sicily, although there are a few acres cultivated upon the Gulf of Naples.

Asia Minor.—The production of cotton in Turkey in Asia (Asia Minor) is of somewhat greater importance. According to the estimate of Ellison, in the beginning of the 'eighties, and of Neumann-Spallart, in the beginning of the 'nineties, the combined production of Turkey and Persia amounted annually to about 48,000,000lb., of which probably one-third is Persian and two-thirds Turkish.

Persia and Russian Asia.—There is but little known of the cotton production of Persia. The chief production is in the Ispahan district, where the crop was estimated at seven and eight-tenths millions of pounds in 1894-95, and where there is a very considerable weaving industry, which consumes the larger part of the cotton of the district. In Russian Central Asia, Trans-Caucasia, and Turkestan the production of cotton increased rapidly until within recent times. In 1887 the area planted in cotton amounted to 116,000 acres, and in 1893 to 370,000 acres, an increase of 125 per cent.; while the crop of Central Asia (not including Trans-Caucasia) increased to 1,975,000 poods in 1890, and to 2,315,000 poods, or over 80,000,000lb., in 1891. Since the beginning of the present decade, however, the growth has been phenomenal; the crop of Russian Central Asia amounting to 3,500,000 poods in 1893, and to 4,000,000 poods, or 145,000,000lb., in 1896, which was more than double the estimate of 1890. In Turkestan, the most important cotton territory of Central Asia, the area planted doubled in the period from 1892-1896. The total production of Asiatic Russia now amounts to about 140,000,000lb. This increased production is largely consumed by the Russian textile industry. In 1880-1881 the Russian industry consumed about 33,000,000lb. of Russian cotton, as compared to almost 140,000,000lb. in 1893. The subsequent rapid increase in the use of the home raw material has been partially due to the tariff regulations, particularly the increase in the duty on raw cotton in 1895, but above all to the rapid extension of the Central Asian railroad, which has opened up the Trans-Caspian territory. The cotton industry in this region is still largely dependent on camels, owing to insufficient railway facilities, the inadequate rolling stock of the railroad, and another cause of its comparatively backward state is the dirty condition in which the cotton appears upon the market. The opportunities for this industry, however, will be great as soon as better seed is introduced and better fertilisers used upon the land which is already being partially exhausted. The opportunities for the advance of the Caucasian cotton are good, in view of the fact that not only does the rough, short-fibred cotton, similar in quality to the Indian variety, thrive in this district, but also the better American cotton.

Japan and China.—The production of cotton in the Far East, notably in Japan and China, is of great importance; but there are not sufficient data to accurately gauge this production. According to the estimate of Ellison, made in the early years of the ninth decade, the consumption of cotton in China and Japan amounted to 2½lb. per capita, and upon this assumption Mr. Ellison estimated the production of cotton in China at that time at 1,425,000 bales of 400lb. each, or about 570,000,000lb., which was equal to about 11½ per cent. of the cotton crop of the world; while the production of Japan was estimated at 132,000 bales, or about 52,800,000lb. Later estimates of the Chinese production coincide with that of Ellison, and it is fair to assume that since 1890 the production has remained fairly constant in China, although the Japanese production has undoubtedly diminished. This latter phenomenon is due to the fact that the Japanese cotton is too hard and short stapled for the manufacture of fine yarns, and although the attempt has been made to raise cotton with imported seed, the home production has not been able to meet the American and Indian competition. By 1890 the production of cotton in China had sunk to 46,000,000lb., while from 1890 to 1894 there was a decline of 27 per cent. in the area planted in cotton, and 43 per cent. of the cotton production of Japan.

Cochin-China.—In the French colony of Cochin-China the production of cotton has rapidly increased. In 1890 the exportation from Saigon amounted to 4,000,000lb., as compared to an export of over 10,500,000 in 1897, and this exportation seems likely to increase, although the crop of 1898 was rather a poor one, and the exportation amounted to only about 4,600,000lb. The absence of any cotton industry in Cochin-China renders the figures of export practically indicative of those of production.

Africa.—With the exception of Egypt, the production of Africa is practically an unknown quantity and a rough estimate, based on an assumed consumption of 1¼lb. per capita, places the production of the whole continent (exclusive of Egypt) at 375,000 bales of 400lb. each, or 150,000,000lb. This estimate, however, is of the roughest character.

Mexico.—The Mexican cotton crop of the year 1895 amounted to 78,500,000lb., that of 1896 to 64,000,000lb., and that of 1897 to 72,500,000lb. The value of the crop is at present smaller than was the case in the earlier years of the decade, owing to the decline in the price of cotton since that time, but it is much larger than that prevailing in the early 'eighties. The production in 1879 amounted to slightly over 50,000,000lb. By far the greatest amount of the crop of Mexico is to be found in the northern and central plateau, Coahuila producing 55 per cent., Durango 17 per cent., Guerrero 13 per cent.

West Indies.—The cotton industry of the West Indies has ceased to be of importance. In Cuba, Porto Rico, Jamaica, and San Domingo the cultivation of cotton has practically ceased, and the area devoted to it in Martinique and Guadaloupe was only 1500 acres in the 'eighties. The exportation of cotton from the Bahama Islands has also declined from 80,000lb. in 1890 and 103,000lb. in 1893 to 31,000 in 1896 and 4000lb. in 1897. In Haiti the export trade in 1897 amounted to 800,000lb., but even here the cotton industry has greatly declined, the exportation in 1890 amounting to 2,333,000lb.

(To be continued.)

Oxford Overcoatings.

THE construction of the present overcoating fabrics upon the market is so varied, and the outlook for quite a change from the fabric now in use is so marked, that it is quite impossible to give a detail of construction and weave that would be sure to be on the lines of any coming cloth. Samples of popular lines vary somewhat in lay out and weave, yet the general character of the stock and mixtures, as well as the finish, does not vary to any great degree. It may be said that whereas the last season was prolific with twills and diagonal effects the tendency at this time seems to be towards a fabric showing no twill, with a face more on the order of a melton, and yet retaining the soft cheviot "feel" and finish.

Regarding the selection of stock, the wool should be on the cheviot order, and short in staple. If any shoddy is used, anything on the worsted order that would give a wiry thread and lack fulling quality should be avoided. While the goods do not require a very heavy felting, they should possess the felting quality to render the finish soft. A medium-staple pulled wool is very suitable, especially for the white in mixtures, and any desire to cheapen the fabric should not interfere with the quality of this white. If it is finer than the black, so much the better. There are various shades on the market ranging from a 2½ per cent. mixture to one containing 25 per cent. of white. A line of shades nicely graduated may run as follows:—2½, 5, 10, and 15 per cent. of white.

The most important matter regarding the mixtures is the manipulation of the stock in the picker-room Oxfords are the most difficult to get evenly mixed when handled in the ordinary manner; but by a special plan that should always be followed with mixtures of this character, the best of results may be assured. In making a mixture of 100lb., having 2½ or 5 per cent. of white, first take 2½lb. of white and 22½lb. of black and run them through the picker; or 5lb. with 20lb. of black may be used; either method would result in a mixture containing one-fourth of the lot. Now by laying down this mixture with the 75lb. of black stock remaining, and running through the picker three times, oiling the second time through, the mixture will be about as uniform as it is possible to make it. It would be next to impossible to get the white evenly distributed by laying the small quantity down with all the black at first.

In making a 15 or 25 per cent. mixture, the preliminary mixture should be about half-and-half of the black and white. The lay-out and weave being determined, the detail of the work would not vary from that of other goods until it came to the finishing-room. To secure a 28oz. finished fabric, the goods should weigh from 33 to 34oz. from the loom, and should have from 16 to 18in. to full. The fulling should be with cold soap, and care should be taken to avoid overheating, regulating the work to secure a moderate and uniform temperature

The width from the fulling mill should be sufficient to allow the cloth to go on the dryer without stretching, otherwise the width would not be retained through the dry finishing process. The width from the dryer should be at least 1in. more than the required finished width. As the finish does not call for any gigging, the cloth should be immediately extracted and dried after coming from the washer.

After drying, the cloth should be given three or four runs over the brushing machine with a moderately hard application, and with a moderate steaming with good live steam. By this process all the fibres that are not thoroughly felted down will be brought to the surface, and the steaming destroys the hard, stiff feeling produced by the previous processes. This steaming will tend to reduce the width to some extent, and it may be easily determined just what allowance should be made for it in the drying, and whether the 1in. is sufficient.

The goods should now be backburled and passed to the shear. While there will be but little shearing required, this operation should not be hurried; while one or two runs may seem sufficient, it will be better to give a few extra runs after the blades are down to the finishing point, in order to give ample opportunity for all the fibres on the face to be brushed up, thus securing an even and uniform face, and avoiding the possibility of the goods roughing up in the wearing, as is often the case when the work is hurried.

Following the shearing comes the specking, and a light brushing to clean the face before pressing. There is, among finishers, a diversity of opinion regarding how the cloth should be pressed for a cheviot finish. Some prefer running with the face up, thereby getting a less glazed effect upon the face, and requiring little if any steaming afterwards; but we would advise pressing with the face down. This gives an appearance to the face that seems far removed from the cheviot effect. The cheviot effect may be obtained by after-treatment, and a much more agreeable "feel" to the goods produced than in any other way. Give them about the same pressure that other goods of the same weight would require, running them on to a roll. Possibly three or four pieces may be run on to a roll together, after which they should be wrapped with heavy paper, and allowed to lie twenty-four hours, for the cloth to cool and the pressure to become set. It is a great mistake to hurry the work, so as to be obliged to open up and handle the goods while they are warm, as much of the good effect of the pressing is thereby lost.

After the cloth has lain the required length of time, it will be found that the handling does not destroy the effect of the pressing, and the steaming can be the more easily confined to the face of the cloth, and not be forced through, destroying a part of the pressure obtained. After the cloth has been removed from the roll, as many pieces as can conveniently be laid down at once for steaming should be sewed together, with a leader on the bottom or last piece, so that they can be run through without interruption. Sufficient steam should be turned on to entirely destroy the glazed effect on the face of the cloth. A little experimenting will soon show the amount required, when the turns of the valve wheel should be noted, and a mark placed upon it, so as to arrive at the same results every time.

The steamer should be well covered with felt or several thicknesses of cloth, so that the full force of the steam may be tempered, causing it to strike the cloth in a gentle, hot vapour, and not with a force that will penetrate the fabric.

After this process, says the "Textile World," the cloth should go to the inspector's perch, and then to the measurer and winder. The closeness of shearing, amount of pressure and final steaming should be subject to the good judgment of the finisher, which with the directions given should result in a well-finished fabric.

Art Nouveau.

EVERYONE is asking what is the "Art Nouveau" that designers are discussing and applying the world over. Briefly, it it is a new school of design which is now being practically and successfully applied in every industry where patterns take precedent. It is really a most extraordinary craze which has spread all over the Continent; to some it is known as the Austrian style, but the French and the many call it l'Art Nouveau. The French, since the time of Francis I., have clung tenaciously to first principles, and although this method is open to criticism by broader viewed nations, it must be admitted that they have been consistent.

All other countries, and their designers, have adapted, adopted, amalgamated, and absorbed influences, theories, and character wherever they found them, but the French adhered closely from the earliest day down to the time of Napoleon to the forms and expressions observed in the early Renaissance; therefore, says the "American Silk Journal," it is a matter of more than casual significance that the French are now presenting this new school of design emanating from a strong and influential coterie at Nancy, not only in upholsteries, furniture, wallpapers, and kindred industries, but, what is most interesting, they have broken down the barriers of conventionality and applied the new school of design to silk fabrics and ribbons. In defence of this action these enterprising spirits say they are practically nauseated by the conventionalities of Henry II., Louis Quatorze, and Louis Quinze, and so go into the fields and gardens and revel in the beautiful forms and colours they find there. Thus the designers of Nancy take natural forms as they are, for the new school is delightfully ingenious, but in thus departing from the conventional and adopting Nature runs riot in form and occasionally oppresses one by the superabundance in colour. They shape a ewer handle from the model of the cornstalk, or of the intertwined birch tree in the case of pottery, and the same idea applied to silks gives results that in many cases double the trade value of the fabric.

When it comes to analysing the style there is nothing startling about l'Art Nouveau. It is a new art in France, but two years before the French took it up it was done in Germany, and, like all things that are strictly German, it was heavy and really grotesque, carrying out the plant treatment to perilous extremes. The French, however, are lending a refining influence to the treatment; but, after all is said, it is the conventional plant treatment that William Morris, Botticelli, and Walter Crane have been doing in England for years past. We see it in some things that are purely Japanese. Again, we recognise things that are emasculated Gothic. Here and there, there is something pre-Raphaelite in tree form and plant life; but with all it is simply a striving for a different effect by old English methods, and this striving ends so often in the grotesque and freakish that it fails in dignity, because so obviously based upon the effort to be different. We are speaking of the early output of this art.

Designs are now being produced in Europe that are so artistic and delightful to the eye that it is an assured thing that l'Art Nouveau has come to stay. The simpler effects are very pleasing, because where the treatment is simple it is Japanesque. But some of the more pretentious work is so closely akin to the English that one would think they were done by Walter Crane. The Japanesque treatment is largely a matter of fresh colouring, and in design utilises all the possibilities of the flower, the leaf, vine, limb, and roots.

It was time for French designers to awaken from their lethargy, for if they had remained forever but simple copyists, reproducing again and again the models of previous centuries, art would have perished of stagnation. While Japan furnished the artisans of Europe with invaluable suggestions, the latter could not slavishly copy her methods; they had to be adapted to Western civilisation and needs Nature is the basis of all art, but Nature must be transformed, not reproduced in its exactitude. Man can never hope to rival the handiwork of the Creator; he must conventionalise the forms he finds in Nature to suit the spirit of human evolution. Austria, Hungary, and Bohemia run riot in l'Art Nouveau, expressed in rather more ponderous and ornate fashion than that of the French.

Serpentine lines and floral suggestions are repeated over and over again, showing that many manufacturers are simply copyists, unable to add a new idea of their own. While each nation possesses some distinctive characteristics, it would seem as if there was a community of interests established by which each borrowed something of the other. Something must always be conceded to the habits of the people of different countries, climatic influences, and modes of thought and education.

Modern German Weaving Schools.

(*Concluded from page* 23.)

THE method of teaching is more or less on similar lines in German as in other schools, with exceptions in detail. The chief feature is that of reading a lecture to the students, which they take down in their note-books. This means that by the end of the year each student has a voluminous book of notes containing a condensed description of the subjects he has studied. Most of the teachers supplement this dictation lecture by oral explanations or by a more extensive lecture on the same subject. Important matters are enforced by terse repetition, whilst the gist of each lesson is condensed into a special paragraph. Copies of sketches or diagrams are lent to the students, and college time saved by their copying them at home. This is done at Chemnitz and Kottbus, whilst, on the other hand, the masters at Sorau think that the diagrams are better impressed upon the memory of the students if copied from a blackboard.

With such systems it will be seen that text-books play little part. This is a great advantage, for the best text-books are frequently behind the time, and the syllabus of lectures varies every year so as to keep pace with improved processes or changing fashions. Practical work is regarded as the most important part of the student's education, at any rate by those of the larger schools which can afford the necessary apparatus. The actual gaiting of machinery takes an important place, and the theories mentioned in the lecture room are better explained during such work.

Silk Spinning in Japan.

IN spite of the fact that Japan occupies the foremost rank in silk produce, the silk-spinning industry remains, comparatively speaking, in its infancy. The work was first taken up as a Government enterprise in 1877; but there now exists only nine mills of the kind, all private, seven of which were established subsequent to 1877. The pioneer mill was started in 1877 at Shimmachi, Gumma-ken, use being made of the water-power available, and the help of three foreign experts, especially engaged by the Government, having been secured. Two years later a number of the shizoku of Mayebashi started a silk mill on their own account, and in 1887 the Government mill was sold to the Mitsui firm, which also had transferred to it, about eight years after, the Mayebashi mill. Meanwhile, another private factory was established in 1887 in Kyoto, and still another near Hodogaya, Kanagawaken, in 1890. All these establishments suffered for a while considerable reverses, brought about by various causes. In addition to the primary defect that the knowledge of the foreign experts, and hence of those who worked under them, was far from equal

to the work to which they applied themselves, ordinary silk ruled low in the market, while the demand was as yet comparatively limited both at home and abroad, the public not caring, says the "Japan Times," to patronise the spun silk, inferior in quality as it was to ordinary silk and comparatively high in price.

It was subsequent to the Japan China war that the silk mills began for the first time to take breath ; for with the sudden launching of sundry enterprises and a greater consumption of silk, with a consequent advance in its price, coupled with the fact that the Japanese experts had in the meanwhile tolerably well initiated themselves into the practice and theory of the work, the business of silk spinning became for the first time profitable—so much so that the first mill in Kyoto, which has subsequently added to itself another mill, was able to declare a dividend of as much as from forty to fifty per cent. This prosperous condition has given a powerful impetus to the growth of the industry. The scale of daily wages varies. For the first-rate male operatives it is from 36 to 75 sen (9d. to 1s. 6d.) on the average, according to the kinds of work they are to undertake ; and the figures for the corresponding female operatives are from 20 to 31 sen (5d. to 8d.).

Degreasing Fibrous Materials.

A METHOD of cleaning or degreasing different kinds of fibrous materials, designed chiefly to meet the cleaning of cotton waste, has been tried in Russia. The chief feature is that the process is carried out without the assistance of volatile, inflammable, and explosive hydrocarbons. It is well known that the purification of or removal of the grease from fibres, except by soap and water—a process not always advisable,—is attended by many difficulties. The cause is, according to general opinion, that the mineral oils, as also hydrocarbon compounds belonging to the fatty series, cannot combine with metals or metallic oxides, and consequently form unsaponifiable bodies ; that they are therefore also completely insoluble in water, and cannot be washed out of the goods by the washing materials generally used. This is, however, far from being the case. Observations which have frequently been made in practice have shown that mineral oils under the influence of certain reagents alter very easily, lose their oily properties, and are converted into soapy liquids completely emulsifiable with water.

It has been repeatedly observed that cleaning waste or rags which are soaked with mineral oil when thrown together in a heap become heated so that they ignite spontaneously. This phenomenon can be accounted for by the mineral grease spread over such a large surface becoming so speedily oxidised that the heat liberated thereby suffices to produce self-ignition. The process of oxidation of the mineral grease taking place on the textile fibre produces alteration in its physical properties, causing the bulk to change into a soapy liquid easily emulsifiable in water—that is, the oil is divided into very tiny drops, assuming a milky appearance, and cannot then be separated from the water, even after standing a long time. These mineral oils thus emulsifiable with water, and separated from the fibres to be purified in the following manner, are adapted in the purified state to serve as excellent solvent and cleansing media for removing any impurities still remaining in the fibres after the removal of the grease by mechanical means. In the chemical processes usually employed the more volatile hydrocarbons of the fatty or aromatic series, such as are contained in petroleum or in gas tar, are employed, by aid of which grease is to be brought into solution. The disadvantage of this method is obvious if its physical properties are considered ; only the excessive inflammability and danger of explosions need be referred to.

The substance from which the fat is to be removed is placed in a hermetically-closed vessel and heated by means of steam to over 100° Celsius until a slight excess pressure (over that of the atmosphere) appears in the vessel, when the melted mineral grease, converted into a thin fluid, is pressed out of the fibres by means of strong hydraulic pressure. The mineral fat separated in this manner is run into a vessel where it is heated for two hours, with continuous stirring, at a temperature of from 130 to 150° C., and then left to settle. The layer of thin oil on the top is then separated from the under layer of soapy grease. The thin mineral oil is purified by filtration, and can be used again. The thick and emulsified grease, on the other hand, is treated with 5 per cent. of lime, mixed to a pulpy mass, and boiled for three hours. The lime compound thus formed, after cooling and settling, is separated from the dirty liquid underneath, washed with water, and decomposed with 1 per cent. of muriatic acid. The mineral grease freed from the surplus muriatic acid is treated with a quantity of pure water and mixed with 3 per cent. ammonia soda. The soapy emulsion then resulting on reboiling is employed to wash the fibre which is not yet quite freed from the impurities adhering thereto, and after being used for this purpose can be purified in the said manner and used again as means for washing, or be employed as an excellent substance for making wagon-grease.

Lubricating Wool Fibres.

WOOL FIBRE is oiled before being carded to prevent the flying of the fibres and to facilitate their adhesion in the making of yarn. Oil applied for this purpose must be subsequently eliminated by washing, and it is desirable that only so much should be used as is requisite to effect the required action of the fibres both in carding and in the manufacture of the yarns. A compound for this purpose that is said to have advantages over the older methods has recently been introduced in the United States. Wool grease contains about 30 per cent. more or less of neutral fat that is not saponified by the action of alkali, and which is especially adapted for treating wool fibre as above suggested. It is of peculiar viscous or sticky or "tacky" nature, and has a marked affinity for water analogous to that which glycerine possesses. The compound, ready for use, consists of neutral wool, fat, soap, and water. Any neutral soap will answer the purpose, but in practice a soap made with tallow and potash has been used. Ordinary crude commercial wool grease or degras, obtained from the cleaning of wool fleeces, has a rank and disagreeable odour due to the presence of rancid fatty acids and impurities, and for this reason is objectionable. The new lubricant is made as follows :—The fatty acids and impurities are removed from the degras, or commercial wool grease, leaving a neutral or non-saponifiable fat having the characteristics above suggested and free from objectionable odour, and which may be wholly or partially bleached. This fat is obtained in several ways, and among which the following may be mentioned. Commercial wool fat is mixed with sufficient alkali, either hot or cold, so as to saponify the whole or greater part of the saponifiable portion, and then mixed with benzene, naphtha, or gasoline. The mixture is allowed to stand until the dirt and saponified fatty acids drop to the bottom, leaving the non saponified fat dissolved in the benzene at the top, from whence it may be drawn and the benzene distilled off. Another way is to mix the grease with sufficient alkali and water to saponify the whole or greater part of the saponifiable portion. The mixture is allowed to stand, and the unsaponified fat rises to the top, and is drawn off and repeatedly treated with pure water until substances soluble in water are removed. Then by heat or centrifugal force the last of the water is eliminated from the fat, which may then, if desired, be refined and bleached as other oils and fats are. This product readily mixes with pure cold water to the extent of forming a somewhat thick cream or paste, but not such a solution as is practically adapted for the proper treatment of wool fibre. Soap, preferably neutral, or containing no free alkali, is melted or dissolved in water and mixed with the neutral wool fat. In this operation use heat sufficient to melt the fat, say at a temperature of about 109° F. Higher temperature is objectionable and is apt to injure the compound. The mixture of such wool fat and soap dissolved in water is a substantially permanent and homogeneous one and remains so when cold or warm water is added.

Owing to the characteristics of the fat, the solution in water is relatively very sticky or "tacky," and consequently it is necessary to apply to the wool fibre only a very small quantity, and the greater affinity of the compound for water permits the use of large quantities of water and affords a very thin milk-like solution which has in a marked degree the characteristics necessary for the treatment of the fibre, and yet in a given quantity of which only a very small percentage of the wool fat is present. Moreover, the solution in water is a permanent one, which is only modified under all the general conditions of use by evaporation, and such modification, if it occurs, may be rectified merely by the further addition of warm or cold water. The solution is free from objectionable odours, which is not the case with many of the oil or grease compounds which have generally been used. Since the solution has the characteristics described, only a relatively small quantity thereof need be applied to the wool fibres, and a minimum quantity of fat to effect the end desired is therefore deposited upon the fibres. It may therefore be removed from the yarn by washing with facility.

