THE TEXTILE MANUFACTURER:

WITH WHICH IS INCORPORATED

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

No. 317.—Vol. XXVII. MAY 15, 1901. Price One Shilling.

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NOTES OF THE MONTH.

Method of Numbering Yarns.

THE report of the recent international congress held in Paris to try to arrange some plan for a general count system has recently been issued, but will probably have little effect upon the English-speaking race. When one considers that Great Britain, the United States, and all the English colonies have a common standard, not only of linear measurement, but for calculating cotton and worsted yarns, it does not appear reasonable to expect a change. Continental manufacturers and spinners naturally wish to have an international counts arrangement based on the metric system, but it does not appear practicable to overlook the fact that the great majority of spinners and manufacturers have already this common standard. If there was any definite chance of the metric system, or even the decimal system, becoming general in England and America, there would be more inducement for the English-speaking race joining in the proposed method. As it is, thousands upon thousands in the different stages of manufacture know, judge, and calculate cotton and worsted yarns by their hank of 840 and 560yds. respectively, and it is only regrettable that such a general system has not been extended to woollen yarns. In the proposed system, one metre of No. 1 yarn would weigh 1grm.; or changing to our measures by substituting the English equivalents for the metre and the gramme, 1094yds. of No. 1 yarn would weigh 15·432 grains. The weight in grains of 120yds. of No. 1 yarn as measured by the proposed international metric standard would be :—Weight of yarn : 15·432 : : 120 : 1·094 = 1692·72 grains. To find the number of yarn English cotton standard corresponding to the number of the proposed international metric standard, multiply the international number by 0·59. That is, 1000 ÷ 1692·72 = 0·59076. On the other hand, to find the number of yarn international metric standard corresponding to the English cotton standard, it is necessary to multiply the English number by 1·69. That is, 1692·72 ÷ 1000 = 1·69272.

The Length of Pieces.

A FEW years ago an attempt was made to limit the length of heavy pieces, but the anxiety to obtain work in slack times made the result hopeless, and excessive lengths were as common as ever. Then again the matter was revived a short time ago by persons interested in the press setters and other finishers' employés, who suffered from handling pieces much too heavy either for safety or good work. At the time we suggested that modern means of transport should be adopted, and that pieces too heavy for manual labour should be moved by power. It would be absurd to give up making large boilers, engines, or other machines just because their component parts were too heavy or too cumbersome; but, on the other hand, it would be just as absurd to expect these parts to be lifted without cranes or derricks. However, the Huddersfield Dyers' and Finishers' Association are very reasonable in their recent requests. Their projected rules do not come into force too suddenly, for the present system is to extend until the end of this month; then from June 1 to August 31 pieces made from warps longer than 70yds. will be charged *pro rata* for overlength; whilst after September 1 it is stated that under no conditions will pieces longer than the above dimensions be accepted. This time the finishers seem to be in earnest, and their association appears strong enough to make a fair stand in the matter, although it is expected that the above terms will be somewhat modified. The chief objectors to the change are the merchants, who are perhaps the best men in the trade for bleeding anything, and who have been the cause of all the trouble. Long pieces have been better for warper, weaver, and manufacturer, but these people have taken them—when they could get them—more as a benefit than a right. The merchant, on the other hand, has frequently resorted to "lumps" or double pieces, which, made and finished as one piece, came in at the price of single pieces, but were afterwards cut in two or more by the merchant. It is contended that under the new system the orders will be smaller, as goods are ordered per number of pieces and not by the number of yards. This statement is only partially correct, and where such is actually the case it is scarcely probable that people will wear less clothing just because pieces are made of a reasonable length. If paid for accordingly, however, and not worked under false pretences, there should be no curtailment of length with the mechanical advantages of the present day. If a man cannot do it, machines generally can, and if long pieces are demanded either now or at some future time, English finishers should be able and willing to meet such a demand. It is by making what the customer wants and how he wants it that business is done nowadays, and those who make to suit their own tastes and accommodation have generally to make way for more enterprising people.

Reform in Worsted Cloths.

THE way of reformers, like that of transgressors, is hard—in fact, very much harder as a rule,—and the newly-formed Yorkshire Worsted Association has not been long in finding this out. The association was only formed a short time ago, with the aim of exterminating the growing practice of adulterating worsted cloths by chemical weighting, and since its formation has probably lost the little faith it had in the average manufacturer. That is, of course, looking at the case from its own standpoint, although we are inclined to think that it has been too stringent in its regulations. It is well known that pure worsted coatings are preferable to the weighted article, but it has yet to be proved that a large number of consumers are not willing, even anxious, to have weighted goods if they can get them cheaper. Coatings are not worn next to the skin, and any chemical disadvantages would not affect the wearer, so that an adulteration which does not affect the appearance to an appreciable extent, yet adds weight and warmth, is really a boon to many in these days of extra taxation. It would be quite sufficient to have a registered mark to distinguish the genuine from the adulterated article, and reformation should take these lines, at any rate in its early stages. The introduction of margarine was welcomed by the poorer classes and is allowable so long as it is not sold as butter, and in a similar manner loaded coatings might be recognised so long as they had a different name or mark to the genuine article. It is also high time that some such definite means was introduced for distinguishing cotton and adulterated flannels and the heavily-sized cottons which are so prevalent. Returning, however, to the Yorkshire Worsted Association, these gentlemen decided on a special trade mark, and made arrangements for being registered as an incorporated body. Unfortunately, it appears, the members of the association are bound by a promise not to weight any worsted coatings, which fact converts them into a trade union, and as such unable to be registered under the Companies Acts. Of course there is nothing to prevent them remaining as they are, and using an unregistered trade mark, but such will be a great disadvantage. Then, another trouble has cropped up: the Association of Leeds Dyers and Finishers, after having given the case a fair trial, have found it impossible to longer refuse to fill goods, such is the demand made by their other customers. This bears out what we have said above, and much more benefit would be derived if the association directed their energies towards securing a recognised legal mark whereby pure coatings, whether made by members of the association or not, could be definitely distinguished from the loaded article. This once done, and the usual test case made upon the first infringement, would seem the most practical way of settling the difficulty.

Direct Trading.

THE ideal method of trading is where manufactured goods go direct from the manufacturer to the consumer. The present method largely consists of employing as many middlemen as it is possible to squeeze in between the two. In many cases the middleman is, as yet, both advantageous and necessary, but as time goes on the instances of his usefulness become fewer, and the parcel post and other rapid means of delivery will take his place. The change is not to be found altogether in these means of improved transit, but to some extent in the middleman himself. At one time there was one middleman between the maker and the consumer, but gradually it began to be seen that the life of the go-between was easier than that of the manufacturer, that he had less risks, less anxieties, less work, and required little or no training for his duties. There are always many persons on the look out for good pay and little work, and the various classes of middlemen grew until now there are sometimes three or four such to be passed before the goods can reach the consumer. The result is that prices become almost doubled on the passage, each merchant, wholesale retailer, agent, etc., making what he can between each stage. No wonder that direct trading has come into vogue in some of the manufacturing districts; persons working in a mill may have friends or relations in the retail trade, the huge difference in prices becomes known, and the retailer naturally tries his utmost to buy in the cheapest market, which means direct from the producer. Such dealings have become somewhat common, and in other cases—less numerous, of course—the trading has been even more direct: namely, between manufacturer and private purchaser. This has raised a cry amongst merchants, and the West Yorkshire Federated Chamber of Trade are trying to make such trading appear dishonest. It is too late in the day to stop the custom, as for the last few years merchants, in their efforts to avoid risks, have been making themselves less and less necessary to the manufacturer. It is, in fact, only the small manufacturer, who is short of capital and in need of a quick return, who is entirely in the merchant's hands, and any system of boycotting would only result in the merchant's influence being still further lessened. It will be remembered how, nearly twenty years ago, one or two Bradford manufacturers commenced exporting direct to America. The result was a boycott, all the merchants refusing to buy their goods for the home and other markets. In true English fashion the manufacturers commenced to distribute their own goods, and were not only very successful in this venture, but in a very short time were besieged with orders from their old enemies. Agents are often necessary, but the merchant who gives orders which are cancelled when he cannot sell is only a deadweight upon industry; and, in addition, it is pitiful to think of the sweating and cut prices which exist, not because the public cannot buy, but so that the various middlemen may each take a substantial amount out of the goods they pass along. We often hear, in other quarters, some mention of the waste labour in our country: such an economic question might be extended by some statistician to the textile trade, for it is possible that the labour wasted in shipping and transhipping, checking and rechecking, would, if properly directed, settle the question of working hours for years to come, by a reduction much more substantial than would be imagined.

The Battle for Indigo.

IT is now generally acknowledged that the battle for indigo between the producer of the manufactured brand and the planter of the natural article will be to the death. Some time or other, sooner or later, one will have to give way and fall, popular opinion favouring the artificial article, whilst patriotic feeling holds out hope for the production of our Indian Empire. The combatants are well matched: on one side stands a young, vigorous, growing industry, which has just found its feet and is feeling a consciousness of developing strength. On the other side stands an old-established industry, with its interests represented in all parts of the world. It has been half-asleep for years in a lazy consciousness of its might, but has been suddenly and rudely awakened by the trespass upon its self-considered monopoly. The question is: Has its strength deteriorated or only remained passive in the long years of inaction? And it is only necessary to point to natural laws to see the inevitable result. The first sign of weakness is shown by the indigo planters' appeal for help—to the Government or anyone else who can lend a helping hand. On the other hand, the Badische Anilin and Soda Fabrik—standing alone against an army of planters—goes heart and soul into the new industry, spending nearly a million pounds on plant for the new venture. It is scarcely likely such an expenditure would have been made without absolute confidence in the manufactured indigo, especially by a company which had the ability to pay a dividend of 24 per cent. on last year's working. Much depends upon the ultimate cost of the two indigoes. The manufactured product can now be sold at 15d. per pound, as against 3s. per pound for natural indigo, but although the latter costs more than twice as much as synthetic indigo, it must be remembered that it contains about 50 per cent. pure indigo, as against 20 per cent. in the German production. Roughly, the natural article is yet 4 per cent. cheaper than synthetic indigo, but the latter is much better and easier to use. Then the revived energy of the indigo planter will soon show some result, such as is estimated by many to reduce the cost of natural indigo by about another 20 per cent. The only thing is that there is a limit to economy in the natural indigo industry, whilst with the artificial product it is impossible to say when the cheapening process may cease. At present much depends upon the supply of naphthalene; but as this is stated to be practically unlimited, and is also comparatively cheap, everything is in favour of the new production.

Trade with Turkey.

THE business man of the present day has to be wideawake in all his dealings if he means to keep his head above water; and if such is the case in England, it needs no little imagination to picture the result when a man, feeling a certain amount of confidence in his fellow-men, commences business relations with Turkey. In that country, from Sultan to beggar, honesty is considered the worst possible policy, and business is often carried on in a manner which would astonish even a company promoter. Partly to collect and diffuse information likely to be valuable to British trade, and also to safeguard British commercial interests, the British Chamber of Commerce of Turkey, which has just issued its thirteenth annual report, came into existence. It seems that during the past year there have still been manufacturers and merchants willing to play the fly to the Turkish spider, and have consigned goods direct to native dealers instead of through some trustworthy English agent. The agent's commission has been saved, but more has been expended in collecting the account, and in some cases payment is still a possibility, but far from being a probability. No one should dream of doing business with a Turkish merchant without first consulting the British Chamber of Commerce. Complaints are made as to the easygoing manner in which the British Government carries on its negotiations with Turkey, every advantage being taken of our weak attitude. Both France and Austria are allowed better postal facilities than Great Britain, and on every hand other of the Great Powers are shown preference. This has been specially noticeable during the last few months, in which contracts and concessions have been obtained by our trade competitors, who, backed by their Governments, have put the necessary machinery into motion for wringing out (there is no other method in Turkey, except bribery) a reluctant consent to their various schemes. All the time that the French and English press were preaching hatred between the two countries, the British and French Chambers of Commerce were working hand-in-hand for the advancement of common interests. Amongst other things, the concerted Chambers demanded reform in export and other charges, Custom-house difficulties, and other local impositions. The Ottoman Government is considering the matter—in fact, has been considering it for the past fourteen months, and will probably go on considering it for months to come. It is only an ordinary instance of Ottoman diplomacy.

The Smoke Nuisance.

THE agitation in favour of repressing the smoke nuisance by more drastic legislative measures has, happily for the harassed manufacturer, quieted down considerably during recent years. Nevertheless, prosecutions are instituted with persistent regularity in most of the large manufacturing towns, and it is now difficult to evade the imposition of a penalty by putting forward pleas which at one time had considerable influence on the decisions given. Recent offenders have discarded the old-time excuses, as is evidenced by an interesting case which has just been decided before the Lord Chief Justice and Mr. Justice Lawrence in the King's Bench Division. It appears that the metropolitan magistrate at the Lambeth Police Court recently inflicted a heavy fine upon a local electric-lighting company for nuisance from black smoke which had issued from the generating station chimney, and at the request of the company the stipendiary granted a case for the consideration of the superior court. When the appeal came before the King's Bench it was contended on behalf of the company that the conviction by the magistrate was wrong because no witness had been called to say that the black smoke was a nuisance to himself. The appeal has, however, been dismissed, the Court holding that it is not necessary for the purpose of a conviction to show that any particular individual or property has been injured. We do not think the point raised has been brought forward before, and it will probably form a precedent for the future. If it were possible to convict the municipal supply stations for black-smoke nuisance, the companies might have no cause for complaint, because the former are in most cases as guilty of the offence as the latter.

ARTICLES.

Specialities in Cloth Structure.

THE introduction of asbestos into the construction of a cloth is far from being new, for Homer relates in his poems how asbestos cloths were used for enveloping the corpses of old heroes when being cremated. For heavy goods we are familiar with the material in cloth form more as fireproof curtaining and in similar capacities, but it has lately been adopted for lighter goods and utilised in dress fabrics; it must not be expected, however, that its fire-resisting qualities are in any way introduced. This season dress goods have been made containing from 5 to 10 per cent. asbestos (the lower limit being the nearer), which proportion is used along with Botany top and spun on the French system. The asbestos, which has previously been worked up into a sliver or roving, meets the wool at either the gill box or the drawing machine. It requires some care, and must not be allowed to enter too deeply into the pins of the gills or porcupines, or it will settle there and take some dislodging, which, in addition to hampering the working of the machine, leaves

SPECIALITIES IN CLOTH STRUCTURE.—FIG. 1.

the asbestos unevenly distributed. The cloth is woven in the grey, and after piece-dyeing the asbestos remains white, and shows up in nops or flakes. The name of "Neige" has been given to this fabric, and attempts are being made to dye the asbestos previous to working in a cloth of contrasting shade, and one which will not be affected by the piece-dyeing process. Fig. 1 shows a cloth in which ordinary white asbestos has been used in conjunction with a 2/28 genappe worsted, plain weave, 38 ends and picks per inch.

Ondulé cloths are not now exactly new, but some of the later specialities in this type are decided novelties. Figs. 2 and 3 show a stripe in two styles, the former being woven in an ordinary reed and the latter with an ondulé motion. The design of the two cloths is exactly the same, as is also the make. There are 152 ends of double grège silk 14/16 deniers in the ground stripe, whilst the

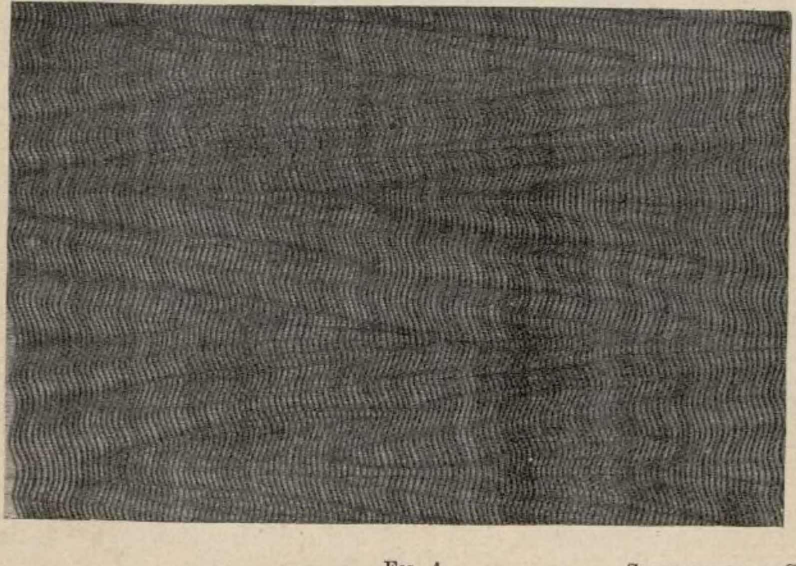
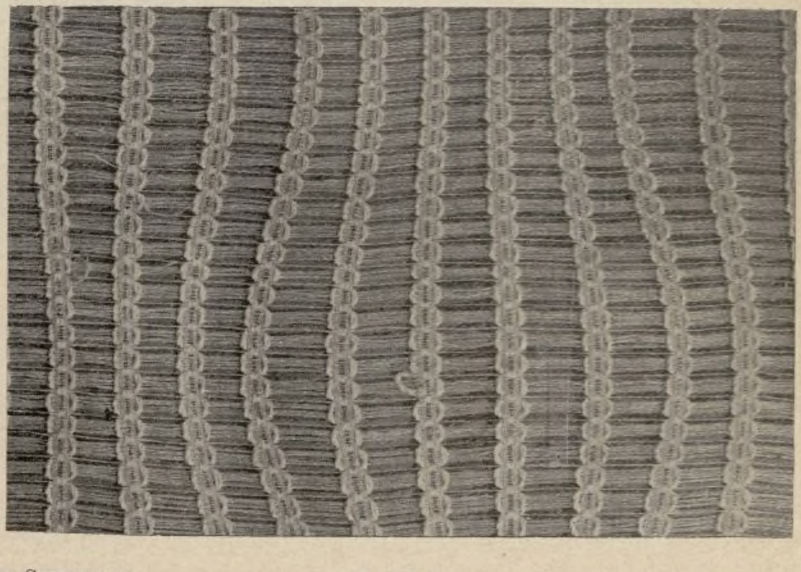


FIG. 4. SPECIALITIES IN CLOTH STRUCTURE. FIG. 5.



centre portion is a closely-woven leno effect. The weft is 2/36 worsted genappe, hard twist, 54 picks per inch. The leno ends in the warp are the same counts and material as the weft.

On the Continent two types of ondulé reeds are chiefly used, the "Patrone" and the "Eventail." By the former of these it is possible to get an all-over pattern, whilst by the latter the undulations must deviate and return from a common centre. Figs. 4

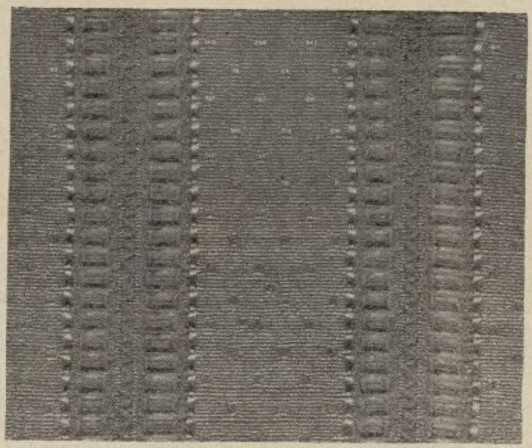
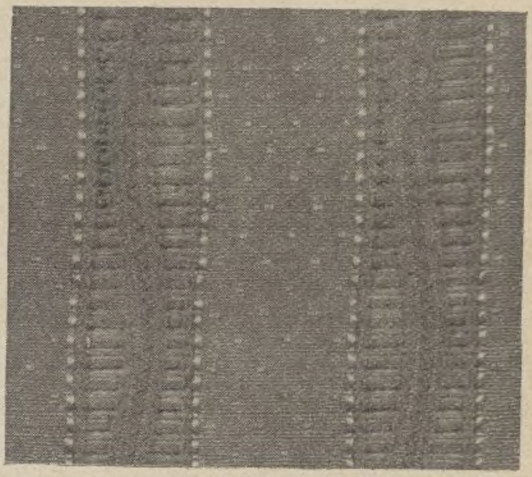


FIG. 2. SPECIALTIES IN CLOTH STRUCTURE. FIG. 3.



and 5 respectively illustrate the two types. In the former (Fig. 4) the warp has a corrugated appearance, but as the waves are not exactly parallel they also cause a pattern to run across the piece following the line which the crest of the ondulé makes. This latter is partly an optical effect, but the weft beds better at one side of the weft than the other, the fine weft lying inside the twists of the thick warp. The weft is fine silk, whilst the warp is hard-twisted two-ply worsted genappe. Fig. 5 shows a simple combination of one doup leno and ondulé. The warp is cotton and the weft linen.

Silk Spinning.—I.

By FILSOIE.

INTRODUCTION.—Although much information is obtainable in this country regarding the weaving of silk goods, very little seems to be understood about the earlier processes of silk working. The terms raw, waste, thrown, spun, or schappe silk are very vague even to the ordinary manufacturer, though he may use silk in conjunction with his cotton or worsted goods, and by others the terms are still less understood. The English silk industry has long been in a declining condition, although anyone looking in the principal drapers' windows cannot but be impressed by the growing popularity of the fibre. It is lamentable to have to admit that instead of progressing, as is the case of most of our other textile fabrics, silk has become less and less an English industry, and unless something is done, and done quickly, there appears the chance of it being entirely overshadowed by Continental competitors. A few years ago silk manufacturing was a most profitable industry in this country; but unfortunately, when import tariffs were removed and foreign competition began to be felt, there was a singular lack of energy displayed, and little attempt was made to keep abreast of the times. No trade has suffered more from conservatism; machines have not been modernised and many in use at the present time have been in existence for a generation. Some manufacturers are still clamouring for protection as the only means of saving the industry, although the possibility of combating foreign competition is demonstrated by the very few energetic firms who have proved themselves capable of competing against all comers in the open market.

SILK SPINNING.—FIG. 1.

Of late years some cotton and worsted manufacturers have turned their attention to silk, and instead of looking to Macclesfield and Spitalfields as the centres of the British silk industry, we now turn to Bradford and district, or to Glasgow, whilst Manchester and the neighbouring East Lancashire towns get through a fair amount of spun silk for shirtings, zephyrs, striped goods, etc.; and although there probably never were fewer who could strictly call themselves "silk manufacturers," it is likely there never were more users of silk, even in the palmy days of the trade. This new life tends to bring the trade into line with other textile industries, and as cotton and worsted manufacturers find there are no great difficulties in the manipulation of silk, the number is likely to increase rather than diminish.

Of the two branches, spinning and throwing, the former, as applied to the treatment and preparation of so-called waste silk, is by far the more important in this country, for while the latter has been a declining trade for the last fifteen years or more, there is to-day in England waste silk machinery capable of turning out more spun silk yarn than ever before ; so in the gloomy picture of the decline of the silk trade it is pleasant to be able to record one branch which has managed to hold its own. Throwing, as one of the three distinct sections into which the English silk industry is divided—viz , throwing, spinning, and manufacturing,—seems to be the branch in which we, as a nation, have failed altogether to keep pace with Continental throwsters. Our throwsters complain of the cheapness of labour abroad, which no doubt is a very important factor; but here again there has been lack of energy, with plenty of hard-headed conservatism, and a marked disinclination to do away with old-fashioned slow-running machinery, which ought to have been displaced long ago by speedier drums and spindles.

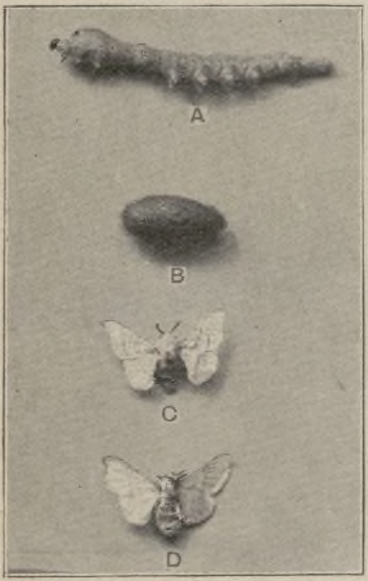


FIG. 2.

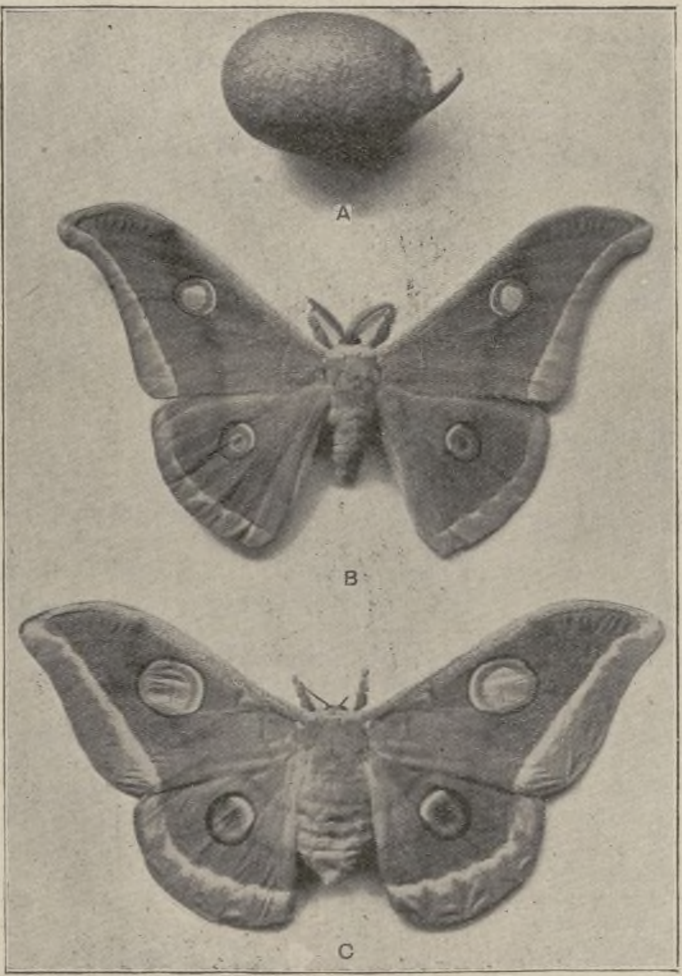


FIG. 3.

In many mills the same old slow-running machines which have done service for fifty or more years still exist, though they are now only fit for the scrap heap, and would not be tolerated in any up-to-date Continental or American mill. Improvements in machinery can be traced to American and Continental sources, but they have not been generally adopted by English throwsters.

There is a large field open for our manufacturers if they could and would cater better for the home market. At one time silk was looked upon as a luxury, but now, owing principally to the fact that a use has been found for waste silk which formerly was of little commercial value, its use as an article of adornment is practically universal. When it is borne in mind that for every 1lb. of raw silk produced there is about 1¼lb. of unreelable silk remaining, and which, prior to the invention of silk spinning, was almost valueless, it will be at once recognised that there was a great possibility before an industry which would be able to use up this vast accumulation of waste. It is to this, then, that attention will be more particularly called, being far more elaborate and more interesting than throwing, although there will be a few notes on this as well, but more with a view to paving the way to spinning than with any attempt to give an exhaustive treatise on the manipulation of the raw silks in the process of making trams and organzines.

The Silkworm.—Almost every country seems to have some kind of silk-producing insect, but we generally turn to China, Japan, Italy, and Southern France as the only countries where the silkworm—which is the chief producer of industrial silk – can be successfully reared. This is a mistake, for in our own country, without the aid of artificial means, silkworms have been reared from the eggs. Splendid specimens of moths have been obtained, and experts who have studied the subject, and who have for years cultivated the silkworm, are of opinion that quite as good silk can be produced here as in any other country. The reason why this is not an English industry is that labour is too expensive as compared with native labour in China and Japan and that of the peasants in France and Italy. It has, however, been proved beyond a doubt that the silkworm can be reared here just as prolifically as on the Continent, and there are worms in England to-day which have been bred from stock introduced very many years ago, and still the moths show no signs of degenerating nor does the silk appear to have become any worse. The breeding and rearing of silkworms is an exceedingly interesting hobby, and followed up on scientific grounds it can be made profitable, as many of the moths are both beautiful and valuable as specimens. The eggs or, "graine," of the silk moth vary in size, according to the family to which they belong, but generally speaking they are about the size of a pin head, and so hard that a person might stand on them without breaking them. If stored in a cold place the eggs can be kept for almost any length of time, but if put in a fairly warm room the eggs can be hatched pretty quickly, although it is always well not to force them too much. Care should be taken that the worms do not appear before the mulberry is in leaf, or whatever food it may be intended to feed them on is quite ready.

After hatching, the worm begins at once to feed, and is most voracious, doing nothing but eat for from three to five weeks, when it is full grown, having in the meantime cast its skin no less than three or four times. Fig. 1 shows the worm commencing to spin its cocoon, which it starts when full grown. The thread, which is secreted in two glands near the head, comes from the worm's underlip in two strands, or brins, which unite, and are then termed "bave." Some species attach themselves to the twig of a tree (as will be seen from the illustration) before commencing to spin, whilst other kinds secrete themselves between two or three leaves, and then envelop themselves in a cocoon of silk.

When the cocoon stage is reached, the worm is in what is called the pupa, or chrysalides state, and thus it remains through the winter. At the approach of the warm weather it gives out a kind of moisture to soften the silk at one end of the cocoon, then begins eating or pushing its way out, and soon what appeared months before an ugly-looking caterpillar bursts forth a winged creation —a beautiful moth, as great a transformation as man can imagine. It is only when the moth is required for breeding purposes or preserving as a specimen that it is allowed to pierce the cocoon, as immediately the silk is thus broken it is unreelable, and the pierced cocoons are only fit for waste spinning purposes.

As the fluid thread is produced by the silkworm it is coated with a kind of varnish known as "gum" or "sericin," which becomes hard in a few days after the worm has completed its cocoon. This gum will dissolve in water, but the thread or "fibroin" itself is insoluble in water, although the chemical composition of each is very similar, as will be seen from the following analysis. The percentages are only given approximately :—

Fibroin.		Sericin.
49 per cent	Carbon	42½ per cent.
6¼ ,,	Hydrogen	6 ,,
19¼ ,,	Nitrogen	16½ ,,
25¼ ,,	Oxygen	35 ,,
100		100

It is also interesting to compare the composition of the worm itself with that of the mulberry leaf :

Dried Worms.		Leaves.
48 per cent.	Carbon	44 per cent.
7 ,,	Hydrogen	6 ,,
10 ,,	Nitrogen	3 ,,
26 ,,	Oxygen	35 ,,
9 ,,	Mineral matter	12 ,,
100		100

There are hundreds of different varieties of silk moths, family *Bombycidæ*, but the best known and most prolific is the genus *Bombyx*, which includes *Bombyx mori*, the typical Chinese silk moth which produces the best silks of China, Italy, and France. In Fig. 2 is shown the worm or larvæ A, the cocoon B, the male moth C, and the female moth D, of the *Bombyx mori*. As will be seen from these, the cocoon is very small—about the size of a pigeon's egg,—but it is very compact. All cocoons produced by the *Bombyx* are reelable, and are termed closed cocoons—*i.e.*, the thread covers the ends of the cocoon without any apparent break, whereas some species produce an open cocoon—*i.e.*, a cocoon with what appears an opening in the outer covering of silk at the end, from which the moth would emerge. Some, but not all, of the so-called opened cocoons are reelable.