A standard solution of wool fat is made in the following manner, the proportions being the same in any quantity :—To 25lb. of wool fat melted is added 5lb. of soap previously dissolved in about 3gals. of hot water ; these are stirred together, forming a thick, smooth, cream-like emulsion ; heat is then removed and about 45gals. of cold water poured in. This manner of making the solution applies to the fat and soap when these are supplied separately. When the fat and soap are supplied in a compound they are mixed together in a solid form (this being done by drying out, as far as possible, the moisture contained in the soap, and incorporating the soap into the fat when melted). The two substances when cold return to a solid fatty compound. All that is necessary, then, is to melt 30lb. in hot water (about 3gals.), then turn off the heat, and add cold water in the proportion stated.

Selvage Creases.

WHEN worsted cheviots crease close to the selvage, and which is generally called "freezing of the selvage"—for pieces are turned over in places, all along the listing, and are so matted together that it is very difficult to pull them apart,—it is usually found that the goods are being fulled in the grease before being scoured. If the goods are scoured first they will go into the fulling mill much softer, and the chances of their cracking or wrinkling will be reduced to a minimum. A neutral soap can then be used, making them felt easier, crease less, and handle much softer when finished. If fulled in the grease, an alkaline soap has to be used to saponify the dirt and grease in the goods ; and alkali is a maker of wrinkles, and an enemy to felting and soft handling.

If this is not the cause, and if the goods have been scoured before fulling, and they wrinkle, then the trouble may be in the weave of the listing. If the goods are a four or six harness twill, the listing should be the same weave with the twill reversed. If they are through-and-through goods with no backing, woven as we state, they should give very little trouble in fulling, if scoured first.

Another cause for this trouble may sometimes be found in the quality of the stock. Some stocks are very hard to keep from wrinkling. Often it is found that the twist in the yarn causes it; also a two-ply warp with a single filling, or a fabric with a back, that has any kind of a listing other than a basket weave. The only way to prevent creases from any of the last-named causes is to tack the selvages together in a sewing machine, and run the goods in a fulling mill like a bag. They should be sewed up all the way, with only a space near the seam about 9in. long left open, to let some of the air escape each time the seam comes round. If this space is not left open, the goods will get so full of air and bag up so much that they will lift the stop motion up every few minutes, and stop the mill ; and should the stop motion fail to work, the pieces would be full of chafe marks and holes. This, says the "Textile Manufacturers' Journal," is a very satisfactory way of fulling goods that are made of coarse stock, or have a complexity of weaves or yarns, as the goods will not run long enough in one position to get a wrinkle in any part. The tacking is best done when the goods are dry, before scouring.

Raffia Fibre.

RAFFIA is the Malagasy name of a palm which furnishes a staple article of commerce called raffia fibre. It is indigenous to Madagascar, and is to be met with everywhere on the coasts, needing no cultivation or attention of any kind. It is not a stately palm, but sends its enormous branches from near the ground ; in a fine specimen, one branch is almost a tree in itself. The rib of each branch is as much as 20ft. long, of a pearly-grey colour, smooth and shiny, flat on the inner surface, but otherwise round, without any knots, and so hard that in perhaps nine cases out of ten a rifle ball would rebound therefrom. At the base it is as large as an ordinary champagne bottle and tapers to a point at the top. The inside consists of a light pith, which can be split into layers of any thickness. Possibly it is this or an analogous production which is used for making pith helmets in the East. These ribs combine great strength with wonderful lightness, and are used for shafts for "filanjanas," or palanquins, ladders, and other purposes, but otherwise have no particular commercial value.

It is the pinnifoliate of these branches which produce the raffia fibre of commerce. One palm branch, or frond, will produce 80 or 100 long green leaves from 2 to 5ft. in length, like the leaves of the sugar cane, but of a dark, lustrous green, and thicker and stiffer. These, again, contain a round and pliant rib, which the natives utilise for making baskets and dredges for catching small fish and shrimps in the rivers after they have stripped off the green part which furnishes the fibre. The under part of this green leaf (which is not exposed to the light, as it remains folded) is of a pale, greenish-yellow colour, and from that side the inner skin can be peeled off in the same manner as the skin on the outside of a pea pod, except that it peels off straight to the tip without breaking. It

is then of the palest green, and after being dried in the sun assumes a light straw colour. This is the raffia fibre of commerce.

It was originally exploited by the natives for use in articles of clothing. The men bring in the fronds and women and girls weave it on hand-looms of any coarseness or fineness. Woven just as it is peeled off from the fronds, it forms a kind of sacking used for wrapping goods, while the perfection of the art, as known by the Hovas only, is to weave a tissue of which the warp is raffia fibre split infinitesimally fine, and the weft of white silk. This gives an article called lamba, which brings fancy prices in Europe and America. The coast tribes use it for clothing, but of mediocre fineness, with dyed stripes of indigo, saffron, black, and a dirty green. It is a cold, comfortless-looking material, and refuses to adapt itself to any folds that a sculptor would care to copy. Raffia fibre is now used by nurserymen, gardeners, etc., for tying up vines and flowers, and for grafting. It possesses the advantages of being as soft as silk, and is not affected by moisture or change of temperature so as to risk cutting or wounding the most delicate tendrils : and it does not break or ravel when folded or knotted. These qualities bring it into use all over Europe, and consequently maintain its price. It is virtually inexhaustible in Madagascar, the supply being limited only by the scarcity of labour. For export, the fibre is merely collected in large skeins, twisted up or plaited, and then baled like raw cotton. Madagascar exports about 20,000 bales annually, and the present prices range from £3 to 3 guineas per bale, f.o.b. New York.

Japanese Sericulture.

THE export of silk fabrics ranks third on the list in the annual statement of the volume of Japanese trade, being exceeded in value only by the export of raw silk and cotton yarn. Silk weaving and silkworm culture are carried on in every other cottage in some parts of Central Hondo, the main island ; the hand-looms employed being of antique design and cumbrous in operation, but capable, in skilful hands, of turning out excellent work. It was in Tomi-Oka, in the district of Tochigi, some fifty miles due north of the capital, that the first experiments were made in 1870 in silk weaving with foreign machinery, and it is from Yokohama, as the nearest port to the centres of this industry, that the bulk of the export trade in manufactured silk is still conducted. Beyond Hachioji, on the high road to the capital of Shinshin province, whence a large proportion of the raw silk is derived, the all-absorbing occupation of the peasantry for weeks in the early part of the year is that of tending the caterpillars, on the preservation of which in health the success of the industry so entirely depends. The visitor at such times will discover, says an Indian contemporary, that even in the established inns the comfort of guests is quite a matter of secondary importance in comparison with the comfort of the silkworm. The temperature of the room must be adjusted to a nicety, lest, as the common belief appears to be, it should take offence and refuse to spin.

The silkworm is, in fact, the valued guest of the establishment, and is spoken of and respected as such. Subsequently, when the cocoon has been completed, and the object to be attained is to prevent the moth destroying the raw fibre by making its exit, it is treated with scant ceremony, for the cocoon, with the guest inside it, now in the chrysalis stage, is plunged into boiling water. Some are, of course, reserved, and from these cocoons the butterflies emerge in eighteen days after the caterpillars begin to spin. Within thirty hours from the time of their appearance the female moths have deposited their eggs on the slips of cardboard provided for the purpose, and the minute grains, usually from three to four hundred from one insect, are preserved with infinite care until the following spring season, when the hatching process begins again. Owing to the silkworm disease in Europe which made its appearance nearly thirty years ago, these cards were much sought after by Italian silk-growers, and commanded high prices as articles of export. They still figure in the returns, but the raw silk itself has practically become the most important commercial product, and the cards are for the most part retained in Japan in order that the supply of the fibre may not fall short.

Thirty-four days are consumed in hatching, and now the temperature of the apartment, usually a loft or attic, must be carefully regulated and kept moderately high. Early in May the worms, of which about 160 equal in weight 1 grain avoirdupois, make their appearance, and it is the duty of the women of the house to separate them, so that at least a square foot of the matted tray on which they are now placed to feed shall be apportioned to every hundred worms or so. The tenderness with which this delicate operation is performed must be seen to be appreciated. Another period of 34½ days now elapses while the silkworm is growing and preparing itself to spin. Just before the spinning begins the weight of a single worm is found to have increased to about 35 grains. The actual time taken up in spinning does not ordinarily exceed three and a half days, and then the worm becomes a chrysalis.

The Silk Trade in France.

THE returns of last year show a very marked falling off in the receipts of raw silk in France. The arrivals of cocoons, raw silk and waste sllk were not as large as those of the previous year. The falling off in raw silk is over 4,000,000lb. The quantity received from China was about 3,000,000lb. less than in the previous year. That from Japan has fallen off 50 per cent. Italy and Turkey send 200,000lb. less of cocoons than in former years. The importations of waste silk fell off 2,000,000lb., the decline being chiefly in shipments from China and Japan. This is the condition the market generally assumes about every four years. The purchases were especially heavy last year, and heavier than usual the year before. There is enough raw material on hand for some months yet, and there are 12,000 bales of raw silk at Yokohama, Japan, and 20,000 in China.

During the last nine months there was a strong market in the United States and London for mixed silk and fancy goods, gauzes, crêpes, and tulles. The falling off in England is possibly due to the war in the Transvaal. In Germany it is the result of increased domestic production. A slight increase is noticed in the sales to the United States, Switzerland, Belgium, Italy, and Turkey. Notwithstanding the higher protective tariff in France, imports of mixed silk goods and ribbons have greatly increased. The following table shows the import and export particulars of the various forms of silk during last year, arranged in comparison with those of the previous year :—

	Imports.		Exports.	
	1899.	1900.	1899.	1900.
	Kilos.	Kilos.	Kilos.	Kilos.
Cocoons	1,121,000	634,000	71,000	112,000
Silk, raw, waste and thrown	17,296,000	13,605,000	6,526,000	7,770,000
Silkworms' eggs	1,800	1,900	60,800	97,600
	Francs.	Francs.	Francs.	Francs.
Silk piece-goods	65,376,000	61,516,000	278,336,000	262,953,000

Gleanings from Consular Reports.

SERVIA.—Goods classified under the head of wool and hair were imported in 1899 to the value of £181,104, an increase, as compared with 1898, of £50,593. Raw wool and hair were estimated at £32,842, an increase of £14,608. Woollen yarns were valued at £34,054, or £7084 more than in 1898 ; of this, German yarns were valued at £19,474, and Austrian at £8777. Importations of British wools were estimated at £5745, which was over £1000 more than in 1898. During the first nine months of 1900 woollen yarns were purchased to the value of £23,209, a slight increase as compared with the figures for the corresponding period of 1899.

The total importation of woollen tissues in 1899 was valued at £114,206, which included the following :—

	Value. £
Coarse homespuns, bedcovers, horse rugs, and carpets	8,653
Flannel and tweed linings	3,115
Dress suitings, German beaver, tweeds, doeskins, serges, etc.	63,783
Orleans, merino, reps, kerseymeres, and furniture stuffs	25,491
Total	101,042

The above figures, compared with those for the year 1898, show an increase of £25,647. Kerchiefs, fichus, and shawls show an increase of £3112 as compared with the value of importations in 1898, the total importation in 1899 being estimated at £10,773.

Of woollen piece goods imported in 1899, Austria-Hungary sent to the value of £63,129 ; Germany, £26,044 ; and Great Britain, to the value of £17,500, being an increase of £9204 as compared with 1898. British goods of this class consisted chiefly of tweeds, cheviots, etc.

During the first nine months of 1900 the importation of woollen piece goods amounted to £61,217, as against £79,110 for the corresponding period of 1899. Carpets and rugs were valued at £7215, a slight increase over 1899.

Cotton yarns were imported by Servia in 1899 to the value of £165,642, an increase, as compared with 1898, of £59,821. Of this, £130,945 represented the value of undyed yarns up to No. 30, and £8986 the value of undyed yarns above that number. There was an increase of £51,006 in the importation of undyed yarns as compared with the business done in 1898. Importations of dyed yarns showed an increase in 1899 of £8815 over the figures for 1898, the total value of these yarns being estimated at £25,711. The gross value of British yarns produced by Servia during 1899 was estimated at £112,129, as against £64,859 in 1898. British yarns consisted of undyed yarns to the value of £107,126, £101,046 being yarns up to No. 30. Yarns from Austria-Hungary were valued at £48,336, or an increase, as compared with 1898, of £12,417 ; of these, undyed yarns amounted to £29,632.

During the first nine months of 1900 the importation of cotton yarns amounted to £64,762, as against £113,526 during the corresponding period of 1899.

The importation of cotton piece goods of all kinds was valued at £192,237, a sum which is £69,491 in excess of the figures for the year 1898. The proportion in which this trade was distributed was : Austria-Hungary, £80,733 ; Great Britain, £51,042, as against £34,137 in 1898 ; Germany, £19,854 ; Switzerland, £23,389 ; Italy, £11,612.

During the first nine months of 1900 the importation of cotton piece goods of all kinds was valued at £107,645, a decrease, as compared with the corresponding months of 1899, of £26,460.

Grey shirtings, T-cloths, domestics, and other unbleached piece goods were imported in 1899 to the value of £16,673, which is nearly double the business done in these goods in 1898. British goods of this class were estimated at £12,246, an increase of £4593.

Materials such as white shirtings, batiste, "madapolams," and chiffon were valued at £22,952, or £9280 in excess of the importation during the previous year (1898). British goods under this head were valued at £15,829, or £7517 more than the amount imported during 1898.

Other cotton tissues were roughly grouped in the official returns for 1899 as follows :—

	Value.	
	1898.	1899.
	£	£
Coloured cottons (other than prints)	14,397	23,306
Thick and close woven materials, as fustians, etc.	21,248	40,577
Ticking, drill, etc.	4,209	3,352
Piqués and similar coloured materials	5,274	11,325
Tablecovers, sheets, etc.	2,216	2,302
Kerchiefs and pocket handkerchiefs.	5,5 9	11,722
Shawls	1,811	7,625
Prints	23,803	22,222
Finer coloured materials, as jaconnets. muslin, etc.	13,017	16,673
Velvets and plush	1,083	2,534
Gauze, lace, etc.	2,802	3,797

The British share of the foregoing was £22,967, or £9145 more than the value of the importation in 1898. The principal items of British trade were prints £5869, and coloured cottons £8953.

Small importations of yarns, other than cotton and wool, were recorded in 1899 to the value of £7343.

The importation of sackcloth during 1899 was estimated at £11,593, and sacks for dried plums at £6151.

Coarse, uncoloured tissues, other than cotton and wool, such as materials for mattress covers, curtains, and furniture covers, were imported in 1899 to the value of £5875, and coloured and checked materials, homespuns, sailcloth, and materials for military clothing, to the amount of £6545. The total importation of all woven materials, other than cotton, woollen, and silk goods, amounted to £39,196, an increase, as compared with the year 1898, of £6489. British goods under this head came to £1296, of which the bulk was sackcloth.

Egypt.—

TEXTILES.

Year.	Total Value Imported.	Of which from United Kingdom.
	£	£
1897	3,614,853	2,288,330
1898	3,371,505	2,063,800
1899	3,415,519	2,249,271
1900 (first 6 months)	1,771,562	—
1899 ,,	1,523,217	—

There was a falling-off in textiles in 1898, but an increase in 1899, though the value of the goods imported in the latter year still fell short of the total reached in 1897. At the end of 1897, however, unusually large stocks remained over.

The increase in 1899 was chiefly in cotton manufactures, there being a falling-off in woollen goods and sacks.

During the first half of 1900 there was a considerable increase in textiles as compared with the corresponding period of 1899. The increase was general, but was most apparent in cotton manufactures and in raw silk and silk thread.

In 1898 large stocks of cotton piece goods remained over from 1897, and during the early part of the year prices were low, while there was but a small demand. Trade improved as the year went on, but could not be regarded as satisfactory. The demand for these goods was reduced by the effect upon the fellaheen of the low prices ruling for Egyptian produce and the moderate size of the cotton crop.

In 1899 there was a marked improvement, and business in this class of goods during that year was very satisfactory. Stocks were small and prices advanced, good profits being obtained, and at the end of the year an unusually small stock was left over. The abundance of the cotton crop, which commanded higher prices than usual, enabled the natives to purchase freely.

NEW COMPANIES.

Designograph Company Limited.

REGISTERED February 9, with a capital of £10,000, in £1 shares, to acquire any patents, licences, concessions and the like relating to the production, drawing, copying, and repetition of designs for textile fabrics, carpets, wall papers, floorcloths, tiles and other decorated materials, to acquire in particular certain inventions by H. Mackintosh, of 23, Bank-street, Bradford, and to carry on the business of designers, dealers in designs, machine makers, opticians, electricians, mechanics, patent agents, etc. No initial public issue. The number of directors is not to be less than three nor more than seven; the first are W. E. B. Priestley, G. C. Waud, and H. Mackintosh; qualification, £250; remuneration, as fixed by the company. Registered by Blundell, Gordon and Co., 16, Serjeants' Inn, London, E.C.

John Oddie and Son Limited.

Registered February 9, with a capital of £5000, in £1 shares, to acquire the business of power-loom cloth manufacturers carried on by J. W. Oddie, at Britannia Mill and Syke Mill, both in Blackburn, under the style of John Oddie and Son, and to carry on the business of cotton spinners and doublers, flax, hemp, and jute spinners, linen manufacturers, flax, hemp, jute and wool merchants, wool combers, worsted and woollen spinners, yarn and cotton-waste merchants, bleachers, dyers, etc. No initial public issue. Registered without articles of association. Registered by Jordan and Sons Limited, 120, Chancery-lane, London, W.C.

R. Rowley and Co. Limited.

Registered February 4, with a capital of £100,000, in £10 shares, to acquire the business and undertaking heretofore carried on by R. Rowley, W. A. Burchnall, and T. S. Rowley, at Queen-street, Leicester, at Fleckney, Leicestershire, and in Derby and elsewhere as R. Rowley and Co., and to carry on the business of hosiery manufacturers, agents, dealers and factors, textile manufacturers, dyers, bleachers, etc. The number of directors is not to be less than three nor more than five; the first are R. Rowley, W. A. Burchnall, and T. S. Rowley. R. Rowley and T. S. Rowley may retain office for life, and W. A. Burchnall for five years; special qualification, £5000; ordinary qualification, £50; remuneration, as fixed by the company. Registered by C. Doubble, 14, Serjeants' Inn, London, E.C.

English Fustian Manufacturing Company Limited.

Registered February 13, with a capital of £300,000, in £1 shares, to carry on the business of manufacturers of and dealers in garments, clothing of every description, hosiery, hats, boots, shoes, slippers, and articles of personal use, manufacturers of and dealers in fabrics, materials and goods necessary or useful to be employed in the course of making such articles as aforesaid, spinners and dyers of and dealers in cotton, wool, silk, and other fibrous substances, weavers, manufacturers, dyers, finishers, buyers and sellers of and dealers in fustian, corduroy, woollen, worsted, and other fabrics, tanners, curriers, dressers, buyers and sellers of and dealers in leather, silk mercers, tailors, clothiers, glovers, boot and shoe dealers, outfitters, drysalters, chemical manufacturers, indigo merchants, extractors, dye makers, etc. No initial public issue; qualification, £1000; remuneration, as fixed by the company. Registered office, St. George's Chambers, Hebden Bridge, Yorkshire.

Baxter, Woodhouse and Taylor Limited.

Registered February 26, with a capital of £45,000, in £10 shares (1500 preference), to acquire the business of merchants and manufacturers of dyed and printed cotton goods now carried on by J. C. Taylor, 11, George-street, Manchester, and 4, Freeman's-court, Cheapside, London, and elsewhere, under the style or firm of Baxter, Woodhouse and Taylor, and to carry on the business of manufacturers of dyed and printed cotton goods and other materials, buyers and sellers of and dealers in cotton goods, dyers and finishers of cloth, etc. No initial public issue. The number of directors is not to be less than two nor more than five; the first are John C. Taylor, Frederick J. Taylor, and Albert T. Roberts; John C. Taylor is governing director, and may retain office so long as he holds £10,000 shares. Registered by Jordan and Sons Limited, Chancery-lane, London, W.C. Registered office, 11, George-street, Manchester.

Jackson and Steeple Limited.

Registered March 2, with a capital of £50,000, in £10 shares, to adopt an agreement between Mary Jackson, A. J. Jackson, and S. Buckley (executors of the will of the late Bannister Jackson), of the first part, W. Steeple of the second part, and the company of the third part, for the acquisition of the business of cotton spinners and manufacturers carried on as Jackson and Steeple, at Crockbottom, otherwise Riverside Weaving Mill, Stalybridge; Weir Mill, Luzley; Scout Mill, Stayley; and Westhulme Weaving Shed, Oldham; and the business of cloth agents and merchants carried on under the same name at 77, Fountain-street, Manchester, and to carry on and develop the said businesses. No initial public issue. The number of directors is not to be less than two nor more than five; the first are W. Steeple, S. Buckley, and A. Newton; qualification, £1000 shares or stock. Registered office, 77, Fountain-street, Manchester.

John Schofield and Co. Limited.

Registered February 19, with a capital of £2000, in £1 shares (1400 preference), to acquire the business of a cotton-waste spinner carried on by J. Schofield at Vale Mills, Bolton, and to carry on the business of cotton waste and cotton brokers, yarn and cloth agents and salesmen, dyers, finishers, bleachers, calico printers, merchants, doublers, cotton-waste dealers, etc. The number of directors is not to be less than two nor more than five; The first are J. Thornley (chairman), J. Schofield, and J. A. Schofield; qualification, 10 shares; remuneration, as fixed by the company. Registered by Jordan and Sons Limited, 120, Chancery-lane, London, W.C. Registered office, Vale Mill, Astley Bridge, within Bolton.

John Walton, of Glossop, Limited.

Registered March 1, with a capital of £50,000, in £5 shares, to acquire the business of bleachers, dyers and finishers, carried on at the Charleston Bleachworks, Whitfield, Derby, as John Walton, and to carry on the business of bleachers, dyers, printers, finishers, etc. No initial public issue. The number of directors is not to be less than three nor more than seven; the first are A. B. Smith, Mary Wyatt, and J. F. Wyatt; qualification, £100; remuneration, as fixed by the company. Registered by Jordon and Sons Limited, 120, Chancery-lane, London, W.C. Registered office, Charlestown Bleachworks, Glossop.

Jones Thread Company Limited.

Registered February 20, with a capital of £1000, in £1 shares, to carry on the business of spinners, doublers, weavers, bleachers, dyers, printers, bobbin and thread-makers, manipulators and buyers and sellers of cotton, flax, wool, jute, silk and other fibrous substances, etc. Registered without articles of association. Registered office, Brookbottom, Mossley.

Lang Bridge Limited.

Registered February 28, with a capital of £40,000, in £10 shares (1500 5 per cent. cumulative preference), to acquire the business recently carried on by J. Bridge (deceased) at Paradise-street Works, Accrington, Lancashire, under the style of Lang Bridge, to adopt an agreement with J. Harwood, J. W. Bridge, and R. C. Livesey (vendors), and to carry on the business of machinists, engineers, iron and brass founders, tin and copper plate workers, manufacturers of tin, copper, and brass goods used in cotton, woollen, and flax mills, printworks, dyeworks, and bleachworks, and machinery for use in cotton mills and weaving sheds, etc. Minimum subscription, 2000 shares. The number of directors is not to be less than three nor more than seven; the first are J. W. Bridge, J. Harwood, and W. E. Wood; qualification, £500; remuneration, as fixed by the company. Registered by Jordan and Sons Limited, 120, Chancery-lane, London, W.C. Registered office, Paradise-street Works, Cannon-street, Accrington.

Moncrieff Spindle Company Limited.

Registered February 22, with a capital of £200,000, in £1 shares, to deal with patents obtained in England and elsewhere by R. W. Moncrieff for improvements in spinning and doubling frames, and to carry on the business of promoters, contractors, merchants, bankers, underwriters, concessionaires, guarantors, property owners and dealers, etc. No initial public issue. The number of directors is not to be less than two nor more than seven; the subscribers are to appoint the first; qualification, £200; remuneration, as fixed by the company. Registered office, 19 and 20, Holborn Viaduct, London, E.C.