The composition of the *Bombyx mori* silk is as follows :—

Water	12·50 per cent.
Fatty and resinous	0·70 ,,
Mineral	1·12 ,,
Gum	22·58 ,,
Fibroin	63·10 ,,
	100·00

The food of this particular worm is the leaf of the white mulberry tree (*Morus alba*), and the fear of frosts in the early spring on the Continent is not so much on account of the damage it will do to the worms as the fear lest it will nip the budding mulberry trees, and so delay the foliage that the eggs may be hatched before there is food for the young worms. The frost scare is often made use of in the early part of spring by speculators endeavouring to run up prices of raw silks. They give out that owing to frost the mulberry will be delayed, and the young worms, having no food, will die, and hence there will be a scarcity of silk. The mulberry is a rare tree in this country, and lettuce and dandelion have been found good substitutes on which to feed the worm, but there is nothing to equal the natural food of the silkworm.

The next best-known group of silkworms is the tussah (tasar, tussar, tussore), of which the *Antherea mylitta* is the principal. Fig. 3 shows the cocoon at A, the male moth at B, and the female at

C. (Both Figs. 2 and 3 are reduced to half the actual linear size of the insect, etc.)

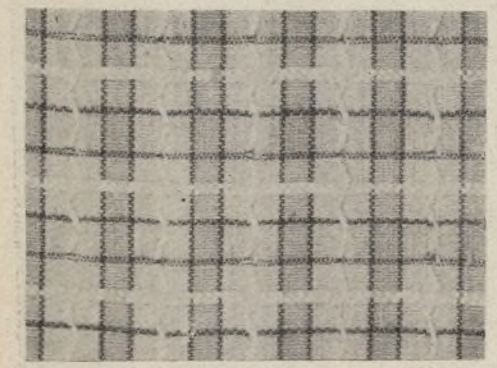
The *Mylitta* spins a much larger cocoon, and is in every respect a larger worm than the *Bombyx*. It thrives in India and China, and although there is a considerable difference in the texture of the China tussah and the Indian variety, the latter having a coarser fibre, both silks are the product of the same worm. For waste-spinning purposes the China tussah is preferred on account of its finer thread, but throwsters hold to the Indian as being cleaner and firmer. Although the *Mylitta* is really the only variety of the *Antherea* family which produces real tussah, there are a score which produce similar silk, all belonging to the same genus of insect. Whilst the *Mori* produces the finest silk, the fibres measuring from $\frac{1}{1600}$ to $\frac{1}{1000}$in. diameter, the *Mylitta* produces the coarsest silk, which varies in diameter from $\frac{1}{1000}$ to $\frac{1}{500}$in. diameter.

The colour of the *Bombyx mori* silk varies from pure white to creams, and yellows to rich orange, but after boiling or discharging the darkest shade will come out cream; whereas the tussah, which varies from light cream to dark red-brown, will not give up its colour so easily, and it is only by the help of peroxides, or otherwise chemically treating it, that light shades can be obtained. Comparatively speaking, very little of the so-called tussah waste which comes to this market is really tussah; at least, it is not the product of the *Mylitta*, but of the many wild varieties which abound in China and India. A great producer of what is called the Indian tussah is the species known as *Assam* of the *Antherea* family, known by the natives as *Muga*. The *Antherea royli*, which is bred in the Himalayas at a great elevation, produces one of the best Indian tussahs. Doubtless the difference in texture between the Indian and China tussah, the product of the *Mylitta*, is due partly to climatic influences and partly to the difference in food. The leaf of the oak is the best-known food for this class of worm, but there are a score of different varieties of leaves on which the worm thrives.

(To be continued.)

Weaving with Beads instead of Doups.

A CHEAP and simple method of making the zig-zag cord effects which are so much in use in fancy cotton zephyr cloths is to employ beads and healds in place of a doup and healds. It is a method which can be recommended (1) because of its cheapness, as it saves the cost of the doup (a considerable item) by substituting a series of beads, which may be used for any length of time without wearing out; (2) because it can be made to produce any design of this class, face side up in the loom, which renders the cloth less liable to contain faulty figuring.



WEAVING WITH BEADS INSTEAD OF DOUPS.—FIG. 1.

A pattern woven in this manner is shown in Fig. 1, the draft being given in Fig. 2, showing the ground healds A, the cord healds B, the ground threads C, and the ends combining to give the zig-zag effect at D. Fig. 3 shows the pegging plan, full squares representing the cord healds, crosses the ground healds, and dots the slackeners, the marks lifting. The method of slaying the warp into the reed is either to put the cord and the threads which work underneath it into the same dent and leave a dent empty on one or both sides, in order to allow the threads to spread out, or to use a reed with a split or open dent; but this latter method would require the reed making so as to fit the style of stripe which is being made, and would probably be useless for any other style. It will be seen from an examination of the drafting plan that the threads which work underneath the zig-zag spider effect are drafted into the ground healds, that the two threads which make the wavy cord are drawn through two healds placed

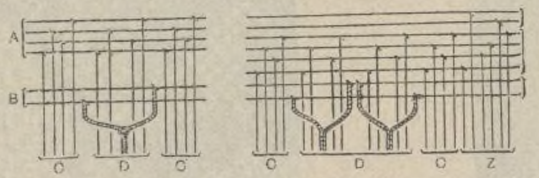


FIG. 2. FIG. 6.

WEAVING WITH BEADS INSTEAD OF DOUPS.

in front of the ground healds, and that one thread is drawn through on the left side, the other on the right, both being then drawn through a head in such a way that the ground threads remain between and underneath them.

The effect of this arrangement is that so long as both the front healds are raised the cord threads work on the top; but when either of the healds is depressed, the one which is depressed draws both threads down, on its own side of the ground threads, owing to both threads being through the bead. In this way the cord may be drawn from side to side of the ground threads by depressing first one heald

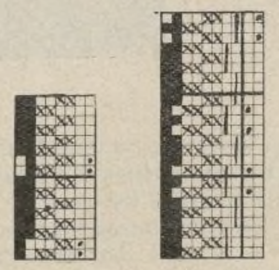
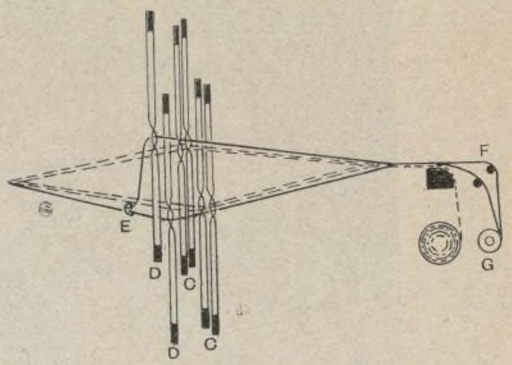


FIG. 3. FIG. 7.

WEAVING WITH BEADS INSTEAD OF DOUPS.

and then the other, but never both together. It will be apparent, however, that the thread which is passed through the heald that remains raised will require to be slightly slackened or eased, owing to the acute angle formed between the heald and bead as shown in Fig. 4. This can be done by any of the usual methods adopted for slackening when weaving this class of patterns with a doup. The chief point to be noticed is to slacken those threads which pass through the heald that remains stationary, and not those which pass through the heald that is depressed. In this drawing the bead is shown at E, the healds for the cord threads at D, the ground healds at C, the slackeners at F, and the whip roller at G.

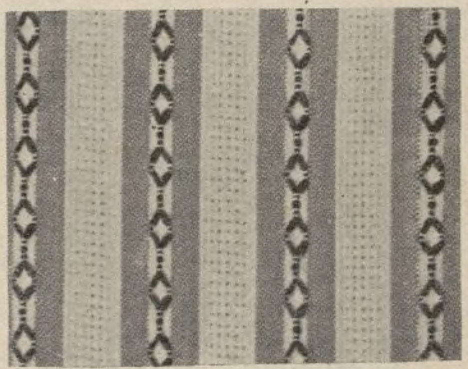
Fig. 5 gives another design of more elaborate style, and an indication of the way in which patterns of a more varied character may be made on this principle. Here the fancy cord is arranged so as to form an intermittent loop effect which when developed in a dark shade of colour on white ground stripe edged with wider stripes either of a lighter shade of the same colour or of a colour complementary to it, gives very effective and harmonious combinations. The pattern may be made more interesting still by developing the white ground stripe in imitation gauze. This can be easily accomplished by having two shafts placed behind the ground healds and made to work three up and three down alternately, and drafting two threads through the ground healds and one through the fancy healds. In order to develop the part which is to show imitation gauze to the best advantage, the threads should be slayed three in one dent—*i.e.*, 1 plain, 1 fancy, 1 plain—and 1 dent missed. Fig. 6 illustrates the drafting required to produce the design shown at Fig. 5, with imitation gauze in the white ground stripes, and Fig. 7 shows the pegging plan. In both these the letterings and markings denote the same sets of threads as in



WEAVING WITH BEADS INSTEAD OF DOUPS.—FIG. 4.

the previous example, although the imitation gauze portion is extra, marked Z in Fig. 6, and its additional healds shown by lines in the pegging plan, where, as before, marks lift.

It will be noticed that the loop effect which characterises this pattern is produced by drafting the cord threads in such a way that when the second heald is depressed both the cords work together in the centre of the stripe, and when the



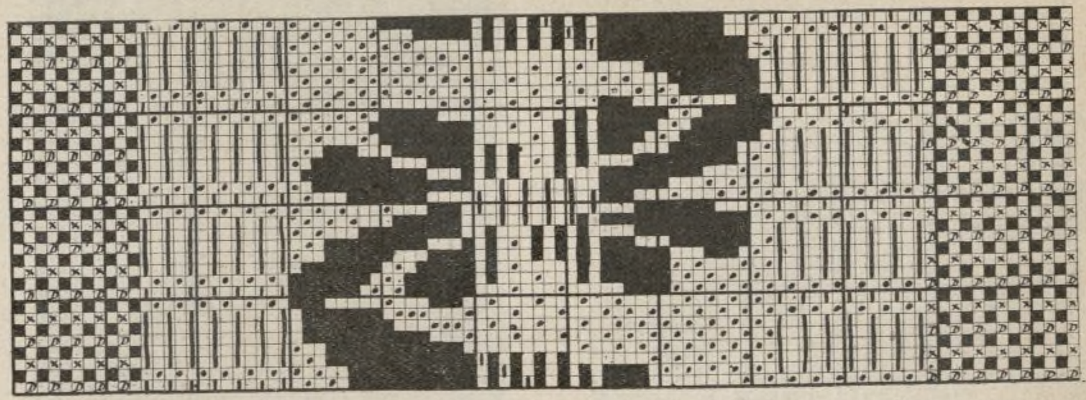
WEAVING WITH BEADS INSTEAD OF DOUPS.—FIG. 5.

first heald is depressed the cords open out and form the loop. The reason for this will be evident on an examination of the drafting plan. By a judicious arrangement of drafting a large and varied assortment of styles may be produced on this principle, at a very small cost, as it is found that for these styles of cloth not only is the cost of the doup dispensed with, but a simpler and easier weave arrangement is introduced, which can be fitted to, and worked with, a double-acting dobby, which in itself is an advantage over the single-acting dobby used for doup work.

Designs for Cotton Fabrics.

SPECIALLY CONTRIBUTED.

PATTERN No. 183 is a pretty grenadine one of many which have lately become fashionable, and which mercerised cotton has made comparatively cheap. The design for one of the stripes is given in Fig. 1, but it will be noticed that the neighbouring stripes are not exact repetitions of the jacquard, but are set lower



COTTON DESIGNS.—FIG. 1.

down the pattern to prevent stripiness across the piece. The blue spot in the centre of the flower is obtained by crammed warp ends, whilst the leno

Fig. 2.

stripe requires one doup, which lifts every third pick where marked D on the design.

Fig. 3.

Pattern No. 184 is a simple and neat, yet effective style, obtained with one doup and plain

Fig. 4.

healds. It is the combination of leno and checking which gives the hieroglyphic suggestion of effect, for the completion of each does not fall on the same number of picks, and the design is thus saved from being stiff. The plain portion of the check is also broken up, although almost imperceptibly, by the introduction of thicker yarn every fifth end in the centre of the check.

Fig. 2 is a design for cotton brocade, and should be made in a 70 reed shot about 90 picks to the inch. The black should be weft, nicely floated, and the grey should be warp. The grey dashes on the ground should be about 5's thick cotton surrounded with tabby. The ground should be 2-and-1 or 3-and-1 warp twill.

Fig. 6.

Fig. 3 is a design for a cotton lining. The warp should be in a 68 reed, and shot with 76 picks to the inch. The figure must be made from the weft on a tabby ground.

Fig. 4 is a new style of design for a cotton all-over, and should be made in a 96 reed, shot with 100 picks to the inch. The black should be weft, and the white trail should be 4-and-1 warp satin, with the zigzag on the ground weft

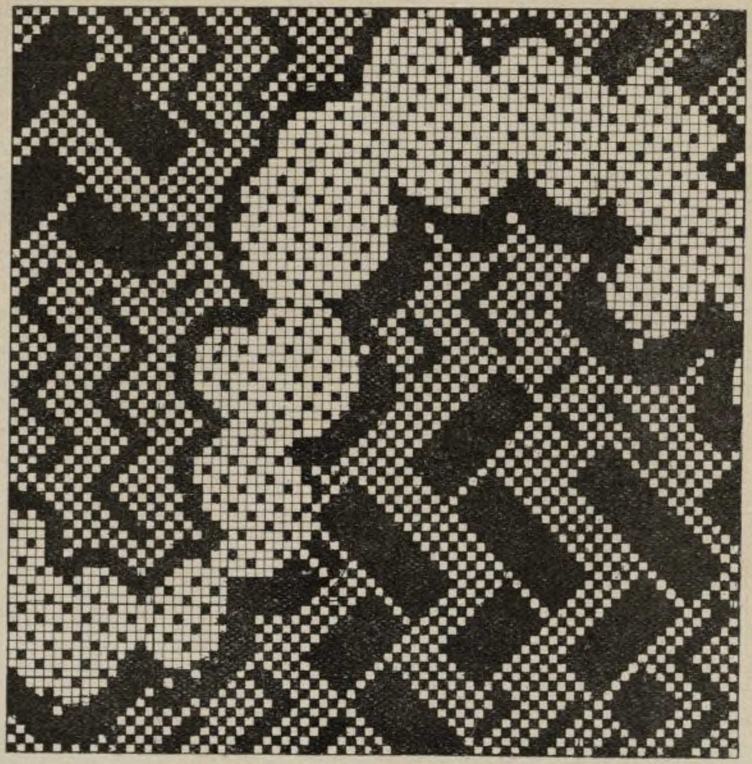


Fig. 5.

filled in with tabby. The marked portion of this design is shown worked out in Fig. 5.

Fig. 6 is a design for a stripe which can be made in an 80 reed and shot with about 96 picks to the inch. The black should be weft; the grey should be a 4-and-1 warp satin of thicker yarn than the ground portion of the warp. The white ground should be 2-and-1 warp twill.

Fig. 7 is a design for a cotton damask stripe. The warp should be in a 72 reed and shot with 86 picks to the inch. The black on the flowers should be weft, with cuttings of warp and fast bindings

Fig. 7.

introduced. The grey grasswork should be weft, bound down with 3-and-1 twill, the ground of the design being tabby. The black lines down the side of the stripe should be crammed in the reed and put 4-and-1 warp satin; the grey ground should be 2-and-1 warp twill with the black figure weft.

PATTERN SHEET No. 98.

Samples of Cotton Cloths.

PATTERN No. 183.

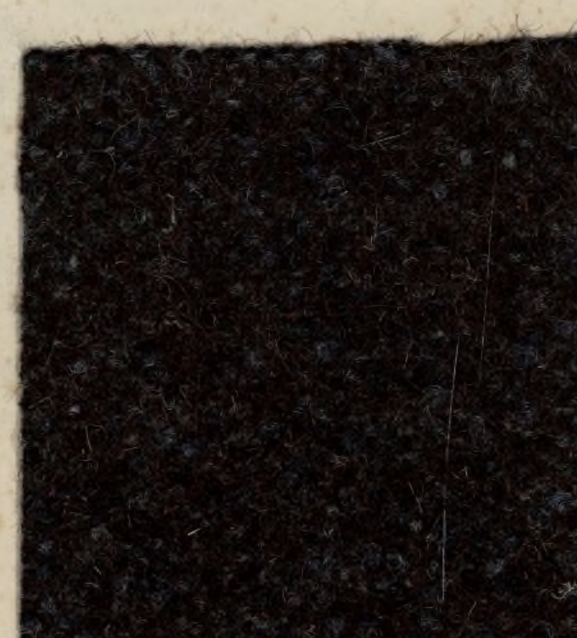
PATTERN No. 184.

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. 99.

Samples of Woollen and Worsted Fabrics.

PATTERN No. 185.



PATTERN No. 186.

CANVAS HOSE. SPHINCTER HOSE.

RUBBER-LINED HOSE. COTTON BELTING.

INDIARUBBER GOODS

For MECHANICAL PURPOSES.

Fig. 8 is a pattern for a dress cloth, and would come up well as a shot effect in a 96 reed with 100 picks to the inch. The black should be weft and the grey warp, on a tabby ground. The inside of the pine shape should be mock leno. There is likely to be a demand for this class of design, which introduces the leno effect.

COTTON DESIGNS.—FIG. 8.

Designs for Woollens and Worsteds.

AFTER a long period of very insignificant demand, fancy vestings seem to be gradually coming more into favour. There is little hope of their ever being either so generally worn or so elaborate in design as was the case a generation ago, and their interest seems to have been best served by the neat, subdued effects which are at present being made. Unfortunately for the better class of vesting, there are many cheap imitations in the market—worsteds printed with lustrous pigment in imitation of silk, and, lower still, cottons got up to imitate a worsted coating, and printed in the same way. Naturally, the presence of such goods has a detrimental influence upon the better-class trade; but there is every appearance of fancy vestings holding their own and making better progress. Pattern No. 185 shows a neat style with a face ground of 3-by-3 twill herring-bone, backed with warp. Fig 1 gives the combined ground weave, and the silk figuring is thrown in pick and pick in the places required, being bound on the back in 6 satin order with the backing warp (11-and-1 satin with the whole warp).

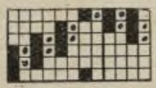


FIG. 1.

FIG. 3.

DESIGNS FOR WOOLLENS AND WORSTEDS.

DESIGNS FOR WOOLLENS AND WORSTEDS.—FIG. 2.

Pattern No. 186 is a heavy 26oz. suiting or overcoating which can be made at a very low cost. The weave is a 2-by-2 twill, and the arrangement of the threads are as below:—

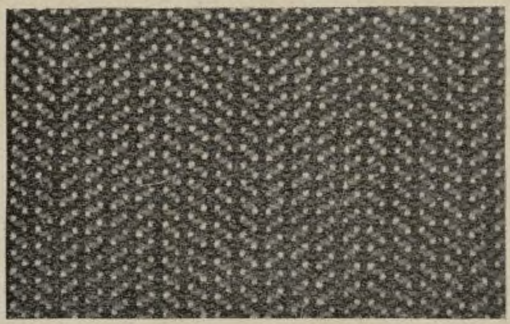
Warp.

1 thread brown mixture woollen.
1 „ steel mixture union.

Weft.

1 pick olive mixture woollen.
1 „ brown mixture union.

The union yarns in both warp and weft are composed of two threads of single cotton and one thread of woollen twisted together, so that the woollen has less drag than the cotton. Then, over this combination another cotton thread is twisted in the opposite direction. The woollen thread protrudes from between the cotton ones, and thus produces a curl effect. The cotton imparts great strength to the yarn, and it is possible to use a wool of very short fibre.



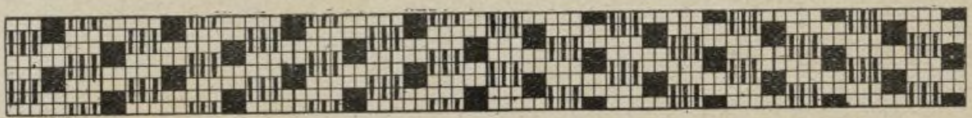
DESIGNS FOR WOOLLENS AND WORSTEDS.—FIG. 4.

Fig. 2 is a neat checking made in worsted, and only requiring four shafts. The design is given in Fig. 3, and it will be noticed that the "cut" of the design does not occur, as is usually the case, either at the change in colouring or the centre of a stripe. Commencing at the bottom left-hand corner of the design, both warping and wefting are as follows:—

2 threads light grey.	2 threads dark grey.
1 „ dark grey.	1 „ black.
2 „ light grey.	2 „ dark grey.
1 „ black.	1 „ black.

The one-side break in the design makes the cloth appear as if a more complicated weave was used, and suggests a crêpe or twilled hopsack combination.

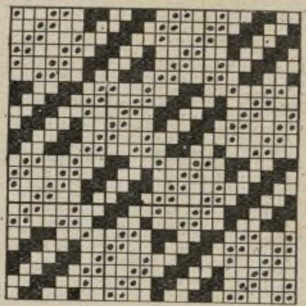
Fig. 4 is a trousering of somewhat peculiar effect. It is really, as regards the lifting of the healds, a 2-by-2 twill, but in the design is elongated as shown in Fig. 5. This design is rather misleading, for the three ends in one lift are composed of fine two-fold yarns, and take up less room than the threads in the double lift, each of which is a thick three-fold yarn. The weft is all black woollen, whilst the warp, which is all worsted, is arranged as follows, commencing at the left-hand side of the design:—



DESIGNS FOR WOOLLENS AND WORSTEDS.—FIG. 5.

3 threads 2/ light grey.	2 threads 3/ black.
2 „ 3/ dark grey.	3 „ 2/ light grey.
3 „ 2/ light grey.	

Fig. 6 is a checked suiting formed with a 2-by-2 twill, cut where the colouring changes, as shown in Fig. 7. This is a style of design largely employed in cheviot and tweed goods, and the pattern depends very largely upon the colourings used, which, if at all loud, are very unsightly. In subdued tones, very tasteful and high-class goods are made, whilst the louder cloths are only suitable for the cheapest ready-made trade.



DESIGNS FOR WOOLLENS AND WORSTEDS.—FIG. 7.

Warping.

1 thread overcheck (2 as 1).
5 „ ground.
3 times { 6 „ twist. / 6 „ ground.
6 „ twist.

The wefting is similar, with the exception of an extra pattern of twist and ground picks (12 picks).

Fig. 8 is a woollen suiting of heavy weight, rather loosely woven, and only slightly milled. The design is 2-by-2 hopsack, and the warping is as follows:—

Twice {
1 thread (*a*) overchecking.
1 „ ground.
2 „ twist.
2 „ ground.
2 „ twist.
1 „ (*b*) overchecking.
1 „ ground.
2 „ twist.
2 „ ground.
2 „ twist.
10 times { 2 „ ground. / 2 „ twist.
}

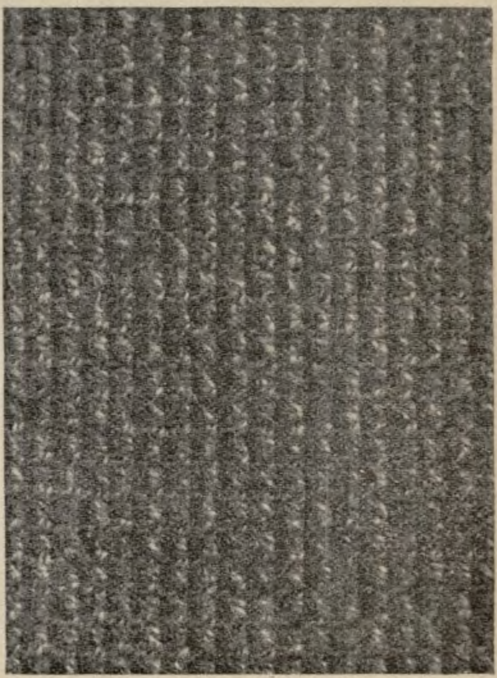


FIG. 6.—DESIGNS FOR WOOLLENS AND WORSTEDS. FIG. 8.

The wefting is similar, but is slightly increased by making the last 10 repeats of ground and twist yarns to 13 times.

Jute and Linen Weaving.—XVII.

By Thomas Woodhouse and Thomas Milne

(Head and Assistant Textile Masters, Dundee Technical Institute).

JACQUARD SHEDDING.—For patterns of a geometrical nature which are beyond the easy compass of a dobby, and for all patterns of a floral or elaborate character, it is advisable, if not necessary, to use the jacquard machine. Many types of this machine are in everyday use, from the ordinary single-lift jacquard to the specially-constructed and in most cases complex machines introduced for the production of certain special fabrics. The introduction of the latter class of machines has been resorted to for various economical reasons, but it is generally admitted that any gain in this direction has been obtained at the expense of the pattern, and in some cases of the cloth. The size or denomination of a jacquard machine, and its capacity for producing large and varied figures, are determined by the number of hooks or threads it is capable of lifting independently of each other, such as a 400 or a 600 machine (in many places termed a 40-design or a 60-design machine). In a single-lift jacquard these would contain respectively 408 and 612 hooks, arranged in 8 and 12 rows of 51 hooks each,

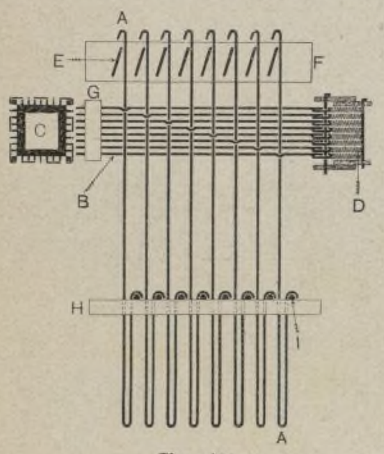


Fig. 101.

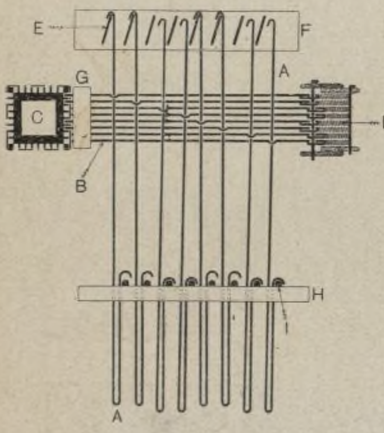


Fig. 102.

the extra row in each case being introduced for selvages or other work outside the pattern proper. The above-mentioned sizes are those most generally used, although machines of a greater or less capacity are often made.

Ordinary jacquard machines may be divided into three well-defined kinds—single-lift, double-lift single-cylinder, and double-lift double-cylinder. Figs. 101 and 102 are sectional views of the first-mentioned kind (single-lift), the action of which is the basis of action of all jacquards. The principal parts are hooks A, cross wires or needles B, cylinder C, springs D, and lifting knives E, these latter being fixed in an iron frame F. The knives and frame together form what is commonly termed the "griffe." The griffe is raised and lowered (by means of suitable connections) every revolution of the crankshaft, and therefore once every pick. The normal position of the hooks A is directly over the knives E, as shown in Fig. 101 ; the hooks are retained in this position by the action of the springs D on the rear end of the needles B, and a suitable bend in the latter passing partly or wholly round the hook. Any hook allowed to remain in this vertical position will be taken up by its respective knife when the griffe is raised. The cylinder C is a square wooden prism built of four separate pieces, each perforated to correspond with the number and the pitch of the needles in the machine. It moves to and from needles B approximately in unison with the falling and rising of the griffe, making a quarter of a revolution each time, and thus presenting its four sides to the needles in regular succession. The looped ends of the needles B are supported by horizontal wires passing between them, while their straight ends are supported in the needle board G, and, provided no obstruction is placed in the way, they will all enter the perforations in the cylinder C when the latter advances to the needle board, and all hooks will be lifted. To form a shed it is necessary that part of the warp, and consequently part of the hooks, must remain down, and to attain this end stiff paper cards perforated or cut according to the pattern to be woven are used. These are laced in an endless chain, are passed round the cylinder, and revolve with it. The size of each card and the pitch of its perforations correspond with every side of the cylinder. As cylinder C advances the needles B enter all perforations in the card presented ; but where the card is uncut the needles are pushed back and their corresponding hooks placed out of the reach of the lifting knives. This action takes place when the griffe is in its lowest position, and in Fig. 101 it has almost reached that point with the cylinder C advancing towards the needles B. In the card facing the needle board it will be seen that needles 1, 2, 5, 6, counting from the top, will enter the cylinder, but needles 3, 4, 7, 8 will be pushed back, as the card is uncut at these points.

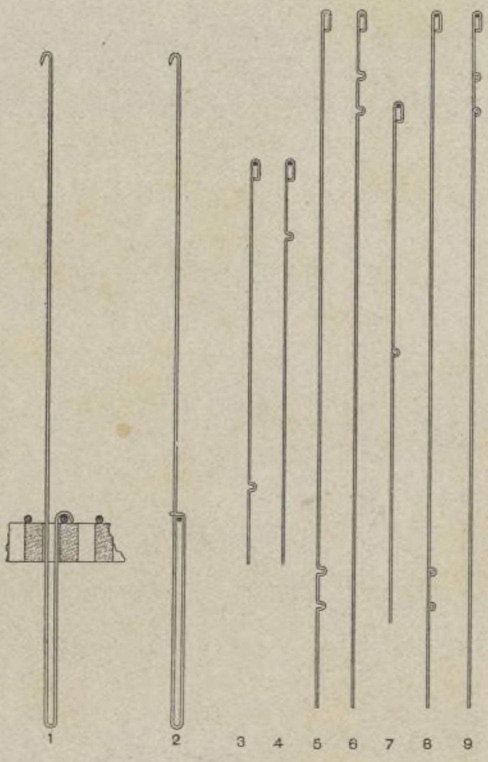


Fig. 103.

Fig. 102 shows the result of this action. Here the cylinder is close to the needle board, and the griffe has begun to rise, taking with it hooks 1, 2, 5, 6, and leaving down hooks 3, 4, 7, 8 as selected. Immediately the cylinder recedes, the compressed springs D compel their corresponding hooks to resume the normal vertical position. Further examination of the hooks A will show that their lower ends are bent upwards from 5 to 6in., and hooked partly round an iron rod attached to, or bead cast upon, the grate H. Rods or beads I support all hooks in their lowest position, and prevent them resting on the knives E when the griffe is down and the new selection is being made. It is obvious that unless hooks were supported clear of the knives the action of the needle would only tend to bend the hook at its point of connection with the needle. The slots in the grate H through which the hooks pass keep the hooks facing the knives. Harness cords, to which the heddles or mails are attached, are connected to the lower end or bend of the hooks.

Fig. 103 shows various types of hooks and needles utilised in jacquard machines. They are represented exactly one-fifth their full size. Nos. 1 and 2 are the two kinds of hooks in general use for single-lift machines. Nos. 3 and 4 are the top and bottom needles of a 400 single-lift machine, and may be used with either type of hook, although generally used in conjunction with No. 1. The needle for No. 2 hook usually passes completely round it, as shown in No. 7, which is a needle for a 600 machine. Nos. 5, 6, 8 and 9 show the top and bottom needle of each kind for a 400 double-lift single-cylinder machine.