Samuel Eden and Son Limited.

Registered February 19, with a capital of £25,000, in £5 shares, to adopt an agreement with S. W. Eden, F. Baldock, and G. W. Swift, and to carry on the business of hosiery manufacturers and merchants, lace manufacturers, and manufacturers of and dealers in textile fabrics of every description. No initial public issue. The number of directors is not to be less than two nor more than five; the first are S. W. Eden, A. E. Howitt, F. Baldock, and G. W. Swift; qualification, £500; remuneration, £1200 per annum, divisible. Resistered by Taylor and Co., 12, Norfolk-street, London, W.C.

THE GAZETTE.

ENGLAND.

Partnerships Dissolved.

CHARLES HENRY COLLIER and WESLEY LIGHTFOOT BUNTING, shipping merchants, Major-stre t, lately St. Peter's-square, Manchester.

Henry Hill, Albert Hill, and Albert Edward Hill, hosiery manufacturers, Harcourt-road, Wigston Magna, Leicestershire; as regards A. E. Hill.

John William Denison and Jonathan Denison, woollen manufacturers and merchants, Crompton Mills, Yeadon, Yorkshire, by the death of Jonathan Denison.

The Bankruptcy Acts, 1883 and 1890.

Receiving Orders.

Thomas Moffat and John Dalgetty Duthie (as Moffat Brothers), woollen merchants, 21 and 22, Warwick-street, Regent-street, London.

Eugene Louis Halbot, stuff and woollen merchant, Selborne Villas, Bradford.

Adjudications.

Robert Crawford, stuff manufacturer, Swan Arcade, Bradford.

Herbert Illingworth and Frederick William Mellor (as Herbert Illingworth and Co.), wool noil and top merchants, Millergate, Bradford.

JOTTINGS.

THE Home Secretary, Mr. Ritchie, has appointed Mr. Frederick Cowell to be an inspector of factories and workshops, under the title of inspector's assistant.

THE Montreal Cotton Company, at its annual meeting held on the 12th ult., decided to increase its capital from £400,000 to £800,000, of which some £100,000 will be required almost immediately to meet the expenses incurred in the erection of the new mill in Valleyfield.

THE gross profits of the Bradford Dyers' Association for the year ended December 31 were £414,293, as compared with £405,396 in the previous fifteen months. The directors have resolved to pay a dividend on the ordinary shares of 9 per cent., to place £45,000 to the reserve fund—making that fund £100,000,—and to carry forward £21,351.

FOLLOWING the lead of Bradford, Huddersfield, Leeds, and parts of Scotland, the manufacturers of worsted coatings and dress goods in the Halifax district have formed themselves into an association for combining together with regard to certain trade questions, such as credit, length allowances, etc., with the object of securing uniformity of practice.

A CONSULAR report says that a new discovery has been made in France by Mr. De Gall, inspector of forests at Lemur, France. By means of dry distillation and high pressure, wood is reduced to a molten condition. After cooling off, the mass assumes the character of coal, yet without showing a trace of the organic structure of that mineral. It is hard, but can be shaped and polished at will. It is impervious to water and acids, and is a perfect electrical non-conductor. Great results are expected from this new discovery.

THE eighteenth ordinary general meeting of the shareholders of the Glasgow Cotton Spinning Company was held in Glasgow on the 25th ult. Mr. John Colville, who presided, moved the adoption of the report and statement of accounts. The report for the first half of the financial year showed a net profit of £5246. The report for the second half of the year showed a profit of only £550, making the total profit for the year £5796, compared with £9420 for the preceding year. This unsatisfactory result of the last half-year's working was due to the very exceptional scarcity of cotton in the autumn months. The directors recommend a dividend at the rate of 7 per cent. per annum for the past half-year. Mr. R. G. Paterson and Mr. James Caldwell were elected directors, and Mr. R. A. Murray, C.A., was re-elected auditor.

IN the articles of silk or silk mixed with other materials, the value of silk laces imported into Mexico decreased from £8447 in 1898 to £7380 in 1899. Silk goods in piece increased from £47,792 to £61,472, while other articles manufactured from silk increased from £53,172 to £73,043. Silk with a mixture of cotton, linen or wool also showed an increase of nearly £6000. The silk industry in Mexico continues to increase, though there is but one factory at present where silk is worked, the principal manufacture being "rebozos" and shawls. Its head office is in the City of Mexico, but it has agents in other parts of the country where the cultivation of the silkworm is undertaken, more especially in the State of Guanajuato, where large quantities of the white mulberry have been planted with a view of increasing the industry.

FOUR HUNDRED textile mills, of all kinds, were constructed in the United States in the year 1900. For the previous eight years the number of new mills has averaged annually 196, and the highest number was 272 in 1892. In other words, the number of new mills built during 1900 was more than double the yearly average for the previous eight years, and 46 per cent. more than the highest number in any one of those years. The following table shows the number of textile mills constructed in the United States during each of the last five years:—

——	1896.	1897.	1898.	1899.	1900.
Cotton.....	66	49	34	91	171
Woollen	31	53	25	49	48
Knitting..	85	71	46	57	109
Silk	17	43	19	32	43
Miscellaneous.	8	14	10	16	29
——	207	230	134	245	400

THE return of the United States Consul showing the value of the exports from the consular district of Bradford to the United States during the month of February has just been issued. The total value of the exports was £71,963 10s., as against £182,554 7s. in the corresponding month of last year, or a decrease of £110,590 17s.), and as against £108,743 0s. 3d. in January of this year (or a decrease of £36,779 10s. 3d.). Stuffs (dress goods and linings) were exported last month to the value of £28,526 16s. 8d., as compared with £45 616 8s. 6d. in February, 1900 (or a decrease of £17,089 11s. 10d.), and as compared with £49,579 9s. 1d. in January this year (or a decrease of £21,052 12s. 5d.). Until this year these exports were dealt with under one total as stuffs, and it is impossible to compare dress goods separately and lining separately with last year's figures. But taking the statistics for this year, the value of dress goods exported last month was £16,013 6s., as against £31,576 18s. 4d. in January, and the value of linings exported last month was £12,513 10s. 8d., as against £18,003 10s. 9d. in the preceding month. The exports of cotton cloths in February were £11,120, as against £16,949 in January and £50,774 in February last year. Wool has fallen from £15,243 in January this year to £6857 last month, the figures for the corresponding month of last year being £25,521. Silk yarns last month were £4494, as against £15,631 in February, 1901. Machinery represented £3261, against £14,692 last year; worsted coatings £4374, against £9511; and silk and cotton piece goods £2809, against £2959.

THE TEXTILE COLOURIST:

DEVOTED TO

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

New Dyeing Materials.

NOTES ON THE PATTERNS ILLUSTRATED.

PATTERN No. 1 is a cotton cloth printed with Coriphosphine O (Bayer). The following is the preparation :—30grms. colour, 100grms. acetic acid 9° Tw. (30 per cent.), 90grms. water, 600grms. wheat starch thickening, and 180grms. acetic-acid tannic-acid solution 1 : 1 Print on unoiled cloth, steam for one hour without pressure, run through tartar emetic, and then soap for twenty minutes at about 90° F.

Coriphosphine O is a basic dyestuff which produces a phosphine shade, and may be employed for the printing and dyeing of cotton, as well as silk, half-silk, wool-silk, and wool. The colour dissolves in water with an addition of acetic acid Starch thickening or gum water is used for a thickening agent, and tannic acid as a fixing agent, in cotton printing and dyeing. In combination with tin crystals or zinc powder Coriphosphine O is suited for colour discharging dischargeable benzidine colours. Printed direct on unoiled or oiled cotton cloth, the shades produced are said to be fast to alkali, acid, and washing. It may likewise be employed for the dyeing of tannined cotton cloth discharged with caustic soda. In combination with other basic colours, such as Methylene Blue B B, Rhoduline Red G, etc., it yields useful fashionable shades.

Pattern No. 2 is a worsted cloth printed with Azo Acid Blue 6 B (Bayer). The following is the preparation :—3grms. colour, 30grms. British gum, and 57grms. water ; boil, and then add 10grms. acetic acid 9° Tw. (30 per cent.). Print on chlored wool, steam for one hour without pressure, then wash and dry.

Pattern No. 3 is a cotton cloth dyed with 2 per cent. Benzo Brown D 3 G extra (Bayer). This dyestuff, when dyed in the usual manner on cotton, yields a yellowish brown of a particularly clear shade, and is possessed of good solubility and level dyeing properties. On the whole it can be used for all branches of cotton dyeing.

Patterns Nos. 4 and 5 are cotton sateens dyed with 2·5 per cent. of Rhoduline Heliotrope 3 B and B respectively (Bayer). Both are basic violets of bright shade, surpassing the older Rhoduline Violet in regard to fastness to light. They are useful for the production of fine heliotrope shades on cotton prepared with tannic acid and tartar emetic (on bleached material). As already indicated by the denomination of the two qualities, the 3 B is distinguished from the B by its more bluish tone. They are both said to be very fast to light, and also to resist washing and acid well. Both colours give nice and bright shades on silk.

Pattern No. 6 is a cotton sateen dyed with 0·2 per cent. Benzo Rhoduline Red B (Bayer). This colour corresponds in shade with Brilliant Geranine B, but the former can be better exhausted, and its shade also resists washing with white better. Even in dyeing pink shades with this red its fastness to washing with white will doubtlessly be found to meet most requirements. As regards fastness to light, Benzo Rhoduline Red B almost approaches Brilliant Geranine B, and is, moreover, claimed to be possessed of good fastness to alkaline and acid. Owing to its great affinity to the fibre, Benzo Rhoduline Red B is said to be adapted for producing dark shades of great brightness and beauty. Being also of good service for the dyeing of any other cotton fibres, it should be of interest for fancy woven cottons and mercerised yarn.

Pattern No. 7 is a worsted cloth printed with 3 per cent. Fast Red P R extra (Bayer). It is produced in the same manner and by using the particulars given with Pattern 2.

Pattern No. 8 is a sateen cotton cloth printed with 25 per cent. Alizarin Viridine F F paste (Bayer). The following is the preparation :—250grms. colour, 600grms. wheat starch thickening, 60grms. acetate of chrome 32° Tw., and 90grms. water. Print on oiled cloth, steam for one hour without pressure, chalk, and soap for twenty minutes at about 90° F. Alizarin Viridine F F paste, on account of its chrome lake, which is very fast to light, is adapted for cotton printing as well as for dyeing cotton material previously padded with chrome. It is dischargeable with oxidising agents. Owing to the beautiful and fast shades of green obtainable, it has been favoured with a prize medal by the Soc. Ind. de Rouen, and generally has already been established to a considerable extent for printing cretonnes and curtains, especially in combination with Alizarin Yellow 3 G for yellower shades of green.

Pattern No. 9 is a cotton yarn dyed direct with Diamineral Brown G (Cassella). It was dyed with 2½ per cent. dyestuff at the boil, with the addition of 20 per cent. Glauber's salt. After dyeing the patterns are rinsed well in lukewarm water, or in cold water acidulated with a little acetic acid.

Pattern No. 10 has been dyed with the same dyestuff (Diamineral Brown G) and the same quantity of both dye and Glauber's salt, but has been after-treated with 1½ per cent. bichromate of potash, 1½ per cent. sulphate of copper, and 3 per cent. acetic acid. The fastness to washing and light is considerably enhanced by this after-treatment with metallic salts. Diamineral Brown G is said to be fast to washing, light, acids, and hot ironing, to a degree which makes it of great service to the dyer. When dyed direct, it may be easily discharged white with tin crystals or zinc dust. By shading with Diamineral Blue R, pat., deeper shades may be produced at will. Diamineral Black B, pat., may also serve for shading if very deep shades are to be produced. Cotton and silk mixed goods are best dyed in a boiling bath with the addition of either Glauber's salt and soap, or Glauber's salt, soap, and phosphate of soda, both fibres in a like manner showing uniformity of shade.

Patterns Nos. 11 and 12 are worsted yarns dyed respectively with 1 and 2 per cent. Peri Wool Blue B (Cassella). The bath is charged with from 20 to 30 per cent. of Glauber's salt and 10 per cent. bisulphate of soda, along with the dyestuff.

Pattern No. 13 is worsted yarn dyed with 2½ per cent. Peri Wool Blue B with the addition of the same quantities of Glauber's salt and bisulphate of soda as the previous example. It is then shaded with ½ per cent. Cyanole Green B.

Pattern No. 14 is a wool cloth dyed with 4 per cent. Peri Wool Blue B and 0·7 per cent. Cyanole Green B, with the addition of from 20 to 30 per cent. of Glauber's salt and 10 per cent. bisulphate of soda. Enter the previously-cleaned pieces at from 140 to 160° F., raise within twenty minutes to the boil, add, after about one hour's boiling, 5 per cent. bisulphate of soda, and then allow to run at boiling temperature for another half-hour. For strongly-milled goods which are difficult to dye through, it is recommendable to add a somewhat larger quantity of Glauber's salt, and to start dyeing with only 5 per cent. bisulphate of soda. After three-quarters of an hour's boiling, 10 per cent. more bisulphate of soda is added in several portions. Wooden or copper vessels should be used. Peri Wool Blue B is said to be superior to many of the acid-blue dyestuffs in respect to fastness to light. Regarding fastness to potting and sponging, carbonising, hot ironing, perspiration and alkalies, it is said to meet the normal demands of the piece-dyeing industry ; its dyeings are of a very good fastness to rubbing and water, and resist a fairly strong stoving without undergoing any considerable change in shade.

Patterns Nos. 15 and 16 are cotton cloths dyed with 2 per cent. Naphthamine Brown R 2 B (Kalle) and 2 per cent. Naphthamine Brown 6 B (Kalle) respectively. The bath is prepared with the dyestuff and from 10 to 20 per cent. common or Glauber's salt ; the cotton is entered at about 40° C., when the temperature is raised to the boil. The former dyestuff gives a yellowish and the latter a more bluish-brown shade. Both brands, when dyed as just described, are said to yield shades of satisfactory fastness to water, soda, acid, and light. They can be rendered fast to soaping by subsequently diazotising and developing. They are also suitable for printing purposes, as they can be discharged white. For half-wool they yield fuller shades on the cotton than on the wool, so that they can be used with advantage for dyeing half-woollen fabrics. The wool is then dyed a somewhat yellower shade than the cotton. For half-silk both colouring matters dye the silk in a neutral bath a slightly yellower shade than the cotton.

Sampling Heavy Bleaching Chemicals.

(*Concluded from page* 65.)

CAUSTIC LIQUOR OR ALKALINE—This is made by dissolving the solid caustic soda and making up to the strength required. The liquor has, when strong and well settled, a slightly turbid appearance ; that at 70° Tw., however, is not so good a colour as that at either 90° or 102° Tw. It is sent out in either carboys or iron drums. These drums should be used with care, as some of the iron is dissolved from them, especially by the 70° Tw. The composition of 90° Tw. is such that at this strength it readily solidifies and causes trouble. Any liquor that does not solidify at first is stronger than the original, while that left behind after thawing is weaker. Thus care must be taken, when this occurs, in order to get uniform results. The samples should be taken by means of a dipper from the drums or bottles, and well mixed together. A sample of known volume is taken and diluted with water, and from this the various samples are withdrawn for the tests. In Twaddelling this liquor, care must be taken that the instrument does not plunge too deeply into the liquid, for if it is allowed to sink too far it will alter the reading to a considerable extent. It should be placed in the liquid gently and allowed to sink slowly. The temperature is read, and if the heat exceeds 70° F. it ought to be cooled to 60° Tw.

Sodium Hydrate and Carbonate are estimated as described under "Caustic Soda," as are the other bodies likely to occur. Sodium sulphide is liable to occur, and, acting upon the iron of the dissolving vessels, forms green coloration generally. The specific gravity only is ascertained, as the composition is constant at that point. Below are given typical analyses of some caustic liquors :—

	70°	72° Tw.	90°	104°
NaOH	29·2	31·4	39·2	44·42
Na_2CO_3	0·36	Nil	0·88	1·11
Na_2SO_4	1·1	0·10	0·17	0·71
NaCl	1·6	0·11	1·03	1·41
Fe_2O_3	0·024	0·007	0·013	0·028
Al_2O_3	0·092	0·010	0·085	0·11
Na_2S	Nil	Nil	Nil	Nil
Na_2SiO_3	0·36	0·22	0·52	0·34

CAUSTIC ASH.—This ash is in use largely for the scouring of linen goods. There are two classes of this product—viz., that made by grinding caustic soda in a mill with refined soda ash, and that made by the direct evaporation of black ash liquor in a furnace.

The first-named product, when packed in casks, can be sampled by boring and withdrawing a portion with an auger. That prepared by the second method is in a more or less granular form, some of the lumps being the size of eggs. The only satisfactory mode of sampling this is to throw it out of the cask on to the floor, and then take a large sample with a spade, reducing to a fraction of the original bulk by quartering, all the lumps being broken by means of a hammer. When the first class is in use the sample can be mixed on a large sheet of paper in the laboratory, and the sample for the tests taken from this ; but when the latter class is used, all the lumps must be broken small, as these contain a larger percentage of caustic soda than the fine. A fair proportion of these must be taken and ground up fine in a mortar, 20 to 25 grms. being weighed out into a beaker and dissolved in boiling water, filtered into a 500cc. flask, the residue being dried and then ignited in a crucible. The percentage is readily calculated. The various constituents are estimated in the manner described under "Refined Ash." The following analysis gives the composition of an ash made by the salting-down process :—

	Per Cent.
Na_2CO_3	59·85
NaOH	15·00
NaCl	11·05
Na_2SO_4	10·73
Al_2O_3	0·75
Fe_2O_3	0·09
Ni_2SiO_3	1·54
Insoluble	0·68

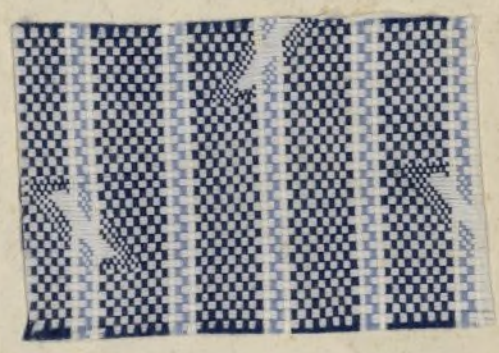
Frequently this class of ash has a faint blue coloration when seen in bulk. This is due to the method by which it is made. When a delivery of either class is received, it is only necessary to estimate the total soda and the caustic soda, the insoluble parts being estimated only approximately by comparison on dissolving. The total and caustic soda may be estimated in one and the same solution, by using phenolphthalein as the indicator for the first portion of the titration ; great care must be taken, otherwise the result for caustic soda will be much too high, owing to overrunning in the first part. The presence of the silicate of soda interferes with the end reaction, so that when it is nearly finished, the liquid should be well shaken, and not carried to complete decolorisation. A little practice will soon enable anyone to determine the exact point at which to stop.

SODA CRYSTALS.—These are not in such great use for bleaching as are the preceding, owing to the fac that the percentage of actual valuable material is

PATTERN SHEET No. 94.

Samples of Cotton Cloths.

PATTERN No. 177.



PATTERN No. 178.

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. 95.

Illustrating New Dyeing Materials.

No. 1.

No. 2.

No. 3.

No. 4.

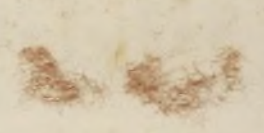
No. 5.

No. 6.

No. 7.

No. 8.

No. 9.

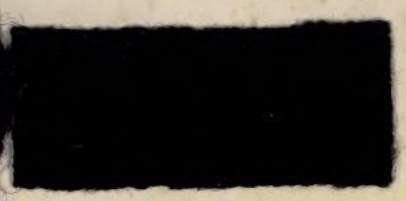


No. 10.

No.

No. 12.

No. 13.



No. 14.

No. 15.

No. 16.

Nos. 1 to 8 have been supplied by the Farbenfabriken vorm. Fr. Bayer and Co., Nos. 9 to 14 by Messrs. Leopold Cassella and Co., and Nos. 15 and 16 by Messrs. Kalle and Co.

CANVAS HOSE. SPHINCTER HOSE.
RUBBER-LINED HOSE. COTTON BELTING.

INDIARUBBER GOODS
For MECHANICAL PURPOSES.

much smaller than the others. The manufacture of these crystals is carried on at most alkali works, and consists in dissolving soda ash in hot water, precipitating out the iron, settling the liquor, then running it off into crystallising cones or tanks and allowing it to stand from eleven to fourteen days. The mother liquors are then drained off, the crystals broken out, and allowed to drain.

The sample is preferably taken from each of the casks by means of the hand, the whole being well mixed. They are broken down small, not ground up fine, otherwise water will be lost. From 20 to 25 grms. are weighed out, dissolved in water and made up to 500cc., aliquot portions of which are taken and the various constituents estimated, as described under "Soda Ash."

Moisture. — 10grms. of the roughly-crushed sample are weighed out into a tared basin, and dried carefully in a water oven Loss by spurting is liable to occur if the heat is too great at the commencement, as the crystals melt in their own water. The last traces are often difficult to get rid of. This may be accomplished by heating over the naked bunsen flame till constant.

The crystals should be of a good clear colour, not showing any yellow tint, and not too wet.

Souring Materials.—*Sulphuric Acid*, or oil of vitriol, is placed on the market in two strengths, one known commercially as O.V., which has a specific gravity ranging from 1·725 to 1·76, and containing about 80 per cent. real sulphuric acid; the other strength is known as D.O.V., which has a specific gravity ranging from 1·835 to 1·845. The term B.O.V., or brown oil of vitriol, is used generally to designate vitriol containing arsenic. Vitriol has the property of possessing a constant strength (within small limits) at a constant specific gravity; hence, when this is ascertained, the percentage of sulphuric acid can readily be obtained from tables which have been constructed. In ascertaining the specific gravity by means of the hydrometer, the sample must be taken from the bulk; if in bottles, a small portion should be taken from a number, if not from all, and well mixed together. These are then placed in a jar, the instrument being allowed to sink slowly into the liquid, care being taken that it does not go beyond the mark, as, being a heavy liquid, the portion which adheres to the instrument alters the reading to a considerable extent. The temperature must also be taken, and for every 10° F. above or below 60° F., 1° must be added to or subtracted from the reading on the hydrometer. If, however, the amount of acid is estimated, it is done best by weighing out the acid from a special pipette having two taps, with a bulb in the centre. The acid is drawn into the bulb and weighed, then some of it is run out, the amount to be obtained by difference. It is then diluted with water, and made up to the mark on a graduated flask. A portion is withdrawn and titrated with standard alkali which has been previously standarised, preferably by means of sulphuric acid, methyl orange being used as an indicator. From the volume of alkali taken the amount of sulphuric acid present may be calculated. Hydrochloric acid is not likely to occur as an impurity, owing to it being readily decomposed, or liberated from any chloride that the acid comes in contact with.

Iron.—This generally occurs in minute quantities only, and it may be estimated by the method given under "Iron," in "Soda Ash," the vitriol being boiled with a small quantity of pure nitric acid, then washed into a Nessler jar, and estimated by the method there given.

Arsenic.—A qualitative estimation of this may be done by diluting the acid, cooling well, and passing through it a stream of good sulphuretted hydrogen gas, when any arsenic will be precipitated as sulphide; or, when in small quantities, by means of Marsh's test. Its estimation may be done by precipitating the arsenic as sulphide by H_2S. This is then oxidised with nitric acid. The solution is then rendered alkaline with NH_4OH, and filtered. Then add to clear solution magnesia mixture, allow to stand, filter on tared filter, dry, weigh, and the precipitate is calculated as As.

Nitre, or Oxides of Nitrogen —These are absorbed by the acid in the process of its manufacture, and are not always driven off in the process of purification and concentration. The presence of these may be ascertained by taking some of the concentrated acid and adding to it diphenylamine, when, if nitre is present, on stirring with a dry glass rod a blue colour of varying intensity is produced. Generally the amount of nitre present is too small to be estimated except by the use of a special nitrometer. Frequently, when shaken in the bottle, a peculiar odour resembling that of the oxides of nitrogen is evolved; this, however, is not due to these, but to some other body present. The comparative freedom from iron allows the use of vitriol where salts are excluded, on this account.

Hydrochloric, Muriatic Acid, or salts, as it is termed, is in great use as a souring agent, especially as a grey sour, as its calcium salt is readily soluble in water. However, the presence of iron prevents its application in every case. Like sulphuric acid, the specific gravity is a guide to the percentage of real hydrochloric present, but it is not of the same value, as the specific gravity may be raised artificially by the addition of other bodies, especially sulphuric acid. With acid containing only a small quantity of sulphuric acid, subtracting one from the degree Twaddell gives the percentage of hydrochloric acid.

The total acid may be estimated by titration with standard sodium carbonate, standardised as described under "Sulphuric Acid." As part of the acid is generally sulphuric, this is estimated by taking 25cc. of the acid, neutralising with ammonia, then rendering slightly acid with pure HCl, bringing up to the boil, and then adding a 10 per cent. solution of barium chloride. Then boil for a short time, allow to stand, filter through an ashless filter paper, dry, and incinerate in the usual manner. The weight of barium sulphate × 42·132, divided by the weight taken, will give percentage of sulphuric acid, which, deducted from the total acidity, will give hydrochloric acid.

Sulphuric Acid may be estimated approximately by adding, in a test tube, 2cc. of the acid, filling nearly to the top with water, and adding a 10 per. cent. solution of barium chloride. On shaking, the white precipitate may be compared with another sample of acid.

Sulphurous Acid occurs occasionally, and may be detected by adding to 50cc. of the acid granulated tin, placing over the mouth of the beaker a filter paper on which a drop of lead nitrate solution has been placed, when there is a dark coloration, due to the liberation of H_2S derived from the reduction of the H_2SO_3 acting upon the lead solution to form lead sulphide.

Arsenic.—When the above test is being made, if any arsenic is present, a brown coloration is produced in the flask or beaker, even when present in small quantities. Marsh's or Reinsch's test may be applied for the detection of minute traces. The quantitative estimation is done in the same manner as described under "Sulphuric Acid."

Iron.—For some purposes the presence of this body is very injurious. Some idea of the amount present can be got from the colour of the salts themselves. Occasionally they are of a green tinge, which is due to the coke in use in the condensers. The iron exists in both the ferrous and ferric state, and as the quantity is only minute, 0·0014 to 0·0036 per cent. precipitation is not practicable. The acid is oxidised by means of pure nitric acid, cooled, and made up to a volume 25cc. of pure HCl are placed in a Nessler tube, the other solution being placed in a similar one alongside, and the analysis conducted with the solution in exactly the same manner as described under "Soda Ash." Another method is to place a sample of known value in a Lovibond's tintometer, and after standardising by means of the standard tints, the numbers of the glasses required to obtain that particular intensity are recorded. Samples of a value unknown are placed in the instrument, and matched by means of these glasses, which will give the percentage required. This method is not a convenient one, owing to the difference in colour in different samples. That containing the higher percentage—viz., 0·0036—has frequently a very high colour. The fact that coke is used as a packing in the tower for condensing the acid gives the acid a variation in colour.

Bleaching Materials.—The principal material in use is bleaching powder. This is prepared by the passing of chlorine gas into a large chamber, the floor of which is covered with fine slaked lime to the depth of from 2 to 3in. The chlorine is gradually absorbed, and when the powder is sufficiently finished, it is packed in casks, being sold as containing 35 per cent. available chlorine. The sampling of bleach, which reaches the works in casks, is a matter of importance, as a variation of from 2 to 3 per cent. may readily occur, even though the bulk may be of the full strength. The casks should have a hole of not less than 1in. diameter bored into them, and if they have been sampled previously, a fresh hole should be made. The sample should not be taken out of an old borehole, as the bleach is generally weaker at these points. The auger should be inserted, then turned round, and the portion against the handle removed, as it is liable to contain chips and paper derived from the casks. On removal, the powder should be placed in a paper, being kept covered up so as to avoid loss, placed in a bottle well corked, and kept in a cool dark place till required. The sample should be tested as soon as possible after taking, so as to avoid loss of chlorine. The sample is ground down on a sheet of paper and sieved, the whole of it being made to pass through. From this, the portion is taken for analysis. Various formulæ have been proposed to show the composition of bleaching powder, but the one generally accepted is the following: $Ca<^{Cl}_{OCl}$, which was proposed by Odling. The methods that have been proposed to estimate the available chlorine are varied, and amongst them is the oxidation of ferrous to ferric sulphate. This is now almost obsolete, as it yields results from 2 to 3 per cent. too high. One or two sellers, however, still adhere to it in spite of this, for obvious reasons. Another method is to add to the solution of bleaching powder a 10 per cent solution of iodide of potash, then acidify with hydrochloric acid, when the chlorine is liberated from the bleach, which liberates an equivalent of iodine from the iodide. The amount of iodine liberated is estimated with $\frac{N}{10}$ thiosulphate-of-soda solution, 127 of iodine being equal to 35·5 of chlorine, with starch used as an indicator. The results obtained by this method are not accurate, owing to the difficulty in determining the exact point at which the reaction ends.

The method now used in most works, both by buyers and sellers, is that of Perrot. A standard solution of arsenious acid being required, this is prepared by dissolving 4·95grms. of pure arsenious acid in water rendered alkaline by means of bicarbonate of soda, the solution being made up to 1 litre. Then 3·55grms. of the powder are weighed out, ground in a mortar with a little warm water, washed into a 500cc. flask, and made up to the mark with lukewarm water. The contents are well shaken, and 50cc. (0·355grm.) placed in a porcelain basin, the pipette being washed out into the basin. The above solution is run in, a drop being removed by means of a rod, and a drop of starch and iodide-of-potash solution touched with it. The solution should be added slowly as the colour grows faint, the reading being taken when, on the addition of another drop, no coloration is given on touching the iodide solution. The number of cubic centimetres taken gives the percentage of available chlorine.

Total Chlorine.—10cc. of the solution is placed in a test jar, 10cc. of bisulphite of soda added, and to this is added a solution of permanganate, drop by drop, until a faint permanent coloration is obtained. Using chromate of potash as indicator, the solution is titrated with $\frac{N}{10}$ nitrate of silver. Note the volume taken. Then 10cc. of the bisulphite is taken and treated with permanganate as before, then titrated, when the cubic centimetres taken are deducted from the previous reading, and the remainder, multiplied by 0·00355, gives the total chlorine. From this the available is deducted, giving the chloride as chlorate and chloride. In a good, well-made bleach this should not exceed from 0·5 to 0·7 per cent. The available chlorine may be estimated by means of the volume of oxygen liberated from peroxide of hydrogen. This does away with the use of a standard solution, but requires a Lunge or some other form of nitrometer, with the addition of the special bottle to hold the two solutions so that the gas is evolved on mixing them. The 10grms. of the bleach are placed in a 250cc. flask, and 5cc. (=0·2grm.) taken and placed in the flask, peroxide being placed in the tube, the bottle inverted, and the two solutions mixed. The volume of oxygen liberated after cooling is read off, being reduced to normal. Taking the temperature, pressure, and tension of aqueous vapour into account, if very accurate work is required, 1cc. of gas evolved equals 0·00317grm. of chlorine. This calculation may be simplified by the use of a nitrometer having a third tube with a standard atmosphere. If a volume of bleach solution be used equal to 0·317grm. of the original bleach, the volume of gas liberated when read in cubic centimetres gives the percentage of available chlorine.

Bleaching Liquor.—This is produced by the action of chlorine upon milk of lime, the finished product containing 7 per cent. available chlorine. The liquor, which is of a greenish-yellow colour, should have little lime in suspension. The sample should be taken by means of a dipper from several bottles in the delivery, and the specific gravity ascertained. Frequently a liquor of 24° Tw. contains a higher percentage of chlorine than one of 28° Tw. The sample taken from the bottles should be mixed, and 10cc. taken, placed in a 500cc. flask, and filled to the mark with water; 50cc. of this (equal to 1cc. bleach liquor) is placed in a basin and titrated with the arsenious acid, the end being ascertained in the usual manner. From this the percentage of chlorine is readily calculated.

Total Chlorine is estimated in the manner described under "Bleaching Powder." The sample of liquor should be tested as soon as possible after sampling, as decomposition readily occurs if exposed to light and air.

Hypochlorite of Soda, patent clearing liquor or parazone, is a compound of chlorine with caustic soda, the liquor being kept cool to avoid the formation of chlorate. In order that the product should not undergo decomposition, from 2 to 3 per cent. of free soda should be left in the finished product. Available chlorine is estimated in the usual manner. Various methods have been proposed for the free soda, but the one improved by English

is the most convenient. To 10cc. of the liquor, peroxide of hydrogen is added in excess, the whole of the available chlorine being oxidised. This is well stirred and titrated with normal sulphuric acid, using methyl orange as the indicator. 1cc. acid equals 0·031 Na_2O.

Bleaching Vegetable Fibres.

By E. Tassel.

(*Continued from page* 66.)

YARN - BLEACHING APPLIANCES. — *Bowking Kiers.*—For the moment we shall leave high-pressure kiers out of the question, these being identical with those used for fabrics. Open kiers are made of wood, wrought iron, or cast iron, the latter, though much more costly, having the advantage of perfectly smooth sides, so that the yarn cannot catch anywhere. The usual dimensions are about 6ft. in diameter at the top and 4in. smaller across the bottom, the height from the rim to the false bottom being about 38in. The yarn is not placed direct in the kiers, but is put into an openwork iron basket, which enables the yarns to be lifted quickly without wasting the bath liquor. Each kier is fitted with a cover containing a pipe to carry off the steam liberated during the boiling. A central injector, with a 1¼in. steam nozzle, maintains the liquor in circulation.

The following is the most suitable arrangement of bowking kiers the author has seen. Six kiers are erected in two parallel rows of three each, about 3ft. apart, each kier being about 1ft. away from the next in the same row. Two lines of cast-iron pillars arranged at intervals along the kiers support a travelling crane, which serves to lift not only the covers but also the baskets containing the yarn, and delivers the latter on to trucks for rapid conveyance to the reels or washing plant. The alkali intended to form the lye is dissolved beforehand, to form a solution of constant strength, in a thick sheet-iron tank mounted at a higher level than the kiers, so as to enable the mother-liquor to be run directly into the latter.

Washing and Washing Machinery.—The question of washing is one of great importance in connection with bleaching, and no trouble should be spared to thoroughly free the yarn from the various bleaching agents. After lye-boiling the simplest method of washing is to wash in the kier. This method is perfect, especially when the hanks are not woven; but it has the disadvantage of keeping the kiers occupied for a longer period than absolutely necessary. Consequently it is often preferred to lift the hanks from the kier in their basket, place them in a truck, which is then covered with a coarse cloth and rolled under a large watering pump. This plan, however, consumes a large volume of water, and, besides, is imperfect, the interior of the mass of yarn never being thoroughly penetrated.

Washing on Frames.—In the process of complete submergence by the aid of frames, the yarns are washed by the stream of water traversing the vat. As the hanks are stationary, the frames must be raised and lowered several times in order to ensure thorough washing. Unfortunately the current of water drives the yarns towards one side of the vat, and it is difficult to prevent them from getting tangled. When the yarn is chemicked in "steeps" it is also washed therein direct; but the operation is followed by a machine washing, this latter being indispensable, because the yarn has to be dried by heat, and any trace of acid or chlorine would spoil it completely. Although the number of washing machines is large, they are all based on the same principle—viz., the stirring of the yarns in a large volume of circulating water, without, as far as possible, getting them into a tangle.

Circular Washer.—This consists of a large circular vat of sheet iron, traversed by a current of water and fitted with a central shaft which may be moved in either direction, and carries twelve radial arms of copper which receive a three-fold movement by means of the shaft and by suitable toothed gearing—viz., a double movement of rotation on their own axis and a turning movement about the central shaft. This machine gives very good results. It is easily loaded and unloaded with yarn, but, on the other hand, is very wasteful of water, being unsuitable for systematic washing.

The Caron Washer.—The active portion of this machine consists of a rotary square shaft and a number of wooden rollers, each of which, on coming in contact with an angle of the square shaft, jerks against the hanks of yarn suspended thereon, dipping them into running water. When the hanks have been turned in one direction they are reversed for an equal number of turns, and are therefore prevented from becoming tangled. The shaft can be raised for the purpose of putting the hanks on and off. Although systematic washing cannot be performed with this machine, it has the advantage of consuming a comparatively small amount of water owing to its triangular section, and a machine with ten heads can wash 3cwt. of cotton yarn per hour.

The Jallas Washer differs but little from the one already described, and is also economical in water consumption. The bobbins supporting the hanks are perforated, and the washing water is introduced into the interior of the bobbins, whence it issues through the perforations and penetrates the hanks.

Beam Washer.—This machine is composed of a rectangular cast or wrought-iron case about 8ft. long, 40in. wide, and 30in. deep, in which the hanks are immersed after having been suspended on bobbins, which in turn are supported by a frame that is moved in a direction parallel to the longitudinal axis of the case. Being thus moved in a rotary and a reciprocal sense, the hanks are worked about in the water without any danger of becoming entangled; consequently the washing effect is perfect, though the consumption of water is large.

The Sulzer Washer.—This machine is superior in many respects—as regards perfect working, capacity of dealing with a large quantity in a limited space, and economy—to those now in use. It carries a series of rubber-covered whisks, on which the hanks are suspended, and which can be moved vertically in the direction of their length. The water is distributed by two injector tubes. At the lowest point traversed by the hank the latter is compressed by two rollers, a compression roller, actuated by toothed wheels, being placed in contact with the lower whisk so that the dirty water is expressed and cannot fall back on the hank, which is therefore brought into contact with clean water only. When washed, the hanks are wrung automatically, and consequently contain very little water when they come to be lifted. One man is able with this machine to wash 36cwt. of cotton in ten hours. A number of other washing machines are known, but as they all belong to one or other of the foregoing types they need not be further described.

Presses.—When the hanks leave the machine they always retain a certain quantity of water, which then dilutes the subsequent baths and reduces their efficiency; consequently it is the almost invariable practice to wring the hanks after washing. For this purpose use is made of a wringing machine consisting of two cast-iron rollers covered with cotton cord, and measuring 3ft. in length by about 27in. in diameter. When not in use the rollers are held about 2in. apart, but when at work the lower roller actuates the upper one by means of deeply-cut spur gearing. The hanks are fed to the rollers by an endless belt. This wringer gets rid of the water very well, but has the inconvenience of distorting the hanks and scraping the yarn, and for this reason preference is accorded to the hydraulic press. The press used in yarn bleaching is constructed so that when at rest the plate is on a level with the floor. The hanks are laid side by side, the rows crossing, on a shallow truck, the wheels and axles of which are so far apart that the truck rests flat on the platform when the press is in use. The work is rather tedious, but the water is thoroughly expressed without the slightest injury to the yarn.

Beating—Between the divers operations making up the bleaching process, the yarn is beaten either by hand or machine, the object being not only to equalise and straighten out the hanks, but also to remove the scraps of outer skin that bleaching has not succeeded in eliminating. When the work is done by hand, the hanks, laid out on a strong horizontal support of wood or metal, are beaten with a rod about 2ft. in length. The workman passing the rod into the hanks then takes hold of it at each end and works it up and down so as to beat the yarn, and at the same time turn the hank by degrees in order to beat all parts in succession. No satisfactory results have been attained from the use of machines for this purpose. A pneumatic machine has been proposed, but is hardly suitable for any except very coarse yarns. The hank is held between a fixed whisk and a striker, which moves between guides and is connected, through a compressed-air piston, with an eccentric keyed on the shaft of the machine. The strength of the blow can be regulated by two taps on the cylinder ends, by means of which the pressure of the air is adjusted.

Driers.—There are three methods of drying—(1) in the air; (2) in stoves; (3) in machines.

When the weather permits—*e.g.*, in summer-time—the best results are obtained by drying in chambers fitted with louvres. In this the white does not deteriorate, the bluing turns neither green nor yellow, and the material retains its strength. Unfortunately, however, since the rate of drying depends mainly on the temperature, the irregularities are so great that the method has had to be abandoned almost everywhere.

In stove drying the hanks are suspended on pegs or rods, so as to form two or three rows, in large rooms—usually low—which are heated by a series of gilled pipes placed on the floor. Whenever possible these rooms are on the first floor, the heat being then furnished by steam supplied from the boilers, and afterwards returned thereto along with the water of condensation, the sole loss of heat in such event being that due to radiation. In order to facilitate drying, the moist air of the room must be removed in proportion as it becomes saturated; but although many devices have been tried for this purpose, such as fans, exhausts, etc., none of them give such good results as an ordinary chimney draught. The problem as to what point the moist air should be drawn off at has been voluminously discussed, some pretending that the top of the room is the best place, since the air, heated at the floor, ascends and becomes charged with moisture; whereas others claim that the most air sinks by reason of its higher density, and that consequently the exhaustion ought to be begun at the floor level. Numerous experiments conducted by the author with the assistance of a hygrometer—and which have been confirmed by practice—tend to show that the level at which the air should be drawn off varies considerably according to the method of heating adopted, and to the disposition of the room, about half-way between floor and ceiling being usually found best. To furnish good results the temperature of a drying stove should never exceed 40° C., the colour, whether white or delicate shades, being then invariably preserved, whereas a higher temperature also affects the bluing. The main disadvantage of stove drying is that a very large floor space is taken up, and for this reason the more economical system of machine drying is most frequently preferred.

The Sulzer Drier.—In the Sulzer drying machine the hanks are mounted on rods and introduced into the lower end of the machine. They are then moved upwards and occupy successively a vertical and a horizontal position. A hot-air current is led into the top of the machine and traverses the same in the opposite direction to that pursued by the hanks, which latter are therefore gradually raised to the maximum temperature, excessive warmth being prevented by the continuous removal of the air. To ensure regularity of drying at the places where the hanks come in contact with the rods, the latter are made to revolve on their own axis. A machine of this kind measuring about 16ft. long by 10ft. wide and 13ft. high will dry from 26 to 28cwt. of cotton in an eleven-hours day, and consume not more than 4H.P.

Truck Drying Machine.—This drier consists of two or three very long corridors (from 25 to 30yds. in length), through which is passed a train of trucks carrying the yarn. The air current flows in the opposite direction to that taken by the trucks, and is heated by a tubular apparatus provided with a steampipe and exhaust fan. The drying is effected in a very uniform manner, and the capacity of the plant is large, but a considerable amount of room is taken up. Attempts have been made to replace this form by a vertical drier, wherein the hanks are fixed horizontally on frames. In this case the corridor takes the form of a high, square wooden chimney, and the frames are set in motion by a series of endless chains, the air being drawn in at the bottom. The drying is perfectly systematic, and the results are good, but the necessity of using frames entails a good deal of handling, which reduces the output obtainable.

Packing.—When dried the hanks are beaten and then packed in the press, but the machinery employed is not of any special character, and therefore need not be particularly described.

(*To be continued.*)

Dressing Preparations and their Application.

INSTEAD of going in for a description of all the special products put on the market by the different manufacturers of dressing preparations—which would be a work of supererogation, owing to the fact that many of them, though called by distinctive names, differ in merely unimportant respects,—the author of an article in the "Färber Zeitung" prefers to commence with the raw materials and describe the preparation of the main products obtainable therefrom. This procedure he regards as the more valuable since it will enable the finisher to make his own preparations, thereby obviating the necessity of paying high prices for so-called specialities, and making him independent of the trustworthiness of the seller of same. This description will be followed by the methods of applying the products in question to various classes of linen and cotton goods.

One of the principal constituents of dressing preparations is starch, and this is distinguished in accordance with its origin—as potato, maize, rice, wheat, sago, and other starches, all of which are more or less suitable for our purpose. As a rule the starch is boiled to a paste with water and used for stiffening fabrics, as well as for glossing those that are to be calendered or mangled. Consequently, when the object of dressing is merely to

load or fill the material and leave it supple, the use of starch is out of place; but, on the other hand, it is indispensable for linings, linen goods, etc. According to the results of lengthy experience, it is a matter of no moment as regards the appearance of the goods which kind of starch is used, except so far as the price is concerned; though of course the divergent thickening properties of the various kinds should be borne in mind, and as a rule the prejudices of the master workman have to be overcome. Thus, for example, 8 to 9 parts by weight of potato starch are equivalent to 10 parts of wheat starch, owing to the superior thickening properties of the former. Maize starch occupies a position about midway between them, whilst sago starch is generally used merely as an adjunct, and in such very minute proportions as to be either dispensed with altogether or replaced by half its weight of potato starch. These remarks are not mere theoretical opinions, but are the reliable outcome of years of experience.

Instead of employing hot water to thicken the starch, this result can be achieved by the use of cold alkalies—generally caustic soda. For example, 55lb. of starch may be stirred up in 44gals. of water and incorporated, by stirring, with 0·44gal. of 45° Bé. caustic soda lye. After a few minutes the mass will have swollen up into a viscous, water-white paste, which is then left for several hours to allow the whole of the starch granules to burst and gelatinise. The caustic soda is afterwards neutralised by sulphuric acid, or, better still, especially in the case of dressings for linen fabrics, by acetic acid, the resulting acetate of soda in that case imparting the desired cold damp feel to the material. This starch, gelatinised by means of caustic soda, is met with in commerce under various titles, such as crystallin, globylin, etc., at prices out of all proportion to the cost of production; in fact, at current rates for starch, the product in question can be made for about 1s. 6d. per cwt.

Between the dressing preparation obtained by boiling starch in water, and that produced by the action of caustic soda on this ingredient, an immediately recognisable difference exists; the former is whitish in appearance, owing to the presence of the undissolved outer skin of the starch granules, whereas the latter are dissolved by the soda, and the product is as clear as crystal. This is more particularly apparent when rice starch is employed, the aforesaid skins forming an incrustation on the ends of the roller and dirtying the fabric when wider cloth is afterwards passed through the dressing machine, whereas if caustic soda has been used this disadvantage is obviated by the complete solution of the starch, skin and all. Consequently, the somewhat more troublesome decomposition of potato starch by caustic soda will be preferred for delicate fabrics, whilst the simple boiling of the starch in water will be sufficient for coarse linings, stiffened linens, and such-like goods.

The present is a suitable occasion for referring to a second derivative of ordinary starch—viz., the so-called "soluble starch." This neither gives the fabric the stiff feel imparted by ordinary starch, nor does it fill the material like dextrin; on the other hand, it shares with ordinary starch the property of rendering the fabric glossy when calendered or mangled, and has the further advantage—desirable in tickings, etc.—of closing up the material. It is therefore used for soft dressings in conjunction with dextrine and a little ordinary starch, or with an addition of wax instead of the latter. To this class belongs the ozonised starch, put on the market in the ordinary form, as well as in the dissolved state, under various names, a preparation recently brought forward consisting of boiled soluble starch mixed with a large proportion of china-clay and then dried and ground. Under the microscope this ozonised starch has the same appearance as ordinary starch.

Whilst ozonised starch is an advisable substance to purchase, soluble starch can be easily prepared either by prolonged boiling in water under pressure, or by boiling along with certain adjuncts. In the former event the mixture of starch and water—from 10 to 20 parts per 100 of water, according to the strength required—is boiled for two hours under a pressure of two atmospheres, in a special vessel—generally a boiling pan fitted with stirrers or with an injector, the boiling being continued until a sample drawn off through a sampling tap exhibits the fluid character of soluble starch. To accelerate the reaction about 1 per cent of a 35° Bé. solution of magnesium chloride solution may be added.