Figs. 104 and 105 show in elevation and plan the framework of a single - lift jacquard machine. Projecting from each side of the frame of the griffe A is a lifting block B, part of which is made to move freely in the vertical slide or guide way C of the framework. Motion is imparted to the block B by means of a crank or an eccentric on the crankshaft of the loom, through the connecting rods D and E, and the lever F F^1 keyed on the shaft G, which is supported in, and extends across, the framework, carrying at its farther end corresponding parts to F^1 and E. A horizontal movement is imparted to the cylinder H by means of "swan-necks" L set-screwed on the rods J. These latter are carried by, and slide freely in, the brackets K. The studs M project from each side of the lifting block B into the swan-necks L, and at that point carry anti-friction rollers. As the block B rises, the studs M force forward the swan-necks L and the rods J, the latter carrying with them the cylinder H. Fixed at each end of the cylinder is an iron head or lantern, rounded at the corners, and slightly cut away between them as shown. When the cylinder H is clear of the needles in its outward movement, one corner of the lantern takes into, or is arrested by, the catch N, and is rotated thereby as the cylinder still further recedes. The spring hammer O serves to keep the cylinder perfectly level by pressure on the two corners of

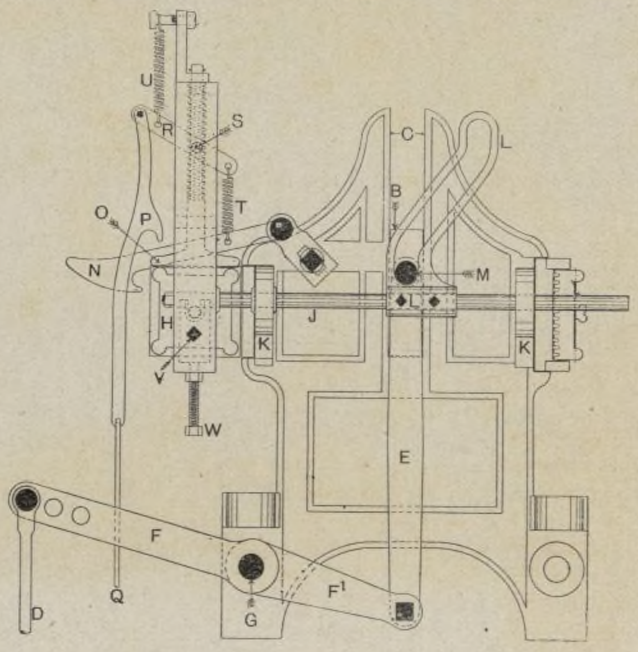


Fig. 104.

the lantern when the latter is not being acted upon by the catch N. Immediately the cylinder begins to rotate, O is gradually raised by the corner of the lantern until the latter in its turning begins to fall, when the pressure of O aids the turning movement, ultimately levels the cylinder, and prevents any rocking in the same before it again reaches the needles. In catch P provision is made for turning the cylinder in the opposite direction when necessary. This must, however, be done when the cylinder is out and clear of the needles ; then, by pulling the cord Q, the catch P takes hold of the corner of the lantern, while at the same time, by means of the lever R, fulcrumed at S, and connecting spring T, the catch N is lifted clear of the lantern, allowing the cylinder H to turn. The spring U keeps the catch P in its normal position clear of the lantern. As it is absolutely necessary that the ends of the needles should be directly opposite the holes in the cylinder H, the latter may be adjusted laterally and vertically by the screws V and W. It will be observed that the jacquard described is a 60 design, or 600 machine.

An end elevation of a slightly different type from that just described is shown in Fig. 106. In this view the griffe A is partly raised (the ends of the lifting knives being shown at E) while the cylinder H is turning by the action of the catch N. The griffe A is supported at either end by two spindles C; these pass through and slide freely in the guide bushes D, supported on brackets inside the framework, and thus ensure a vertical motion to the griffe. The spindles C, near their upper ends, pass through and are rigidly fixed in the lifting blocks B, which are attached to the griffe A. Bolted on the upper ends of C, and passing across the griffe, is a crossbar Z. This is attached at the centre by a pendant connecting rod to an overhead lever, which is actuated in the usual manner by means of a crank or an eccentric on the crankshaft of the loom.

A horizontal movement is imparted to the cylinder H in a manner exactly similar to that already described, the cylinder in this case, however, being supported by slides J instead of spindles, adjustment being provided for by means of the screws W on the brackets K. The spring hammer O, while serving the same purpose as that already mentioned, is of an entirely different kind. To reverse the motion of the cylinder H it is only necessary to pull the cord Q when the catch P is brought into gear with the cylinder; the catch N being at the same time lifted clear by means of the wire X. This reversing motion is, however, suitable for hand looms only when the cylinder is actuated by a swan-neck. Y is a spring arranged for keeping the cards on the cylinder where sufficient tension is not obtained by the weight or drag of the cards themselves.

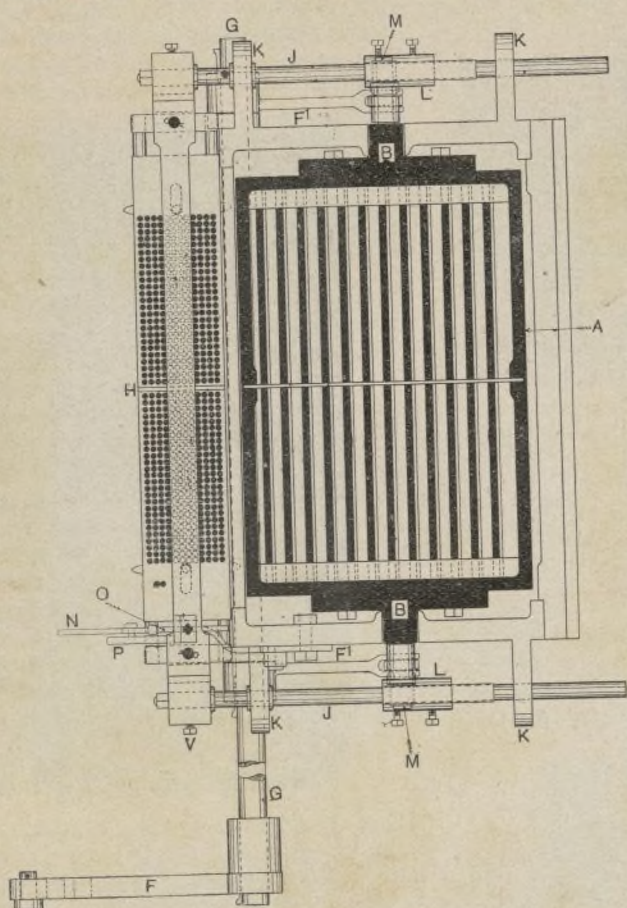


Fig. 105.

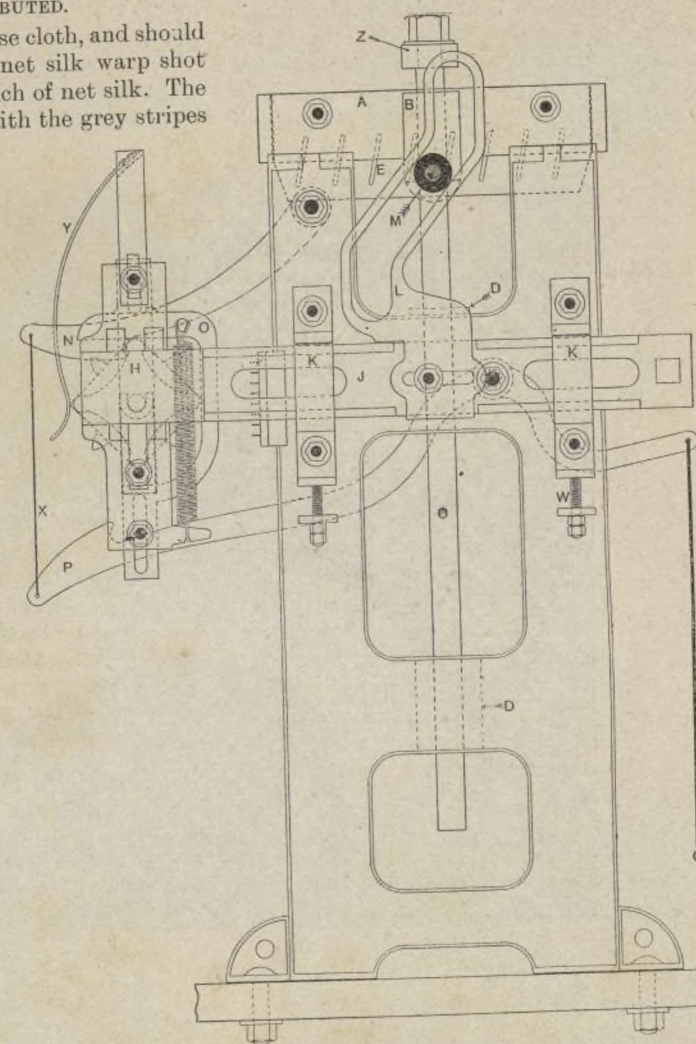


Fig. 106.

Jute and Linen Weaving.

Designs for Silk Fabrics.

Specially Contributed.

Fig. 1 is a design for a blouse cloth, and should be made with a 2000/4 net silk warp shot with 100 picks to the inch of net silk. The black figure should be weft, with the grey stripes 7-and-1 warp satin, and the white stripes tabby. Designs in this character should be made in nice shot effects, so that the weft figure will appear lying on the warp satin stripes.

Fig. 1.

Silk Designs.—Fig. 2.

Fig. 3.

Fig. 2 is a design for a dress cloth of a cheaper quality. The warp should be an 1800/2 spun silk shot with 110 picks to the inch of net silk. The black should be weft, with good floats left when binding, and the grey figure should be 3-and-1 weft twill on a 3-and-1 warp twill ground.

Fig. 3 is a sketch for a brocade cloth, and should be made with an 1800/4 net silk warp, shot with 96 picks per inch of net silk. The black should be weft and the grey leaves 3-and-1 weft twill. The white figure must be 7-and-1 warp satin, which will have a rich effect in this quality. The ground should be a warp and weft oatmeal or frost effect. Fig. 4 shows the marked portion of the pattern worked out.

Fig. 5 is a design for piece goods made with a 2400/2 net silk warp and shot with about 100 picks per inch of net silk. The black should be weft, well floated, and the grey inside the objects should be warp. The grey lines on the ground pattern should be 3-and-1 weft twill with small weft spots lying on the tabby, and the white stripe should be 3-and-1 warp twill; or the spots might be on a 3-and-1 warp twill with tabby threads on each side of the weft lines, and the white stripe 4-and-1 warp satin.

Fig. 6 is a sketch for a blouse cloth made with an 1800/2 mercerised cotton warp and shot with 100 picks of tram to the inch. The black spots should be floated weft, and the grey figure should be 3-and-1 weft twill, all on a 3-and-1 warp twill ground. This is a very cheap make of cloth, but it has a good appearance, as the figure is made from the net silk weft.

Fig. 4. Silk Designs.

Fig. 7 is an idea for piece goods made with a 2400/2 net silk warp and shot with 110 picks of tram to the inch. The black figures should be weft, and the grey warp, on a tabby ground.

Fig. 5.

Fig. 8 is a design for a silk brocade. The warp should be a 2200/2 of heavy silk, shot with 110 picks of tram to the inch. The figure should chiefly be made with weft (the black flowers being well floated), but some little warp can be used as shadows, etc. The ground should be 3-and-1 warp twill or 4-and-1 warp satin.

Worsted Spinning.

By M. M. Buckley

(Lecturer on Worsted Spinning at Halifax Technical School.)

(Continued from page 79.)

BOTH the front rollers and the lifter are driven by the cylinder, but from different points, so that either may be altered independently of the other. It must be observed that a definite relationship exists between the roller delivery and the speed of the lifter in the case of spools, tubes, and cops. The capacity of an ordinary spool $5 \times 1\frac{1}{4} \times \frac{3}{4}$ is approximately 8·75 drams net, or about 30 spools in 1lb., and from this we can readily calculate the length each will hold of any counts, and afterwards the requisite relative speeds.

It is the invariable custom when starting new frames with different gearing to make trials until the proper build is obtained: this is not only a waste of time, but necessitates the rewinding of the bobbins, which is at all times undesirable.

Silk Designs.—Fig. 7.

If the bobbin capacity of 8·75 drams be multiplied by 27·34 grains, and the product divided by $12\frac{1}{2}$ grains, it equals 19·13, the number of yards of 1's counts it will hold. This number is used as a constant or G. P., and if multiplied by any count will give the number of yards. Assuming that the heart gives a $1\frac{3}{4}$in. traverse and the screw is $\frac{1}{2}$in. pitch, it must make six revolutions during the filling of the bobbin, one to form the head and five for the barrel; therefore (19·13 × counts) ÷ 6 = yards required to form the head this length in inches, divided by circumference of the front roller, gives its revolutions to one of the scroll. To illustrate: suppose it is required to spin 1/24's upon the above size of spool, then (19·13 × 24) ÷ 6 = 76·5yds., or 2754in. If the front roller be 4in. diameter, then $2754 \div 12\frac{1}{2} = 220$ revolutions to one of the scroll.

The speed of the cylinder may be ascertained, and suitable wheels put on to give this result, but the best and most reliable way is to time the rollers and lifter, and ascertain their actual relations, because there is always a small amount of slippage to be allowed for which theoretical estimations do not give. We must now determine how these 2754in. are to be distributed. By taking the reciprocal of the square root of the yards per pound a value is obtained which represents the diameter of the yarn sufficiently near for all practical purposes, and this, divided into the filling space of the flange, will give the number of layers or traverses. Whether

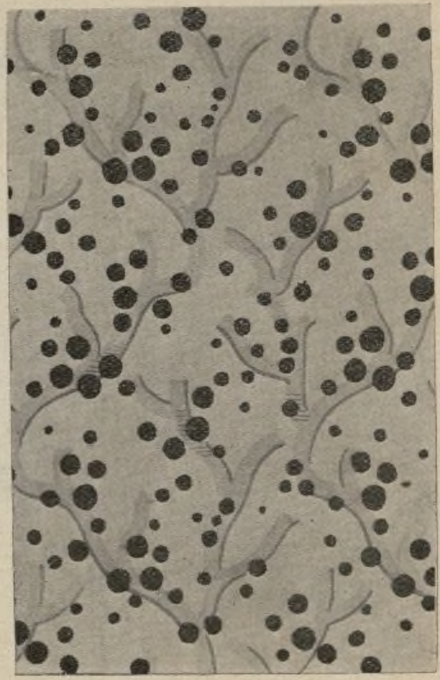
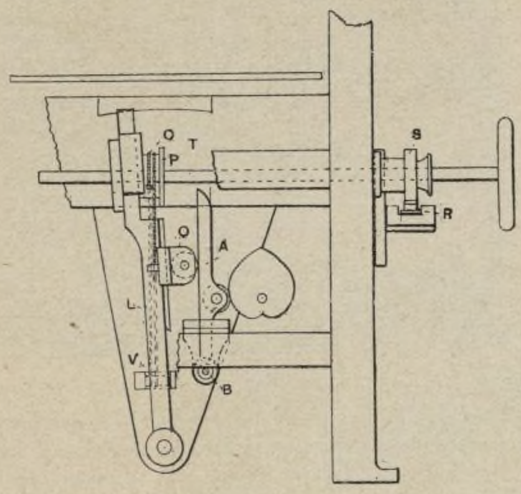


Fig. 6.

Fig. 8.

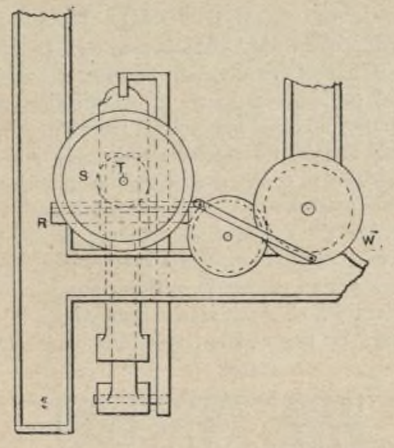
these fill the head or not will depend upon the drag or tension during winding. After a very large number of tests and experiments, performed with a wide variety both of counts and quality, we are led to believe this is the proper arrangement of the picks. Extra drag and tight winding enable greater lengths to be put on the bobbin, but the yarn is not in the best condition for use directly it leaves the frame. The close proximity of the coils, and the pressure they exercise upon each other, prevent the fibres from regaining the elasticity they have lost owing to their stretching during the drafting.

It is well known that new, or "red-hot," rovings never spin as well as those allowed to stand on the bobbins a short time; and similarly, tightly-wound weft yarns never give the same handle as those more loosely wound. Spinners would do well to remember this, for if the yarn is spun light to allow for the moisture lost during manipulation,



WORSTED SPINNING.—FIG. 75.

the object is defeated by tight winding, and streaks in the weaving occur, which are often wrongly interpreted. Space must be allowed for expansion due to absorption, and the best result is obtained when the diameter of the thread is made the basis. Reverting to the instance taken, the $\sqrt{560 \times 26}$ (allowing two counts for condition) = $\frac{1}{120}$in., and $\frac{1}{4} \div \frac{1}{120} = 30$ traverses. From this we see that the front roller must make 220 revolutions, the heart shaft 30, and the scroll wheel 1. By arranging the various wheels concerned according to their effect, the requisite change wheels are obtained. When the proper relations have been determined by the above method, the necessary wheels for different counts can be easily ascertained. The lifter pulley wheel and motion wheel are proportionate, and hence, if one be changed, the other must be altered correspondingly to maintain the proper shape. The two factors which now influence the speed are the



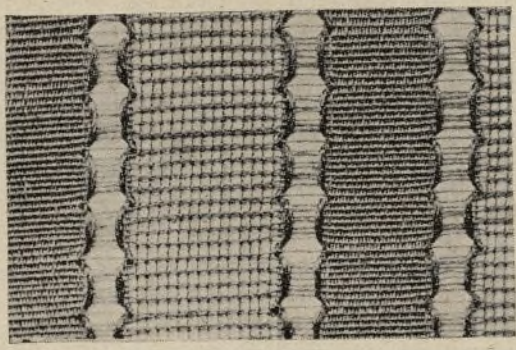
WORSTED SPINNING.—FIG. 76.

weight of the yarn and its rate of delivery. The following rule will enable the wheels to be found :—

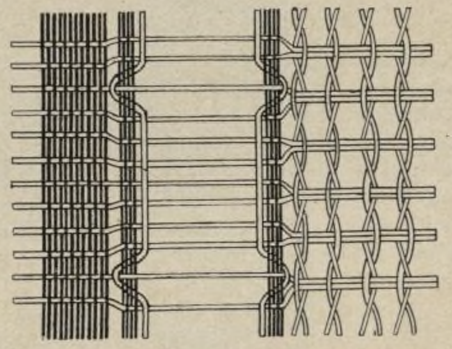
$$\frac{\text{Pres. counts} \times \text{new twist wheel} \times \text{pres. motion wheel}}{\text{New counts} \times \text{present twist wheel}}$$

= change wheel required.

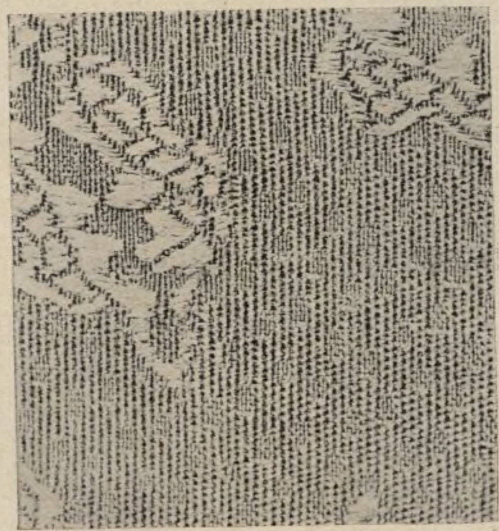
Before dealing with the different changes required for various shapes of bobbin, it will be best to consider the modifications of the motion so that the effects may be taken together. The introduction and general adoption of the cross or cheese winder has necessitated an alteration of the ordinary lifter. When winding from the double-headed bobbin the upper flange puts considerable strain on the yarn, especially as the barrel is approached. The caps at present used only partially remedy this defect, hence when possible it is advisable to wind from spools, which effect a saving in waste and knots. The common spool, suitable for weaving, is extensively used, but even here the difference in the tension on the end when the bobbin is full and empty has led to the long traverse spool, in which the initial pick covers the full filling space of the barrel.


FANCY DRESS FABRICS.—FIG. 165.

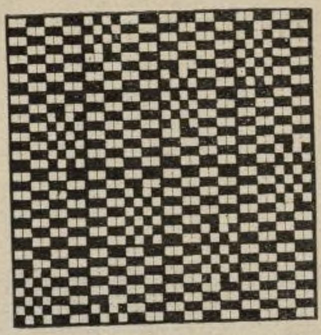
As the building proceeds the traverse is shortened by the adjustment of the rack to form the taper. Various methods of securing this have been devised, most of which are closely guarded by the owners; but if our description of the motion has been studied, no difficulty will be experienced in its adaptation. In Fig. 75 is shown a front view of one which gives the rearrangement of the parts. The short swing lever A is reversed so that its centre is below the heart


FANCY DRESS FABRICS.—FIG. 166.

instead of above it, which enables a longer chase of the rack to be obtained. To the rack is a chain attachment C which connects it with the scroll so as to regulate its position. With suitable gearing the order of traversing may be reversed in the second doffing, so that it is practically an automatic adjustment, which dispenses with the setting of the lifter plate. Fig. 76 shows the driving of the modified parts. The motion wheel W has a crank which connects it with a rack R, gearing with the


FANCY DRESS FABRICS.—FIG. 167.

scroll wheel S, the result being that S alternately rotates in opposite directions, and similarly influences the shaft or scroll T; on T is fixed the chain pulley P, to which one end of the chain C is secured, the other end being fastened to the rack O. After first passing around the pulley V the end of the scroll is not screwed, but supported in a bearing. The lateral movement of R causes the chain to alter the position of O with regard to the


FANCY DRESS FABRICS.—FIG. 168.

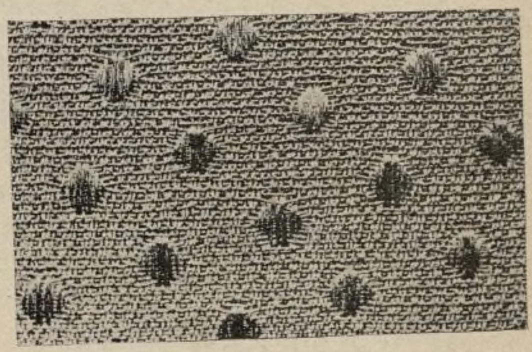
centre B, thus shortening or extending the traverse according to the direction in which R is moving.

(To be continued.)

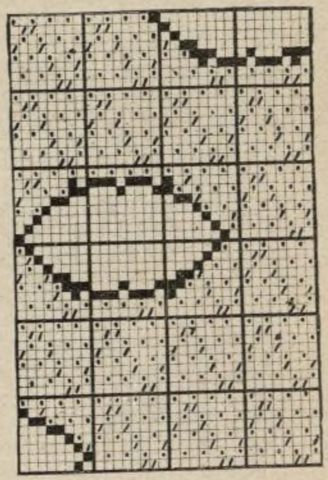
Fancy Dress Fabrics.—XVII.

BY G. WASHINGTON.

A VERY effective grenadine stripe is shown in Figs. 165 and 166. One of the novel features of this fabric is that only one kind of yarn is used for the warp, the variations in appearance being due to reeding. The thick whip


FANCY DRESS FABRICS.—FIG. 169.

threads, consisting of nine single ones, are all drawn through one heald; this nine-fold thread gives the peculiar scalloped appearance to the edges of the various stripes. The four stationary threads weave plain for seven picks, and are all down for the eighth, when the doup healds come into action and draw the whip thread round them. The fine setting of the warp in the plain portion causes it to bend round the weft and hide it, thus producing


FANCY DRESS FABRICS.—FIG. 170.

a corded effect. The open texture of the gauze stripe is obtained by leaving two empty reeds between each pair of gauze threads, and also drawing two picks into one shed.

Warp.

All 60/2 silk.

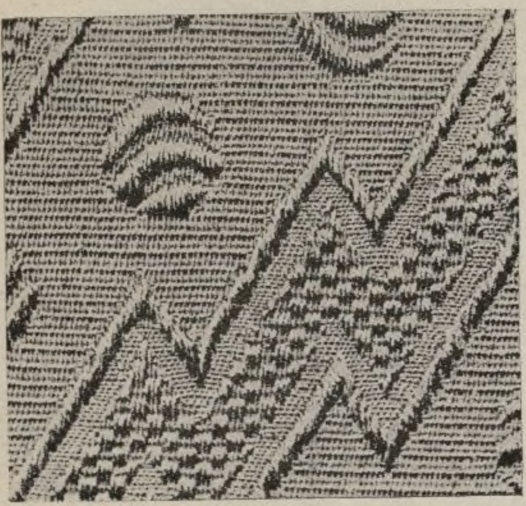
1 reed { 9 ends (as 1) for whip. / 4 stationary threads.
2 „ empty.
29 „ 57 plain threads 2 in a reed.
2 „ empty.
1 „ { 4 stationary threads. / 9 ends (as 1).
10 „ empty.

1 „ {9 ends (as 1). / 4 stationary threads.
2 „ empty.
14 times {1 „ 2 ends gauze. / 2 „ empty.}
1 „ {4 stationary threads. / 9 ends (as 1).
78 reeds per inch.

Weft.

25's worsted.
39 picks per inch.

The fabric illustrated by Fig. 167 has solid weft figures upon an irregular cord ground. One repeat



FANCY DRESS FABRICS.—FIG. 171.

of the ground weave is given in Fig. 168, each group being made up of 26 picks of cord and 6 picks of plain; the effect of the plain is to divide two large cords into four small ones, and reflecting the light differently, to give an indistinct spotted appearance to the ground when viewed at certain angles.

Warp.

2/50's cotton.
60 threads per inch.

Weft.

30's mohair.
72 picks per inch.

Another type of ground weave is shown in Figs. 169 and 170. This fabric is ornamented, with solid warp spots, eight to the repeat, arranged in sateen order. The structure of the ground weave is peculiar, and causes the curiously streaked appearance of the fabric. Every other pick weaves plain

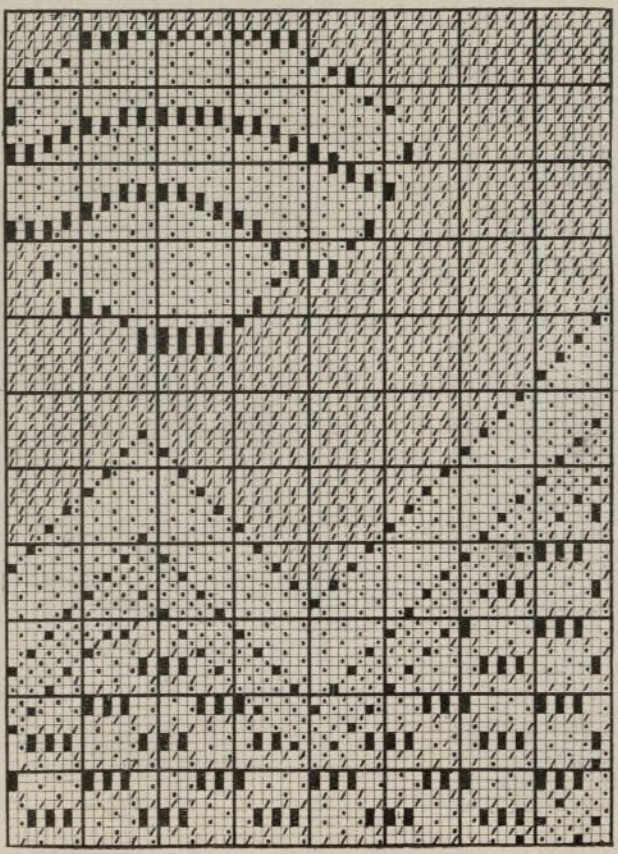


FIG. 172.

with the warp limiting it to floats of three; the remaining picks are tied on the back in a zig-zag fashion, causing the warp at these places to be over two picks only, and thus preventing these short floats from standing up so prominently as the others.

Warp.

70/2 silk.
104 ends per inch.

Weft.

2/40's worsted.
56 picks per inch.

Figs. 171 and 172 illustrate the appearance and structure of a fabric ornamented with a very effective zig-zag diagonal pattern containing four different weave effects. In the repp ground, the cords, each containing two picks, are covered with mohair and cotton warp alternately; the mohair cords show most prominently on account of the difference in thickness and lustre between the mohair and the cotton. The raised figures are formed by long floats of mohair warp, with the cotton warp and weft weaving plain behind them. The hopsack effect is separated from the raised warp by a small portion, where the weft weaves plain with all the warp, and not only makes a firm fabric, causing the outline of the zig-zags to be very clear and decided, but also presents

FANCY DRESS FABRICS.—FIG. 173.

a pleasing contrast to the other portions of the design. In the hopsack effect three mohair threads move over six and under two picks alternately. The first and last of the six picks act as wadding, lying between the two warps in the position indicated by strokes in the design; the remaining four picks, marked in round dots, weaving plain on the back with the cotton warp.

Warp.

1 end 2/36's mohair.
1 „ 2/50's cotton.
96 ends per inch.

FANCY DRESS FABRICS

Weft.

35's cotton.
64 picks per inch.

The appearance of a crammed silk stripe on a plain worsted ground is shown in Fig. 173. The stripe consists of an 8-shaft sateen, bordered with warp cord. Fig. 174 is the design.

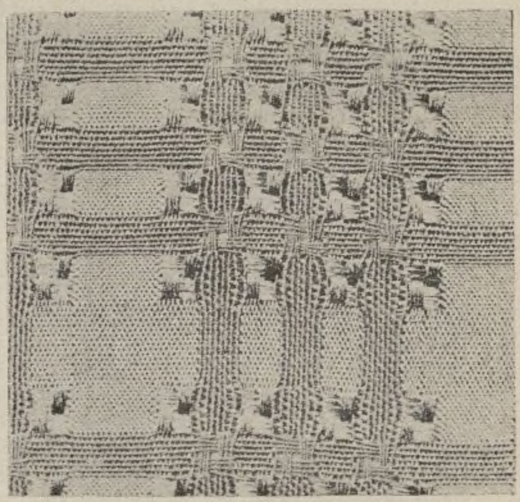
Warp.

40 ends 70/2 silk.
8 in a reed.
24 ends 2/60's worsted.
2 in a reed.
26 reeds per inch.

Weft.

2/60's worsted.
52 picks per inch.

Fig. 175 illustrates the appearance of a fabric irregular in both reeding and picking; an abridgment of the design is given in Fig. 176. In addition



FANCY DRESS FABRICS.—FIG. 175.

to the long floats of warp and weft, there are three distinct effects produced in the plain weave: Plain where both warp and weft are silk, and each bends equally round the other; warp cord, by silk warp bending round worsted weft; and weft cord, where the silk weft bends round the worsted warp.

Warp.

3 times {16 ends 60/2 silk. / 8 „ 2/80's worsted.}
16 „ 60/2 silk.
32 „ 60/2 silk plain stripe.
Silk 104 ends per inch.
Worsted 52 ends per inch.

Weft.

3 times {12 picks 50/2 silk. / 8 „ 2/70's worsted.}
12 „ 50/2 silk.
18 „ 50/2 silk plain.
Silk 72 picks per inch.
Worsted 48 picks per inch.
Plain silk 56 picks per inch.

(To be continued)

The Mechanism of Spinning.—XIII.

BY H. R. CARTER.

SPINNING MACHINES FOR LONG AND COARSE VEGETABLE FIBRES (*Continued*).—For lighter yarns from similar material, say yarn of 360yds. per pound from the best white Manila, a machine rather differently constructed is required. Fig. 31 shows such a machine, which is known as Lawson's inclined spindle gill spinning frame. A is the can of sliver from the finishing drawing frame. As shown, the sliver is lifted from the can by a pair of rollers B, which deliver it to a pair of feed rollers C. As it issues from these latter it is "pinned" by the gills on the faller bars D, which

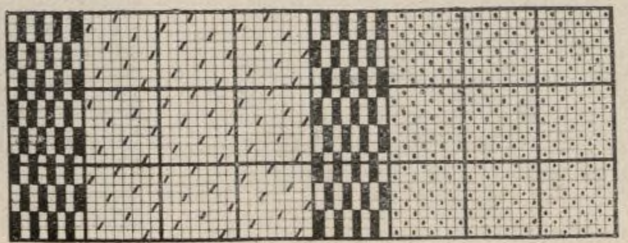
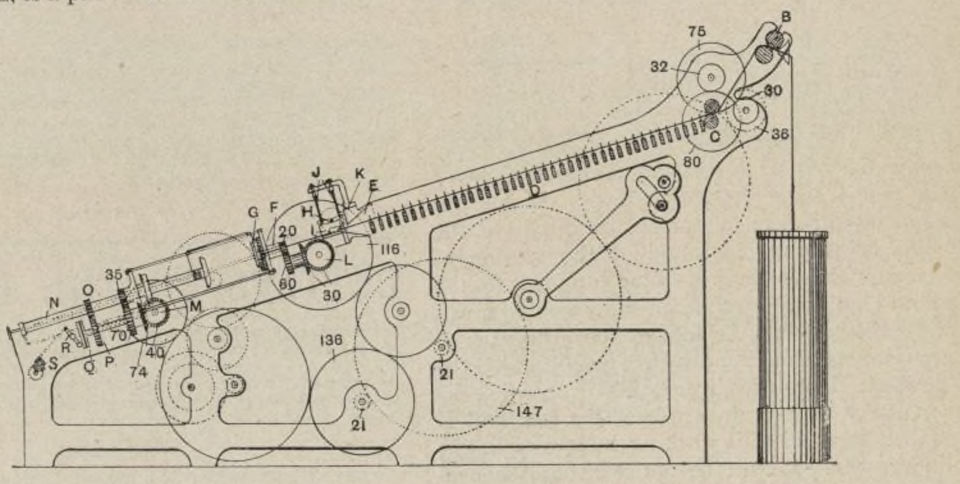


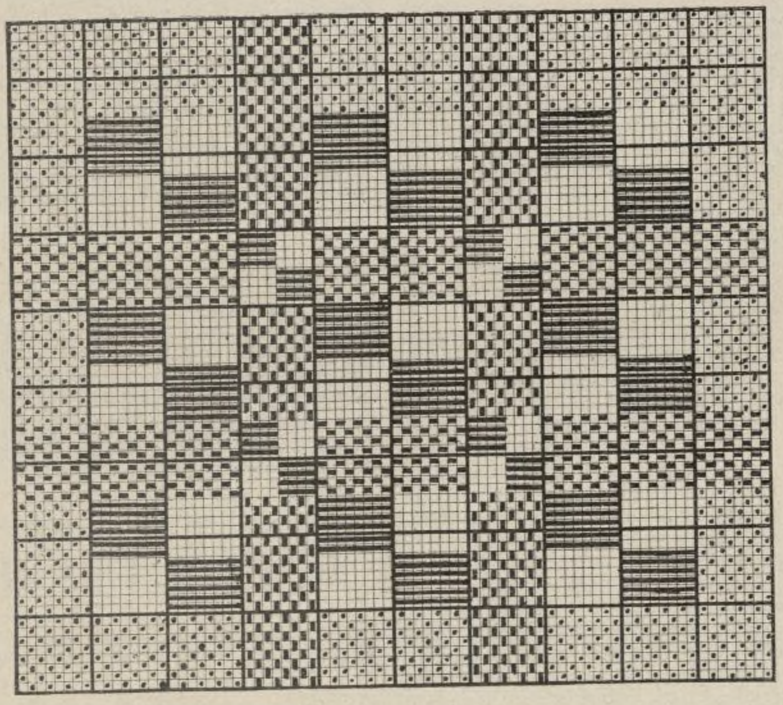
FIG. 174.

work in the ordinary way on the screw gillbox principle, as described in connection with the drawing frame, Fig. 27. From the gills the material is drafted through a trumpet mouth arrangement E and a twist tube F by means of haul pulleys G of similar construction, and working in a similar manner, to those of the automatic spinner described in the last article. Unlike the latter, however, this machine has no draft-controlling mechanism, its trumpet mouth merely serving to retain and draw out lumps, etc.; and to maintain such a grip upon the fibres as will prevent them from being "gulped." The condensing trumpet mouth is formed by an eccentrically-grooved roller H and a grooved block I, the grooves forming a tapering passage for the sliver. The roller H is held in position by springs J, J acting upon arms projecting from the roller axle in opposite directions, as shown, and by the frictional drag of the sliver on the roller, by which means a light nip is maintained, the twist running up to this point. The bracket K, carrying the roller, is hinged to the block I, and held down by a spring hook. The bracket K is also constructed to form the upper half of the trumpet mouth, guiding the sliver to the nip. It will be noticed that in this machine the gills and spindles are both mounted at the same inclination, the object being to allow the sliver to pass in a direct line through the nip. The theory of the drafting, twisting, and winding is similar to that of the automatic spinner, the method of driving the parts and the construction of the machine alone being different. This machine has usually six spindles side by side, and is adapted for an 8 by 4in. bobbin. Gearing takes the place of belts in the flyer and twist tube drives, and in dragging the bobbin, and has the advantage that, being a positive drive, the weight and twist of the yarn cannot be affected by slipping belts, as in the automatic spinner. The twist tube is driven through an intermediate wheel, as shown, by a shaft L running across the frame, upon which shaft is the wheel of 116 teeth, which is driven from the driving shaft by change gearing. The flyer is driven through intermediates from another cross shaft M, also driven by gearing from the pulley shaft. The bobbin is as before pulled round by the tension of the yarn and connected by a pin with the sliding sleeve N, which has upon it a pinion O upon a feather, which pinion gears with the wheel P compounded with the friction disc Q, upon which additional pressure is applied as the bobbin fills by the lever R, actuated through a chain by a shaft S upon which the chain is wound, and which gets a semi-turn through a worm compounded with a ratchet wheel, which is moved by a detent at each traverse of the bobbin in a manner which will be readily understood.

As the calculations for draft and twist upon this machine are rather difficult, we will give particulars of the wheels and speeds in detail. The draft is the ratio between the length of sliver taken in by the feed rollers in a given time, and the length of yarn which in a like space of time passes over the haul pulleys and is wound upon the bobbin. Taking one minute as the unit of time, and the speed of the frame pulley as 450 revolutions per minute, we find the length of sliver taken in by the back roller as follows :—Upon the other end of the frame shaft from that upon which the driving pulley is keyed, is a pinion of 21 teeth driving the large stud wheel of 147 teeth. Compounded with this stud wheel is another pinion of 21 teeth driving the back shaft or draft change wheel of 36 teeth through the two large spur carriers shown.

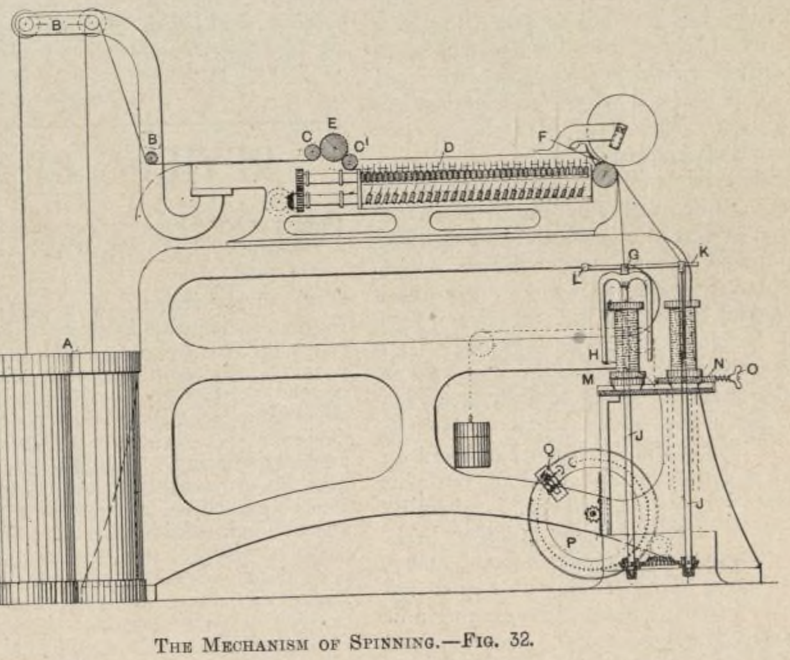


THE MECHANISM OF SPINNING.—FIG. 31.



FANCY DRESS FABRICS.—FIG. 176.

Upon the other end of the back shaft is the pinion of 30 teeth driving the stud wheel of 75 teeth compounded with the stud pinion of 32 teeth driving the back or feed-roller wheel of 80 teeth at a speed of $\frac{450 \times 21 \times 21 \times 30 \times 32}{147 \times 36 \times 75 \times 80} = 6$ revolutions per minute. The circumference of the back roller, which is 3in. in diameter, is 3 × 3·1416 = 9·4in., so that it draws in 6 × 9·4 = 56·4in. of sliver per minute. To find the length of yarn delivered to the bobbin by the haul pulleys in the same time, we proceed as in the automatic spinner to find the difference between the power of the flyer and the twist tube drives. Motion is given to both flyer and twist tube from a speed wheel of 136 teeth upon the frame shaft. This wheel drives the wheel of 74 teeth upon the flyer shaft through the large intermediate shown. Upon the flyer shaft are bevels of 40 teeth, gearing with similar bevels upon studs. Compounded with the latter are spur pinions of 70 teeth driving the flyers through pinions of 35 teeth at a speed of $\frac{450 \times 136 \times 40 \times 70}{74 \times 40 \times 35} = 1654$ revolutions per minute. The twist tubes are driven in a similar manner to the flyers, through a wheel of 116 teeth upon the cross shaft, upon which are bevels of 30 teeth driving stud bevels of similar size, which latter are compounded with spur wheels of 60 teeth driving the twist tubes through pinions of 20 teeth at a speed of $\frac{450 \times 136 \times 30 \times 60}{116 \times 30 \times 20}$ = 1582 revolutions per minute. Upon the inside end of the twist tubes are pinions of 20 teeth, gearing with similar pinions upon the haul pulleys. The velocity given to the haul pulleys by the twist-tube drive is thus equal to 1582 revolutions per minute. The flyer revolves in the same direction as the twist tube, and carrying round with it the haul pulleys, tends to give them a velocity of 1654 revolutions in a direction opposite to that of the 1582 revolutions given by the twist tube. The effective speed of the haul pulleys is thus 1654 − 1582 = 72 revolutions, and their diameter being $2\frac{3}{8}$in., the length of yarn drawn through per minute is 72 × 2·375 × 3·1416 = 537in. Since the rate of feed is 56·4in., and that of delivery



THE MECHANISM OF SPINNING.—FIG. 32.

537in. per minute, the draft of the frame is $\frac{527}{56 \cdot 4}$ = 9·5. The turns per foot of twist being put into the yarn, the speed of the flyer being 1654 revolutions and the rate of delivery $\frac{537}{12}$ ft. per min. are $\frac{1654 \times 12}{537} = 37$.

To produce yarn about 400yds. per pound from Manila hemp, Lawson's gill spinner should have:—

Length of reach	80in.
Breadth of gill	$1\frac{1}{2}$in.
Pins per inch (1 row)	8
Length of pin out of stock	$\frac{3}{4}$in.
Pitch of screw	$1\frac{5}{16}$in.

Fig. 32 shows another form of gill-spinning frame which is used to produce strong and heavy yarns from coarse vegetable fibres. It is practically a roving frame minus its bobbin drive, the bobbins being dragged round by the tension of the yarn, friction brakes being applied to the bobbin to maintain a strain on the yarn and give a firmly-built bobbin. As before, A are the cans of sliver from the finishing drawing frame, and C the feed rollers. B are the sliver guides over which the sliver passes as it is drawn from the can, and D the faller bars and gills working in screws in the ordinary way. It will be noticed that the construction of the feeding or retaining rollers, shown in this frame, is different from those previously described. In the case of the machine Fig. 27, for instance, the sliver is held by direct pressure between the two feed rollers. In the combination under consideration, however, a third roller E, called a "jockey roller," is introduced, which, made in short lengths and lying upon and between the rollers C, is turned by friction. The sliver passes first under the roller C, over and around the jockey roller E, and then under the roller C^1, before being pinned by the gills. It is nipped and held at the points of contact of the roller E with the rollers C and C^1. To avoid referring to these rollers again, we may here say that when they are used in rather finer machinery of this class, working dirty material, a metal trough sometimes surrounds the lower portion of the rollers C and C^1, around the exterior smooth and stationary surface of which trough the sliver is drawn by the grip of the jockey roller upon the revolving feed roller. It is thought that in this arrangement some of the shove or dirt in the sliver is scraped off upon the edges of the troughs.

The sliver is drawn through the conductor F by the comparatively high surface speed of the drawing rollers, similar to and pressed together in the same way as those in Fig. 27. Leaving the drawing rollers, the sliver passes through a hole in the head of the flyer, down the leg, and on the bobbin. The flyer is of steel, and of very similar construction to that of the cotton roving frame described in a previous article. A "presser" is not required, however, and the flyer works equally well with or without a "curl" or eye H upon the extremity of its leg. The flyers are fast upon the top of the spindles J, which are driven at a constant speed by gearing, as shown from the frame shaft. The long and heavy spindles, usually driven at a rather high speed, are steadied by the plate K, which fits over the spindle tops and flyer heads, and which, being hinged at L, may be raised to remove the flyers and full bobbins. The bobbins are pulled round by the tension of the yarn. They rest upon the carriers M, with which they engage by means of pins, as shown, and which they pull round with them. A suitable drag is applied to the bobbin by means of wooden friction brakes, one of which is shown at N. These are composed of two wooden blocks which surround the carrier upon which they are pressed with more or less intensity, as the thumb-screw O is turned and the blocks tightened together.

The yarn is built upon the bobbin in a regular manner in consequence of the up-and-down motion of the builder with the carriers upon which the bobbins rest. This up-and-down motion, which in this machine is constant and regular, both as regards speed and length of traverse, is given by means of a wheel P, known as the "mangle wheel," which is frequently met with in spinning machinery, and which, acting in conjunction with a rack and pinion, gives the required motion in a manner now to be described. The driver of the mangle wheel is a small pinion Q, keyed upon the end of a shaft driven by gearing from the other side of the frame. This shaft is not rigidly carried, so that its extremity, with the pinion which it bears, can change its position in the slotted bracket shown when the mangle wheel is moved round to a position such that the last of its teeth is in gear with the small driving pinion. The teeth of the mangle wheel are brass pins ranged in an uncompleted circle. As the pinion reaches the last pin at either end it moves round it, being assisted to do so by the semi-circular guides shown. It will be seen that the pinion, which constantly turns in the same direction, drives the mangle wheel alternately in opposite directions, giving the builder its up-and-down motion in a manner easily understood from the drawing.

(To be continued.)

LETTERS TO THE EDITOR.

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

AIR PROPELLERS.

Sir,—Referring to the excellent article on "Air propellers" in the March issue of The Textile Manufacturer, we quite agree with your contributor that the principles governing the actions of fans of the volume or screw type do not appear to be understood either by the users of fans generally, or by the majority of volume-fan makers themselves, judging by the crude "rule-of-thumb" methods adopted in the construction of most fans now on the market.

Most fan makers construct their fans with blades having the same, or nearly the same, angle at the centre as at the circumference. It is easy and cheap to construct fans so, but it is entirely wrong in theory, and certainly not in accordance with the principles which should form the basis of all fans of the screw type. Fans of this kind must of necessity cause the air to travel through them with varying velocities, decreasing from the periphery towards the centre. They are therefore weak at the centre, and when put to do hard work will simply churn the air up in themselves, instead of forcing it forward.

As regards the pitch of the blades, we may say that in our patent screw fan they are formed with a varying pitch, increasing from the feed edge to the delivery edge. This allows the fan to pick up the air at a moderate velocity and gradually increase its speed as it passes through the fan, thereby preventing shocks and vibration, and ensuring the air being discharged in a strong, steady flow, instead of in gusts, as is the case with fans having blades not of the screw formation.

Respecting the question of "slip," we may say that our patent fan has a volumetric efficiency of over 90 per cent.—that is, a fan with blades of a known pitch, running at a given speed, will move within 10 per cent. of its full theoretical capacity, or in other words, less than 10 per cent. is lost in slip and friction, which is a very high standard of efficiency.

Fans fitted with too many or too wide blades have a very low mechanical efficiency. One reason for this is that the air passages are blocked, and another that when running at a high speed the air which has been disturbed by one blade has not time to re-form for the succeeding blade to work against, and hence what is known in marine work as "cavitation" takes place, and a large amount of power is uselessly expended.

F. Hattersley, Pickard and Co.

REVIEWS OF BOOKS.

Decorative Flower Studies. By J. Ford. London: B. T. Batsford, 94, High Holborn. 25s. net.

The surroundings of a textile designer are seldom in keeping with the class of work he is expected to produce. In some out-of-the-way corner, in a room useless for any other purpose, probably intermixed with stores or old iron, and throbbing with the clatter of looms—here the designer is expected to give birth to novel, attractive, and beautiful designs more suggestive of sunshine and flowers than of the bustle and dust with which the originator is surrounded. This state of affairs is one of the reasons why English textile designers take a secondary position, why we have to send to Paris for many of the new suggestions for designs or tasteful colour combinations, and why Continental fabrics are still held to be the pioneers of coming styles. In France new designs are worked out by artists of artistic training and surroundings, and only in the last stage is the new design placed in the hands of the person who transfers it to point paper, previous to card-cutting. This is so very different in the English trade that it is impossible not to admire the man who develops useful designs, transfers them himself to point paper, and in some of the small mills has even sometimes to lend a hand with card cutting—all amidst surroundings far from conducive to any approach to art. It is as a help to such men, amongst many others, that this book has been published, although its value will, if not so noticeable, be all the more readily perceived by those standing higher in the artistic ranks. It consists really of a series of elaborately-illustrated flower studies. The various plants are taken both from an artistic and botanical standpoint, the latter being introduced more as a help to the former; and as the flowers are taken in detail, there are suggestions for every phase and position of petal and leaf. Even the natural deformities of some of the flowers are taken, the compiler believing that every possible state and stage is necessary to fully illustrate the characteristics of each. Altogether, the forty large coloured plates and the accompanying plain drawings and illustrations should give food for many designs and artistic effects, in addition to lifting the designer out of the stereotyped groove of concocted shapes and imaginative floral effects into a more natural, and therefore more beautiful and artistic, line of work.

Cotton Spinners and Manufacturers' Directory. John Worrall, Marlborough-street, Oldham. 5s. net.

The last issue of this directory, being brought up to the date of the present year, contains the usual information in as handy a form as its predecessors. A ready reference index, with names arranged alphabetically, and also with firms classed as to their various trades and districts, gives access to all firms engaged in the textile trades in Lancashire. In addition, the book gives some valuable statistics regarding the increase, decrease, and present number of looms, spindles, and firms; whilst the range of counts spun by each spinner is also shown in tabular form.

We have also received:—The "Sprinkler Bulletin" for March, containing a description of a large cotton mill in Roubaix and some weaving and spinning mills in Russia which have been fitted up with Grinnell sprinklers.—A catalogue of chemical fire extinguishers and other fire-preventive outfits, as made by Messrs. Dowson, Taylor and Co., Blackfriars Bridge, Manchester.—Report for 1900 of the British Chamber of Commerce of Turkey.

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.

E. J. (Ystrad Meurig).—The Sizing Materials Company, Marsden-square, Manchester, or Mr. James Eastwood, Market-place, Manchester.

J. G. (Rochdale).—The inventor of the new cleaning process described in our February issue is Mr Felix Wislicki, Tubize, Belgium.

T. F. and Co. (Bainbridge).—The cross-border jacquard in question is made by the Standard Jacquard Company, Wellington-street, Newton Heath, Manchester.

E. A. (Manchester).—In Lancashire and district there are, according to Worrall, 43,119,580 cotton spindles, and these represent most of the kind in the United Kingdom.

C. T. (Berlin).—We believe the English firms you mention are simply the various agents of Messrs. Homo and Co., of Paris, who supply patterns of the goods you mention.

L. Kien (Vincey).—You will find the matter thoroughly treated on pages 164 and 200 (May and June, 1900). We believe that Platt's make is the most used in all the countries you name.

D. S. and Co. (Manchester).—"Mechanism of Weaving" (Fox), 7s. 6d. net; "Cotton Spinning" (Nasmith), 6s. net; "Finishing Cotton Goods" (Depierre), 30s. net, may be obtained from this office.

M. M. and B. (Blarney).—Apply to nearest post office, or direct to the Patent Office, 25, Southampton Buildings, Chancery-lane, London, W.C., for Provisional Protection form, which will cost £1. Also ask for the official pamphlet of the Patent Office, which is supplied free and gives all the necessary instructions.

G. S. Co. (Belfast).—We cannot refer you to an article covering the whole ground in The Textile Manufacturer although fibres have been compared in pairs from time to time, in a very exhaustive manner. You will obtain all the information you require, in convenient form, in "Yarns and Textile Fabrics," by Dr. Herzfeld, 10s. 6d. net.

C. M. and Co. (London).—The following are books we can recommend:—"Coal-tar Colours" (Benedikt), 6s. 6d.; "Dyeing and Tissue Printing" (Crookes), 5s.; "Dyeing Textile Fabrics" (Hummel), 5s.; "Bleaching and Finishing" (Practical Bleacher), 2s.; "Bleaching Linen and Cotton Yarn" (Tailfer), 12s. 6d.; "Manual of Dyeing," 3 vols. (Knecht, Rawson, and Loewenthal), 45s.; "Bleaching and Calico Printing" (Duerr and Turnbull), 12s. 6d.; "Finishing Cotton Goods" (Depierre), 30s.; "Dyeing and Calico Printing," 3 vols. (Sansone), 36s.—all of which can be obtained from this office.

THE TEXTILE MACHINIST:

Devoted to Machinery, Apparatus, Tools, Etc.

Loom with Stationary Shuttle Race.

MESSRS. PANITSCHEK AND HEROLD, BRUNN.

IT is very unlikely that the present method of beating-up the weft in weaving will ever be superseded by any radically different system, but there are cases where special fabrics are made when it would be a decided advantage to have a stationary shuttle race, and beat-up the weft by some independent mechanism. When a

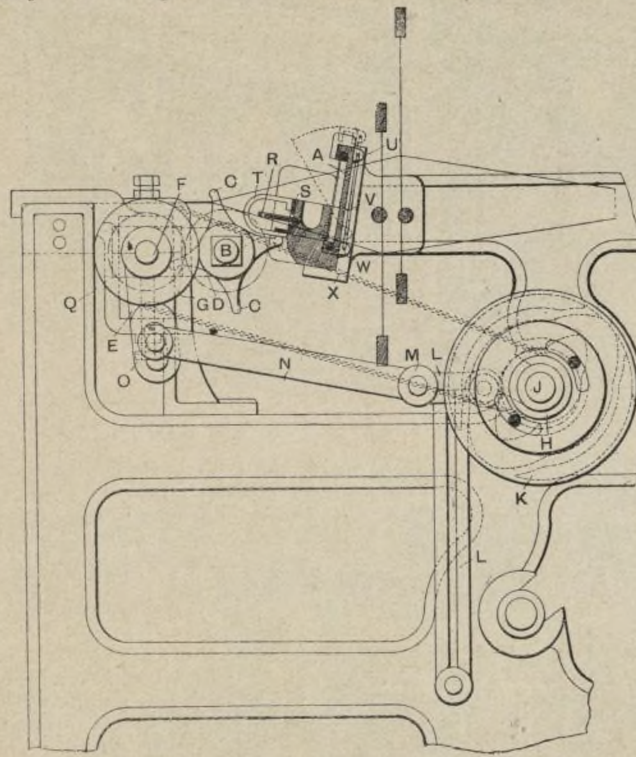


FIG. 1.

reed is manipulated to give ondulé or very fancy leno patterns, the mechanism could be greatly simplified if the shuttle race was fixed instead of retaining the rapid reciprocating motion generally found so necessary. It is also needless to add that where patterns are formed by a moving reed there is an increased liability to

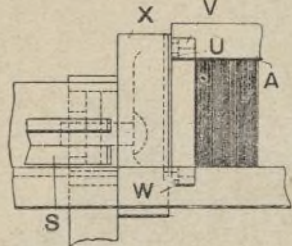


FIG. 3.

shuttle flying, which a stationary race will almost if not entirely, neutralise. Then the method of beating-up about to be described would not be practicable with a plain or ordinary fabric, where the fabric must be perfect and entirely free from reed marks; but in the openwork effects just described, such marks, if visible, would be entirely overlooked in the general effect of the design.

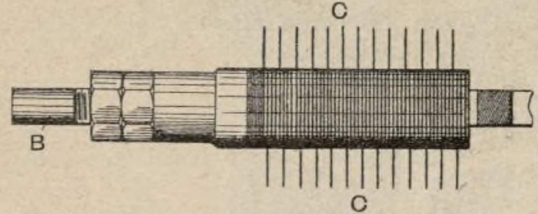


FIG. 4.

A side elevation of part of a loom fitted with the new apparatus is shown in Fig. 1, whilst a front elevation of the apparatus itself is given in Fig. 2. Part of the lay and shuttle race is shown in front elevation in Fig. 3, whilst the new beating-up medium, known as the "reed shaft," is given in Fig. 4. In front of the slay A this reed shaft B is placed (Fig. 1), being, as the drawing shows, of rectangular section, and carrying reed blades C (Fig. 4), which are strung upon it and kept equidistant by means of intermediate discs or washers, which may be varied to suit the fabric being woven. The reed blades are set at right angles to each other, and are put together so that the blades of each of the four sets are not placed opposite, but between, each other, and so that each beats up at the fell of the cloth in places between the previous beats-up.

The reed shaft turns in a bearing at one end of the arm D of the bent lever E, which is keyed on the shaft F. To impart the requisite movement

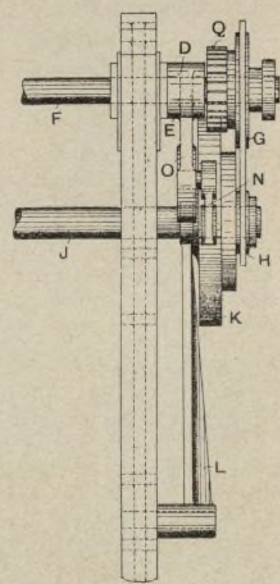


FIG. 2.

for beating up to the reed shaft B, a chain wheel G is placed to run loose on the shaft F, driven from a chain wheel H keyed on the mainshaft J, giving a velocity in the ratio of 1 to 2. There is fixed to the chain wheel G a toothed wheel Q gearing with a second toothed wheel keyed on the reed shaft B. These toothed wheels are of equal diameters and have the same number of teeth. This contrivance produces, as will be afterwards explained, an intermittent motion of the reed shaft B, and its rising and falling are effected by causing the bent lever E to be actuated from a cam K, fixed on the main shaft J. In the groove of this cam K there is a roller, capable of revolving, attached to the

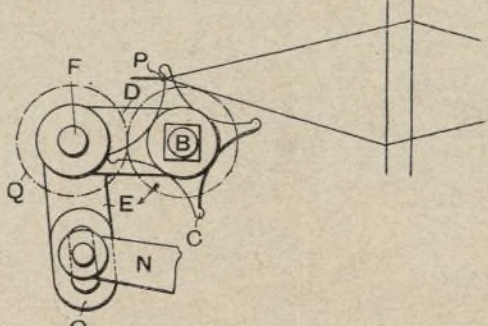


FIG. 5.

free end of a lever L, of which the fulcrum is in the frame of the loom. Opposite to the roller the lever L has an eye M, by which it is joined to a connecting rod N, the other end of which is attached by means of a slot to the arm O of the bent lever E.

The following is the method of working the apparatus:—Let it be supposed, first, that the reed shaft is in the beating-up position, Figs. 1 and 5, and after the shed has been changed that the weft P, previously laid in the shed, has been beaten up to the cloth. At the same instant the weft begins to be sent through the crossed and open shed, Fig. 5, and then the reed shaft B drops. This is effected by the connecting rod N having been pushed during this interval towards the left, which has caused the bellcrank lever E to turn in one direction of the arrow, Fig. 5. By this turning movement of the bellcrank lever E the turning of the shaft B ceases momentarily, as the angular velocity of the arm D is the same as the velocity of the continuously-driven toothed wheel Q. As the reed shaft B drops, Fig. 6, the reeds which were just before in the beating-up position move slightly backward to the right, as at the instant of their moving down the mechanism just described

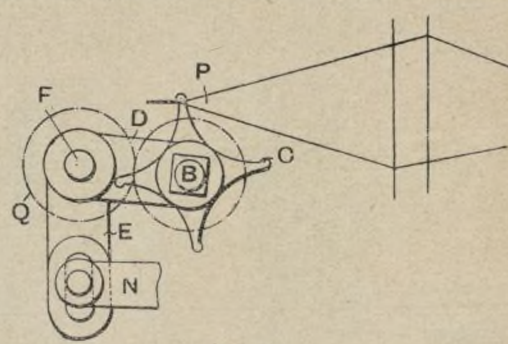


FIG. 6.

forms a rigid system which is turning round the shaft F. If a slight backward movement of the reeds in question did not take place, they might, in the downward movement of the reed shaft B, drag along with them the finished cloth.