A simpler method of producing soluble starch without any special apparatus is as follows:—22lb. of potato starch and 15gals. of water are placed in an ordinary cask, about ½lb. of finely-ground malt being added. The mixture is then brought to the boil by blowing steam into the liquid, which is kept stirred, and boiling is continued a short time after thickening has set in (the cask being by this time covered up with a lid to prevent spurting), until the mass becomes fluid again like dextrine, whereupon the preparation is ready for use. Of course a product twice as strong can be obtained by taking double the above quantity of potato starch, the amount of malt being also doubled.

Provided a little care be observed, bleaching powder also may be used in the preparation of soluble starch. Thus, for instance, to obtain a 20 per cent. solution, 44lb. of potato starch are gradually heated with 13gals. of water by the aid of direct steam, to a temperature of from 62 to 65° C.—near the temperature of gelatinisation. Hereupon 4·4gals. of a 7° Bé. solution of bleaching powder are thrown in at once, the temperature being raised as quickly as possible to the boiling point, and kept there until liquefaction ensues. Soluble starch prepared in this manner contains an appreciable quantity of calcium chloride from the decomposition of the bleaching powder, and as this salt is hygroscopic, the dressing makes the goods supple. By prolonging the boiling for about a quarter of an hour after the liquefaction has occurred, all danger of the presence of residual free chlorine will be obviated, this substance otherwise having an injurious influence on the dyestuffs in the fabrics to be dressed. Moreover, its elimination can be ascertained by the potassium-iodide test, which reagent, when added as a 1 per cent. aqueous solution to the mass, develops a dark blue coloration in presence of free chlorine. When this indication appears, the boiling must be prolonged until the test gives negative results. For the sake of completeness it should be mentioned that the solubilisation of starch can be effected by an addition of 0·1 per cent. of sulphuric acid, 10 per cent. of magnesium chloride or other hygroscopic reagents, the only precaution necessary being to afterwards completely neutralise the free sulphuric acid when this acid has been used. The various forms of starch paste found on the market generally contain an addition of some other current dressing material, so that their quantitative examination is often rendered difficult and always a protracted task.

Next in order to starch comes dextrine, the composition and mode of manufacturing which may be taken as generally known. White dextrine should contain from 60 to 70 per cent. of soluble dextrine; when the proportion is lower, the presence of an excessive percentage of soluble starch is indicated. Dextrine can be advantageously prepared on a small scale by the finisher, 2cwt. of potato starch being stirred up in 55gals. of cold water and slowly raised to boiling, with a suitable amount of stirring, in the presence of an admixture of 600cc. (about 1 pint) of 66° Bé. sulphuric acid. The mass, thick at the commencement of boiling, becomes more liquid at the end of half-an-hour or so. To examine whether the decomposition has proceeded to a sufficient extent, use is made of a solution of 2grms. of iodine in 4grms. of potassium iodide, diluted to 1 litre with water. A little of the boiling mass is transferred on the end of a spatula to a tumbler containing cold water, in which it is stirred up and then tested with a few drops of the aforesaid iodine solution. On applying this test at the commencement of boiling, a deep blue coloration will be produced, but after boiling about one hour the coloration given will be violet-red; the formation of a wine-red shade indicating that boiling has been carried to excess. After the foregoing reaction has occurred, the liquid is neutralised by caustic soda, lime, or ammonia.

The dextrine prepared from potato starch by this process contains a small percentage of grape sugar, which is very favourable for the work of dressing, since dextrine, besides filling the goods, also renders them harder—an undesirable result, especially where the dressing is stiff (30 per cent. of dextrine) and is applied to flannel shirtings and other raised goods. On the other hand, grape sugar not only fills the fabric, but also renders it very soft and supple, the only defect noticeable being that it makes the goods feel greasy. By a skilful admixture of the two substances (dextrine and grape sugar) the best qualities of both bodies may be utilised, whilst at the same time the above defects are removed. The best results will be obtained by using 100 parts of dextrine along with 10 parts of grape sugar, or by adding to the above-named solution 13lb. of grape sugar. Owing to the insignificant economy resulting from the home manufacture of the latter, a description of the process would be devoid of advantage, even for large consumers.

China-clay serves both to load fabrics and to fill up the interstices of the same. In the case of linens this substance is replaced by talc or soapstone, which produces a smoother feel and facilitates bleaching; whichever be employed, some agglutinant is indispensable, starch being the one most in use, glue only occasionally.

Magnesium chloride, calcium chloride, and zinc chloride serve only for loading, but their antiseptic properties render the use of salicylic acid superfluous, though in other preparations for sizing and dressing about ½oz. of this acid is added per 100gals. to prevent subsequent putrefactive fermentation. Other loading substances include various salts, such as magnesium sulphate, common salt, Glauber's salt (sodium sulphate), and even the poisonous lead acetate (sugar of lead). All of these, however, when used in excess, make the goods hard and thin, like paper, the hardening in many cases only making its appearance after the goods have been stored for some time, and being then due (especially with Glauber's salt and magnesium sulphate) to the absorption of water of crystallisation and the consequent formation of crystals.

The fats and oils, both in a natural state and after saponification, also form important adjuncts to dressing preparations, chief among them being tallow, palm kernel oil, wax, olive oil, and castor oil, though saponified bone oil is often used on account of its low price. Saponified linseed oil is also used, but according to the author's experience is not particularly suitable for this purpose. The object of using fats and oils is to impart a softer feel to the goods, and their applicability stands in direct relation to the melting point. Thus, fats of high melting point are chosen for goods that are to be hot calendered or mangled, the solid and rather hard feel noticeable in the dressed fabric being modified by the subsequent operations of calendering and mangling. For other goods, such as flannels, meltons, and the like, a fat of lower melting point—olive oil, castor oil, or bone oil—is preferable. Unsaponified fats can only be used along with thick dressings—*i.e.*, such as contain a sufficient quantity of starch. The following three examples will show in what order the various ingredients should be added, and how the whole should be prepared.

1. *Dressing for Black Shirtings* (*22gals.*).—

Dextrin, 22lb.
Water, 2·2gals.
Tallow, 2·2lb.
Wax, 1·1lb.
Logwood extract, 0·44gal.
Copper sulphate (blue vitriol), 0·66lb.
Bichromate of potash, 0·44lb.
} added to the finished mass.

The first four ingredients are melted together and stirred, the melted fat collecting on the surface as soon as boiling and stirring cease. The steam being turned off, 11gals. of cold water are stirred in, and at the same time 20lb. of potato starch are mixed with 2·2gals. of water in another vessel, and, after being strained through a hair sieve, are added to the boiled and cooled mass in the first vessel. If indirect steam be used, another 2·2gals. of water are next added, and the whole again raised to boiling temperature and kept there for twenty minutes, whereupon the dressing will be ready for use. When direct steam is used, a proportionally smaller quantity of water will be necessary.

2. *Dressing for Stiffened Linens* (*22gals.*).—(*a*) 40lb. of bone glue are left to soak in 9gals. of cold or lukewarm water overnight, and then boiled until completely dissolved, an addition of 22lb. of dextrine dissolved in 6½gals. of water being next made, and this followed by 4·4lb. of the softening described below. (*b*) A cheaper dressing is made by stirring 17½lb. of potato starch with 11gals. of water, and gradually adding 1¼ pint of 45° Bé. caustic-soda solution. When gelatinisation is complete, the mixture is left at rest for at least twelve hours, whereupon a solution of ¾lb. of 66° Bé. sulphuric acid in 1 quart of water is stirred in. The reaction of the mass is then tested with litmus paper, an addition of ammonia being made to render the whole alkaline, if not so already. On the other hand, 11lb. of glue are put to soak overnight in 9 pints of water; and in a third vessel, 11lb. of china-clay are boiled with 2·2lb. of wax and 4½gals. of water containing 22lb. of dextrine in solution. The glue is added, and, when dissolved, is followed by the starch solution, the whole being afterwards well boiled. A single treatment with the dressing will suffice for all goods but the commonest, which will require a second application.

3. *Dressing for Sizing Warps* (*22gals.*).—

China-clay, 33lb.,
Water, 2·2gals.,
Palm kernel fat, 6·6lb.,

are boiled together and stirred till cold,

Zinc chloride solution, 11lb.
Magnesium chloride, 11lb.
} 35° Bé.

being added whilst lukewarm.

On the other hand:—

Potato starch, 26½lb.,
Water, 4½gals.,

are stirred up together and poured into the china-clay mixture, followed by 11lb. of grape sugar, the whole being finally kept on the boil for twenty minutes with continued stirring. By the aid of this preparation warp yarns may be increased in weight up to 60 per cent.

The foregoing examples are selected to show the constitution of dressing preparations. It should be remarked that the fats (tallow, wax, etc.) are boiled with china-clay to an emulsion, from which they do not separate again on cooling. Dressings of the type described above are suitable only for smooth goods, and not for raised materials, since they would clog the pile of these latter. In preparing dressings for raised goods, the fat or oil must be saponified, an operation performed in the

following manner, except in the case of linseed oil :—

A mixture is prepared of 220lb. of oil and 11lb. of sulphuric acid, and kept at a temperature of 50° C. for about 24 hours, with frequent stirring. If lower temperature be employed, the quantity of acid must be increased to about double the foregoing amount. Solid fats are first melted, the acid being then run in by degrees, so that the fat is not turned brown and no smell of sulphurous acid is produced. Provided the prescription has been followed exactly, the separation of the fatty acids from the glycerine will generally be complete in 24 hours. This being the case, 22gals. of water (hot for solid fatty acids) are added, the whole being then boiled and left overnight. Next day the water (containing the initially-added sulphuric acid) is drawn off through a tap at the bottom of the vessel, and is replaced by 40gals. of fresh water, the whole being afterwards heated to boiling and receiving an addition of 4gals. of 45° Bé. caustic-soda solution, run in slowly and with constant stirring. The resulting soap—which contains about 33 per cent. of fat—should have an acid reaction.

This is the cheapest method of saponification, though in the case of linseed oil in particular—on account of its strong drying properties—a preferable plan is to boil the oil with an equal weight of 22° Bé. caustic-soda solution until the formation of soap is completed, the excess of alkali being then neutralised with hydrochloric acid. The product is the same as before, except that the glycerine of the oil is present as well as a little common salt. In case it is desired to employ magnesium sulphate in the dressing preparation, care must be taken that the prepared oil has a strongly alkaline reaction, and that the magnesium salt is always added to the dressing before the oil. The following heavy dressing for inferior flannel shirtings may serve to elucidate this point :—

To prepare 22gals. of this dressing, 77lb. of dextrine are dissolved in 10gals. of hot water 13½lb. of magnesium sulphate being then dissolved therein by vigorous stirring, and the preparation completed by adding 7 pints of oil prepared in the manner already described. Flannel raised on the one side only is dressed on the other, but goods raised on both sides have to be passed through the dressing preparation. At the same time it should be noted that when Glauber's salt or magnesium sulphate is used, it becomes advisable to pass the dressed fabric, after dyeing, through a small continuous steaming apparatus (large enough to hold about 10yds. of cloth), and to then leave the goods rolled up for a day or two, since this treatment improves the thickness of the material. In order to remove the very hard feel of dressed flannels and impart sufficient softness, the goods are drawn several times over a knife on the calendering machine, and are then raised and brushed.

The softening referred to in an earlier paragraph is composed of saponified palm kernel fat, and is prepared by the method described above. It is distinguished above all other soaps by the amount of water it is capable of retaining ; for example, whereas an olive-oil soap becomes appreciably soft when the proportion of olive oil sinks below 60 per cent., a softening containing 22 per cent. of palm kernel fat is still quite hard.

For the sake of completeness, mention will be made of a product intermediate between the natural fats and the soaps—namely, the emulsion prepared from oil (generally olive oil) and alkali, and used in the process of Turkey-red dyeing, either alone or in conjunction with wax, tallow, or the like. A product of this kind may be prepared from :—Hot water, 11gals.; wax, 11lb. ; boiled together until the wax is melted, and then mixed with a solution of 13¾lb. of soda in 4½gals. of hot water, followed by an addition of 44lb. of olive oil stirred in until the mass has cooled down to the condition of a white paste.

Printing Paranitraniline Red.*

I HAVE ventured to bring before you the following curious phenomenon, because it is one of those rare, interesting experiences which result from a very peculiar combination of circumstances. Considerable thought has been devoted to the elucidation of the difficulty, and the explanation which will be offered appears to me to be the true solution.

Some time ago we were printing a seven-colour chintz pattern in the following colours :—(1.) Yellow : Auramine fixed with tannic acid, and containing a small percentage of tartaric acid. (2.) Pink : Rhodamine 6 G fixed with acetate of alumina. (3.) Red : Paranitraniline. (4.) Green : Brilliant Green and Auramine fixed as No. 1. (5.) Black : Logwood. (6.) Blue : Victoria Blue fixed with the acetates of chrome and alumina. (7.) Red (blotch) : Paranitraniline.

* A paper read by Mr. R. J. Flintoff, F.C.S., before the Manchester section of the Society of Dyers and Colourists.

The only reference it is necessary to make to the process is that the cloth was prepared in the usual aqueous solution of beta-naphtholate of soda, printed in the above colours, aged, fixed, and soaped. Now I wish to state very exactly what happened during the actual printing. It will have been observed there are two rollers of paranitraniline red, one in the peg colours and the other in the blotch. In this particular design both rollers placed approximately equal amounts of colour on the cloth. Generally the blotch roller requires many times more colour than the peg roller. This is one point I wish you to remember. Eight lumps of cloth (120yds. each lump) were wound on a shell for printing. The first and second lumps were printed with perfectly satisfactory results. At the end of the second lump the peg red was scraped out of the box, and fresh colour added. This was done because we have previously found the peg red colour has had a tendency to decompose, giving an orange shade of red. Since the peg roller usually withdraws very little colour from the colour-box, it is not necessary to make additions of new colour. Therefore this colour, not being refreshed like the blotch, begins to decompose owing to agitation in the heated atmosphere behind the printing machine. To avoid this contingency explicit instructions had been given to the printer engaged on this style to empty the red peg colour-box every two or three lumps, but in no case to run more than three.

The red blotch in the third lump was not as good as in the previous ones, but it was passable. At the commencement of the fourth it was fair, but it changed by gradations from a yellow shade of red to an orange. It continued to change in this direction to the end of the sixth lump, when it was quite unrecognisable as a red. At this point the printer, with characteristic perspicacity, realised it was time to stop his machine. These discrepancies in the shade of red were more particularly marked after the soaping process. In fact, they became more strongly emphasised after every succeeding process. The compounds used in the preparation of the diazo solution were carefully examined and found sufficiently pure for this purpose. I next prepared some of the diazo compound myself, yet after thickening, it still gave the same fault. Just as the matter appeared to be quite inexplicable, a man in the colour-shop drew my attention to the starch paste, which was quite sour. I at once realised that the products of starch fermentation would probably exert a decomposing influence on the diazo compound. It only required a very simple experiment to determine the accuracy of this surmise, which proved to be fully justified. I now proceed to give my explanation, and will afterwards discuss other possibilities.

It must be assumed that the fermented starch was primarily responsible for the decomposition of the diazo compound. I propose to deal further with this subject in another paper, since very interesting results have been obtained in an investigation made to throw further light on the decomposition of the diazo compound of paranitraniline. After the initial decomposition of the thickened diazo compound has taken place, owing to the influence of the fermented starch paste, the rate of decomposition is represented by an ever-increasing factor up to the period of almost complete decomposition, or at all events to such a point when no red precipitate can be obtained by mixing this solution with an alkaline solution of beta-naphthol. The influence of the decomposing diazo compound on the colour of the oxyazo compound is also somewhat remarkable. For instance, up to a certain point the regularity of decomposition is indicated by the gradual increase in the yellowness of the shade of red ; but this stage in the process having been reached, the colours of the compounds produced by the interaction of the decomposing diazo compound and beta-naphthol vary from an orange in the one case to a light brown in the next transition. Comparatively speaking, a very short interval of time is required to effect this final transformation. These facts having been determined by experiment, the following general proposition must be accepted as true :—The rate of decomposition of a thickened solution of the diazo compound of paranitraniline is a progressively-increasing quantity up to a certain point, which, having been reached, the rapidity is infinitely increased.

Consider the two colour-boxes filled with the same mixing of colour, both having an equal tendency to decompose, and the colour being withdrawn from both boxes at practically the same rate. Owing to the agitation of the colour during the printing, the rate of decomposition will be greater than the colour remaining in a state of quiescence. Now the blotch box is simply filled up with new colour by an amount equal to that which has been imparted to the printed fabric. In the peg colour-box the products of decomposition have been entirely removed, whereas in the blotch colour-box they are being allowed to accumulate, hence the rate of decomposition will be much greater in the latter case than the former. Therefore, the shades of red of the combinations produced by the diazo compounds in the respective boxes will be entirely different. Consequently it is now easy to understand why the peg colour-box gives a good red, and the blotch colour-box an inferior one. This is my explanation. It may be advisable to show the impossibility of other causes being responsible for this effect. Errors might occur in the following directions :—(1.) In the preparation of the beta-naphthol prepare. (2.) In the preparation of the diazo compound. (3.) By the introduction of a decomposing agency into the blotch colour-box during the printing process.

1. *The Preparation of the Beta-naphthol Prepare.*—From the conditions of production stated at the commencement of this paper, it must inevitably follow that anything wrong in the prepared cloth would affect the peg red quite as much as the blotch red. But this is not the case. Therefore this possibility may be dismissed.

2. *The Preparation of the Diazo Solution.*—Suppose the preparation of the diazo compound to have been at fault ; and to take an extreme case I will consider the amido base to have been either partially or entirely omitted. In one case a bad red would result, in the other no red at all would be obtained. But the effect of either of these conditions would happen at the commencement of the printing, and it would be impossible to find a good red in the blotch at the start, and an inferior one after working some time. Also the argument which has been used in the other case may be applied here—viz., an error in the preparation of the diazo compound would influence both the peg and blotch reds to an equal extent.

Finally, it is ingenious to suppose the blotch to have been affected by the tannin contained in the yellow and green. Some of this tannic acid might possibly get into the blotch colour by the blotch roller pressing against the partially-printed fabric, and withdrawing small portions of these colours, and then carrying them round to the colour in the box. But so far as one is permitted to dogmatise, it is quite permissible to refer to this explanation as absurd, because owing to the arrangement of the rollers in the printing machine it is impossible for the yellow and green to get into the blotch red to any appreciable extent. The blue, which contains no tannin, works immediately before the blotch. This roller would remove all the superfluous colour from the fabric, and consequently the only colour which could influence the shade of red would be the blue ; yet the blue contains no tannin. Therefore, since no tannin could pass into the blotch colour, it necessarily follows that the action of tannin on the diazo compound could not be the cause of its decomposition.

I think Mr. Herbert Spencer has formulated the proposition that the best method of accumulating knowledge is the study of causations, because in doing so it is necessary to familiarise oneself with so many dependent conditions. Surely it is safe to say the most interesting and profitable kind of research for the technologist is the study of the antecedent causations, which bring about apparently inexplicable phenomena. I believe there is an insatiable desire in the breast of every chemist to fully and truthfully account for every abnormal event happening within his own particular branch of the science, be it pure or applied. And further, I can imagine no greater torments than the mental mortification produced by an incomprehensible result. The more difficult it is to find an explanation, the more carefully the chemist observes, and the more assiduously he reasons until the problem is solved. Then he is, at last, a contented being. It is in pursuance of these ideas that I offer for discussion the subject of this paper. Although I am firmly convinced the explanation deduced from the most careful appreciation of all the facts is the true solution, nevertheless I shall feel greatly indebted to any gentleman who proves it erroneous by bringing forward considerations which have not occurred to me.

Discharging with Hydrosulphites.

THE use of hydrosulphites in solution for discharging dyed fabrics has been generally considered impracticable, for it has only been possible to prepare comparatively weak solutions, and therefore a sufficient quantity of the active salt could not be incorporated with the printing paste. In addition, hydrosulphite solutions are easily oxidised, and the frequent contact with the air which occurs during the preparation of the discharging colour and the printing itself frequently gives rise to irregularities. On this account it has been usual to prepare, in the operation itself, the hydrosulphite used in printing textile fabrics by printing the material with a mixture of zinc dust and sodium bisulphite, and drying and steaming it. This method, however, has many disadvantages, and is only used when no alternative process of

discharging the goods can be employed. Recently, the Badische Anilin and Soda Fabrik, of Ludwigshafen-on-Rhine, have found that hydrosulphites in the concentrated and solid form, and more especially the double salts of hydrosulphurous acid such as zinc-sodium hydrosulphite, are well suited for discharging purposes, since it is possible to bring sufficiently large quantities of the active agent into the printing paste. The printing paste so obtained can be used for discharging the colour of silk, wool, cotton, and mixed goods, whether these be dyed with substantive or wool azo-colouring matters, with basic dyestuffs, with sulphonated colouring matters of the triphenylmethane series, or with dyes that have been developed on the fibre, such as nitrosamine red, indigo, and others. The nature of the hydrosulphite salt employed has to some extent an influence on the appearance of the discharge, and zinc hydrosulphite, for example, gives rise to a most brilliant white on account of the zinc hydroxide which is precipitated on the fibre.

It is also possible, by the addition of dyes which are not acted on by hydrosulphite, to the printing paste, to produce variegated effects. The following are examples of procedure, the parts being by weight :—

Production of a White Discharge.—Mix thoroughly together from 250 to 150 parts of solid zinc sodium hydrosulphite, 170 to 250 parts of luke-warm water, and 600 to 580 parts of gum water (1 : 1), and make the solution up to 1000 parts by volume. Print the material with this mixture, dry and steam it. The length of the steaming necessary varies somewhat with the nature of the dye to be discharged. Nitrosamine Red, for example, requires for from five to ten minutes in a Mather and Platt apparatus, but as a general rule cotton goods dyed with other colouring matters, as well as silk goods, should be steamed for about one hour, not under pressure. With woollen goods it is preferable to use the steam as damp as possible.

A Yellow Discharge on Woollen Material Dyed with Acid Violet 6B N.—Print the dyed fabric with a discharge paste made up as follows :—Dissolve, by heating together 30 parts of Rheonin A in 60 parts of water, 100 parts of Acetin J and 560 parts of gum water. When cold, add 250 parts of zinc sodium hydrosulphite, and stir well till solution has been effected as far as possible. Dry and steam the printed goods.

A Discharging Paste Containing Sodium Bisulphite.—Into 540 parts of British gum thickening (1 : 1) stir in 10 parts of ammonia (containing about 20 per cent. NH_3), 100 parts of glycerine, 100 parts of sodium bisulphite solution (containing about 40 per cent. $NaHSO_3$), and 250 parts of zinc sodium hydrosulphite. Dilute this mixture well with water to 1000 parts by volume. Print the material to be discharged with the paste, and proceed further as in the first example given.

Printing Silk Goods.