During the turning of the bent lever E the shuttle has travelled across the loom, has drawn in the weft, and is in the other box. The shed now begins to close, Fig. 7, the reed shaft begins to rise

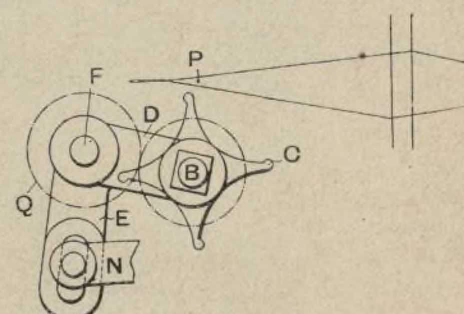


FIG. 7.

and to turn rapidly, for, on the one hand the connecting rod N is pulled to the right by the cam K, and on the other hand the toothed wheel Q drives the other toothed wheel positively. The reed shaft is lifted in this way to the position Fig. 8 to grasp the weft already laid in and beat it up, when the shed has been again crossed against the finished

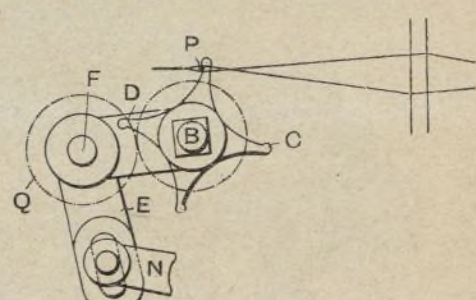
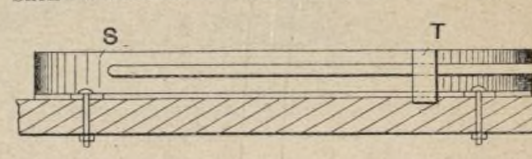


FIG. 8.

cloth, Fig. 5, as the construction of the cam is such that the turning of the reed shaft through a little more than 90° is produced. The excess of the turning beyond 90° corresponds exactly with the backward movement from the position of Fig. 5 to



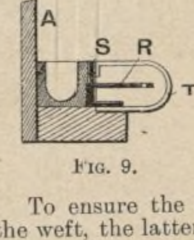
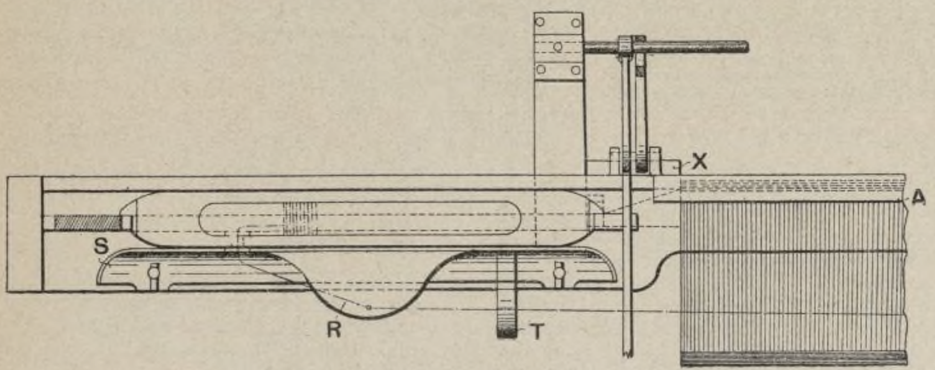


FIG. 9.

that of Fig. 7. To ensure the certainty of the reeds catching the weft, the latter must be laid as close as possible up to the apex of the shed, and this is effected by applying an attachment or projection R to the shuttle through an eye in which the weft is passed, and which is shown in Fig. 10. In consequence of this projection, the front side S of the shuttle box is provided with a long slit, which is shown in elevation and cross section in Fig. 9. There is also a stirrup-piece T fitted to the front side of the box for the purpose of stiffening it.

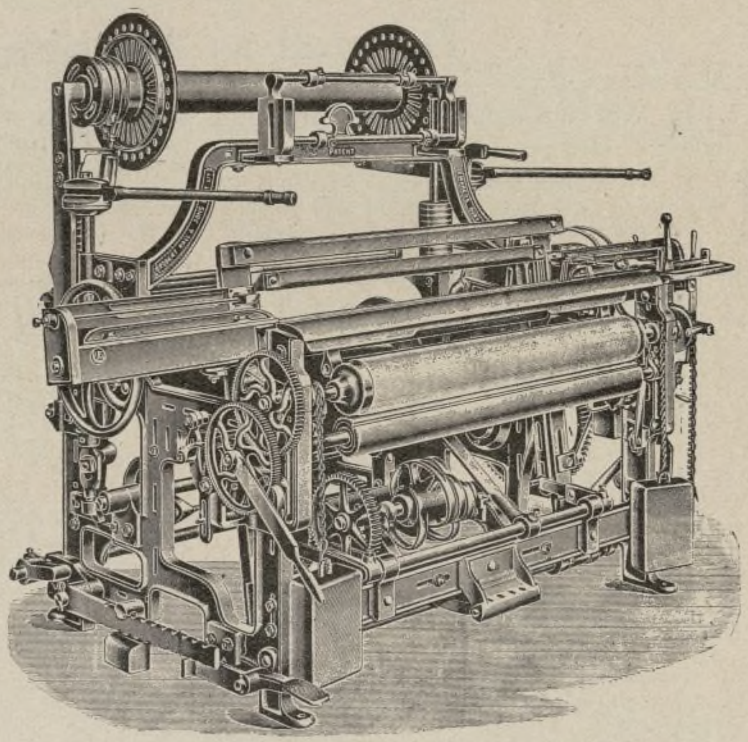
In order to facilitate access to the warp threads in the case when several shafts are arranged one behind another, a contrivance has been adopted for looms provided with the beating-up arrangement above described, which allows, during the weaving, of the fixed slay being turned over, as shown in Figs. 1 and 3. This consists in attaching flaps U to the back side of the frame V, both right and left (one above and one below), into which the studs W are fixed. To the side of the loom angle pieces or brackets X are attached which have slits in them. Into these slits the slay is guided by the studs W, so as to come into definite position. If it is desired to turn over the lay, it is first lifted to the position shown by dotted lines in Fig. 1, and then turned over to the position also indicated in dotted lines.



Loom with Stationary Shuttle Race.—Fig. 10.

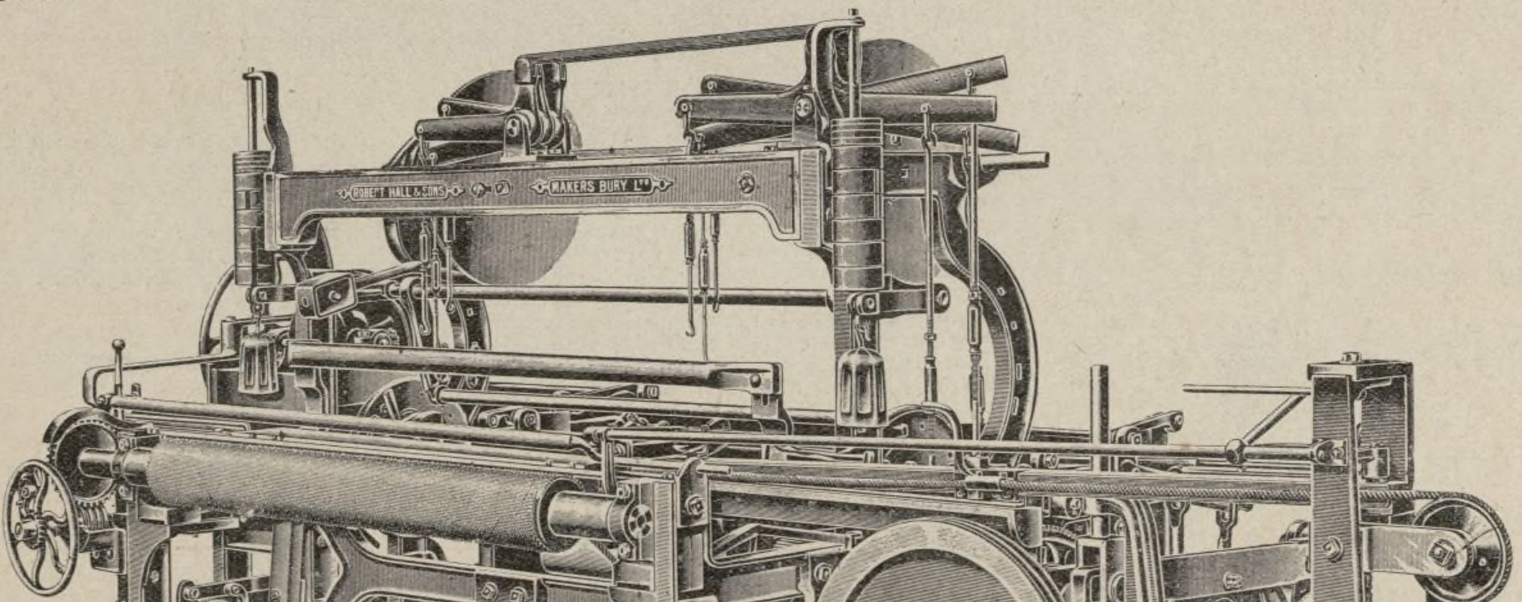
Machinery at the Glasgow Exhibition.—I.

THE Glasgow Exhibition, which was opened on the 2nd inst. by the Duke and Duchess of Fife, falls on the jubilee year of the first of its kind—namely, the Great Exhibition of 1851. There is little in common, however, between the two exhibitions except as regards aim and purpose, for we have lived at a fast rate during the last fifty years, and almost every industry has been revolutionised. Great as the Exhibition of 1851 was considered, it only covered about one-quarter the area of the present great show, although situated in a far more central position. It is only thirteen years since Glasgow had her last exhibition, and this was such a success as to almost ensure the present one being, in at least a degree, the same. The last Glasgow exhibition yielded a profit of £54,000, which was increased by subscriptions to £125,000. This was doubled by the Corporation, and half-a-million pounds provided for the erection of an art gallery. This building was opened on the same day as the present Exhibition, part of whose buildings it is, but a part which will remain when the Exhibition of 1901 is almost forgotten.



Machinery at the Glasgow Exhibition.—Fig. 2.

The Exhibition is of international interest, and the chief countries of the world are officially represented, with the exception of Germany and the United States. Both these countries, however, are largely represented by individual manufacturers. Our colonies are well represented, Canada especially being well to the front. A noticeable feature is the interest which has been taken by Russia, who, next to Great Britain, is the largest exhibitor. The Czar has taken a special interest in the Exhibition, making a grant of £30,000 for suitable buildings, and appointing special Imperial Commissioners to supervise the Russian section.



Machinery at the Glasgow Exhibition.—Fig. 1.

The Machinery Section, which by many is declared the principal feature of the Exhibition, requires 5000H.P., the steam being supplied by the most modern types of boiler. This power is practically all consumed by the dynamos which supply the various motors with electrical energy. The textile industry is only one of the very many trades represented, and almost every type of mechanism used in the various manufactures is represented. American labour-saving appliances open our eyes to the ingenuity of the Yankee, who will do nothing by hand which it is possible to make a machine do; examples of marine engineering and shipbuilding are shown both in progress and by a hundred models in the grand avenue; and in addition there are railway engines, electric tramway stock, and steam, hydraulic, and electric motors in large assortment. The sections devoted to art, agriculture, and other subjects of interest, although fully represented, do not come within the scope of these columns.

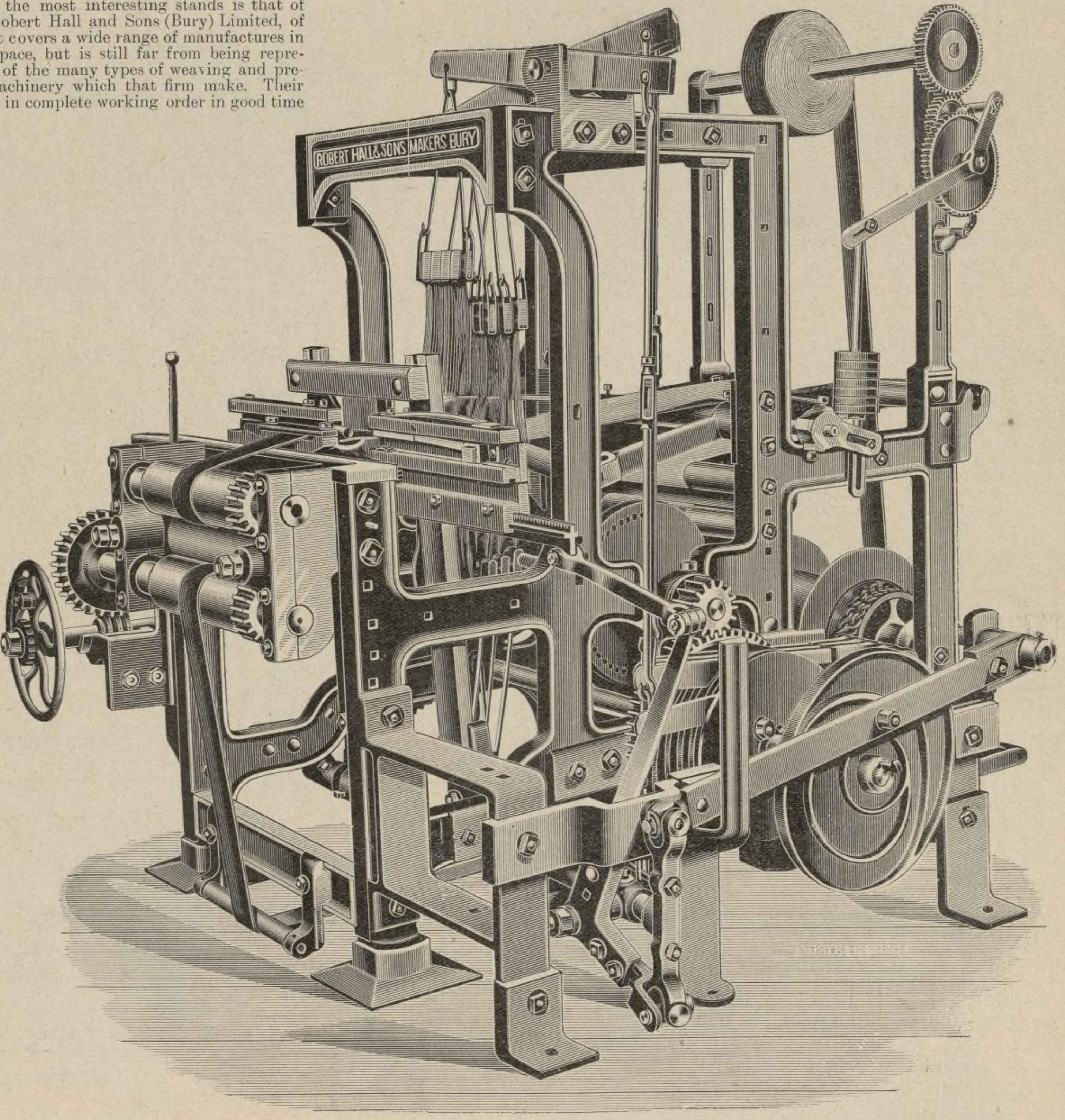
Considering the importance of the textile industries both in Scotland and Great Britain generally, there are a very small number of textile exhibitors. However, what is wanting in quantity is made up by the interesting character of the machines shown, nearly every one being a speciality in its way, and the total being a fair representation of the various types of machines. This applies more to weaving, preparing, dyeing, and hosiery machinery, for the spinning section has been sadly neglected.

One of the most interesting stands is that of Messrs. Robert Hall and Sons (Bury) Limited, of Bury. It covers a wide range of manufactures in a small space, but is still far from being representative of the many types of weaving and preparing machinery which that firm make. Their stand was in complete working order in good time for the opening, and as soon as the motive-power was available, the machines commenced working.

Perhaps the most noticeable machine (which, on account of its size, at once attracts the eye) is the tapestry and velvet carpet loom. It is a present-day development of the Moxon system, about which, it will be remembered, so much litigation took place in the carpet trade many years ago. Messrs. Hall and Sons have been identified with the loom ever since that time, although the numerous improvements and patents which they have added to it have greatly changed its features and added to its utility by increased speed and production. Fig. 1 shows the loom, which is the 6/4 (54in.) size, and which is capable of 20 per cent. more output than the older types of ten or twelve years ago. The take-up is positive, and the picks can readily be altered by change wheels. The let-off is also positive, both for the stuffer and chain warps, the worm and wheel type of motion being used. As is customary in the manufacture of tapestry carpets, the pile warp has the pattern printed on it in elongated form, previous to weaving, and the total warp threads are passed through three healds actuated by side tappets. The lay is made of cast iron, and is planed and milled, as are also the various joints and connections throughout the machine. The main feature of the loom is the wire-inserting motion, which has been designed for high speeds. The wires are put into the shed automatically, and after being woven into the cloth are withdrawn by automatic action. The driving of the loom is double gear, the picking is underpick, and the woven carpet is coiled up by a negative motion. This machine is equally applicable to cut or uncut pile goods, the only difference being in the kind of wire inserted.

The Turkish towel loom is only slightly less interesting than the preceding machine, and perhaps more interesting to many. It is illustrated in Fig. 2, and, as will be seen, is fitted with inside tappets, four shafts being required for the ordinary kinds of Turkish towelling. There are two yarn beams, one for ground and the other for face, and there is a special motion for letting off the two sets of warp. The take-up is positive, and there is an arrangement whereby the length of terry may be adjusted at will. Another motion allows the number of picks in the headings to be varied as required, whilst an arrangement produces the fringes automatically and rapidly. The usual overpick motion is used, but the picking tappets are of special construction, being designed so as to cause very little vibration.

The hosepipe loom shown is, like some other looms built for very heavy work, made so as to give a double blow at the fell of the cloth for every revolution of the crankshaft. As the web is comparatively narrow, the shuttle is worked positively, being propelled backwards and forwards by a rack and pinion. This motion is partly visible in Fig. 3, which illustrates the loom. A reciprocating motion is given to a rack operating on two toothed pinions, which in turn engage with a rack secured on the shuttle, and transmits the requisite motion. All the parts of this loom are very strong and rigid, and the take-up is positive; there are two warp beams and double-driving gear. The treading tappets are placed outside the loom, whilst the woven hosepiping is coiled up at the back of the loom in a position which allows of very long pipes being woven in one length.



Machinery at the Glasgow Exhibition.—Fig. 3.

The plaiting or folding machine exhibited is shown in Fig. 4, and is suitable for making 18 to 45in. plaits in cloth up to 40in. wide. Of course this is only one size of a series of machines which cover every width and length of plait. The machine is provided with a special grip and relieving motion for holding down the cloth after the fold is laid, and which ensures freedom from damage to the goods, a point very essential when folding bleached or finished fabrics. A regulating motion attached to each machine enables changes to be readily made from one length of plait to another, by means of right and left-handed screws, which from one point control the grip rail at four separate places. The machine is provided with an inspection table, and also an indicator for denoting the number of plaits made.

The cross-winding machine exhibited was so recently described in these columns (November, 1900) that it will be fresh in the minds of our readers, and need not be gone over again. Since that time, however, in addition to the features

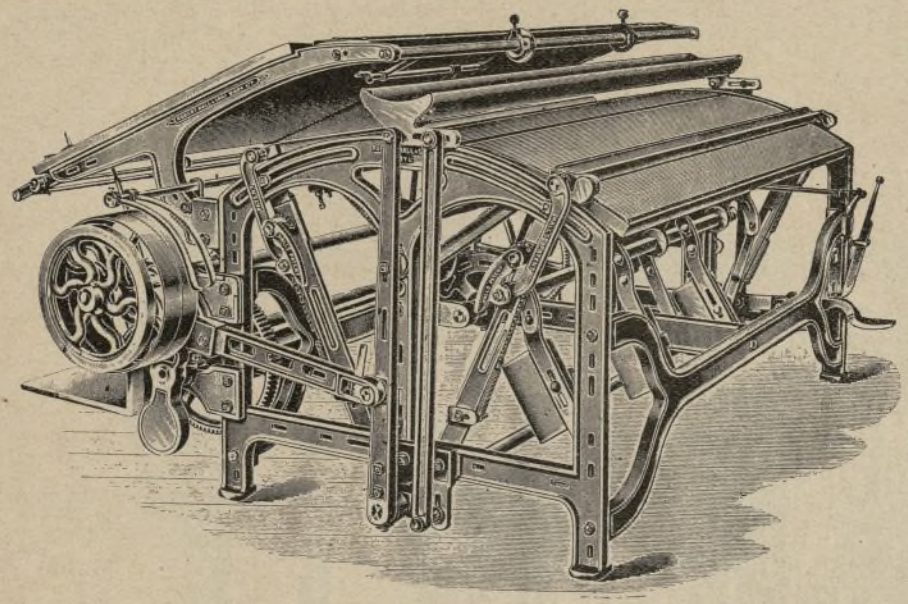


Fig. 4.

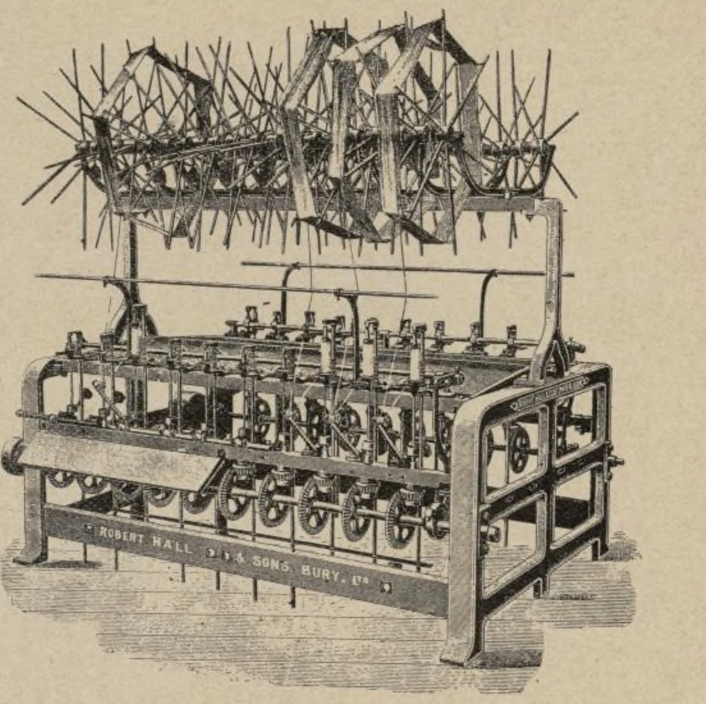


Fig. 5.

Machinery at the Glasgow Exhibition.

then described, a stop motion has been supplied which, when two or more threads are being wound together, stops each spindle separately when a thread breaks. There is also an arrangement whereby each individual spindle is stopped when the cheese it is winding reaches a certain (predetermined) diameter.

The tubular winding machine illustrated in Fig. 5 winds weft yarns on the bare spindle, thus producing cops which are practically solid yarn. As there is no space taken up by bobbins, spools or pirns, it is possible for the cops wound on this system to hold from twice to five times the amount of yarn of other methods. Needless to say, this system, which is gradually gaining ground, reduces the labour of the weaver to no slight degree, and is really a step in the direction taken by the self-changing or automatic looms, on a more substantial and practical basis. The machine exhibited is arranged to wind from cotton or linen hanks, cops, warping or slubbing bobbins, and can be arranged to make any length or diameter of cop. A show-case is also to be seen near, containing specimens of cops wound on this principle, the cops being collected from manufacturers in different parts of the country who have been supplied with these machines. It is unnecessary to say that the cops can be drawn off from either the outside or inside, and their use is so simple that in known cases it has been found that where special work originally required the attention of one weaver per loom, the introduction of solid cops has enabled the weaver to attend to two looms without any extra work.

(To be continued.)

Hank Mercerising Machine.

MESSRS. KOPP AND USUELLI, BREITESTRASSE, ANDERNACH.

Although the art of mercerisation has made rapid advances during the few years of its existence, such has only been made possible by the mechanical ingenuity displayed in the construction of the various machines. These have been introduced by the dozen—good, bad, and indifferent,—so that the merceriser has had a wide selection to choose from. Many types have now proved their value and become classed as standard machines, but it is yet by far too early to say that the competition is ended, and that these machines will be generally adopted in the future.

It is now some time since the "Whitefield" hank-mercerising machine was introduced, and described later in these columns (August, 1900, p. 273); yet a very similar idea has been conceived by some German inventors. In some respects, especially rigidity and strength, the new machine seems decidedly inferior to the Whitefield one, but some of its points are very ingenious and worthy of notice. As we have said before in these pages, it is the weeding-out of the many faulty machines and the adoption of their good points on a common machine which place a practical apparatus at the disposal of any class of manufacturer.

The new machine is shown in front view in Fig. 1, being constructed with a cast-iron base A, on which rests a plate B. On this plate is a raised rim supplied with ball bearings for the plate H to rest upon whilst rotating around the main vertical shaft O. There are four pairs of crankarms E attached at right angles to each other to the plate H, each having carrying fluted rollers C. There is a camslot D in the plate B, in which the levers E are guided by their guide rollers F, while round the plate B, and corresponding with the pairs of crank axles fitted with the rollers, there are four tanks G—really one tank separated by four partitions. In the first tank the yarn is taken off and put on the rollers, in the second it is mercerised, in the third it is squeezed, and in the fourth washed. Over the plate H, and carried by four uprights, is an annular fixture J, on which are carried four

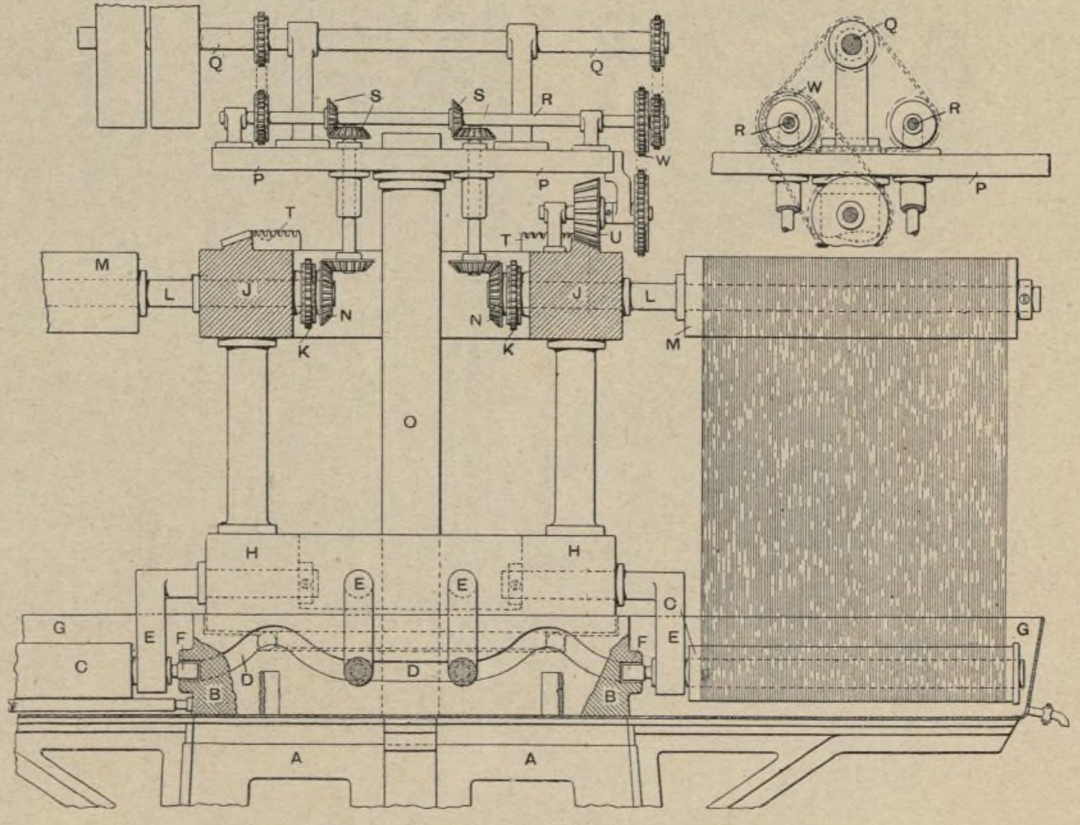
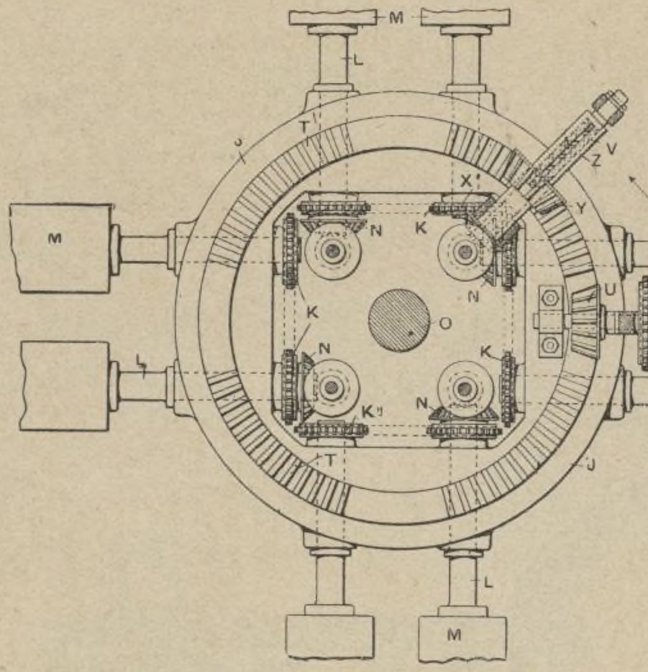


Fig. 1 —Hank Mercerising Machine. Fig. 2.

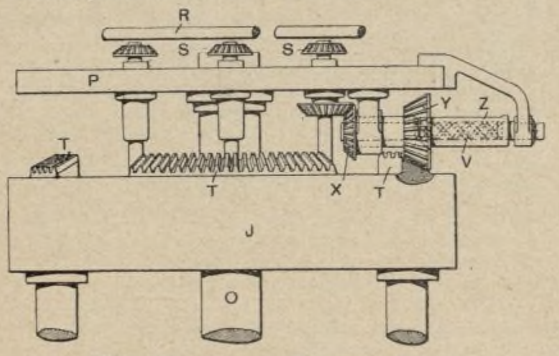
rollers M, which correspond to the cranks E on the plate H. The plate H and the fixture J are firmly secured to each other by uprights, and rotate around the main shaft O, this shaft being provided with roller bearings, so that it may turn more smoothly. Above the fixture J there is a fixed plate P, carried by the main axis O, on which there are three driving shafts, of which Q is the main driving shaft, and R shafts driven by it. Through these two latter shafts (better shown in Fig. 2) the whole of the mechanism of the machine is set in motion. The driving of one of each of the four pairs of axles L in the fixture J is effected by the bevel wheels S. The driving of the second straight axle L of each of the pairs which have bearings in the fixture J is effected by a chain and chain wheels K.

The machine must stand still for one minute after every ten seconds' working, so that the yarn at the time hanging in the tank filled with the mercerising liquid may absorb sufficient of the liquid. For this purpose there is arranged on the fixture J a conical toothed wheel rim T in which at distances of 90°, corresponding to the distances apart of the pairs of axles L, a number of teeth are missing, so that four segments of the toothed wheel rim are formed of equal size. The bevel wheel U, which is driven from the chain wheel W on the shaft R, gears with the toothed rim T, and rotates the plates J and H, transferring the hanks by means of the guide curve D into the next tank. Now when the toothed wheel has got to the place in the toothed rim where the teeth of the toothed rim are missing, the machine comes to rest, whilst the wheel U continues to rotate. At the same time each of the four bevel wheels N which have been out of gear with their driving wheels while the machine was in motion—that is, during the transference of the yarn from one tank to the next,—comes again into gear with the succeeding driving wheels, which are symmetrically arranged round the axle O. When the bevel wheel U is at a place where there are no teeth in the toothed rim T, the bevel wheels N are being driven by the wheels that drive them, and the axles L and cylinders M of the four pairs of rollers are rotated. In this way the mercerisation of the yarn is accomplished. During this interval the double-threaded worm V is set in action. This worm is of such a pitch that it takes one minute exactly to bring the next toothed rim segment into gear with the bevel wheel U, whereby a further rotation of the machine is obtained to the point where the bevel wheel U again comes to a place where teeth are missing in the toothed rim. This is repeated until the rollers have returned to the position from which they started, when the operation is commenced afresh.