BY printing a mixture of caustic soda lye and a thickening agent on silk goods, carefully drying, and afterwards rinsing or acidifying the material, a local degumming of the portions printed can be effected, while the remaining parts of the material are left unchanged. In this manner it is possible to obtain beautiful glossy effects, which previously could only be produced by weaving. In order to prevent the action of the caustic soda lye on the silk from going too far, it is as a rule advisable to add grape sugar or glycerine to the printing paste. If desired, colouring matters which sufficiently resist the action of alkalies, such, for example, as Indigo, Anthraquinone Black, Oxamine Red, and the like, can be added to the degumming paste, so that coloured glossy effects on, say, dull white result. The degumming mixture may be printed on the undyed material or on the dyed material. Colouring matters, such as Rhodamine B or Methyl Violet 4 B Extra, are suitable for previously dyeing the material in the latter case. Instead of printing an alkaline degumming paste on the material, it may be printed with a resist which, when dried or steamed, is sufficiently stable to the action of caustic alkali (for example, chromium acetate), and the material so treated is afterwards passed through a degumming agent. The parts which have been printed with the resist are protected from being degummed, and in this manner it is possible to produce similar effects to those obtained by first printing the alkaline degumming paste on to the material. Suitable colouring matters can of course be incorporated with the resist if desired, such as Victoria Blue, Oxamine Red, and Cotton Yellow G. Undyed material which has been locally degummed can be subsequently dyed in the usual manner. The following examples, given by the Badische Anilin and Soda Fabrik, who have introduced the process, will serve to better illustrate the procedure. The parts are by weight :—

1. *Preparation and Use of a Degumming Mixture with the Addition of Grape Sugar.*—Stir 100 parts of British gum into 700 parts of caustic soda lye (containing about 35 per cent. NaOH). Dissolve 300 parts of grape sugar in 100 parts of water by heating on the water bath, stir till cold, and then pour it into the alkaline British-gum paste, and make up with water to 1200 parts. Print this mixture on the dyed, or undyed, material, and dry at a moderate temperature, rinse with plain or acidified water ; if desired, the locally degummed undyed material may be subsequently dyed in the usual way.

2. *Preparation and Use of a Degumming Mixture without the Addition of Grape Sugar.*—Make a paste of 200 parts of British gum and 400 parts of hot water, and when cold stir into this 400 parts of caustic soda lye (containing about 35 per cent. NaOH). Print the material with this paste, and proceed further as in Example 1.

3. *Preparation and Use of a Degumming Mixture for the Production of Grey Effects on a White Ground.*—Mix 10 parts of anthraquinone black into a paste with 50 parts of cold water ; stir well together 60 parts of British gum and 700 parts of caustic soda lye (containing about 35 per cent. NaOH) ; add, as in Example 1, a solution of 300 parts of grape sugar in 100 parts of water, and then add the anthraquinone black paste ; make up with water to 1200 parts. Apply as in Example 1. A grey effect on a white ground may be thus obtained.

4. *Preparation and Use of a Degumming Mixture for the Production of Bluish-grey Effects on a White Ground.*—Mix together 60 parts of British gum with 700 parts of cold caustic soda lye (containing about 35 per cent. NaOH), and add 30 parts of a 20 per cent. paste of indigo pure. Dissolve 300 parts of grape sugar in 100 parts of water by heating on the water bath, stir till cold, and mix this with the aforementioned mixture of British-gum paste and indigo pure. Make up to 1200 parts with water. Apply as in Example 1.

5. *Treatment of the Material with a Resist, followed by Subsequent Degumming of the Material.*—Stir well together 300 parts of British gum and 550 parts of hot water; add, on cooling, 150 parts of chromium acetate of 20° Bé., and make up to 1000 parts with water. Print the material with this resist, dry it, and pass it for from two to five minutes through a degumming bath made up of 300 parts of glycerine, 200 parts of water, and 700 parts of soda lye (containing about 35 per cent. NaOH). Rinse well in flowing water.

NOTES ON DYEING, BLEACHING, FINISHING, &c

Specially compiled for THE TEXTILE MANUFACTURER.

DIAMOND BLACK F B.—This dyestuff has been introduced to meet the growing preference for wool blacks of a blue shade, and it gives a shade slightly bluer than the older Diamond Black F (Bayer). It has the same purity and fastness to light and milling as the older brands, and besides being level, works well in combination with other dyestuffs. To obtain a good black shade, prepare a bath with the addition of 3 per cent. acetic acid, enter at from 85 to 105° F., raise slowly to the boil, continue boiling for a quarter of an hour, and then add ½ per cent. sulphuric acid ; when the dye liquor has been exhausted, treat the goods with 1¼ per cent. bichromate of potash for half-an-hour at the boil.

OXAMINE BLUE B G.—A dark blue on cotton yarn, which is claimed to be fast to washing and acid, may be obtained by using Oxamine Blue B G (Badische), diazotising and developing with Oxamine Developer R. For 100lb. of cotton yarn, dye for three-quarters of an hour, boiling with from 2½ to 3½lb. of the dyestuff, 5 to 20lb. of crystallised Glauber's salt, and 2lb. calcined soda. Rinse, cool, and place in a cold bath containing from 1½ to 2½lb. nitrite of soda, and 3 to 5lb. sulphuric acid 168° Tw. Work well for a quarter of an hour, and rinse, with the addition of 1½lb. hydrochloric acid 32° Tw. The rinsed yarn is then treated immediately in a cold bath containing the developer, which dissolves better if about one-fifth of its weight of hydrochloric acid 32° Tw. is added.

CHROME PATENT BLACK D G AND D G G.—These colouring matters (Kalle) can be dyed on woollen hanks and pieces, as well as on loose wool, slubbing, and felt. They go on slowly, dye evenly, penetrate well, and have the property of leaving cotton effect-threads or selvages practically untouched. Their fastness to milling is said to be remarkable, as they stand even a severe milling process ; they are also claimed to be extremely fast to light, steaming (dry or wet), and sulphurous acid. White yarn, woven or milled along with the dyed material, can be over-dyed hot with acid colours, without risk of the black affecting the brightness of the last dyeing. The following are the instructions for using :—Dye boiling for one hour with the addition of 10 per cent. Glauber's salt and 4 per cent. sulphuric acid. When the dyeing material is difficult to penetrate, add the necessary acid in small portions. The dyed wool shows a dark-brown violet shade, which is rendered black by subsequently treating the goods on the same or a fresh bath for thirty minutes with from 1 to 1½ per cent. bichromate at the boil.

DIAMINE COLOURS.—An interesting shade card has been issued by Messrs. Leopold Cassella and Co. showing the adaptation of Diamine colours to fancy wool fabrics. The patterns in question are striped and checked cloths for ladies' dress goods and blouses, and with the exception of a few acid colours, Diamine dyestuffs have been used throughout.

DIAZO INDIGO BLUE B R EXTRA.—This is really a more concentrated preparation of the older M quality (Bayer), being in a more convenient form for packing and transportation. When diazotised and developed with developer A, it is, like the M quality, fast to light, being better even than indigo. When dyed direct it is of minor importance. It is also useful for the dyeing of loose cotton, as well as for cops, yarns, and piece goods. Diazotised and developed shades are discharged well with tin crystals or zinc powder.

VIGOUREUX PRINTING.—A varied range of cloth patterns illustrating various kinds of vigoureux printing are shown in a pattern card just issued by Messrs. Leopold Cassella and Co. There are only shown the results of dyestuffs which can be used at a low cost, and those selected are also such as can be easily applied, yet completely fixed on the fibre. It is claimed that after the slubbing has been printed the natural spinning properties of the fibres are unaffected, and the white parts are not tinted by the rinsing which follows.

BENZO BROWN R C.—This is a further addition to the Benzo Brown series (Bayer), which is dyed on cotton with Glauber's salt in the usual manner. It produces full red-brown shades, and is adapted for diazotising and developing. With developer H it produces a dark brown of tolerable fastness to washing. When dyed on cotton, this dyestuff is only moderately discharged with tin crystals or oxidising agents (cream shade), but discharges white fairly well with zinc powder. It is suitable for padding purposes as well as for topping aniline black, and printing cotton, silk, and half-silk. Silk and half-silk prints are fairly fast to water.

NEW VICTORIA BLUE B.—The adaptability of this dyestuff, and also Victoria Blue B, as a blue suitable for colour discharges with tin in preference to Methylene Blue and similiar dyestuffs, is shown by some printed cotton and half-wool patterns issued by Messrs. Bayer and Co. The cotton patterns are dyed with 1 per cent. of Geranine G, and discharged with 2 per cent. of either Victoria Blue B or New Victoria Blue B, 5 per cent. acetate of tin 32° Tw., and 6 per cent. acetate of chrome 32° Tw. The older brand gives the darker shade.

GALLAMINE BLUE PASTE.—This dyestuff has been found very suitable as a colour discharge for Para-nitraniline, Benzo Purpurine 4 B, and Benzo Fast Scarlet 4 B S. The cotton cloth is dyed with from 4 to 7 per cent. of either of these latter colours, and then discharged with 20 per cent. Gallamine Blue 10 per cent., or 7 per cent. Gallamine Blue 30 per cent., along with tin crystals, sulphocyanide of ammonia or acetate of tin 32° Tw., and citric acid or acetate of chrome 32° Tw.

WOOL BLUE.—This new product (Kalle) is adapted for the dyeing of wool. The dyeings obtained with the addition of Glauber's salt and acid are said to possess a good resistance to water, soap, and lime ; they stand a moderate milling well, and their fastness to light is claimed to be remarkable. It is useful for dyeing woollen hanks and loose wool ; and it may also be employed for piece-dyeing, owing to its great fastness to light, and because cotton selvages or effect-threads are not tinged by the colouring matter. Half-wool (wool and cotton), when dyed from an acid or a neutral bath, takes the colour exclusively on the wool. In half-silk piece-goods dyed with Wool-blue, the cotton is left white ; this new brand will therefore be of use for covering the silk contained in such fabrics, as also for the production of two-coloured ("changéant") effects. The following are the instructions when treating wool :—Dye with the addition of 10 per cent. Glauber's salt and 4 per cent. acetic or sulphuric acid. Enter at 40° C., raise slowly to the boil, add the acid (preferably in several portions), and then dye boiling. The colouring matter exhausts the bath completely. By subsequently chroming, the shade is scarcely altered, so that it can be dyed in conjuction with other products which require an after-treatment with chrome. Silk is dyed in a bast-soap bath broken with 5 per cent. sulphuric acid ; the bath is not quite exhausted.

C

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.

4th February.

2305 A. STELL and OTHERS, Keighley. Doffing apparatus.
2317 THOMAS HOLT LIMITED and F. A. HOLT, Manchester. Electric stop motions for warping machines.
2326 J MACFIE, Lanark. Spindles and tops for winding machinery.
2328 C. H. SMITH, Bradford. Spinning fibres.
2333 J. GRAY, Glasgow. Cotton opening or scutching and spreading apparatus.
2334 THE ANDERSTON FOUNDRY COMPANY LIMITED and J. C. BUNTEN, JUN., Glasgow. Shuttle-box motions on looms.
2390 T. SEILER, London. Picker sticks for looms.*
2393 R. B RANSFORD, London. Dyeing with sulphide colours. (*L. Cassella and Co , Germany.*)
2397 J. Y. JOHNSON, London. Production of diazo colouring matters. (*The Badische Anilin and Soda Fabrik, Germany.*)

5th February.

2433 S. SYKES, Ebley Twisting spindle.
2434 A. FAHIE, Dublin. Spinning frames. (*A. Coulter, Russia*)
2473 F. A. BREEZE and J. WILSON, London. Spinning frames.*
2483 H. NIEDERGESASS, London. Fulling and washing machines.*
2489 B. J. B. MILLS, London. Looms. (*La Société Civile d'Etude du Métier à Rubans Barbier, France*)
2514 J. GREGORY, London. Hair and wool clipping machines.
2515 J. STANSFIELD and T. MASON LIMITED, Bradford Producing straight selvages to piece goods.

6th February.

2538 T. HAWORTH and A. WADE, Darwen. Taking weight off heald staves in dobby looms.
2555 J. F. RIDING, Manchester. Bleaching of vegetable textile materials and products.
2564 J. D. TOMLINSON. Manchester. Raising machines for textile fabrics. (*W. Ortmann, Germany.*)
2565 R. E. OLDROYD, London. Apparatus for cop dyeing and sizing.
2592 R. B. RANSFORD, London. Manufacture of dyestuffs from amido-nitrosalicylic acid. (*L. Cassella and Co., Germany.*)

7th February.

2609 H. I. JONES, Kingston-on-Thames. Yarn guide for knitting machines.
2629 B. COHNEN, Manchester. Machine for treating hanks of yarn with liquid, and also drying and stretching the hanks.
2631 J. E. GILHAM and J. E. MUSGRAVE, Leeds. Devices in connection with piece-dyeing, washing, and bleaching machines for the prevention of crimping and similar defects.
2645 J. PATE, Burnley. Sizing preparation.
2646 J. GREGORY, Burnley. Yarn-winding frames
2648 E. E. SAUNIER, London. Lace representing mosaic work.
2661 J. FOULKES and THE COLONIAL AND GENERAL EXPLORATION AND LAND SYNDICATE LIMITED, London. Scutching machines.*
2679 A. KRONSTEIN, London. Process for rendering materials proof against the action of moisture and of chemical agents.*
2697 J. DOLDER, London. Machine for stretching and drying yarns in mercerising.*

8th February.

2716 J. SMALLEY, Stockport. Polishing yarns or threads of cotton, wool, flax, and other fibres.
2717 R. and J. HARLING, Burnley. Dobbies of looms.
2737 J. KOHLER, Manchester. Feed rolls of machinery used for joining together hosiery and the like fabrics.

9th February.

2792 J. C. MERRYWEATHER and C. J. W. JAKEMAN, London. Automatic sprinklers.
2823 J. BOWKER and OTHERS, Manchester. Guard for the carriage wheels of spinning mules and twiners.
2824 T. ASHWORTH and J. S. GAUNT, Manchester. Footstep for spindles used in machines for preparing, spinning, and doubling cotton.
2826 G. J. HEPWORTH, Manchester. Ring-spinning machines.
2833 S. LEWIN and A. LEHMANN, London. Imitation Crimean or Persian fur goods.
2839 J. IMRAY, London. Blue dyestuffs. (*La Société Anonyme des Matières Colorantes et Produits Chimiques de St. Denis, France.*)

11th February.

2871 T. P. SUMMERSKILL, Keighley. Couplings for the driving tapes or bands of machinery used in the preparation of fibrous substances.
2907 H. H. LAKE, London. Colouring matters. (*Farbwerke Mühlheim vorm. A. Leonhardt and Co., Germany.*)
2908 G. SCHMIDT, SEN., London. Weft fork mechanism of looms.*
2913 H. E. NEWTON, London. Basic dyestuffs. (*The Farbenfabriken vormals F. Bayer and Co., Germany.*)
2914 S. SILBERSTEIN and OTHERS, London. Separator device for ring spinning machines.*
2916 I. ENGEL, London. Mechanism for use with ring spinning machines.
2927 R. B. RANSFORD, London. Preventing the deterioration of dyed cotton. (*L. Cassella and Co., Germany.*)

12th February.

2961 C. THOMPSON, Halifax. Stop motions and loose reed motions of looms.
2974 DOBSON AND BARLOW LIMITED and T. H. RUSHTON, Manchester. Ring spinning and doubling frames.
2986 W. BIRCH, Manchester. Clips for tentering machines.
2987 C. H. and P. SCHILLING, Goerlitz, Germany. Spinning machines.
3040 H. E. NEWTON, London. Machines for winding continuous lengths of material into rolls.* (*T. H. Savery, United States.*)
3051 W. WEBER-HONEGGER, London. Means for changing the position of the shuttles in power looms.*

13th February.

3071 E. M. TAYLOR, Prestwich. Alkali creosolate compound for bleaching and scouring.
3084 R. F. S. MOLESWORTH, Manchester. Production of azo colours on cotton and other fibres.
3093 J. H. SHORROCKS, Chorlton-cum-Hardy. Boxes or cases and frames for velvets, and other fabrics required to be packed in a folded condition.*
3095 J. HALL and OTHERS, Manchester. Wire motion of looms for weaving carpets and other pile fabrics.*
3135 S. LEWIN and A. LEHMANN, London. Imitation Crimean or Persian fur goods.

14th February.

3148 S. WRIGLEY, Werneth, Oldham. Flooring of mule rooms.
3180 T. E. WILSON, Manchester. Pneumatic appliances for stripping the card surfaces of carding machines.
3213 J. ROBINET, London. Thread separator for sizing machines.
3239 J. Y. JOHNSON, London. New colouring matter. (*The Badische Anilin and Soda Fabrik, Germany.*)

15th February.

3248 J. SHAW, Bradford. Table for facilitating feeding piece goods to dyeing, tentering or other machines.
3253 A. KEIGHLEY and J. RATCLIFFE, London. Tension devices for driving bands or tapes of spindles for spinning, doubling, and twisting machinery.
3267 B. BUTLIN, Huddersfield. Alarm apparatus for carding or scribbling machines.
3286 J. WEBSTER, Dundee. Spindles and their nuts used in cop-winding machines. (*W. Panton, India.*)
3311 H. E. NEWTON, London. Dyestuffs of the anthracene series. (*The Farbenfabriken vormals F. Bayer and Co., Germany.*)
3316 M. M. GREEVES and T. LUCAS, Manchester. Scrapers for the rollers of drawing frames.*
3330 J. Y. JOHNSON, London. Treatment of raw silk, of mixed raw silk and woollen goods, and of mixed raw silk and cotton goods. (*The Badische Anilin and Soda Fabrik, Germany.*)

18th February.

3424 A. MACDOUGALL, Glasgow. Looms for weaving wire.
3463 W. A. E CROMBIE, London. Artificial threads or fibres.

19th February.

3517 J. TWEEDALE, Castleton. Rings employed in ring spinning and doubling yarn.
3518 F. TAYLOR and OTHERS, Halifax. Appliances employed in the process of bleaching.
3519 THE FRASER AUTOMATIC ROVE STOP COMPANY LIMITED and J. FRASER, Glasgow. Rove stop mechanism for spinning machines.
3528 J. DUGDALE, JUN., and T. HINDLE. Manchester. Traverse guide motion for machinery used in preparing, spinning, doubling, and similarly treating textile materials
3550 W. H. BOWMAR and J. A. SWAINE, London. Tom-toms or fabric-scouring machines.
3568 F. SHUMAN, London. Machines for use in the mercerising of yarn.*

21st February.

3714 S. WRIGLEY, Werneth. Wheels or runners of mule carriages.
3756 W. ARKWRIGHT, London. Circular knitting machines.
3783 A. J. BOULT, London. Knitting machines. (*La Société Générale de Bonneterie and C Boucher, France*)
3786 J. A. LACOTE and P. E. MARCOU, London. Scutcher or fibre-preparing machines.

22nd February.

3801 W. H. HACKING, Manchester. Loom dobbies.
3806 W. MCGEE, Glasgow. Machines for balling yarn or thread.
3807 W. MCGEE, Glasgow. Machines for balling yarn or thread.
3808 W. MCGEE, Glasgow. Automatic spooling and ball-winding machines.
3848 TAYLOR, LANG AND CO. LIMITED and W. STORRS, Manchester. Self-acting mules and twiners.
3861 J. IMRAY, London. Lustrous and variously-coloured threads and strips of textile materials.* (*Heberlein and Co., Switzerland.*)

23rd February.

3891 G. THOMAS, Manchester. Shuttles used in looms (*G. L. Lundin, Sweden.*)
3918 B. and R BLACKBURN, London. Machines for winding or spooling yarns.
3924 P. V. AVRIL, London. Embossing or stamping and printing fabrics or materials.

25th February.

3968 J. RHODES, Keighley. Noble's combs.
4017 A. A. VOGELSANG, London. Electrolytic bleaching of cotton and other textile materials.*
4024 J. Y. JOHNSON, London. Blue colouring matters and intermediate products. (*The Badische Anilin and Soda Fabrik, Germany.*)

26th February.

4041 E. KILNER, Huddersfield. Helder for spindle on split drum cross-winding machine
4077 C. L. and H. L. JACKSON, Manchester. Composite bowls or rollers employed in machines for hot-pressing and otherwise treating and finishing textile fabrics.*
4078 DOBSON AND BARLOW LIMITED and T. H RUSHTON, Manchester. Machinery for spinning and doubling cotton.
4090 H. BROWN, London. Knitting seamless stockings with lace-work effect by machinery.*

27th February.

4179 J. SYKES and J. ROBERTS, Halifax. Sheet-card setting machines.
4193 G. F. STURGESS, Leicester. Knitting machines.
4219 C. H. ALDRIDGE, London. Rotary or straight-bar knitting machines.
4244 BROOKS AND DOXEY LIMITED and W. H. COOK, Manchester. Cap bars for spinning and roving frames.
4245 BROOKS AND DOXEY LIMITED and W. H. COOK, Manchester. Apparatus for adjusting the ring rails of ring spinning and doubling frames.

28th February.

4260 W. MASON and A. HEWITT. Manchester. Motion for changing the shuttle boxes of check looms.
4270 J. A. SCHOFIELD and P. DEARDEN, Keighley. Woven fabrics.
4279 J. C. HAMER, Manchester. Apparatus for dyeing and otherwise treating yarn or rovings in compact form.
4280 J. C. HAMER, Manchester. Apparatus for dyeing and otherwise treating fibrous material in a spun or other state.
4282 ACTIENGESELLSCHAFT VORMALS J. J. RIETER ET CIE., Manchester. Machines for cross-winding spools close coiled.
4286 H. W. SMITH, London. Woven fabrics such as towelling.*
4303 J. IMRAY, London. Manufacture of thread from cellulose solutions. (*E. Bronnert, M. Frémery, and J. Urban, Germany.*)
4304 E. ROUSSEL, London. Decorated fabric.

1st March.

4386 O. ZERKOWITZ, London. Means for the production of jacquard cards
4416 C. H. SIMONS, London. Means for ascertaining the length of rolls of cloth

2nd March.

4439 J. FAIRCLOUGH and OTHERS, Manchester. Mechanism for stripping the revolving flats or rollers of carding engines.
4441 J. A. SACKVILLE, Manchester. Apparatus for use in the bleaching, dyeing, drying, and like treatment of textile fabrics.
4456 S. TAYLOR, Stalybridge. Machines for spinning and twisting fibrous substances.
4476 W. TYLER, London. Circular knitting machines.
4477 W. TYLER, London. Linking and analogous machines.
4523 J. POYSER, London. Means for propelling shuttles in looms.

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:—

1899.

23,476. Colour matching. Nov. 24. A. Dufton, 81, Watson-road, Sheffield, and W. M. Gardner. It is found that almost any artificial light can be made to resemble daylight by absorption of such rays as are found present in excess in such artificial light when compared with the spectrum of normal daylight. To bring about this, the light is caused to pass through a suitable coloured screen or is reflected at a coloured surface, or a combination of both may be employed. For practical purposes the electric arc light is most convenient to apply, the ordinary white or opalescent globe being in such case replaced by a coloured glass globe so tinted as to absorb all rays of light in excess, and to render the emergent light the same quality as daylight; or a separate coloured globe may be employed.—Feb. 1, 1901.

1900.

974. Winding yarns or threads. Jan. 16. R. Voigt, 36, Limbachstrasse, Chemnitz. Relates to a cross winding machine provided with an arrangement for altering the speed of the thread-guiding device in such a manner that the accurate and solid winding of the yarn is secured by means of intermediate machine elements constructed for regulating the relation between the to-and-fro movements of the guiding device and the rotary motion of the bobbin.—Jan. 16, 1901.

1272. Cop carriers. Jan. 20. J. Major and T. J. Wood, 30, Cannon-street, Eccles. Relates to the construction of the spindles or cop carriers used for holding cops of spun yarn in apparatus for dyeing, bleaching, and similar operations, and is more particularly applicable to that class of apparatus wherein the dye or other liquor is forced or drawn through the centre of the cop in an outward direction, or *vice versâ*, and the objects are to hold the cop firmly on the spindle, and at the same time to give free access for the dye or other liquor to the interior of the cop. The spindle is made from two thin strips of brass or other metal tapered from the butt to the point, and formed with a longitudinal groove or flute from end to end. The two butt ends are held slightly asunder by a little solder, and are fixed in the central opening of the taper bush by means of which they are fixed in the machine so that the ends of the grooves or flutes are open to the bore or internal space of the said taper bush. The narrow taper points of the two blades are soldered together back to back for about an inch down, the end being made round and pointed bluntly, and at the widest part (say about one-third from the butt end) they are bulged or curved outwards from each other, and the brass or other metal of which they are formed having a slight spring temper, the spindle will have a tendency to preserve this bulged or curved form externally, but will at the same time yield to the pressure of the cop as it is pressed on to it.—Jan. 19, 1901.

1489. Weaving open-work goods. Jan. 23. L. Widmer and G. Welti, St. Gallen, Switzerland. Relates to a jacquard loom or warp frame in which open-work goods with meshes of various lengths can be produced by knocking off those needles which produce the long meshes much more than those needles which produce short meshes, and in which the sinkers, while knocking-off and picking up these unequal meshes, adjust themselves individually, both in regard to the frame needles as well as in the direction opposite thereto. The loom is furthermore provided with a jacquard apparatus, in which the number of cards is reduced by the arrangement that one card contains several patterns which come into operation one after the other as the jacquard prism is adjusted at right angles to the row of frame needles.—Jan. 23, 1901.

1622. Ring-spinning machines. Jan. 25. P. P. Craven, 16, Devonshire-street, Ardwick, Manchester. The object is to provide means whereby ring-spinning machine spindles on which discs are used may be made taper like the ordinary mule spindles, in order that the cops may have taper holes through them instead of cylindrical so as to fit the pegs of the shuttle used for weaving cops spun on a mule.—Jan. 12, 1901.

1792. Dobbies. Jan. 29. James Ward, John Ward, Joseph Ward, and John Ward the younger, Ingham-street Ironworks, Blackburn. Relates to improvements in dobbies or shedding mechanism of looms for weaving, and to an improved measuring motion for measuring plain cord bordered handkerchiefs and the like which are woven with a single-barrelled dobby, and in which the measuring mechanism usually attached to the side of the loom and operated by means of the taking-up roller of the loom is dispensed with, and instead thereof the measuring mechanism is attached to and operated by the dobby, and the measuring is rendered more accurate and certain; of an improved method of jointing the draw knives of dobbies to their connecting rods; of an improved peg feeler which obviates the liability of the feelers lifting in their slots or being displaced; of improved means of connecting the two rows of lifting or shedding levers to the baulk levers of dobbies; and of an improved method of blanking the push catches in a cross-border dobby.—Jan. 26, 1901.

1977. Fast sulphur dyeings. Jan. 31. R. B. Ransford, Upper Norwood (communicated by Leopold Cassella and Co., Frankfort-on-Main.) Direct-dyeing cotton dyestuffs containing sulphur, such as immedial black, vidal black, katigene brown, and the like are as a rule after being dyed subjected to an after-treatment on the fibre, in order to improve the shade or to develop and completely fix the colour. An after-treatment with bichromates—which have hitherto been used almost exclusively for this purpose—has a detrimental effect on the structure of the cotton fibre, and it is a well-known fact that vidal black dyeings which require a very energetic chroming become tender after having been stored for some time. It is now found that chromous or chromic salts are an excellent means of fixing dyestuffs of the sulphur group. If dyeings of immedial black, for instance, are after-treated with chrome alum, such dyeings become fuller and deeper, just as if after-treated with chromate. The fastness of dyeings treated with chromous or chromic salts to milling, and especially also the fastness to rubbing, meet the highest requirements, and no tendering of the fibre is observable. Of course, with dyestuffs which have to be first developed by oxidation, such as vidal black, chromous or chromic salts cannot be substituted for chromate, but in such a case after-treatment with chromous or chromic salts is very advantageous, as a comparatively small addition of chromate proves sufficient, and consequently the fibre is less changed. The after-treatment is effected by turning the dyeings, after being well rinsed for about one hour in a bath of about 80° C., which has been charged—according to the dyestuff used and the intensity of the dyeings—with 3 to 5 per cent. chrome alum (calculated on the weight of the cotton).—Jan. 31, 1901.

2054. Cloth-cutting machines. Feb. 1. R. A. England and H. Roberts, Britannia Mills, Bingley. Relates to cloth-cutting and like machines, the object being to provide an appliance for taking up the slack edges of the fabric or adjusting the tension of the fabric at any desired part.—Jan. 26, 1901.

2195. Permanent black acid-proof cotton dye. Feb. 3. W. W. Stolaroff, Kriovkslenny Pereulok House, Troleff, Moscow. Has reference to the production of a superior black dye for cotton, which shall be unaffected by sulphuric acid, light, and other agents that deteriorate black cotton dyes heretofore manufactured. It is produced by the action of heat on a mixture of alkali sulphide, sulphur, and dinitrophenol, it being a feature of the invention that not less than 4 atoms of sulphur act upon 1 molecule of dinitrophenol.—Jan. 26, 1901.

2510. Driving calico-printing machinery. Feb. 8. D. Stewart, London-road Ironworks, Glasgow. Has for its object to devise improvements in means for driving calico-printing, bleaching, washing, dyeing, finishing, and like machinery, so that such machinery will be more efficacious and satisfactory in use than as hitherto constructed. This class of machinery as at present constructed is usually worked in a series, and in the case of calico-printing machinery, for example, each machine is driven by a separate steam engine or engines, so that a high temperature is soon raised in the print shop, which acts very injuriously on the colouring matter employed and on the cloth in process of printing, this injurious action being avoided according to this invention. There is also a considerable amount of water used in works where this class of machinery is employed, which water is usually allowed to run to waste after having been used once, say in the washing machines, but which water it is proposed to further utilise and thus reduce expense. For driving each machine a Pelton wheel or other suitable turbine is used. The buckets of the turbine are driven by jets of water projected, by preference, from three nozzles, and a regulating valve (or valves) is applied so that the

speed at which the turbine is driven can be accurately adjusted. The water used to drive the turbine may be supplied with the necessary pressure obtained by gravity, or it may be propelled by pumps; and the water may also be made to act in the washing or like machines or be returned back to the pumps. By these means the injurious effects of heat on the colouring matters and cloth are avoided, and a considerable saving is effected in motive power. Fig. 1 is a vertical section of the improved motor, and Fig. 2 is an elevation of part of a calico-printing machine and the gearing connecting it with the motor. The motor consists of a wheel A made with buckets B in the usual manner and enclosed in a casing C The shaft D of the motor passes through the casing, and has on it a worm E (shown by dotted lines in Fig. 2) gearing with a worm wheel F on an intermediate shaft G, which has on it a spur wheel H gearing through a

FIG. 1.

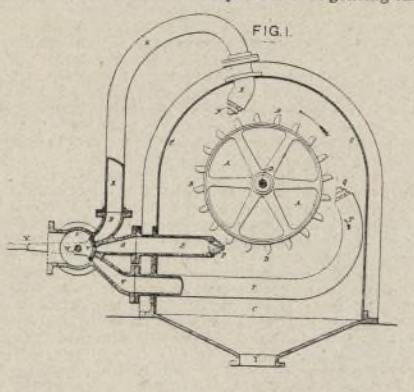
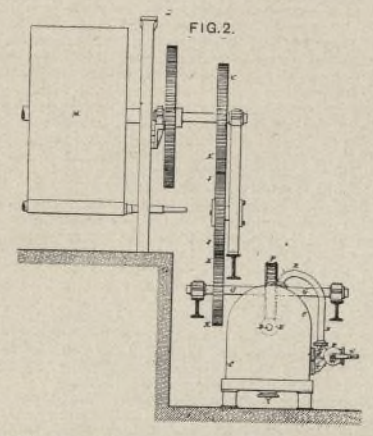


FIG. 2.



pinion J with a second spur wheel K on the star wheel or main driving shaft L of the printing (or other) machine M. The buckets B are acted on by jets of water projected from three nozzles N, P, Q on the ends of the pipes R, S, T passing through the casing C. The inlet ends of these pipes are connected to a valve box U in which is a valve V on a spindle W, one end of which passes out through the side of the box U, and is fitted with a hand lever X. The valve is so shaped that when starting or stopping the motor the inlet ports are opened or closed in succession, and the use of the three jets combined with the gearing hereinbefore described prevents vibration and gives the necessary steadiness required, which is not attained when only one or two jets are employed. The water, after acting in the motor, passes off by the outlet Y from the casing C, and, as hereinbefore stated, it may be made to act in the washing or like machines, or be returned to the pumps. —Feb. 1, 1901.

2736. Cop-winding machines. Feb. 12. W. Lee and G. Croll, Lawside Foundry, Dundee. The spindle tops, instead of being screwed to the spindle as formerly, have a tapered or conical hole fitting a corresponding cone on the spindle, in which is cut a helical or L-shaped groove, into which groove a small pin or stud or button fixed inside the spindle top passes and holds the spindle top firmly down on to the cone of the spindle while being rotated. —Jan. 12, 1901.

2772. Azo dyestuff for wool. Feb. 12. O. Imray, London (communicated by The Farbwerke vormals Meister, Lucius and Brüning, Hoechst a/Main). It is found that from diazotised 6-nitro-2-amido-1-phenol-4-sulphonic acid on the one hand, and beta-naphthol on the other hand, a monoazo body may be obtained which directly dyes wool deep violet, and which on treatment with chromium compounds may be transformed into a black dye of excellent properties.—Jan. 12, 1901

2784. Azo colouring matters. Feb. 12. J. Y. Johnson, London (communicated by The Badische Anilin and Soda Fabrik, Ludwigshafen-on-Rhine). In Patent No. 25,511 of 1899 there is described the production of a new mono-azo colouring matter from 2 naphthylamine-1-sulpho acid and beta-naphthol, and the production of lakes from this colouring matter. It is now discovered that certain of the isomeric colouring matters yield valuable lakes. They are derived from hetero-nuclear beta-naphthylamine-mono-sulpho acids and beta-naphthol. Of the azo colouring matters which are thus usable for the production of lakes, that obtained by the combination of the 2·7 sulpho acid with beta-naphthol appears to be new; that obtained from the 2-naphthylamine-5-sulpho acid has long been known, but does not appear to have been used in any way hitherto, but to have been regarded as a useless product; whilst the beta-naphthol-azo dyes from 2-naphthylamine-8-sulpho acid and the 2-naphthylamine-6-sulpho acid are known, and find a limited application as dyes for wool and silk.—Jan. 12, 1901.

2832 Textile drawing rollers. Feb. 13. A. Hitchon, Globe Works, Accrington. Relates to the making of what are known by the trade as fluted drawing rollers, such as are made use of in the spinning preparation of textile yarns (or the Arkwright's draw rollers), and are usually jointed together with square-socketed jointings, which have hitherto been difficult to get to run when newly coupled together into true alignment with each other; so much so that it is as yet customary for each section roller to be coupled up to its companion roller before turning their outer diameter to the finished size, and, after uncoupling, each second roller, the unturned roller having then to be turned up whilst in their coupled state to their companion rollers, which makes against their manufacture in duplication in case of accident through their not being interchangeable. With a revolving milling cutter all the four sides of the male square ends are milled while revolving by being brought into contact with a single milling cutter made in one piece (or blocked together in sectional parts), so that each so-milled surface is of equidistance from the centre of the roller, and equilateral also in alignment with the body of the roller so operated and finished.—Feb. 9, 1901.

3418. Shake willows. Feb. 21. H. Morton and W. Morton, Heckmondwike, Yorkshire. The wool is put on to a sliding server or table and taken into the machine automatically. When it has been in the requisite time (one minute), it is delivered out at the top on to a revolving sheet, which conveys the same out as the side of the machine; thus the dust is kept in the machine, as it is continually closed up when cleaning the material.—Jan. 26, 1901.

3640 Warp beaming machines. Feb. 24. J. T. Haworth, T. C. Usher, and A. E. Hodgson, 10, Harrison-road, Halifax. Relates to improvements in warp beaming machines, the object being to combine with such machines a frictional device applied to the beam arms, or to the shaft of the latter in such a manner that the warp beam is prevented from jumping or jarring, and is kept in close contact with the driving drum, and the yarn is consequently laid evenly on the warp beam.—Jan. 12, 1901.

3727. Knitting machines. Feb. 26. C. H. Aldridge, Pinfold-gate, Loughborough. The object is to produce improvements in rotary or flat-bar knitting machines when adapted to make what is known as lacework or open work in socks, hose, underwear and the like. The improvements are intended for knitting machines known as "Cotton's patents"; but they are also applicable to other types of knitting machines.—Jan. 19, 1901.

4065. Carding engines. March 3. J. Fairclough, 7, Salt-street, Shaw. After having stripped the cylinder, the operative often neglects to close the door, and as the strippings from the flats fall in front of the respective opening, the operative cannot see whether the door is closed or open. These flat strippings are removed from time to time by the operative, and it has frequently happened that owing to the door having been left open, the operative's hands have been caught between the cylinder and doffer, and the operative has thereby received serious injury. The invention provides means whereby the door is closed automatically, and thereby such injury is entirely obviated, and consists in placing the door under the influence of a spring or weight having a tendency to close it, and providing the stripping brush with means which control the action of the spring or weight—*i.e.*, means which, whilst the brush is in its bearings, retain the door open, and when removing the brush allow the spring or weight to close the door.—Jan. 19, 1901.

4215. Tubes, bobbins, and spools. March 6. F. D. Irvin and J. Baldwin, 8, Waverley-road, Preston. Relates to improvements in the manufacture of tubes, bobbins, spools and pirns employed in machinery for preparing and spinning textile fibres, and the object is to strengthen and otherwise improve such bobbins. The body, say for a tube, is formed of wood, papier-mache, or any other suitable foundation material. If of wood (which may be of lighter and cheaper quality than is at present considered satisfactory for such purpose), care is taken to employ it in a highly-seasoned state, and if of other material, in an unshrinkable condition. This body is enclosed in a sheath or cover of metal, which may be either solid drawn or seamed longitudinally and internally, the seam being brazed, soldered, lapped and pressed or otherwise suitably made up so as to form a tube, and, if necessary, the body of the tube may be grooved longitudinally to receive the seam.—Jan. 12, 1901.

4374. Lace curtains. March 7. R. F. Carey, Heathcote-street, Nottingham, and G. Cholerton. The object is to securely fix a cord across the curtain or lace fabric at any point along its length. Preferably the cord is not attached throughout its length, but loops are left at intervals through which hooks or pins can be gathered to suspend the curtain. In order to do this a channel is fixed above the warp sley, running the whole length of the machine, and the cord is placed in this channel. This may be done by a carrier drawn through the channel by lines attached to loops at each end of the carrier. When the part of the curtain where the cord is required is arrived at, the cord is raised above the carriages. When they are at the back, then the carriages coming to the front fasten the cord to the warps and the points take it up.—Jan. 19, 1901.

4481. Noble's combs. March 9. W. Holdsworth, Mount-street, Halifax. Relates to improvements in Noble's combs, and consists in so mounting or fixing the pins in the circular brasses or circles and so forming the pins that portions of the pointed ends of the pins in adjacent circles lie approximately parallel to one another, consequently the fibre is easily driven on to the pins by the action of the dabbing brushes, and with less wear and tear of the latter.—Jan. 12, 1901.

4584. Circular warp machines. March 10. H. Hill, 63A, Mansfield-road, Nottingham. Relates more particularly to improvements in circular warp machines, such as described in the Specification of Letters Patent No. 3605 of February 10, 1897, for producing seamless tubular warp lace fabrics.—Feb. 9, 1901.

4858. Treating velvet. March 14. R. Cleff, Crefeld, Steckendorfer-Str. 74; F. J. Schmall, and A. Langen. Relates to a mechanical teasing process for giving a fuller appearance to common velvet fabrics.—Jan. 19, 1901.

5040. Colouring matters. March 16. J. Y. Johnson, London (communicated by The Badische Anilin and Soda Fabrik, Ludwigshafen-on-Rhine). Relates to the manufacture of new aromatic compounds and dyestuffs by condensing one molecular proportion of 1. 3. 4. 6 dinitro-dichlor-benzene with one molecular proportion of ortho-amido-phenol, para-amido-phenol, or the ortho-sulpho or ortho-carboxylic derivative of the latter.—Feb. 1, 1901.

5066. Bleaching. March 17. H. Hadfield, Fir Cottage, Buxton-road, Furness Vale. The cloth is singed and then steeped in rope form for some hours in water, or in some cases it is passed through a weak sour solution. While still in the rope form it is washed in water, and after opening out is passed through a weak solution of caustic soda and lime, whence it is taken in the form of a rope to a steaming vessel, where it is exposed to the action of low-pressure steam for several hours. This steaming vessel, which may be constructed as a modified form of an ordinary boiling kier, is provided with a plurality of perforated steampipes between and round which the cloth is disposed for the steaming operation so as to distribute the live low-pressure steam throughout the interior of the body of the cloth On leaving the steaming vessel the cloth is rewashed, preferably in hot water, and again subjected to a souring bath. After being washed again the cloth is treated in the manner described in Patent 29,645, 1896. An important feature is that at no stage is the cloth boiled or subjected to the percolation or circulation of large quantities of liquids through the cloth.—Jan. 12, 1901.

5093 Stretching fabrics. March 17. J. Westley, 10, Southview, Belvoir-avenue, Levenshulme, Manchester. Relates to apparatus for stretching cloth in the direction from selvage to selvage, so as to increase its width, and consisting of an arrangement of sector stretching plates arranged on a revolving frame, and traversing in directions parallel with their axes of rotation, and provided with grooves so as to stretch the cloth in opposite directions from the centre, each having an increased effect according as its position is more remote from the centre of the series, and consists in a more efficient means of driving and traversing such stretching plates —Jan. 19, 1901.

5126. Producing jacquard designs. March 17. J. Y. Johnson, London (communicated by La Société de Dessins Industriels, of 15, Rue Hégésippe-Moreau, Paris). Relates to a process for producing on a card a design formed by the combination of a series of patterns obtained from a ground pattern, such process consisting in successively projecting upon a sensitised support two photographic impressions, of which one represents a surface divided into squares, while the other exhibits the points representing the ground pattern, a screen being so applied to the last-mentioned negative as only to allow the light to pass through the portions corresponding to the ground pattern and the patterns derived therefrom, such screen being covered with a series of translucent supports, or having folded down upon it successively a series of translucent films arranged in accordance with the impressions of the several patterns derived from the first, and each having blackened or dulled parts or patches where they have received the necessary impressions through the supports or films previously applied, the application of the main screen and the replacing of the supports, or the folding down of the films thereon, being followed by those operations which remain to be performed in order to obtain upon the pattern card the impressions of the ground pattern and the patterns produced therefrom.—Jan. 12, 1901.

5138. Looms. March 17. The Radax Pneumatic Tyre Company Limited, 3, Winwick-street, Warrington, and W. Caldwell. Relates to looms for the manufacture of textile fabrics for forming the outer covers of pneumatic tyres or other similarly shaped articles, and relates more particularly to looms of the character described in Patent 9631 of 1898.—Feb. 1, 1901.

5237. Scutching flax. March 20. T. F. Mackie, Albert Foundry, Belfast, and G. Shaw. Relates to machines employed in the breaking or scutching of flax, in which the scutching rollers receive an oscillating movement, in addition to the usual onward rolling motion. The improvements are designed to produce such motions simultaneously, and in a more effective and simple manner than hitherto. Fig. 1 is a sectional elevation on line *x y* in plan. Fig. 2 is a plan of the mechanism. A is the framing of the machine. B is a cross-shaft, C and D are loose sleeves mounted on cross-shaft B. Fixed to sleeve C are the wheels E and F, and fixed to sleeve D are the wheels E^1 and F^1. The bevel wheels E and E^1 gear with a carrier bevel G, which is loosely mounted on a pivot at one end of the lever H. Lever H is pivoted on shaft B at H^1. The other end of lever H is connected to an eccentric K by means of pin R and link J. Lever H is provided with a slot so that pin R may

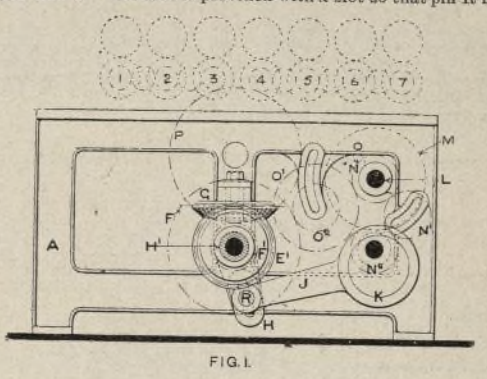


FIG. 1.

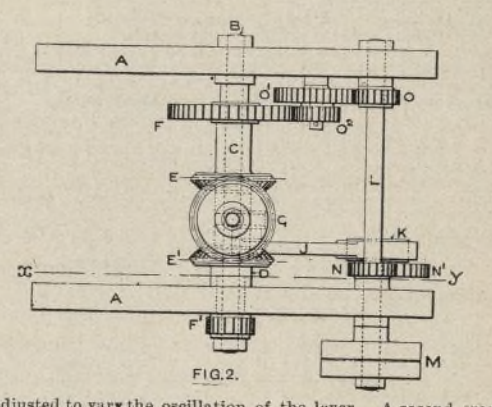


FIG. 2.

be adjusted to vary the oscillation of the lever. A second cross-shaft L, upon which are fixed the driving pulleys M, drives the eccentric K by means of the adjustable gearing N, N^1, N^2, N^3 being a change wheel to vary the speed of eccentric K. The spur wheel F is driven by adjustable gearing O, O^1, O^2, O^3 being a change wheel to vary the speed of F. The spur wheel F^1 drives the rollers of the machine 1, 2, 3, 4, 5. 6, 7 by means of the carrier wheel P. It is obvious that any oscillation of the lever H and bevel wheel G, either forwards or backwards, is reproduced on sleeve D and communicated to the rollers 1, 2, 3, 4, 5, 6, 7, also that such oscillation requires no separate adjustment and timing of various parts. Further, it will be seen that loose sleeve C is being driven at a constant rate, and that its motion is transmitted to loose sleeve D, causing sleeve D to receive a constant onward motion, in addition to its oscillating motion. Thus all dead centres on loose sleeve D and consequently on rollers 1, 2, 3, 4, 5, 6, 7 are avoided.—Jan. 26, 1901.

5459. Anthracene colouring matters. March 22. J. Y. Johnson, London (communicated by The Badische Anilin and Soda Fabrik, Ludwigshafen-on-Rhine). Patent No. 21,572 of 1899 shows that by treating certain diamido-anthraquinone-sulpho acids with certain halogens in aqueous solution, halogen derivatives of diamido-anthraquinone are formed, whilst the sulpho group is probably split off. By subjecting the alpha and beta nitro-anthraquinone-mono-sulpho acids described by Claus ("Berichte der Deutsche Chemische Gesellschaft," 15, 1514) to the action of reducing agents, they are easily converted into reduction products which are presumed to be the corresponding amido-anthraquinone-sulpho acids. It is found that these mono-amido-anthraquinone-sulpho acids are converted, by the action of chlorine or bromine, for example, in aqueous solution, into halogen derivatives; but in this case the sulpho group is not split off, and halogen-amido-anthraquinone-sulpho acids result. These are in themselves colouring matters, and dye wool red to brown shades; but they may be used as initial products for the manufacture of other new dyestuffs.—Feb. 1, 1901.

5495. Cutting cloth. March 23. M. Musgrave and G. A. Barnes, 583, Chorley Old-road, Bolton. Relates to a new or improved machine for cutting cloth to any required width, or in two or more widths at one and the same time, and consists of suitable framework provided with adjustable bearings in which is mounted a screwed spindle, on which are disposed any desired number of circular cutters secured and adjusted in any convenient manner to compensate for wear and tear.—Jan. 19, 1901.