The partitions which divide the four tanks are of such a height that the rotation of the rollers C carried by the crank axles is not impeded. The worm V, which cannot revolve, is provided with a sleeve Z (Figs. 3 and 4) having a longitudinal slot therein. The bevel wheel Y, which acts to advance the toothed rim into gear with the bevel wheel U, is fitted loosely on the sleeve Z and is keyed thereto by a key which slides in a longitudinal slot, and has a projection which slides in the groove of the worm V. The bevel wheel X is fast to the sleeve Z, so that when it is driven from the shaft R (Fig. 4) the sleeve Z will rotate on the worm V. As the sleeve Z rotates, the bevel wheel Y will be carried to and fro by means of the projection on the key sliding in the groove of the worm V. This motion is so adjusted that the wheel Y takes one minute exactly to travel to and fro and come into gear again with the toothed rim T, bringing it into gear with the wheel U and setting the machine again in motion. In this way the bevel wheels N are brought out of gear again with their drivers, so that the mercerising is suspended until the yarn has passed into the next tank, and the bevel wheels are again brought into gear with the succeeding drivers. When the bevel wheel Y comes out of gear with the toothed rim T it is carried outwards by the double worm V, so that the following toothed rim segment can come into its place. When the wheel Y slides back it comes into gear again with the toothed rim segment, and brings it to the wheel U, whereupon it slides outwards again.



HANK MERCERISING MACHINE.—FIG. 3.



HANK MERCERISING MACHINE.—FIG. 4.

The stretching of the yarn is accomplished as follows:—The crankarms E are compelled to travel along the guiding curve D by the guide rollers F, and when these arms are in their lowest position the hanks of yarn hanging on the rollers M and C have the greatest tension. When the yarn is put on, the arms E are in the highest position of the guiding curve D. The arms, along with the axles of the lower rollers, move nearer to the straight axles L, and thus the yarn can be easily put on. Then the machine moves to the next tank, which is filled with soda lye. The yarn is dipped into the lye while at its natural length under slight tension, whilst the rollers on which the yarn hangs are continuously revolving. This operation takes place in that position where the teeth of the toothed rim T are missing and the machine stands still for one minute. At the next forward movement of the machine the skeins of yarn come into the tank for squeezing the yarn. The machine again stands still for a minute, and the yarn in this tank is a little more stretched under the continued rotation of the straight axles L with the rollers M. At the same time the crank axles stand vertically over two indiarubber rollers which are carried by suitable bearings in the bottom of the tank, so that when the machine is standing the yarn is drawn between the indiarubber rollers and the cylinders C fitted on the crank axles E, and thus squeezed. At the same time the requisite pressure on the indiarubber rollers is exerted by the cylinders C, which rest upon them. This squeezing of the yarn is not for the purpose of clearing the yarn completely from the mercerising liquid, but only to provide that any superfluous liquid which the yarn may have absorbed be not lost. At the next forward movement of the machine the skeins of yarn hanging on the rollers come into the next tank to be washed. Here the tension of the yarn is the greatest, the arms E being in their lowest position. In this tank, while the rollers M, which carry the yarn, are kept continuously rotating, the yarn is washed by a spray arrangement and squeezed, and then by the next forward movement of the machine it comes into the first tank, where it can be taken off and replaced by other yarn. The finished yarn having been taken off and other yarn put on, the same process begins afresh. It is claimed that this type of machine will mercerise 1000lb. of yarn per working day of ten hours, and that by making a machine on similar lines, but of the largest practicable size, it would be possible to turn out 2000lb. per day.

Machinery at the Paris Exhibition.—XI.

A CARDING ENGINE which was shown by the Elsässischen Maschinenbaugesellschaft is illustrated in Fig. 53, and the details of the setting arrangement are given in Figs. 54 and 55. The bend has five points of support, all of which are simultaneously adjusted radially by the same distance, but each of which can also be separately adjusted. The points of support are at the ends of the radially-guided bolts E, which, as shown in Fig. 54, are connected by links G to a disc S, so that when the latter is turned by the compound worm gear A B, which can be effected very accurately, the bolts are drawn towards the centre. The toggle joint G produces, with a large turn of S, only a slight movement of E, but it is to be noted that the movement is not proportional to the angle turned, and the exactitude of the setting depends upon a stiff fit of the joints and the greatest accuracy of the links. To ascertain the distance, the amount of adjustment on each operation is indicated on a scale at the last bolt but one from the feeding end. For separate adjustment, each bolt is made of two

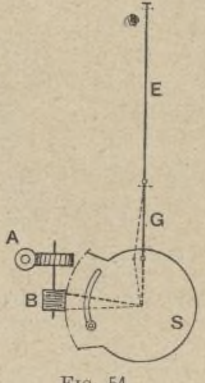
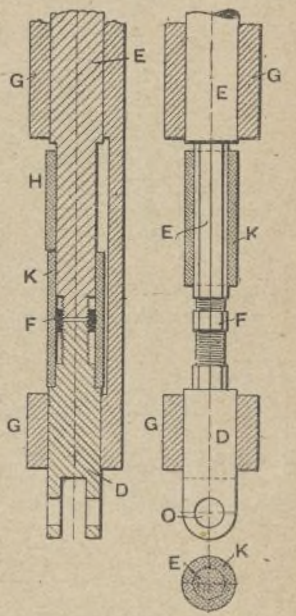
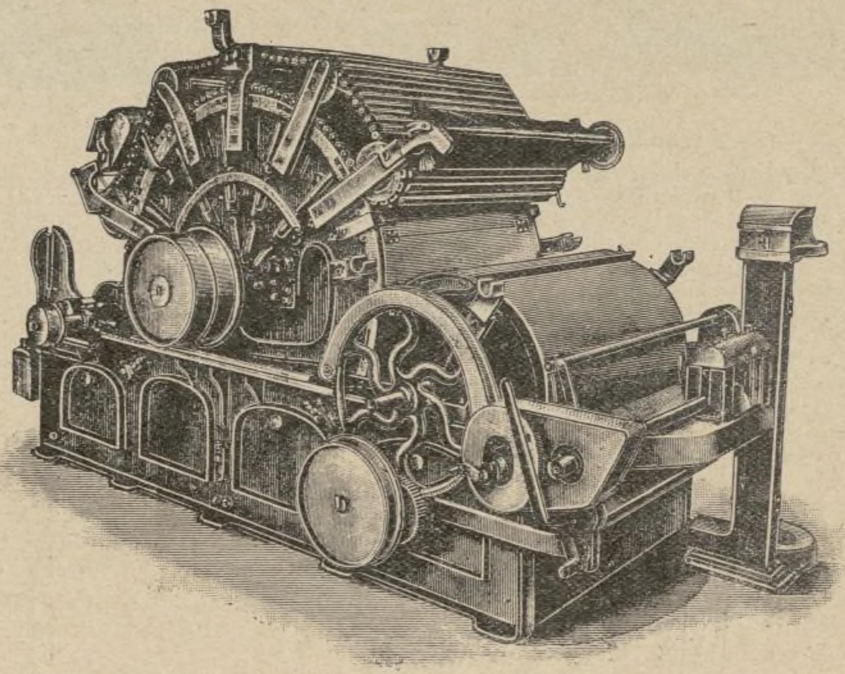


FIG. 54.



MACHINERY AT THE PARIS EXHIBITION.—FIG. 55.

parts E and D, Fig. 55, formed with screwed ends and connected by a tapped bush F. The screwed ends have threads of the same inclination but of different pitch, so that on turning the nut F the two parts are drawn together by the difference in the inclination of the threads. The thread on the lower part D has 3mm. pitch, that on the upper part E only 2·6mm., so that a complete revolution of the nut F only produces a radial movement of 0·4mm. In order to fix each eighth part of a revolution with 0·05mm. adjustment, the nut F is octagonal, and the parts E and D have corresponding octagonal parts over which a bush K is pushed. The bush is held in by a segment H passing over all the bolts. To effect a separate adjustment this segment has first to be removed, after which the bush K can be pushed up and the nut F rendered accessible. For unfastening the segment, and also for gaining access to the worm A of Fig. 54, separate peg spanners are used which are kept in the possession of the overlooker, so that the adjustment can only be made with his knowledge.



MACHINERY AT THE PARIS EXHIBITION.—FIG. 53.

The double doffer of Mr. S. Beran, of Brünn, along with a carding engine by the same maker, is shown in section in Fig. 56. The fleece from the lower doffer A is taken off by a roller B, from which it is transferred by the small cylinder G to the upper larger doffer P, after the latter has already received a first layer of fibres from the cylinder T. Here also the lower fancy D works with the small cylinder C, so as to stroke out the fibres and obtain a good delivery to the doffer P. It is claimed for this arrangement that the lower fleece experiences an additional working, against which it may be urged that the upper fleece is less pure than the lower one, and therefore has always to undergo further working. The lower fleece does not require the repeated working particularly, and the new arrangement can only be allowed to have one advantage over the usual double doffers, where the fleeces are placed separately upon each other, in that the aprons for carrying the fleeces are discarded, and that the thin lower fleece, which in the case of fine yarns easily becomes uneven, finds a safe support.

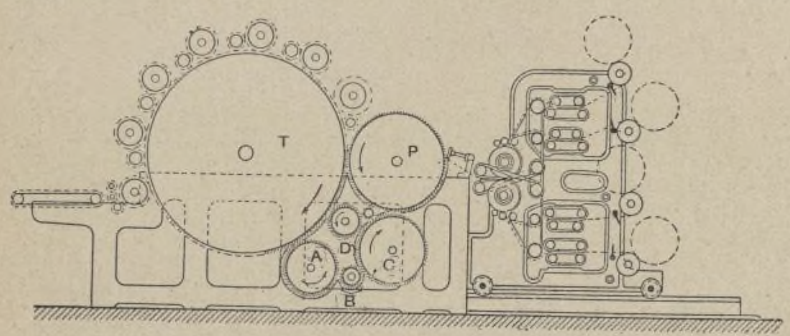


Fig. 56.

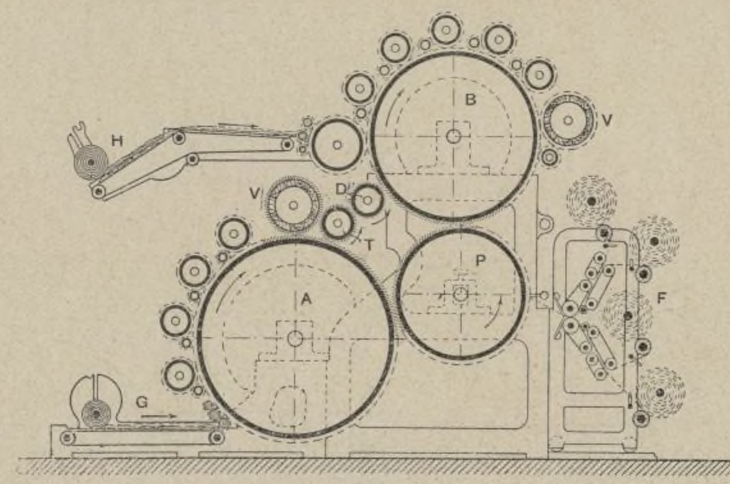


Fig. 57.

Mr. P. Bastin, of Roubaix, showed the double doffer which is shown in Figs. 57 and 58, the former being a section, and the latter a view from the feeder end. The engine has two feed aprons G and H, upon which laps are placed, the exhibited

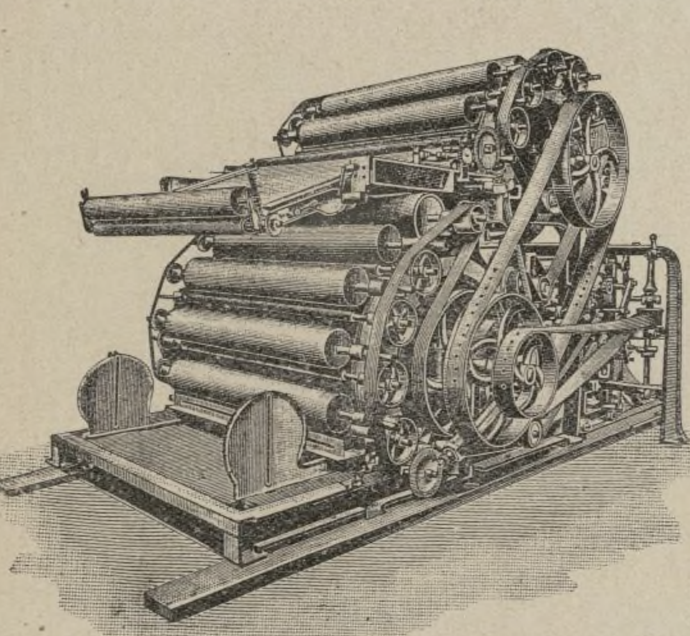


Fig. 58.

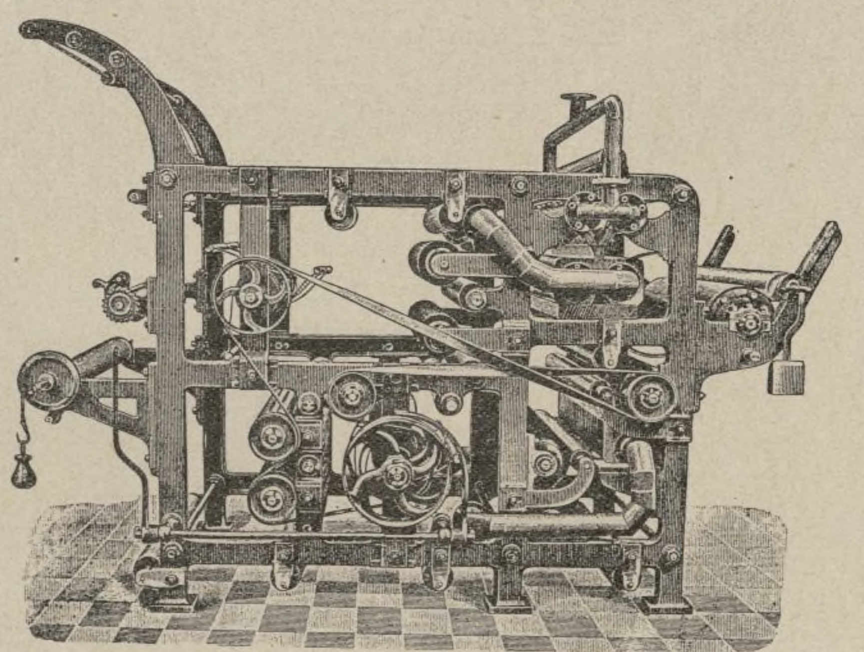


Fig. 61.

engine being a finishing card. The fleece passes upon the cylinder A directly through the feed rollers and to the cylinder B, by means of a licker-in; the lower cylinder A is 47¼in. in diameter, and has four pairs of workers and clearers; the upper cylinder B is 39½in. in diameter, and has five pairs of rollers, which, after having received the action of the respective fancies V, both transfer their layers of fibres to the doffer P placed between them, the upper one first. The double fleece from the doffer passes through a steel-band dividing apparatus F

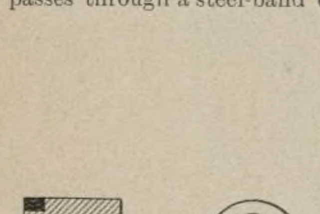


Fig. 59.

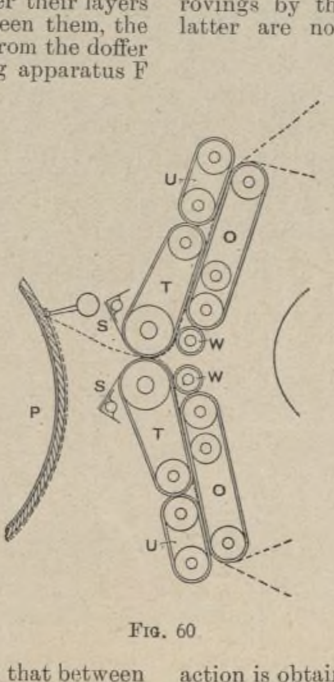


Fig. 60

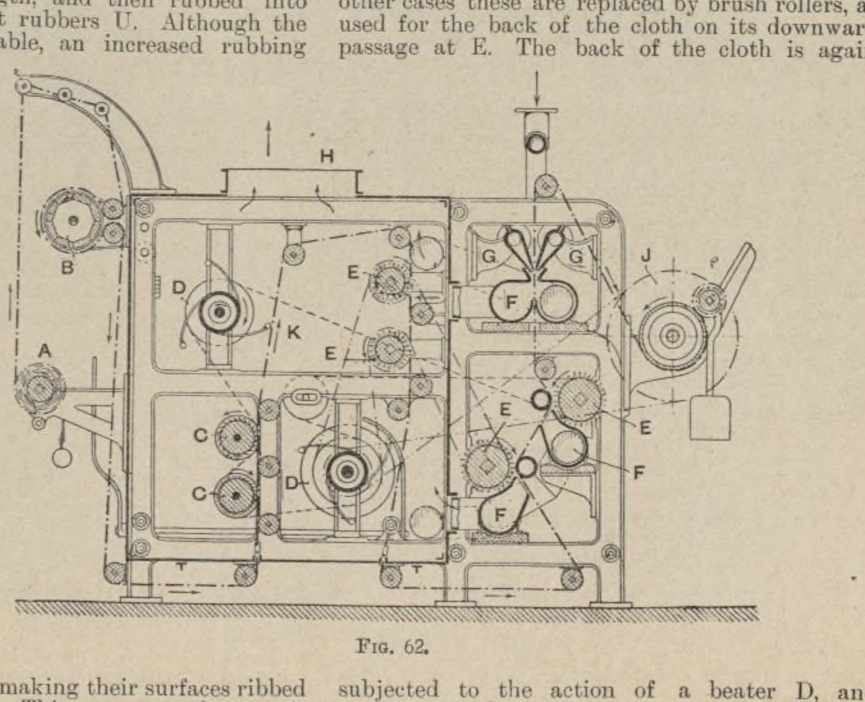
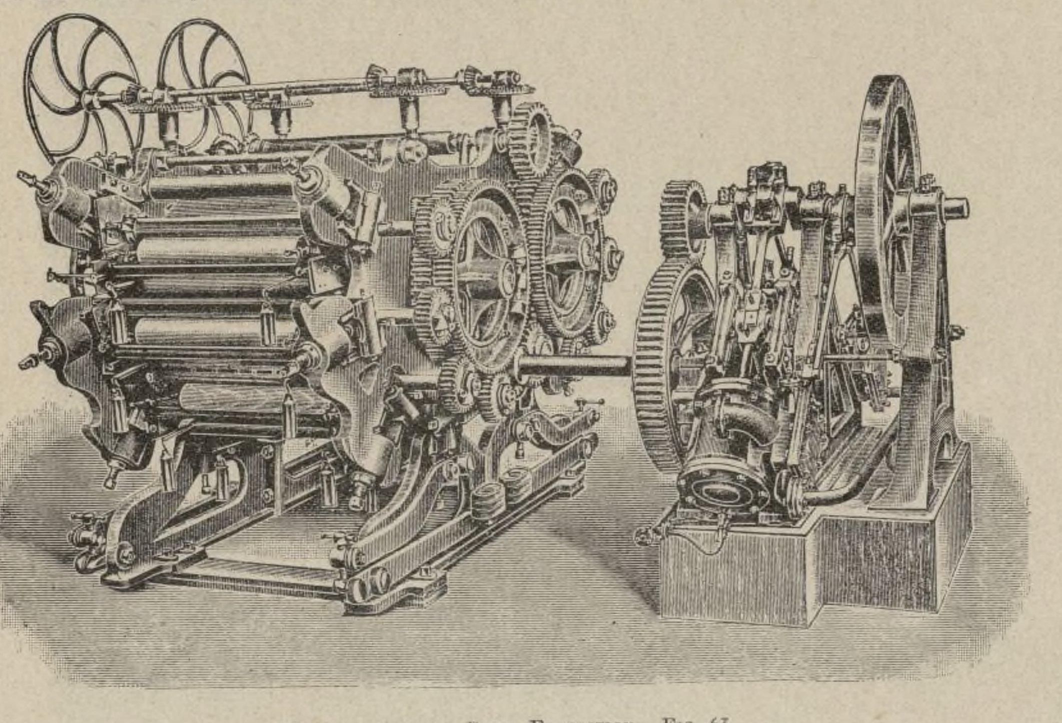


Fig. 62.

to form the roving. It is to be noted that between the two cylinders A and B there is arranged another pair of rollers T, D. The fibres on the lower cylinder consequently are taken off in their upper layer or entirely by the roller T, which in Fig. 57 acts as a doffer, and is transferred by the roller D to the upper cylinder, or otherwise, by a roller touching both cylinders, to the upper one, where it is further carded. The workers and clearers run in brackets, with gun-metal bearings, divided to allow the rollers to be lifted out for clearing, the caps being held on by means of hoops R, Fig. 59.

The steel-band dividing apparatus has a new arrangement of the rubbers. As Fig. 60 shows, the fleece coming from the doffer P is divided by the diverging or crossing steel bands S fixed to angle-iron rails, the free ends of which are held by the rollers W; the ribbons of sliver thus obtained receive a first rubbing between the dividing rubbers T and the long movable rubbers O, which are of different length, and then rubbed into rovings by the short rubbers U. Although the latter are not movable, an increased rubbing action is obtained by making their surfaces ribbed or otherwise uneven. This uneven surface, as is known, cannot well be used for the dividing rubbers, and therefore the new fleece divider will work better than the usual simple steel-band divider, and early attain the effect of the steel-band dividers with double rubbing, without having their complication.

A machine for dressing cloth preparatory to printing, as shown by the Elsässischen Maschinenbaugesellschaft, Mülhausen, is illustrated in Fig. 61. As shown in Fig. 62, the roll of cloth is drawn off the roller A, which is provided with a band brake, to the top, and then passes over guide rods downwards again, the required tension being obtained by means of a brake roller B. In passing upwards it is first operated upon by two scraping rollers C running in opposite directions, and then by a beater D on one side. The scraping rollers C, fitted with knives, are only used for grey cloth; in other cases these are replaced by brush rollers, as used for the back of the cloth on its downward passage at E. The back of the cloth is again subjected to the action of a beater D, and on its second upward passage both sides are brushed by rollers E, which throw the impurities brushed off into the troughs F. The fluff still adhering to the cloth is then blown off on both sides by jets of compressed air issuing from slits in the mouthpieces G, the fluff being collected in the troughs F. The cleaned fabric is rolled up again under pressure at J. The beaters and the first brushing and scraping rollers are in a closed chamber (the enclosing sheets being removed in Fig. 61) from which the air and dust are exhausted by an exhauster at H. The troughs F are also connected to this chamber, so that the dirt and fluff collected therein are continually removed and a perfectly



MACHINERY AT THE PARIS EXHIBITION.—FIG. 63.

clean cloth obtained. The machine can pass the cloth at a speed of 80yds. a minute, and has adjustable bearings for the rollers for the purpose of regulation.

The same firm exhibited the printing machine shown in Figs. 63 and 64, which was driven direct by a steam engine, and is of the type adapted to print four colours on each side, or eight colours on the face only. The cloth passes to the first printing cylinder P, then to the underside of the second cylinder Q to be printed on the other side, then to the steamchest W, and lastly to a drying frame. D is the endless felt apron for the first cylinder, and E the corresponding apron for the second cylinder. M and N are the backing aprons lying upon the aprons underneath the fabric. If the machine is to be used for one-sided printing the first cylinder is rotated in the same direction as the second one, the fabric and aprons being conducted to P from above and at the bottom directly to Q, so that the whole resetting is very simple. In order that the patterns may exactly coincide when both sides are printed, the printing rollers, driven by spur wheels, must be set very accurately. For this purpose all the wheels are engine-cut, and the required rotary adjustment is made by means of set-screws, which may be distinctly seen in Fig. 63.

(CONCLUDED.)

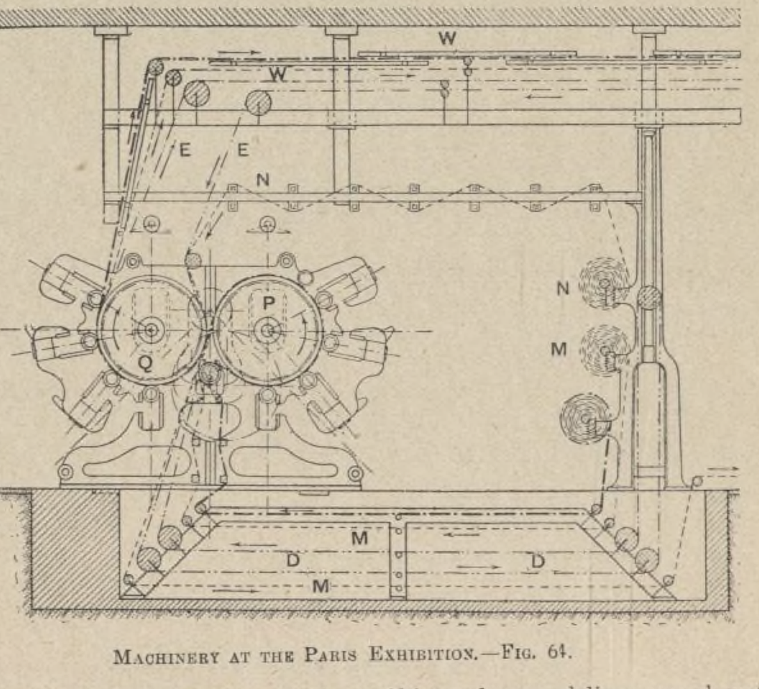
Water of Condensation.

WATER of condensation will be formed inevitably whenever steam passes from a boiler directly into cool pipes, or from hot pipes into a cool cylinder, due to loss of heat in heating up the surfaces and walls of the pipes or cylinder. This loss of heat is absolutely unavoidable, since heat will always transfer from hot to cooler bodies, and it is impossible to prevent such loss except by jacketing the pipe and cylinder surfaces and heating them to a temperature equal to that of the steam. The plan of jacketing and heating externally by the application of steam or hot air is ordinarily so expensive and complicated as to be impracticable except in cases where extraordinary advantages are obtained, as in an engine cylinder. The plan of internally heating pipes and cylinder surfaces is, however, proving to be so efficient that a more general adoption of it may be reasonably expected in the future; it is accomplished, of course, by using superheated steam. Such extra-heated steam is able to lose a very considerable portion of its heat in raising the temperature of the pipe and cylinder walls without being cooled enough to cause condensation.

In ordinary practice, not prevention, but only a reduction of the condensation is attempted. By covering the steampipes, cylinders, and steam passages with some approximate non-conductor of heat, the radiation of heat from their outside surfaces is greatly reduced; consequently the loss of heat and the resulting condensation of the steam are also reduced. With the best pipe covering, however, there will inevitably be some radiation of heat and resulting condensation of steam. And in any case, whether the pipes, cylinders, etc., are covered or not, there will be very profuse condensation when steam is first admitted into them, because they are then cold, or at least very much cooler than when in active use.

If the water of condensation is produced in very small quantities, it will be carried along or entrained by the steam, in which case it naturally cannot accumulate. In fact, small quantities of water will not remain in a pipe through which steam is passing at its usual velocity. But if condensation takes place faster than the entraining action of the steam can carry away the water, as happens in pipes or passages which are directly exposed to cold air, accumulations of water will form which, if not properly disposed of, will cause trouble.

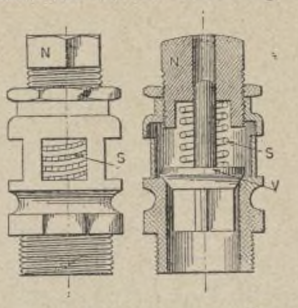
The results of "taking water" by an engine cylinder are painfully familiar to most engineers, but a consideration of the action in detail may be of interest. Unless the amount of water carried into the cylinder is insufficient to fill the clearance space, it will be caught between the piston and the cylinder head in the immediately following exhaust stroke. Since water is very sluggish in its movements as compared with steam, it will not flow out of the exhaust ports readily with the exhaust steam and make room for the full travel of the piston; it passes out at the port so slowly as to form



MACHINERY AT THE PARIS EXHIBITION.—FIG. 64.

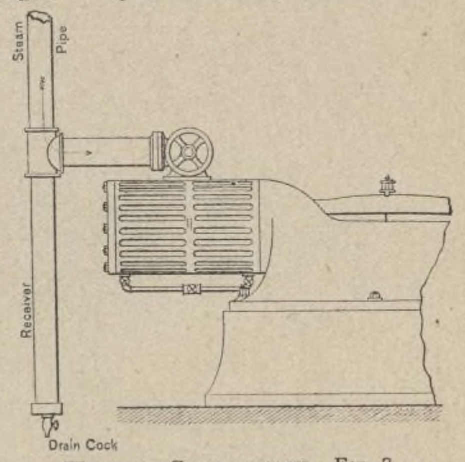
practically a solid barrier behind the piston, and, owing to its almost absolute incompressibility, acts like so much metal, preventing further free movement of the piston. Ordinarily the moving parts of the engine might be expected to simply stop under such restraint, but at that point of the piston travel they are driven, not only by the force of the expanding steam on the "live" side, but also by the inertia of the fly-wheel acting through the crank and the connecting rod, which, as the crank-pin is then nearing its dead centre, are forming a straightening elbow joint having the tremendous leverage of a toggle joint.

The liability of water to do harm in the cylinder is greatly reduced when the exhaust ports of the engine valves are placed on the bottom of the cylinder, so that the tendency will be for such water to drain out before becoming imprisoned



WATER OF CONDENSATION.—FIG. 1.

between the piston and the cylinder head. However, many engines are not so built, in which case the cylinder cocks must be relied on to drain the cylinders when excessive water is indicated by the peculiar metallic snapping or cracking noises that are always heard under such conditions. For further protection in such emergencies automatic relief valves are sometimes provided. These valves, known as snifting valves, are arranged to open outwardly from the clearance

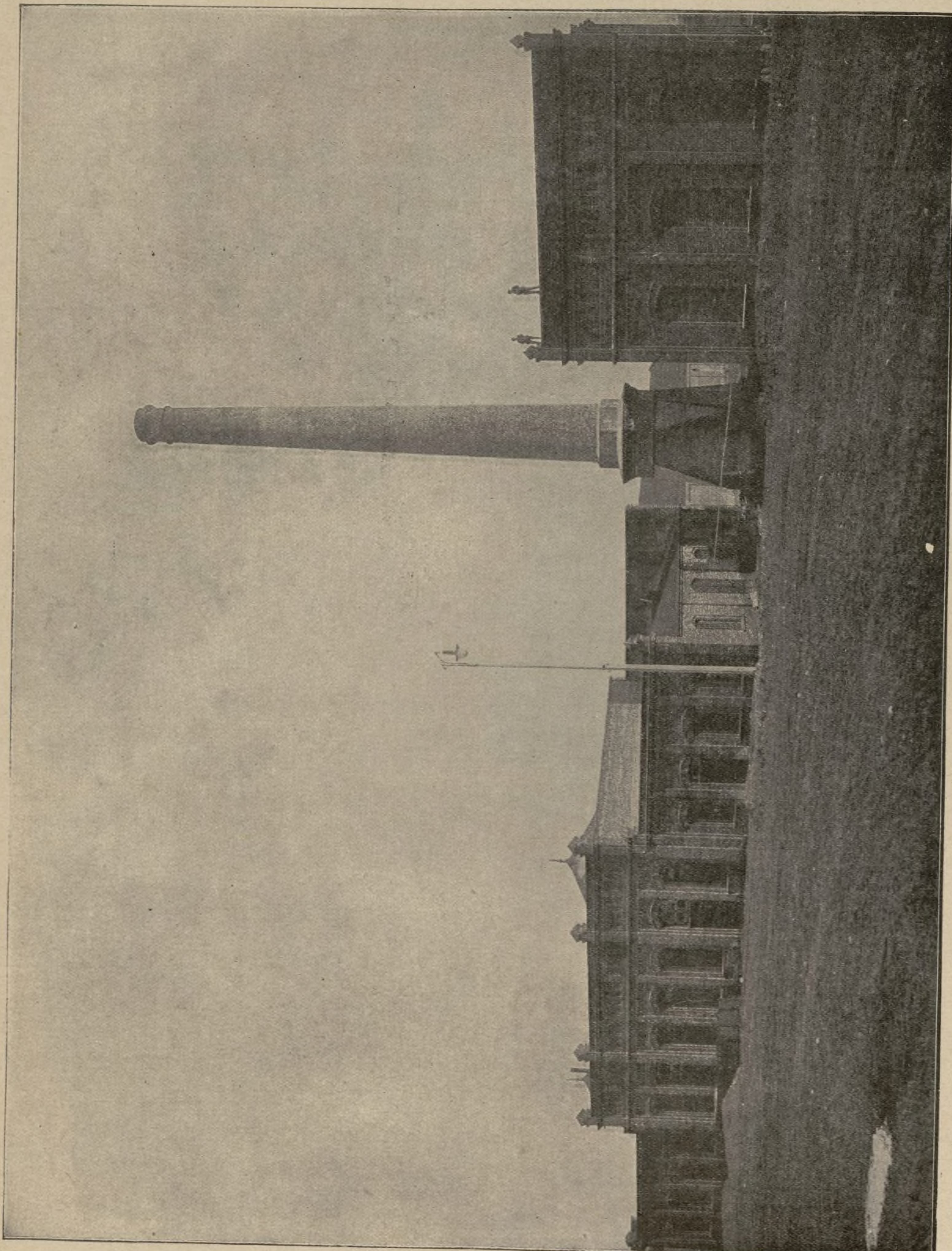


WATER OF CONDENSATION.—FIG. 2.

space in the event of extreme pressure inside, being held shut under ordinary conditions by a heavy spring. Fig. 1 shows the construction of a snifting valve. It consists of a plain conical valve disc V, which is held upon its seat by the spring S, and this spring may be compressed by the adjusting nut N, to hold the valve shut against all ordinary working pressures in the cylinder, but to open outwardly for relief at any higher pressure. This device is not, however, to be thoroughly relied on as a protection at high speeds, because in a high-speed engine the damage may be done before the snifting valve can deliver enough water to ease the pressure, as was demonstrated recently in an accident to a high-speed engine so equipped.

Entrained water is much more easily taken care of by preventing it from reaching the cylinder than by attempting to get it out after it has once got in. By far the best disposal that can be made of condensation in the steampipe is to grade the pipe so that it slopes gently downward from the boiler towards the engine, and then place a receiver in the pipe, close to the engine, to catch all water draining towards it, as well as that entrained by the steam.

There are several different forms of receivers for this purpose in successful use, all of which consist broadly of an extension or an enlargement of the steampipe into which condensation water may drain by gravity and collect, to be drawn off at convenience. Perhaps the simplest form that may be used is that shown in Fig. 2, which is merely an extension of the vertical part of the steampipe downwards beyond the elbow leading to the throttle valve. The water carried along by the steam will be carried past the elbow into the extension by the combined effects of inertia and gravity. As water collects in the extension it can be drawn off at intervals, of course. A much more effective form of receiver is the separator. This apparatus accomplishes the same result as the receiver, says C. W. Obert, in the "American Electrician," but in addition it gives the steam a whirling or centrifugal motion as it enters, so that the finely-divided drops of water tend to fly to the outside, while the lighter dry steam remains towards the centre and passes out first through a central opening into the steampipe beyond. The water thus thrown outward lodges on the walls of the separator and trickles to the bottom. In some forms of separator, the action depends on capillary action on perforated or roughened metallic baffleplates placed in the path of the steam, the centrifugal action being partially discarded. In those types of which the Austin is representative, the smaller particles of water are hurled against the baffleplates, on which they stick and collect, finally dropping into the reservoir below. Combinations of these two fundamental principles are sometimes made use of in separators, giving very effective and satisfactory results. A separator is very efficient if large enough, but not when it is too small, and many separators in use are inefficient for this reason. Well-designed separators have, under test with reasonably dry steam, shown the remarkable result of delivering steam containing less than 1 per cent. (by weight) of water.

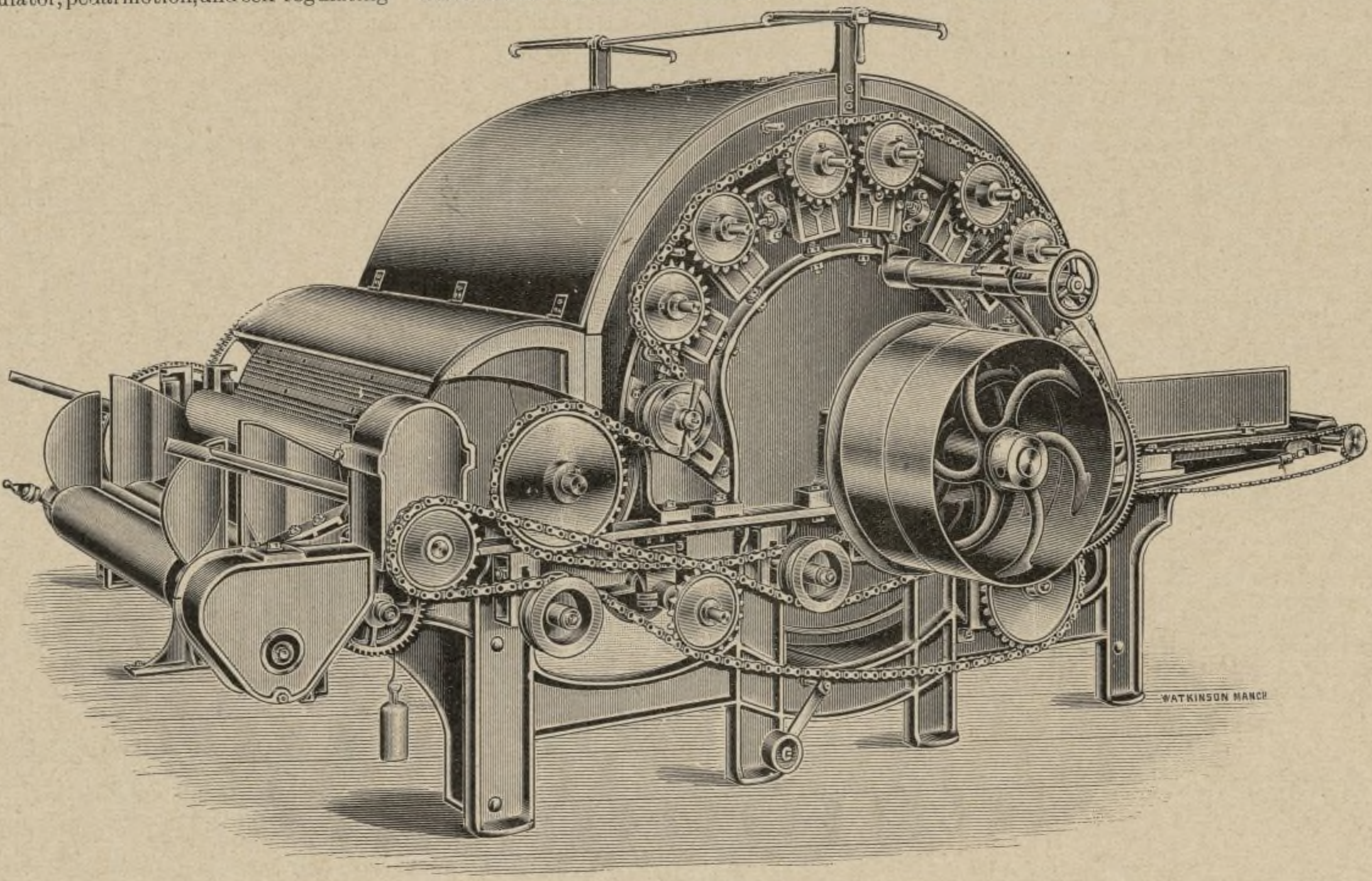


New Mill in Russian Poland.

New Mill in Russian Poland.

A FEW months ago (December, 1900) an illustrated description of a new mill built by Messrs. Krusche and Ender, of Pabianice, was given in these columns. An extension has quickly been made, for Mr. Ender, of the above firm, has now built another mill at Baby, near Piotrkow, equipping it with 6000 ring spindles for spinning weft from 8's to 24's, and twist from 18's to 40's. The mill, which is shown in the accompanying illustration, has been fitted up regardless of expense and trouble, and nothing has been spared in the way of patents, improvements, etc., to put it on at least a level with the best-equipped mills known.

All the spinning and preparatory machinery has been supplied by Messrs. Dobson and Barlow Limited, of Bolton, and includes one large-size double opener, with two beaters, the lap part to make laps of 41in. wide ; a "Simplex" automatic hopper feeder, with cone feed regulator, pedal motion, and self-regulating feed ; single-beater scutchers and lap machines, with one beater for 40in. laps, cone feed regulator, and pedal motion ; revolving flat carding engines, 39in. wide on the wire, with strap fork arrangement, anti-flexion grinding motion, and grinding rollers ; drawing frames, with front line of top rollers having loose boss, loose bushes to three lines of top rollers, back roller motion to prevent single, weight-relieving motion, top clearer, front line of bottom rollers casehardened all over, three back lines casehardened in necks only, and indicators ; slubbing frames, with front line of top rollers having loose boss, long collars, polished steel division plates, self-lubricating footsteps with loose brass bottoms, casehardened front line of bottom rollers, two back lines casehardened in necks and squares only, and outside support to driving shaft ; intermediate frames and roving frames similar to the slubbing frames ; twist and weft ring spinning frames, with rope pulley driving (for twist frames only), loose boss top rollers to front line, "Simplex" spindle with self-lubricating attachment, anti-balloon plates with knocking-off motion (for twist frames only), front line of bottom rollers casehardened all over, two back lines casehardened in necks and squares only, and indicators ; a ring doubling frame, with "Simplex" flexible spindle and self-lubricating attachment, top rollers of iron covered with brass, copper troughs and arrangement for lifting the rollers of the water, knee brake, travellers, and rope driving arrangement ; cop reel, on Coleby's principle, of 40 hanks, arranged to reel from cops or ring spinning bobbins.



Engine Cleaning-waste Making Machine.

Engine Cleaning-waste Making Machine.

MESSRS. WILLIAM TATHAM AND CO., VULCAN WORKS, ROCHDALE.

AT the present day everything may be utilised, and every kind of waste serves some useful purpose. In the textile industry this may be said of even the meanest descriptions of waste, whilst many kinds fill a place from which they could ill be spared The waste throughout most of the spinning operations is mixed with the virgin fibre, and again passed through the operations, and it is only when too much twist has been imparted that such procedure becomes impossible. Then, if the roving or thread is not too hard, it is torn up again and eventually worked up once more into an inferior yarn.

Many threads receive too much twist in the spinning or twisting to allow of their being worked up again to advantage, especially in the case of cotton yarns with hard or warp twist and other forms of weaver's waste, and it is such which are usually made into engine-cleaning or wiping waste. There is a large demand for this material, and when one considers the great number of engine rooms on land and sea, and the multitude of large machines on which this waste cotton is used, there appears little chance of the demand slackening.

Naturally, the bits of warp, beeting, and other kinds of hard cotton waste are not in a form suitable for being used without some treatment. It is necessary to pull the threads apart and tear them into a more usable form, so that a handful can be readily taken and the material absorb the grease and dirt on which it is used. For this purpose an engine-cleaning or wiping - waste making machine is provided, of which the accompanying illustration is an up-to date type which has been evolved from an older form by the makers, as the result of a wide experience and a large scope of practice. The machine is also frequently required to tear up cop bottoms and similar hard waste previous to such being treated by the cop-bottom machine.

The waste ends are fed on to the lattice shown at the right-hand side of the illustration, and are taken into the machine by feed rollers composed of strong-toothed discs. They are then caught by the cylinder, by which, and the requisite clearers and rollers, the material is subjected to a thorough opening and loosening action, which is more of a combing than a carding process. The iron cylinder, which is 45in. in diameter, is strongly built and covered with wood lags holding the teeth, whilst there are four clearers and three rollers arranged around it. The clearers are covered with strong toothed leather filleting, and the rollers with cock-heel teeth, and all are 7in. diameter before being clothed.

The doffer is 25in. in diameter, covered with metal plates or lags, in which are fixed cast-steel teeth, which are tempered and hardened, whilst underneath the doffer, in the angle between the doffer and the cylinder, a roller which catches any of the loose fibres, and so conveys them to the doffer. The waste is next taken from the doffer by a pair of rollers, the upper plain and the lower fluted, from whence it is wound in lap form ready for use or making into a bale.

The new model of machine has been made much stronger than the older type, for strength has been found to be a very important factor in the life and usefulness of such apparatus. The material treated is usually strong and inelastic, and, in addition, the machine must be capable of withstanding the extra strains enforced by the presence of bits of string, rope, etc., which often find their way into the material being worked. The strengthened machine can also run at a higher speed with less risk, and is capable of an output of from 6 to 8 tons per day of ten hours.

No belting is now used for internal driving, all transmission being accomplished by either 1¼in. pitch chain driving or by toothed-wheel gearing. This makes all the drives positive, whilst being more convenient and taking less room. The clearers and rollers are supported in very strong brackets, which are held in sliding fits. The roller brackets are adjustable vertically by screw adjustment, whilst the clearer brackets are adjustable both vertically and horizontally by the same accurate means. As will be seen from the illustration, every dangerous part is well protected by suitable guards, whilst feeder and doffer stop motions are provided. The various brackets are milled and tooled on the facings, all parts are made to template, and everything has been done to make the machine reliable in work and easy to repair.

MESSRS. JAMES STOTT AND CO., Vernon Works, Lee-street, Oldham, have received an order from the Guide Bridge Spinning Company to have their cardrooms fitted with ventilating fans to take away the dust.

MESSRS. DOWSON, TAYLOR AND CO. have received an order from the Westinghouse Company to protect their new buildings at Trafford Park, Manchester, with Grinnell sprinklers. The installation, when completed, will be a very perfect one, comprising some 10,000 sprinkler heads. This is the most important order secured in the United Kingdom for the protection with sprinklers of an electrical engineering concern.

WHAT is to be the largest loom in the world is now being erected at the works of Messrs. Robert Hall and Sons (Bury) Limited, and will eventually be placed in a Lancashire shed. The loom which has hitherto been considered the largest, and which is at present running in Lancashire, was also made by Messrs. Robert Hall and Sons. It will be remembered that when this latter loom was made a few years ago, an American firm of loom-makers disputed its title, but subsequent comparisons gave the English loom the first place by 6in. The new loom is to be another foot wider, so that there will be no doubt as to its claim to be the largest loom in existence.

THE economy of electrical as compared with engine driving is a point still open to settlement, and proofs of the efficiency of either are constantly being advanced. The latest proof in favour of electricity comes from a spinning mill in Kidderminster where the steam engine has been replaced by the electric motor in the driving of carding machines. The output of the machines has been increased by 10 per cent. The actual reason seems to be that the motor can be regulated much more easily and surely than the steam engine, and it is thus kept running always at the exact speed required. In this way the variations incidental to the use of steam are obviated. It is worth noting, also, that the texture of the yarn turned out by the electrically-driven machines is more even than that obtained by steam power—a difference which is due to the uniform running of the motor, which has no dead centre. These in themselves are secondary matters, but they are typical of the superiority of the motor for countless industrial purposes.

RAW MATERIALS, PROCESSES, FABRICS, &c.

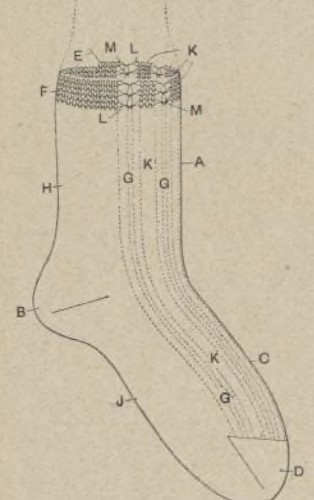
Lace Effects on Stockings.

THE older methods of ornamenting stockings with lace effects leave the foot untouched as regards lacework, the design being confined to the leg portion only. In making such goods, the stocking is formed on a dial needle or ribbing machine until the leg portion is complete, when it is transferred to another machine which knits the plain foot portion without lace effect. Or, if the stocking is formed upon a straight knitting machine, the blank is knit with a lace or openwork effect, somewhat in the same manner that fabrics are woven in a loom, and the flat blank is suitably sewn into a stocking having a seam at the back.

By the newer method—a plan, we believe, first adopted in America—seamless stockings are knit by one continuous operation, with the leg, heel, foot, and toe portions formed by one continuous thread, the stocking having on its front a series of open or lace effects, which are produced in one continuous line from the leg to the foot portion over the instep of the stocking. Circular knitting machines of various types may easily be altered to produce this effect, the features of which are shown in the accompanying illustration.

The leg of the stocking is shown at A, the heel at B, the foot at C, and the toe at D, all of which are knit by the continuous thread E at one operation. The rear or back portion of the leg A, marked H, the entire heel portion B, the back or sole portion J, the foot C, and all the toe portion D are formed of a plain regularly-knitted fabric F. The front portion of the stocking, however, extending along the leg and instep, is formed of sections of regular knitted fabric K, connected by the sections of open or lacework G.

The courses which form the sections K and G commence at the top of the stocking, when the thread E is first knit into a series of regular loops G, after which the thread crosses in a crossing loop L for a space of from three to five loops, when it is formed into a series of regular loops K, again into a crossing thread or loop L, and continues

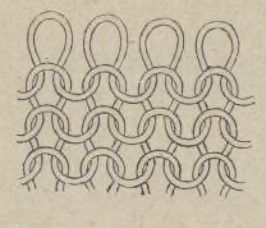


LACE EFFECTS ON STOCKINGS.

until the course of regular and crossing threads or loops are completed. For the next course, the regular loops are knit, but instead of crossing threads, a series of long loose loops M are formed, above which the crossing loops or threads L are held. The openwork stitch, therefore, comprises a crossing thread or loop L, locked to an elongated loose loop M, and is of a depth corresponding to a double course of loops. The entire stocking is thus formed of a plain seamless knitted tubular fabric in which the leg and foot portions are formed of alternate sections of open or lacework united to sections of ordinary loops, the rows of ordinary loops in one section being joined to the rows of ordinary loops in the adjoining section by alternate crossing threads and elongated loops forming an open or lacework stitch or sections. The regular or ordinary loops are also arranged continuously along the rear of the leg, the entire heel and toe, and along the sole portion of the stocking, while the alternate sections of regular and openwork meshes are arranged continuously along the front of the leg and the instep portion of the stocking. The thread E is meant for either a single strand or a series of strands, which, however, are manipulated to form a single loop and are all fed from a single yarn feed.

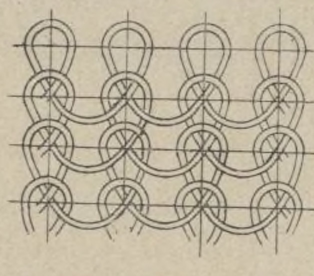
Framework Knitting.

THE technicalities of framework knitting are so little studied by the majority of those connected with the trade that it is but few who know the exact compositions of the different kinds of fabrics that can be made upon one or other principles of knitting machines. It is, however, only by a knowledge of such technicalities, says the "Hosiery Trade Journal," that a true interest can be obtained, and a piece of fabric so dissected as to be able to produce at once its exact facsimile. Much of the competition of the present day from German manufacturers is due to their minute study of all the technicalities of detail of the trade, and not a few instances could be given



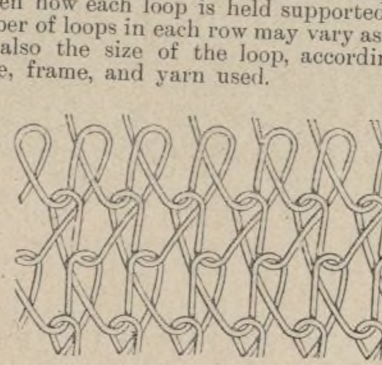
FRAMEWORK KNITTING.—FIG. 1.

in proof of this, but one will suffice. It is not due to the superior power of design which is so necessary in connection with fancy warp fabrics that the shawl and fancy trade has emigrated to Saxony, and now that district is the centre of an industry that once was the pride of the "Midlands" of Great Britain. The students in the trade schools of Germany pay particular interest in the designing and dissecting of patterns, and this, together with a knowledge of machine construction and drawing, enables them to follow all new introductions, and to study both fabric and machine to its minutest detail. It is proposed, under the heading of this article, to deal with a few of the technicalities of the knitted stitch, examining it in its various forms, and dealing with each alteration as it appears. In examining any knitted fabric, its composition can be better ascertained from the back of the fabric than from the right or face side. It will therefore be from the back of the fabric that most of the sketches will be taken.



FRAMEWORK KNITTING.—FIG. 2.

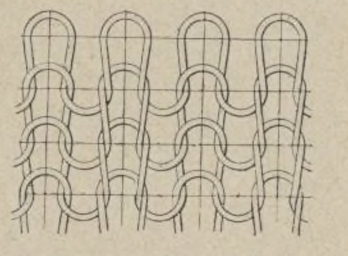
Plain Framework Knitting.—Fig. 1 shows the composition of a plain knitted stitch as made from a single thread, which is formed by suitable means into continuous rows of loops, each row supporting a similar row. A knitted loop consists of two parts, an upper and a lower loop, the former being a needle loop, and the latter a sinker loop, as formed on the ordinary jack and sinker frame. It will be seen how each loop is held supported, and the number of loops in each row may vary as required, and also the size of the loop, according to the gauge, frame, and yarn used.



FRAMEWORK KNITTING.—FIG. 3.

Twisted Knitting.—Fig. 2 shows a speciality in a knitted fabric, each loop having a peculiar twist, as shown. The loops in this fabric are formed from a continuous thread, and each row of loops support a similar row; but it differs from plain framework knitting by the peculiar twist which alters altogether the characteristic of the sinker loop, while the needle loops remain the same.

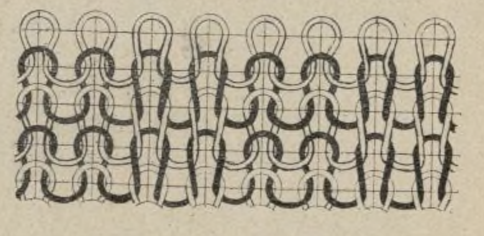
Warp Framework Knitting.—Fig. 3 shows the arrangement of the thread in a plain warp knitted fabric. This is made from a number of threads equal in number to the needles used. Each thread has a particular traverse on two needles, and so each thread connects with the adjoining thread, and a fabric is formed. This traverse in the diagram shown is over one needle at the right of the thread at one course, and at the next course over the adjoining needle to the left. In this fabric the threads do not have a connection with the adjoining loop of the same course, as in an ordinary knitted fabric, but with the adjoining loop of the next course. This is a special feature, and together with the fact that each thread runs lengthways of the fabric, instead of across same, distinguishes it from ordinary knitting.



FRAMEWORK KNITTING.—FIG. 4.

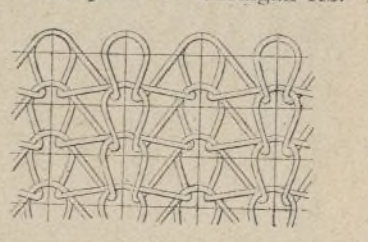
There are few knitted fabrics that have the same appearance on both sides, but this is the particular characteristic of certain kinds of rib and pearl work.

Rib Work.—There are a number of combinations in rib work. Fig. 4 shows the simplest form, known as 1/1 rib, which has both sides alike, each adjoining loop of one course being one to the front and one to the back. To make this fabric two rows of needles are necessary, which must stand to one another either at right angles or parallel, while the needle hooks must face to the outside, the one row of needles knocking over the loops to the right, the other to the left. In the most simple



FRAMEWORK KNITTING.—FIG. 5.

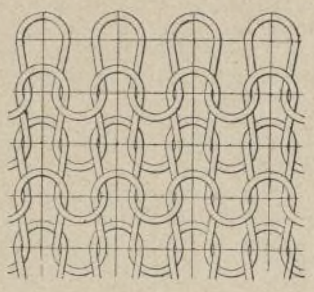
arrangements the needle of the one row changes with the needle of the other row alternately, and the goods made are used, by reason of their great elasticity, as beginnings or ends of garments such as ribbed tops, cuffs, etc. The invention of this class of fabric dates back to about 1755, and the hand frame, for a hundred years, was the only machine on which this fabric with a right side at either side could be made. Many other combinations of rib can be made, such as 2/1, 3/1, 4/1, 6/1, etc., but these do not have that characteristic of having the two sides alike. There are other forms of rib which do, however, claim this peculiarity—*i.e.*, 2/2 rib and polka or Cardigan rib. Fig. 5



FRAMEWORK KNITTING.—FIG. 6.

shows the combination of the 2/2 rib, which has, alternately, two loops to front and two loops to back of the fabric. Fig. 6 is the polka or Cardigan rib, similar to 1/1 rib, but stouter, as there are two threads to each needle, the one knitted and the other a tuck stitch, as shown. The thread from one frame needle loop to the next forms the tuck loop for the rib course, and the thread from the rib needle loop of one course to the adjoining rib needle loop forms the tuck loop for the frame needle. With the improvements in circular machines these could be constructed to make 1/1 ribbed tops or Cardigan stitch, the latch needle, which was invented about 1848, coming into great use. The second row of needles for making rib fabrics has also been added to the Cotton's patent and other rotary frames with bearded needles, and latterly the Lamb machine has been made to do ribbed work, although it was originally meant only for seamless plain stockings when it was invented in 1866. At first it was only used for ribbed hose, but it was slow and did not give satisfaction, and the machines were put aside, and would have been forgotten altogether if it had not been found, eventually, that by altering the locks the Cardigan stitch could be made on this class of machine better than on any other. The position of the two needle rows was so similar to the hand frame that it was easy to attempt to make rib work, and 1/1 rib goods could be made at once; but the quality of the fabric was slack and irregular and not satisfactory, and it was ten years before a suitable construction of the locks was applied which could make rib tops satisfactorily. 2/2 ribbed work could be made at once in an excellent quality, which the hand frame could do, and later on the Cardigan fabric could also be made successfully. Circular machines also, with the latch needles, could make tubular plain fabrics.

Wrought goods include all those goods which have a selvage, whether they are fashioned or not. Such fabrics can only be made on flat machines, though imitations are made on round machines, in giving articles a shape by tightening the fabrics, as well as by using two sizes of yarns, or by varying the rib, or with tuck stitches; but all these



FRAMEWORK KNITTING.—FIG. 7.

imitations are not the regularly-fashioned goods. They do not look so well, and are not so valuable. Many attempts have been made to get a regularly-fashioned ribbed article seamless, which can be done on the Griswold type of machine, by hand, by starting "the leg" with 1/1 rib, then continuing in 3/1 rib, then by fashioning the calf by gradually taking off a loop from the cylinder and hanging it on the machine needle, taking out the empty needles, thereby making a 2/1 fashioned leg; but this method leaves a little gap where the needles have been taken out. Although this is, as far as possible, counteracted by making the fabric stiffer and drawing the ribs together, as a matter of fact the tubular fabric is narrower there than on the top of the leg. The same effect can be attained by working the opposite way—*i.e.*, making the foot portion first and working up to the top of the leg. But in the future this will no doubt be overcome, and the ribbed stitch will be equal in importance to the plain stitch or ordinary framework knitting.

Purl Work.—Purl or pearl work has also both sides of the fabric similar when in its simplest form of 1/1 purl work. Its peculiar characteristic is that at each row or course the loops are knocked over in opposite directions—*i.e.*, at the first course the looms will be formed and knocked over as plain framework knitting, appearing at the front of the fabric; at the second course they are formed in a similar manner, but all old loops are knocked over, the new ones in opposite direction to ordinary framework knitting, or to the back of the fabric. It will be seen that 1/1 rib work and 1/1 purl work differ, from the fact that alternate loops in one course of 1/1 rib work are knocked over in opposite directions, while in 1/1 purl work alternate rows or courses are knocked over in opposite directions. Fig. 7 shows the arrangement of loops in 1/1 purl work, and by comparison with 1/1 rib work, Fig. 6, the difference will be at once seen. This fabric is sometimes known as left-and-left fabric, while the 1/1 rib is sometimes designated a right-to-right fabric.

The Indian Jute Industry.

THERE were thirty-three mills in India working jute at the end of 1899-00, and employing a daily average number of 101,630 persons. The small jute mill maintained by the Government of Bengal in the Alipore prison is not included in this statement. The mills contained 293,218 spindles and 14,021 looms. The nominal capital of such of the mills as are worked by joint-stock companies is stated at £3,500,000; but the figures are not quite complete, one of the mills (privately owned) having rendered no statement of capital. Except one at Cawnpore, all the mills are in Bengal, most of them in the vicinity of Calcutta.

The progress of the jute spinning and weaving industry during the last twenty years is illustrated by the increase in the number of mills, looms, spindles, and persons employed. While the number of mills has increased by 65 per cent., their working capacity has been much more largely augmented, looms having increased by 181 per cent., spindles by 327 per cent., the number of persons employed by 195 per cent., and the capital by 129 per cent. During the last three years there has been an increase of 12·7 per cent. in the capital. There was a marked addition to the number of the mills and to their working capacity in 1896-7, and further large increases have since been made.

The following table shows the progress of the jute-growing industry, being the clearances from Calcutta and Chittagong to all parts of the world. The figures relate to the eight months from August to March inclusive, and the bales represent an average of 400lb. each.

	1900-01. Bales.	1899-00. Bales.	1898-99. Bales.	1897-98. Bales.
To London......	343,614	367,534	283,212	450,827
Dundee	965,365	651,219	886,305	1,454,235
Liverpool ...	11,199	70,111	61,051	83,425
Continent ...	1,328,698	864,066	760,039	1,205,239
All other ports	15,375	6,528	11,054	17,119
Total Europe...	2,664,251	1,949,458	2,001,661	3,210,845
Do. America	221,509	176,054	111,740	184,395
Total......	2,885,760	2,125,512	2,113,401	3,395,240
	REJECTIONS.			
To U. Kingdom	30,199	29,060	11,776	34,801
Continent ...	9,265	1,451	250	3,775
America......	7,634	8,064	4,551	8,000
All other ports	115	1,000	250	—
Total	47,213	39,575	16,827	46,576
	CUTTINGS.			
To U. Kingdom & Continent.	37,872	44,935	29,004	58,621
America	207,694	202,840	186,970	293,297
All other ports	2,156	1,099	2,497	1,950
	247,722	248,874	218,471	353,868
Grand total..	3,180,695	2,413,961	2,348,699	3,795,684

A New Artificial Silk.