5605. Carding engines. March 26. E. Tweedale, S. Tweedale, and J. Smalley, Globe Works, Castleton. Mounted on the side frame of the engine is a semi-circular casting provided with a series of radial slots and a radial groove. Within the radial groove is received a toothed segment at the back of which is a stud; there are also steadying or bearing lugs and slots. One end of the stud is passed through one of the radial slots, and to this end is bolted a slide bar extending across the end frame of the engine, and provided at each end with an operating hand lever. The centre portion of the slide bar is preferably curved. When either handle is operated the segment wheel is caused to move in its slotted groove, and as the segment wheel is in gear with a bevel pinion mounted on the lower end of a short shaft carried by a boss and collar, the shaft receives a partial rotation, and at its upper end is a finger and crankpin, the latter being received in a slot formed in the end of a casting which at its outer termination forms a collar which carries the strap fork, so that when either hand lever is operated the segment pinion and crankpin impart the requisite lateral movement to the casting carrying the strap fork on its supporting axis. The axis is provided with three squared parts, on one of which rests the end of a spring stud. The end of the stud protrudes through the boss of the strap fork and bears on one of the squares, so serving to hold the strap fork in any one of three positions—that is to say, on either side of the driving shaft or in a neutral position, so that the strap guide can be instantly set so as to receive and control the driving strap from either the right or left of the engine, or for throwing the guide clear of the strap when necessary. Facility for adjusting the strap fork to any required angle is provided by a series of radial slots formed near the outer diameter of the curved casting first mentioned as the strap fork, and its carrying and operating parts can be readily transferred from one slot to another on the curvature of the said casting, and thereby the fork can be set to receive a driving strap at any required angle.—Feb. 9, 1901.

5765. Decorticating. March 27. T. Burrows, Hope Villa, Clarence-street, Staines, and J. F. Woods. Relates to a machine or apparatus for decorticating and scutching fibrous plants, stems, or straws, consisting of the combination with feed-crushing rolls and scutching devices, each pair of which extend the full width of the machine, of a feed trough located to one side of the machine, an overhead endless travelling belt mounted to the opposite side of the machine, and adapted to return the fibrous material when laid thereon to the feed end of the machine, and a feeding apron arranged below the overhead belt, and adapted to feed the fibrous material for the second time into the machine, but at another point in the feed-crushing rolls to where the same is fed in for the first time.—Feb. 9, 1901.

5858. Laying cloth in layers. March 29. J. B. Barton, Palace-street, Market-street, Manchester. Relates to apparatus for laying cloth in layers and cutting it into lengths, such as is described in Patent 17,003 of 1898, and has for its object to prevent slackness of the cloth during delivery.—Jan. 12, 1901.

5936. Winding yarn. March 30. J. Gordon and J. M Malloch, Blackness Foundry, Dundee. Relates to winding machinery in which the yarn or thread is wound in the form of a cylindrical ball on a spindle extending across between outwardly extending arms of a carrier, so that balls of various widths may be formed in an expeditious and satisfactory manner. In this class of machinery as hitherto constructed, when it was desired to form a ball of a width less than the full size for which the carrier was intended, the ball was held whilst being wound in the desired position on the spindle extending between the arms of the carrier by a collar or collars adjustably fixed on the spindle. Now the arms of the carrier are made adjustable, so that they can be moved more or less outwards or inwards from the centre to suit the width of the ball intended to be wound. This is effected by having a plate or bar fixed or formed transversely on the part of the carrier which is hinged on the framing. This plate is of a length suitable for the largest width of ball intended to be formed, and is made with two longitudinal slots extending one on each side of its centre. Fitting strips are formed on the upper and lower edges of the plate, the arms being made with counterpart recesses, so that when in place the arms can slide inwards or outwards on the plate. When the arms are in the desired position to suit the width of ball intended to be formed, they can then be secured by nuts on screw bolts passed through holes formed for them in the arms and through the slots in the transverse plate —Jan. 26, 1901.

6092. Flax spinning. April 2. J. H. Webster, Kincardine, Scotland. Relates to improvements in drawing and roving machines for flax, jute, and the like, the object being to improve the quality of the yarn and to reduce the waste which at present obtains.—Jan 19, 1901.

6119. Cleaning spinning rollers. Oct. 4. S. Davenport, Saint Pol-sur-Mer (Nord), France. Has reference to an improvement in the manner of covering rubbers used in spinning and similar machinery. This improved covering is more economical than any previously used, and renders the work of the rubbers more efficient. A covering is made for the rubber by winding it with string or cord of manilla, hemp, or other fibre of any suitable kind. The winding or wrapping of the cord round the rubber is done helically, in such a way that the spirals, being in contact, completely cover the surface —Jan. 26, 1901.

6193. Lustring yarns. April 3. A. Mellor, Stanley Mount, Crompton-road, Macclesfield, and H. E. Mowbray. Relates to machines for clearing or cleaning and lustring yarns of silk or like fibres, and the primary object is to provide means and so arrange certain parts of the machine with respect to each other that the number of times which the yarns must be traversed through the machine to obtain the desired result is minimised and a considerable saving in time and labour therefore effected, a cleaner yarn being likewise obtained and the lustre thereof enhanced.—Feb. 9, 1901.

6268. Cotton cords. April 4. J. Collins, Halifax-road, Todmorden, and A. Collins. Relates to improvements in the manufacture of cotton cords or other ribbed pile fabrics and the like, in which it has hitherto been customary to have each cord or rib made up of six or more ends of warp—namely, four back ends and two face ends, or six back ends and two face ends, or a somewhat similar arrangement, the object being to arrange the warp ends in a different way, and so that more weft can be put into a piece of a given weight and less warp, which results in a fabric having a softer finish, especially in goods of a light character. The fabrics are made with four or five warp ends to each rib. Thus in a four-end cord two face ends and two back ends are used, whilst in the five-end cord there are two face ends and three back ends. Any or all of the four or five ends composing the warp for each rib may be of single twist, double twist threefold, or any other multiple of fold that may be most suitable for production of the fabric required. And again all the ends to each rib may have additional ends, and may be drawn in one, two, three, or more in the heald.—Feb. 9, 1901.

6591. Knitting machinery. April 9. J. C. Moore, 18, Crafton-street, Leicester. The object is to introduce a system of jacks and needles working in combination and in such a manner that the needles do not require to be soldered to, or in the jacks as is done in the methods now employed.—Feb. 9, 1901.

7074. Black colouring matter. April 17. C. D. Abel, London (communicated by Actien-Gesellschaft für Anilin-Fabrikation, Berlin). Relates to the production of a black colouring matter directly dyeing cotton, and is based on the observation that when a mixture of molecular proportions of picramic acid and dinitro-oxydiphenylamine is boiled with sulphur and sulphides of alkali metals it is transformed into a sulphurised bluish-black dyestuff.—Jan. 26, 1901

7075. Black colouring matter. April 17. C. D. Abel, London (communicated by Actien-Gesellschaft für Anilin-Fabrikation, Berlin). Relates to the production of a black colouring matter directly dyeing cotton, and is based on the observation that when a mixture of molecular proportions of dinitrophenol ($OH : NO_2 : NO_2 = 1 : 2 : 4$) and of dinitro-oxydiphenylamine is boiled with sulphur and sulphides of alkali metals, a sulphurised dyestuff is obtained.—Jan. 26, 1901.

7076. Black colouring matter. April 17. C. D. Abel, London (communicated by Actien-Gesellschaft für Anilin-Fabrikation, Berlin). Relates to the production of a black colouring matter, and is based on the discovery that when the dinitro-cresol is boiled with sulphur and sulphides of alkali metals, a sulphurised dyestuff is obtained.—Jan. 26, 1901.

7292. Blue trisazo dyestuffs. April 19. H. E. Newton, London (communicated by the Farbenfabriken vormals Friedrich Bayer and Co., Elberfeld). Relates to a new and useful process for the production of valuable trisazo colouring matters, and consists in first combining a diazo derivative of monoacidylparaphenylenediamine, such as acetylparaphenylenediamine with one molecule of one of the Clève's alphanaphthylamine beta-sulphonic acids (alpha$_1$-beta$_3$ or alpha$_1$-beta$_4$); secondly, rediazotising the resulting amidoazo compounds, and combining the diazo derivatives thus obtained with a second molecule of one of the Clève's acids; again diazotising the resulting amidodisazo dyestuffs and coupling the diazo compounds thus produced with a naphthol-mono or disulphonic acid. From the resulting dyestuffs the acetyl groups can be split off, colouring matters which can be rediazotised on fibre being thus produced. The last-mentioned dyestuffs dye unmordanted cotton from reddish-blue to greyish-blue shades. When diazotised on fibre and coupled with betanaphthol, they yield blue shades of considerable value, which are distinguished for their fastness to light and to washing.—Feb. 9, 1901.

7566. Embroidering. April 24. J. H. Hollinghurst, Torriano Buildings, London, N.W. Is an improvement upon Patent 432 of 1888, and relates to a new or improved manufacture of machine embroidery twist consisting of three or other odd number of cords having a loop of four or other even number of cords at one end.—Feb. 9, 1901.

11,107. Jacquard looms. June 19. E. Edwards, London (communicated by C. Handwerck, Leipzig). Consists of improved methods of constructing and using patterns serving by, the aid of electricity, for regulating the operation of card punching machines and jacquard and other looms. Patterns of this kind hitherto known have consisted of a plate of a material conducting electricity, upon which plate the pattern is drawn with an insulating varnish, or the design is etched into the plate, or upon which plate the free space between the outlines of the design is filled up with insulating material, and the design itself is left bare In making use of such a plate as an electric pattern the sliding contact terminals or the means for completing the electric circuit must be insulated from one another, and this condition implies considerable distances being left between the terminals—that is to say, the plate must be made of great size, and the design of the pattern thus becomes unduly enlarged. The invention has for its object to entirely avoid this disadvantage, and it consists substantially in making the pattern of various portions, which may either be separated from one another, or each of which may be separately insulated from the others. With the improved electric pattern it is rendered possible to increase or diminish the dimensions of the same according to requirement, without being compelled to take its insulation into account. The terminals for completing the electric circuit which slide over the pattern may be constructed as brushing combs, being slightly elastic either as a whole or in their separate portions, according to the object aimed at. It is also rendered possible to make use of the improved electric pattern for several hand-looms working simultaneously and uniformly, the warp and weft threads in all of them being selected and actuated by the electric currents passing through the pattern, and thence through the several looms. It is applied to the machines in the same manner as has been hitherto usual with a pattern consisting of a plate—that is to say, after having placed the various strips which constitute the pattern block or surface directly and tightly against one another, all their combined surfaces together may be considered as one uniform surface. As soon as the design has been made in any of the known manners, the strips are, when they are required to be used, separated or insulated from one another.—Feb 1, 1901.

11,257. Hosiery. June 21. I. Briggs, jun., Rutland Mills, Wakefield. Relates to improvements in the manufacture of stockings and other hosiery, and in the machinery to make shaped or fashioned stockings and other knitted articles with the same number of stitches in the narrow or contracted parts as in the wider parts —Feb. 9, 1901.

11,507. Chenille spotting machines. June 29. L. O. Trivett and F. Randall, 4, Lavender-street, Nottingham. Relates to improvements in automatic machines for forming and attaching loops of chenille or like material to lace nets, such as veilings or other fabrics, so as to form what are termed chenille spots.—Jan. 19, 1901.

11,908. Extracting moisture from fabrics. July 2. Janet Miller, John Miller, Robert Miller, and John Miller, 162, Manningham-lane, Bradford. Relates to the suction tubes or rollers employed in apparatus for waterproofing fabrics, and for other suitable purposes. These tubes or rollers are for extracting all superfluous moisture or liquid from the fabric passing over same. Hitherto the suction tubes or rollers employed have been unable to efficiently extract the superfluous moisture or liquid from fabrics—in the first place on account of an unavoidable leakage in the suction; in the second place, of great inequality in the action of the suction upon the fabric, consequent upon the suction outlet being at one end of the tube; thirdly, the amount of friction of the fabric upon the tube set up by the suction often causes the same to twist or overlap in its passage over the said tube, thereby stretching or otherwise damaging the fabric. With the invention leakage of suction is prevented by adjusting the area of the suction according to the width of the fabric passing over same.—Feb. 9, 1901.

13,767. Preparing, carding, and cleaning wool. July 31. A. J. Boult, London (communicated by H. and J. Sonneville, Rue Carnot, La Madeleine-lez-Lille, France, and E. Landriau). Consists essentially in passing the raw material, consisting of wool or the like, from a feeding cylinder to a drawing or stripping cylinder or device turning in the same direction, and preferably at a greater speed, and in interposing between the two cylinders a baffle device or retaining plate, arranged in such a manner as to cause the stripping cylinder to remove from the feeding cylinder a layer or lay of the raw material, drawing it in a broken line over the edge of the retaining plate, thereby forcing the fibres to open or straighten out when passing over the fixed retaining edge and to arrange themselves parallel with each other, while on the lap itself an effect of lamination is produced. The foreign bodies contained in the raw material are thus completely exposed without any destructive effect taking place, and can be easily extracted by the carding devices.—Jan. 12, 1901.

13,768. Extracting impurities from fibrous material. July 31. A. J. Boult, London (communicated by H. Sonneville, Rue Carnot, La Madeleine-lez-Lille, France; J. Sonneville, and E. Landriau). Relates to a device for extracting teasels, burrs and other foreign bodies contained in fibrous material, comprising a fixed plate arranged in a direction tangential to the lap-stripping cylinder and against the direction of movement of this cylinder, and a rotatory cylinder or block provided with blades, and turning in contact with the bevelled edge of the fixed plate and in the direction of the latter, for the purpose of producing a clean separation of the foreign bodies from the fibres and of avoiding all danger of breaking the fixed plate —Jan. 12, 1901.

13,876. Winding fabrics. Aug. 2. W. P. Simpson, Overbrook, Montgomery, U.S.A. Relates to machines for winding cloth, and more especially to that class of machines in which the operation is continuous by winding a roll of cloth in contact with a driving roll and then transferring it while continuing the rotation, and cutting the cloth and starting the winding of another roll. Heretofore this has been accomplished by the use of three driving rolls, the cloth roll resting upon two of the same and turning therewith until it is of the proper size, and being then transferred to a position to be turned by one of the first pair of rolls and a third roll. The object is to reduce the cost of construction and facilitate the operations in this class of machines.—Jan. 12, 1901.

14,536. Drawing frames. Aug. 14. A. W. Mathewson, Lewiston, Maine, U.S.A. The improvements, while applicable to the various forms of railway heads and other similar forms of machinery in use in the transformation of cotton fibres into yarn, are designed with more especial reference to the forms of such mechanisms described in Patent No. 17,192, 1896, their object being to simplify the construction of these general classes of machines, and, while making them more compact in form and sensitive in operation, to render them more efficient and reliable in action than has been possible with machines of these classes as heretofore constructed. To accomplish this it consists, first, in the means through which the front or last pair of drawing rolls and the calender rolls are operated from the main driving shaft of the machine; second, in an evener mechanism and in the means through which the back pairs of drawing rolls are operated from the cone pulley or drum of the machine, and the speed of rotation of these pairs automatically varied in their speed with respect to the speed of the front pair of drawing rolls as the condition of the material passing through the machine may demand; third, in mechanism through which the trumpets are counterbalanced, and devices through which this mechanism is both thrown out of operation when the weight thereon has been moved in either direction beyond certain limits, and afterwards brought back into operation when the weight is retracted therefrom; fourth, in evener drums or pulleys and in the appliances through which the belt passing over them is maintained at a uniform tension at any position to which it may be adjusted; and fifth, in means through which the stop motion of the machine is operated.—Jan. 19, 1901.

15,706. Double-sided pile fabric. Sept. 4. J. Zimmermann, Krefeld, Oberstrasse 15. Relates to a double-sided pile fabric of the kind described and claimed in Patent No. 7652, 1900, and its object is to produce a new tie by which a considerable number of pile warp threads for both the upper and lower pile warp may be saved.—Jan. 19, 1901.

15,987 Printers' blanketing. Sept. 8. F. Reddaway and Co. Limited, Cheltenham-street, Pendleton, Manchester, and G. Mack. Has reference to the weaving of an improved fabric for printers' blanketing and other purposes. The essential feature consists in weaving each pick of weft alternately on the face and back of the fabric. To effect this a three-shaft loom is used, or a loom with shafts a multiple of three. In inserting the pick at the top or face of the fabric the healds are manipulated so as to raise one and lower two, which will lay the pick upon the face of the fabric. On the return of the shuttle the healds are lowered one and raised two, so as to insert the weft pick at the back of the fabric, and so on. The weft threads laid alternately at the top and bottom of the fabric do not cross each other, but on the contrary the warp which forms the face of the fabric also forms the back —Jan. 19, 1901.

16,161. Mercerising yarn. Sept. 11. W. R. Lake, London (communicated by F. C. Johnson, 110, Worth-street, New York, U.S.A.). Relates to a machine for mercerising hanks, which are placed over two sets of rollers, these latter being capable of exerting a tension operated by screws. Bowls containing the liquor are placed underneath.—Feb. 1, 1901.

16,601. Hawking machines. Sept. 18. W. Turner, Wheatley Dyeworks, Halifax. Provides an improved means of stripping the pieces from the rollers as they pass through the hawking machine, whereby all possibility of damage to the pieces is prevented. With the present system of strippers the piece in passing through the rollers sometimes adheres to the same, and should the blade stripper not be in close contact with the roller at any part from some cause or other, the piece gets between and is in every instance badly damaged. With the improvement this possibility is entirely obviated. The fast and loose rollers are formed with a series of necks a suitable distance apart; attached to the scray lag are a corresponding number of metal bands or strippers, which pass around the nipping side of the rollers, and are again attached to the opposite side of these lags; the metal bands within the necks are nearly flush with the outer peripheries of the rollers, which are free to revolve, while the metallic bands or strippers remain stationary. When the piece passes through the rollers of the hawking machine it travels direct to these bands or strippers, which, being slightly below the surface of the rollers, lift and drop the piece into the vat.—Jan. 26, 1901.

17,462. Straight-bar knitting machines. Oct. 2. H. Kiddier, Waterway-street, Nottingham. Relates to two modifications of the machinery described in Patent 2255 of 1882. In the first modification, when applied to a straight-bar knitting machine, a flat bar is used, on which two pairs of narrowing brasses slide to each division, the brasses being connected by rods working in pairs, each pair being controlled by a worm box at the end of the machine. Each worm box carries an arm attached to one of a pair of bars which connect the right narrowing brass in one division of the machine to the right narrowing brasses in the other divisions. Between the pair of bars an axle is fixed on the flat bar first named, on which a pulley runs loose. Round the pulley is a flexible steel or other band, its upper end being secured to the upper bar of the pair and its lower end to the lower bar, which is connected to a bracket operated by the worm in the usual way. The upper end of the flexible band carries a chain or cord passed over a second pulley and provided with a weight at the end of the machine, thus keeping the band tight, thereby causing the bars to slide the reverse way to each other at each operation of the worm box. A like set of parts are supplied to the worm box at the reverse end of the machine to control another pair of bars connected to the left narrowing brasses in each division of the machine. The second modification consists in securing an axle on the flat bar first named, between each pair of bars connecting the narrowing brasses; the axle carries a toothed pinion wheel engaging with toothed racks formed in or secured to the bars, thus causing them to slide the reverse way to each other at each operation of the worm box.—Feb. 1, 1901.

18,090 Shuttles. Oct. 11. A. Baldwin, Goffs Falls, Hillsborough, U.S.A. The object is to provide a more even and uniform tension, and of a construction whereby the tension is adapted to be automatically released by contact of the filling thread when any dangerous increase of the natural tension is encountered, and comprises an automatic tension device for loom shuttles, so constructed as to gradually decrease or increase as the requirements of the yarn on a bobbin may demand.—Jan. 12, 1900.

18,436. Printers' blankets. Oct. 16. J. E. Rhodes, 776, Carroll-street, Brooklyn, New York, U.S.A. Consists of a printers' blanket, having at one side a number of independent projections made of such proportions and elasticity that they may expand transversely, and having on the other side a material practically incapable of being stretched.—Feb. 1, 1901.

19,187. Spinning and doubling. Oct. 26. G. Salffner and A. Soergel, Hof, Bavaria. Relates to a machine for spinning and doubling yarn, in which the spindle for receiving the yarn does not rotate. Thus the bobbin, pirn, or cop is formed at rest with respect to rotation, unlike all known practice wherein the bobbin, pirn, or cop is formed by rotation with the spindle, or by means of the spindle.—Jan. 12, 1901.

21,397. Mercerising. Nov. 26. F. Simons, Golzheim 24, Dusseldorf, Germany. Relates to restoring the cotton to its original dimensions, while using but little force, and while recovering nearly the whole of the soda liquor which had been taken up by the cotton during mercerisation.—Jan. 12, 1901.

21,754 Checking picking sticks. Nov. 30. F. A. Mills, 203, Broadway, Methuen, Mass., U.S.A. Regulates the speed of the flight of the shuttle, cushions and prevents the destructive effects generally of the picker-staff motion caused by throwing the shuttle through the open shed from one shuttlebox to the other; and consists in the provision of a strap buffer carried around rolls mounted to roll freely with the movements of the strap under the impact of the picker staff and the tension of a spring.—Jan. 12, 1901.

23,664. Cloth tentering machines. Dec. 27. J. J Fearon, 1152, North Third-street, Philadelphia, U.S.A. Heretofore the side rails of that class of tentering machine in which such rails swing back and forth have been operated by a disc plate with a crankpin inserted in it a sufficient distance from the centre of the

FIG.1.

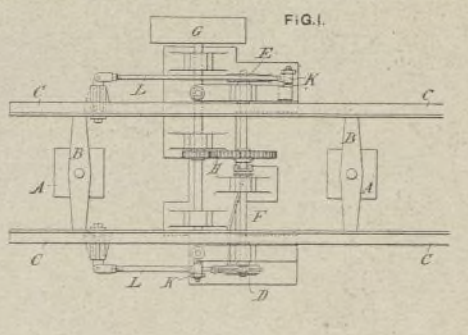
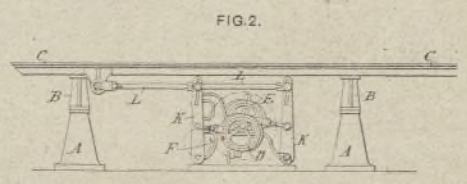


FIG.2.



disc to give the desired longitudinal motion to the rails and a rod connection between the crankpin and the rail. It has been found in practice that with this customary mechanism it was necessary to bolt the machine down very solidly, and even to supply special foundations for it, owing to the momentum of the heavy side rails, and that there was a large amount of resulting jar which has become particularly objectionable with the modern machines using nicely-adjusted chain clips, owing to the tendency of such jarring to throw the chains out of their proper place and otherwise interfere with their proper working. The mechanism described herein prevents this jarring to a very great extent, and makes it possible to run a machine with much less attention paid to its foundations, and at a higher rate of speed. Fig. 1 is a plan view of such parts of a tentering machine as are required, and Fig. 2 is a side elevation of the same. In these drawings A, A represent the standards for the machine throughout its length resting upon the floor or proper foundations, and B, B cross arms resting and swinging upon the standards A, A and supporting the side rails C, which rails carry the chains for holding the edges of the cloth to be tentered. These side rails are swung back and forth by means of the two eccentrics D and E, each consisting of a disc and its surrounding strap, and located one on each side of the machine and mounted upon the shaft F, and which latter is driven by the pulley G and spur gears H, or in any other suitable manner. These eccentrics are each connected to one of the upright levers K, and they in turn by the rods L to the side rails C. Provision is made by means of the slots in the upper ends of the levers K for varying the amount of the swinging motion given to the rails, but it is manifest that the same result of varying the throw of these levers may be obtained in many other ways. By observing and comparing Figs. 1 and 2 it will be seen that the lever arm K on one side of the machine (as, for example, the lower side, as shown in Fig. 1) is placed on the left side of its eccentric D, while the lever arm on the other side of the machine is placed on the opposite or right side of its eccentric E. Such a position of the levers with reference to their respective eccentrics is necessary in order to use eccentric and lever on both sides of the machine, owing to the fact that if the connection between the two eccentrics and their respective side rails are upon the same side of both eccentrics, the latter will bind and fail to work upon portions of their revolution.—Jan. 26, 1901.