IT would be interesting to collect samples of the various methods which have been devised for imitating silk, although such a collection would be of most unwieldy size. The trouble is that there are so many processes and recipes which are almost identical—so much so that in future years it will be a difficult question naming the real inventor of any brand of the artificial product. The latest method, although on far from novel lines, is as follows:—

Nitrocellulose is prepared by treating cotton or other cellulose material with a mixture of (azotic) nitric and sulphuric acids by the manufacturing process used for the production of pyroxylin, known under the name of nitro-cotton, at a low temperature. This nitrocellulose is then dissolved in a mixture of acetone, acetic acid, and amyl alcohol. The proportions employed may vary, but equal volumes of each of the three components give the best results. The solution, after having been suitably filtered, has the appearance of limpid and colourless collodion. 200grms. of dry nitrocellulose are dissolved in 1 litre of a mixture of the three components above mentioned, and a very thick paste is thus obtained. This substance is expressed from a capillary orifice, and instantly solidifies on contact with the external atmosphere, by reason of the evaporation of the acetone, and forms a thread which can be drawn and wound without necessitating the passing of it through coagulating or similar baths. The filament, which is said to be comparable in its fineness, brilliancy and transparency to that yielded by the cocoon of the silkworm, differs from it by its excessive combustibility, due to the presence of the nitrocellulose, and this has to be remedied to render it safe for the same uses as natural silk. For this purpose suitable reducing agents, such as hydro-sulphurous acid, ammonium sulphydrate., etc., are employed in order to act upon the nitrocellulose, which is thereby reduced to totally or partially denitrated cellulose, according to the length of the reaction. It is best to employ alkaline sulphydrates, the hanks of thread being immersed in a solution of the sulphydrates for several hours, then washed in pure water and dried. The material thus obtained may be formed into a pellicle or film, in any convenient manner, as by spreading a layer of the product upon some prepared or polished surface—a sheet of glass, for example—allowing the solvent to evaporate, and detaching the film.

Gleanings from Consular Reports.

GALVESTON.—The cotton crop of the United States for the year ending August 31, 1900, amounted, according to the statement issued by the New Orleans Cotton Exchange, to 9,436,416 bales, or a decrease of 1,838,424 bales as against the crop of 1898-9. The greater portion of the decrease was in Texas and the Indian territory, the production there falling off 27 per cent., whilst that of the Atlantic and other Gulf States only dropped 11 per cent.

Texas and Indian territory showed a decrease of 964,000 bales. The year was peculiar, as wide differences of opinion existed as to the probable production, and also as to the effect of the weather on the crop. Prices, however, gradually advanced from an average for the whole country of 6·7 cents in September to 7·46 cents in January, and 9·34 cents in April, whilst the "squeeze" in July pushed prices up to an average of 10·01 cents. The season was more favourable for gathering and marketing than its predecessor, and the average grade was better.

The average price for the total crop was 7·65 cents per pound, as against 4·88 cents during 1898-9, the average value per bale being 38dols. 55 cents, as against 25dols. 8 cents in 1898-9.

The cotton crop of the United States for the year 1900-1 has been estimated at from 9,750,000 to 9,900,000 bales, or slightly larger than that of 1899-1900.

So far as Texas is concerned, careful estimates place the proportion grown in this State at one-third of the total crop, or from 3,100,000 to 3,300,000 bales. Judging from the latest indications, it may possibly reach the latter figure.

Up to December 31 last it was estimated that Galveston had only received 52·2 per cent. of the Texas crop, as against 71·8 per cent. during the season of 1899-1900. The indications are that no fewer than 646,183 bales more of the Texas crop have been taken by rail to New Orleans and other points than was the case a year ago up to December 31. Under ordinary circumstances, by December 31, 1900, Texas would have received 1,703,202 bales, whereas only 1,229,584 bales were actually received here. This port has therefore lost the handling of 473,618 bales by the storm. Prices for cotton have ruled very high throughout the present season. On October 1, 1900, spot middling cotton was 10 cents at Galveston. It declined to 9 cents on November 1, but at the end of the month had risen to 9⅞ cents. At the close of December it was 9$\frac{7}{16}$ cents, and at the end of January, 1901, 9⅝ cents. At the time of writing (February 20) it is 9½ cents, as compared with 8⅝ cents a year ago.

Charleston.—A review of last year's textile mill construction shows that this country is rapidly becoming one of the leading nations in this line of industry, the total number of new enterprises during 1900 having been 531 mills of all kinds, large and small, compared with 299 mills for the year before.

Returns for the second half of the year, however, were not so satisfactory as those for the first six months, when all previous records were broken in mill building. There was a depression experienced in manufacturing during the summer and autumn months which acted as a check on mill construction, and particularly was this the case in regard to cotton mills. During the first six months of the year there were 307 new mills undertaken, in comparison with 224 for the latter half, a decline of about 25 per cent. Of the above-mentioned 224 mills last projected, 144 were devoted to the manufacture of cotton, 51 to knit goods, 14 to wool, and 16 to miscellaneous purposes, such as silk and linen manufacturing, bleaching, dyeing, etc.

There has been a considerable increase also in mills making finer qualities of goods, especially in the cotton manufacturing business, this having been caused in part by the situation in China, which has lessened the demand for the coarser grades. The number of knitting mills constructed last year is the largest heretofore reported in any one year, nearly all of them being built to make cotton hosiery and underwear.

From the returns received of new mills built throughout the country last year the State of Georgia leads with 43 mills; North Carolina reports 41; South Carolina, 31; Tennessee, 10; Alabama, 16; Virginia, 12; Pennsylvania, 11; Mississippi and Texas, 9 each; Massachusetts, 7; New York, 6; New Jersey, 4; Louisiana, 3; California, Maine, and New Hampshire, 2 each; and Arkansas, Florida, Maryland, Missouri, Ohio, and Oregon, 1 each.

During the year 1900 South Carolina has maintained the position she has held for the past five years of being the leading Southern cotton-manufacturing State of the American Union. The official figures furnished by the office of the Secretary of State for South Carolina show that during 1900 there were 31 textile mills chartered within the State, of which 27 were for spinning and weaving, three exclusively for knitting, and one for bleaching and finishing, with a combined capital of £900,000.

There were also effected last year, for the purpose of enlargement, increases in the capital stocks of 14 previously-established mills, amounting in the aggregate to 2,945,000dols. (£589,000), and in addition to this commissions were issued for the organisation of 12 other cotton mills—which had not up to the close of the year filed their returns and received their charters,—the proposed capital of which amounted to 1,495,000dols. (£299,000). The above-stated projected mills are mentioned merely as probabilities. Some of them may not be brought forward to completion, although at least one of the list is a certainty. The Inman Mill and two others at Union and Whitmire, South Carolina, are also certainties, although they have not been commissioned as yet. But in any case the record for the year is good, showing, with the projected mills omitted, that there were 45 new mills and enlargements.

The relative importance of last year's statistics is apparent from the fact that, during the year 1899, there were only 11 new mills established and 16 enlargements.

In order to form a just idea of the State's achievements in the cotton manufacturing industry, it may be of interest to state that South Carolina is the smallest State in area in the South, and the smallest in population with the exception of Florida and Arkansas, and that it has fewer white persons than any other Southern State except Florida. Measured by the standard of looms, spindles, labour employed, and dollars invested, the white population are doing from four to six times as much in this industry as those of any other Southern State.

The cotton mills of this State are, as a rule, situated in the middle parts of South Carolina, between the pine-belt region bordering on the sea coast and the mountains of the up-country—a section of country well adapted for the purpose, having a good supply of white labour, ample water-power, and a most salubrious climate. There has, however, been one mill in operation in Charleston for several years which has been more or less of a failure, and which it is reported is about to be removed to Gainesville, Georgia, as it has been found that the negro labour employed in this mill, after several year's experimenting, has proved to be unsatisfactory. It is stated that no definite time has yet been arranged when the mill is to be moved, but there seems to be no doubt that the change is necessary, and will soon be made.

Much interest was felt when the employment of negro labour in the Charleston mill was first undertaken, and its apparent failure has been a disappointment to the friends of the coloured man, who had indulged in the hope that as a mill operative he might be made useful to himself and the community. Racial peculiarities seem to explain the matter, the negro being indisposed to steady employment of any kind unless absolutely forced to it. His shiftless, indolent, careless nature appears to render him ill-adapted for the work of a mill operative.

The books in the office of the Secretary of State of North Carolina show that 38 textile companies were chartered in that State during the first eleven months of the year 1900, 26 of them being cotton spinning and weaving mills, 11 knitting mills for hosiery, underwear, etc., and 1 silk mill. This list does not include all the textile mills under way or about to be built, but only those actually chartered, for some of the plants do not take out charters until they are completed and ready to begin business. There are at least half a-dozen spinning and 1 more silk mill now being erected that have not yet secured their charters.

There are now over 250 textile mills in operation in North Carolina—more, numerically speaking, than in all the other Southern States combined, —but they are generally small in size, most of them having only about 10,000 spindles, many less, while probably not over 25 operate as many as 25,000 spindles, as the North Carolina manufacturers seem to believe in mills of very moderate size.

In the rush to build cotton mills it must not be supposed that South Carolina has been neglectful of her other industrial resources, as reports received from throughout the State go to show that she is now deriving a considerably increased revenue from the marked advance which has taken place in the lumber business.

The principal features that characterised the cotton trade of Charleston during the year 1900 were, generally speaking, high prices, a marked disposition on the part of producers to hold back stocks in hopes of further advances in values, and much difficulty experienced by charterers in securing cotton cargoes for ships at remunerative figures, in the face of low rates of freight offered by regular coasting steam lines, which handled an unusually large part of the autumn business, carrying the cotton to New York, and forwarding it thence to the United Kingdom and the Continent. This resulted in about 33 British vessels leaving this port last year in ballast going to other ports where cargoes could be had at profitable rates of freight.

The same difficulties were also experienced at other neighbouring ports, and serious losses were sustained in some cases by charterers owing to expenses incurred for cancellation of charters, settlement of demurrage claims, and incidental litigation charges arising therefrom. The above state of affairs explains the fact that, notwithstanding that the cotton receipts of this port were larger during the last four months of the past year than for the corresponding period of the previous year, there were nevertheless fewer British ships employed than usual in the direct carrying trade from here to Europe, as is shown by the following official cotton figures.

The total receipts of upland cotton at the port of Charleston during the cotton season of 1899-1900, ending September 1, 1900, were 258,719 bales, compared with 366,857 bales received the previous year, these figures showing a decrease in last year's receipts of 108,138 bales of this staple.

The exports during the year ending September 1, 1900, were 257,328 bales, in comparison with 364,429 bales, a decrease last year of 107,101 bales, while the stock remaining on hand on September 1, 1900, was 2310 bales, compared with 5629 bales for the corresponding date of the year before. Of last year's exports of upland cotton, 62,848 bales come to the United Kingdom, 175,678 bales to other European ports—mostly Bremen and Hamburg,—and the remainder coastwise to American ports, and to interior places in the United States by railway.

The total receipts of Sea Islands cotton at Charleston from September 1, 1899, to September 1, 1900, were 7772 bags, compared with 5642 bags for the same period of the year before, an increase in last year's receipts of 1130 bags of this quality of cotton.

The total exports for the year ending September 1, 1900, were 7675 bags, in comparison with 6616 bags received the year before, with a stock remaining on hand (and on shipboard) on September 1, 1900, of 347 bags, compared with 255 bags for the same date of the preceding year.

The cotton figures of the port from September 1, 1900, for uplands and Sea Islands cotton were as follows :—

Total receipts of uplands cotton at Charleston for the last four months of the past year as above-mentioned were 174,454 bales, compared with 160,273 bales for the same period of the previous year, an increase last year of 14,181 bales over the preceding year's receipts.

The exports from September 1 to December 31, 1900, were 156,158 bales, compared with 142,096 bales during the corresponding period of the year before, an increase in last year's exports of 14,062 bales of uplands, these figures leaving a stock on hand (and on shipboard) on December 31, 1900, of 16,932 bales, in comparison with 26,555 bales on the same day of the year before. Of the above stated exports last year, 66,251 bales came to the United Kingdom, 50,974 bales to Continental ports in Europe, and the remainder to various ports and places in the United States, principally to New York and Philadelphia and interior points by rail.

The receipts of Sea Islands cotton from September 1 to December 31, 1900, were 6750 bags, in comparison with 6375 bags for the corresponding period of the previous year. The total exports during the same time were, for last year, 4774 bags, compared with 3677 bags during the previous year, these figures showing a moderate improvement in last year's business. Of last year's exports of Sea Islands cotton, 1127 bags were shipped to the United Kingdom, and 3021 bags to New York, there being no other foreign shipments of this grade of cotton.

The closing prices for cotton of standard grades in Charleston market on December 31, 1900, were, for upland middlings, 9¼ cents per pound, and for Sea Islands, 24 cents per pound for fully fine, and 25 cents for extra fine qualities, the tone of the market on the last day of the year being firm, with sales of 300 bales.

Savannah.—The cotton season of 1899-1900 ending on August 31 was an eventful one in the cotton world, its conditions standing in striking contrast at the close with those prevailing at the beginning of that year. When the season opened, stocks were large throughout the world, a large crop was anticipated, estimates of 11,000,000 bales were made, and prices for middling grades were quoted at about 5½ cents per pound. At the end of the cotton year, on August 31, 1900, it turned out that the crop was only 9,400,000 bales, a decrease of over 1,800,000 bales in comparison with the previous year, but prices had in the meantime risen to 9 cents per pound.

The total receipts of upland and Sea Islands cotton at Savannah during the commercial year ending August 31, 1900, were 1,091,884 bales, of which amount there were 72,250 bales of Sea Islands, these figures showing a falling off last year of about 10,000 bales in receipts in comparison with the previous year.

The exports during the same period were, for last year, 1,071,110 bales, of which 1,000,451 were uplands and 70,659 Sea Islands. Of last year's exports Bremen took 352,739 bales ; Liverpool and Manchester, 181,474 bales ; Barcelona, 48,097 bales ; Gothenburg, 46,497 bales ; Havre, 37,153 bales ; Russian ports, 16,925 bales ; Belgium, 6275 bales ; and Italy, 2400 bales ; the rest of the exports, amounting to about 371,477 bales, going coastwise to American ports, principally Boston, New York, Philadelphia, and Baltimore.

During the last four months of the past year, from September 1 to December 31, 1900, the receipts of cotton at Savannah were 682,607 bales of all classes, compared with 640,649 bales received during the corresponding period of the previous year, a gain last year of 41,958 bales. The exports for the same period last year were 554,185 bales, of which 421,824 bales went to foreign countries, in comparison with the previous year's exports of 501,444 bales, of which 330,051 bales went to foreign countries, these figures showing an increase of 52,741 bales in last year's total exports. About four-fifths of the foreign exports were shipped to the United Kingdom and Germany during the past season.

The closing prices for cotton at the Savannah Cotton Exchange on the last day of the year 1900 were, for middling uplands, 9 5/16 cents per lb., compared with 7⅜ cents on the same date of the previous year, the quotations for Sea Islands at the end of last year being from 18 to 24 cents per lb., according to quality.

Switzerland.—In wool and cotton goods there was a net decrease of £223,000, or nearly 9 per cent., the principal items being :—

—	Value.	
	1899.	1900.
	£.	£.
Wool, raw and washed, dyed and combed	742,724	673,481
Textures	1,162,813	1,049,558
Carpets	127,863	117,079
Braids and trimmings	127,330	108,500

The decrease in the imports under wool and woollen goods of £212,000, as shown above, combined with the increase of £7000 in the export of Swiss woollen goods, is much in favour of this Swiss home industry. Although Switzerland does not produce the finer stuffs made in England and France, she manufactures a very good medium cloth, for which there is a large sale on the Continent.

Roubaix and Tourcoing (France).—The cotton trade of the North of France has been much unsettled during the year 1900, partly through similar conditions to the Liverpool and American markets, and also owing to the unfortunate state of the wool trade and consequent check to business in general. But the principal disturbing element was the uncertainty in the price of raw cotton, which rose from 5½d. per pound in January to 7½d. on September 13, and fell again at the close of the year to the former price.

As in the wool trade, there were fears of a short supply, and speculation took the place of legitimate trade. Had it not been for the action of the British spinners working short time, and so reducing consumption, the effects might have been disastrous. The British cotton market was affected by the plague and famine in India and the disturbances in China, which brought about a further dislocation of affairs, and the result was a position of considerable difficulty, in addition to which economic conditions in the markets of Southern and Central America and Turkey caused merchants to restrict their purchases. Examination of the situation shows that a pause has undoubtedly occurred in that expansion of trade which was a noteworthy feature of the two preceding years.

The outlook for the future is to all appearance fairly healthy, but it would seem that a basis of 5½d. per lb. for "middling American" is an impediment to active buying, and it is to be feared that the volume of business at present prices will not be sufficiently large to enable manufacturers to keep machinery fully and profitably employed. Owing to the uncertain conditions of the past year, buyers have shown a disinclination to purchase, and in some cases to accept delivery, so that the year closed with larger stocks than have ever been known before.

As to the wool trade, the year has been described as one of "unmitigated gloom, disappointment, and disaster," and as the Roubaix - Tourcoing district was the starting point and the centre of the disturbance, events here may be worth recording. The year seemed to open well ; during the last half of 1899 prices of combed wool, especially the finer sorts, went up by leaps and bounds, and so did the price of raw wool in London, the Colonies, and South America.

The following prices per pound, taken from the wool circular of Messrs. Charles Balme and Co., are illustrative of this :—

—	Prices.	
	December, 1898.	December, 1899.
	d.	d.
Australian scoured merino	16	25
Greasy coarse crossbred	6	8
Australian greasy merino	8½	14
South African greasy	7	10½

Meanwhile almost all the available wool in Australia and South America had been bought at prices which had not been known for a generation, large quantities being purchased by men who had bills to meet, and consequently could not afford to hold long. One or two firms began cautiously to unload, and by the middle of January the fall had begun, wool which was quoted at the end of December at 2s. 7d. per pound falling in January to 2s. 3d. per pound.

New York.—There has been a great variation in the demand for cotton; during the first three months of the year prices were advanced, stocks were in almost every instance depleted, and large contracts for future supplies were made. This was followed by a marked contraction in the demand for the home trade in April, but manufacturers were so well supplied with orders that the dull demand had no effect for a considerable time, while the high price ruling for raw material tended to keep up values. In the late summer an easier tone prevailed, but in September there was a renewed demand, on predictions of another short cotton crop; this, however, was of short duration, and the closing months of the year were marked by inactivity, and in some cases lower prices. In heavy lawn goods the large purchases made for China in 1899 acted as a check on business at the beginning of 1900. A good demand developed suddenly in the spring, but this was arrested by the "Boxer" troubles, and business with China came practically to a standstill. In the cotton prints market the cost of production, cloths, dyes, wages, etc., all increased materially, but there was no corresponding increase in the price of prints. The stock was small at the beginning of the year, and manufacturers gradually advanced the price from 3¼ cents (1⅝d.) to 3⅜ cents (1¾d.) in March; business was checked, stocks began to accumulate, and the Fall River manufacturers decided to close during four weeks in August and September, prices having fallen to 2⅞ cents ($1\frac{7}{16}$d.) in June and July. A large purchase in September, accompanied by a rise in the raw material, raised the price to 3¼ cents (1⅝d.) in October, but it quickly receded to 3⅛ cents ($1\frac{9}{16}$d.), from which there was no advance to the end of the year.

It was estimated at the end of August, 1900, that the number of spindles in the North had increased by 100,000 to 14,050,000; those in the South by over 500,000 to 4,540,515. The new mills erected and in course of erection in the South are said to show a very large proportion of plants with 15,000 spindles or less put up almost entirely by local capital, showing confidence in the future of the Southern cotton industry. The price of middling cotton at New York opened at $7\frac{11}{16}$ cents ($3\frac{27}{32}$d.) in January and rose steadily till it reached 9⅞ cents ($4\frac{15}{16}$d.) early in May.

The market for woollen goods was at the beginning of the year strong and active with advancing prices for both raw materials and manufactured goods. In a little over a month the demand was extraordinarily large, and during that time sales were reported from the mills equal to their production for the greater part of a year. By the end of March, however, many of these orders had been cancelled, the whole tone of the market changed, and prices for both raw and manufactured goods moved downwards.

In heavy weights the market was irregular, and at the close of the year prices for next autumn showed little if any advance on those of 1899.

The spring season in men's wear was uniformly quiet and with relatively lower prices than the preceding heavy-weight season. In woollen and worsted dress goods the market opened strong, and prices were advanced sharply, in some cases 70 per cent. and upwards; the demand was checked in consequence. In many instances the advance had to be relinquished, and the year closed with no indication of improvement in the near future. The total imports into the United States of unmanufactured wool show an increase from about 106,000,000lb. in 1899 to about 140,000,000lb. in 1900; in carpets there is an increase from 761,000 to 916,000 square yards; and in dress goods from 23,661,000 to 25,446,000 square yards; the import of cloth has fallen slightly from 4,676,500 to 4,446,700 square yards. There is a further increase in the import of unmanufactured wool from the United Kingdom, but a slight decrease in that of woollen cloth.

Hiogo and Osaka (Japan).—Cotton manufactures show a drop of from £812,000 in 1898 to £645,000 in 1899. With few exceptions the figures for all descriptions of yarn and piece goods exhibit a falling-off. The fact, however, ought not to be ascribed to a diminished demand from the consuming districts, but rather to the remarkable coincidence that the yield of cotton in America, India, and Egypt was considerably below the average—a coincidence so unusual that many years may elapse before it again happens.

The off-take in grey shirtings of 8½ and 9lb. was much less than usual, increased appreciation being shown of the finer cloths made from Egyptian yarn. This is a change of taste which is likely to be permanent. The demand for white shirtings was meagre, owing to the failure of the native dealers to recognise the fact that the rise in the price was due to the advancing cost of the raw materials.

In cotton prints the special feature of the trade was the marked preference shown for the superior grades of goods and expensive patterns, and the same movement in favour of the higher classes of goods was shown in regard to cotton Italians.

The import of this article, owing to the rise in the value of the home raw silk, rose from £35,000 in 1898 to £128,000 worth in 1899. Nearly two-thirds of the import was in cocoons, but Tussah silk yarns constituted the bulk of the remainder.

As with cotton, so with wool: the increase in the import of the raw material is at once the accompaniment and the cause of a diminished import of the manufactured products. Of wool in 1898 the import was only 145 tons, value £118,000; last year the import reached 1560 tons, value £965,000, an increase in round numbers of ten-fold in one year. Of woollen manufactures, cloth fell from £875,000 in 1898 to £650,000 last year; flannels from £460,000 to £212,000; in blankets and woollen yarns there was a similar decrease, the only rising fabric being Italian cloth.

Of cotton yarn, the manufacture and export continues rapidly to increase. In 1899 over 35,000 tons were sent abroad, as against 37,560 tons in 1898, the value being respectively £2,634,000 and £1,890,000. Most of it goes to North China, distributing itself over the four ports Shanghai, Tientsin, Chefoo, and Newchwang; and Hong Kong serves as the distributing centre for the share of it which goes to Southern China. Korea is also beginning to take an appreciable fraction of this staple. The trade, however, is but to a small extent handled by foreign merchants. Japanese and Chinese shipping the bulk of it. It was not till the year was more than half over that business was brisk; but after August the average price rose from under £8 per bale to over £9 in December. The average price per bale, including all counts in 1898, was £8 15s., whilst the average for 1899 was at least 10s. cheaper. Appended is a tabular statement of the quantities and values exported from Kobe (omitting the Osaka fraction) during the past five years :—

EXPORT OF COTTON YARN.

Year.	Quantity. Tons.	Value. £
1899	51,000	2,353,300
1898	36,000	1,762,500
1897	21,170	1,139,000
1896	6,020	311,000
1895	1,330	66,000

NEW COMPANIES.

Andrew Berry and Sons Limited.

Registered April 12, with a capital of £20,000, in £10 shares, to acquire the business of cotton manufacturers, carried on by E. Berry and E. S. Berry at Mount Pleasant Mills, Leyland, Lancashire, as Andrew Berry and Sons, and to carry on the business of cotton spinners, doublers, and manufacturers, flax, hemp, and jute spinners, linen manufacturers, cotton, flax, hemp, jute, and wool merchants, dyers, bleachers, etc No initial public issue. E. Berry and E. S. Berry are the first managing directors, and each may retain office so long as he holds 250 shares; remuneration, £520 each per annum. Registered by Jordan and Sons Limited, 120, Chancery-lane, London, W.C. Registered office, Mount Pleasant Mill, Leylands-lane, Leylands.

Delta Mill Company Limited.

Registered April 10, with a capital of £100,000, in £5 shares, to carry on all or any of the businesses of spinners, doublers, weavers, dyers, bleachers, printers, manipulators of cotton, flax, wool, jute, silk, or other fibrous substances, buyers and sellers of any such substances in the raw (unmanufactured) state, dealers in the products of the company's mills and in the yarns, fabrics, and manufactures of other firms producing or dealing in similar goods, brick and tile makers and vendors (only to the extent of using up any clay found on the company's land), builders, patent owners, financiers, merchants, etc. The number of directors is not to be less than three nor more than seven; remuneration, £420 per annum, divisible. Registered by Jordan and Sons Limited, 120, Chancery-lane, London, W.C. Registered office, 71, Shaw-road, Royton.

Joshua Whiteley and Co. Limited.

Registered March 19, with a capital of £50,000, in £10 shares, to acquire and carry on the business of cotton spinners and doublers, warp makers, etc., carried on by J. Whiteley at Albion Mills, Huddersfield, and at Spring Mill, Rishworth, near Halifax, as J. Whiteley and Co. No initial public issue. The number of directors is not to be less than three nor more than seven; the first are J. Whiteley, S. S. Whiteley, J. G. Hayley, J. C. North, and H. Wadsworth; qualification, £1000; remuneration, £50 per annum, divisable. Registered by Jordan and Sons Limited, 120, Chancery-lane, London, W.C. Registered office, Albion Mills, Milford-street, Huddersfield.

Ireland Brothers Limited.

Registered in Dublin, April 12, with a capital of £100,000, in £10 shares, to acquire and carry on the business of linen manufacturers, warehousemen, and merchants, carried on by Ireland Brothers and Co., at 29, Linen Hall-street, Belfast, at Lurgan, Ireland, and at Milk-street, London. The number of directors is not to be less than two nor more than five; the first are J. Ireland, A. L. Ireland, R. Ireland, and F. Hollins; qualification, £1000; remuneration, as fixed by the company. Registered office, 29, Linen Hall-street, Belfast.

John Baldwin and Sons Limited.

Registered April 1, with a capital of £7000, in £10 shares, to acquire the business of silk spinners, carried on at Brighouse, Yorkshire, by J. H. and T. Baldwin, as John Baldwin and Sons, and to carry on the same and any business connected therewith. No initial public issue. The number of directors is not to be less than two nor more than five; the first are J. Baldwin, H. Baldwin, and T. Baldwin; qualification, 70 shares. Registered by C. Doubble, 14, Serjeant's Inn, London, E.C.

Joseph Maude and Co. Limited.

Registered April 1, with a capital of £15,000, in £1 shares (5000 preference), to acquire the business carried on by H. Maude, trading as Joseph Maude and Co., at Pike's-lane Mill, Deane-road, Bolton, and to carry on the business of cotton winders, warpers and agents, cotton, silk, linen and fancy cloth manufacturers, etc. No initial public issue. The number of directors is not to be less than three nor more than seven; the first are to be appointed by the subscribers; remuneration, £20 each per annum. Registered by Waterlow Bros. and Layton Limited, Birchin-lane, London, E.C.

Littleborough Hosiery Company Limited.

Registered April 6, with a capital of £5000, in £5 shares, to acquire the business carried on at Littleborough, Lancashire, as the Littleborough Hosiery Company, to adopt an agreement between E. Cryer and W. Cryer, of the one part, and C. H. Hudson, of the other part, and to carry on the business of manufacturers of cotton and woollen goods, hosiery, underclothing, and knitted goods, etc. No initial public issue. The number of directors is not to be less than three nor more than five; the first are E. Cryer, W. Cryer, W. Taylor, and W. Lord; qualification, 20 shares. E. Cryer is permanent managing director with £156 per annum. Registered by The Solicitors' Law Stationery Society Limited, 12, New-court, London, W.C.

Priestley's Limited.

Registered April 3, with a capital of £400,000, in £1 shares (205,000 preference, 100,000 ordinary, and 95,000 preference or ordinary at option of directors), to acquire the business carried on in Bradford, London, New York, and elsewhere by Briggs, Priestley and Sons, and B. Priestley and Co., and the business carried on in Bradford, London, and elsewhere by James H. McEwan, as Rule, Greenless and McEwan, and to carry on the business of woollen, worsted, mohair, cotton and silk spinners, manufacturers and merchants, woolcombers, dyers, finishers, waterproofers of textile fabrics, etc. No initial public issue. The number of directors is not to be less than three nor more than five; the first are B. Priestley, W. E. B. Priestley, and J. H. McEwan; qualification, £1000; remuneration, as fixed by the company. Registered office, 65, Vicar-lane, Bradford.

Thomas Jowett Limited.

Registered April 20, with a capital of £10,000, in £10 shares, to acquire and carry on the business of spinners heretofore carried on at Greenhill Mills and Marshall Mills, Bradford, and elsewhere, under the style of Thomas Jowett. No initial public issue. The number of directors is not to be less than three nor more than five; the first are J. R. Briggs, J. Crabtree, Lavinia Briggs, Mary E. Jowett, and Elizabeth Crabtree; qualification, £100; remuneration, as fixed by the company. Registered by Jordan and Sons Limited, 120, Chancery-lane, London W.C. Registered office, Greenhill Mills, Florence-street, Bradford.

C. H. Nuttall and Co. Limited.

Registered April 24, with a capital of £20,000, in £1 shares (8000 5½ per cent. cumulative preference), to adopt an agreement with I. Dootson, jun., and C. H. Nuttall, and to carry on the business of cotton spinners and doublers, flax, hemp, and jute spinners, linen manufacturers, wool merchants, worsted stuff manufacturers, bleachers, dyers, etc. No initial public issue. The number of directors is not to be less than two nor more than four; the first are C. H. Nuttall and I. Dootson, jun.; qualification, 1000 shares. C. H Nuttall is managing director; remuneration of ordinary directors, £50 each per annum; of managing director, as fixed by agreement. Registered by Busk, Mellor and Norris, 45, Lincoln's Inn Fields, London, W C.

John Dalton Limited.

Registered April 26, with a capital of £100, in £1 shares, to acquire the goodwill, trade marks, and designs of the business of John Dalton, and to carry on the same or any other business acquired by this company as agents for the Calico Printers' Association Limited, or otherwise. The directors are to be appointed by the Calico Printers' Association Limited. Registered by Grundy and Co., 89, Gresham-street, London, E.C.

McMahon, Yates and Co. Limited.

Registered April 25, with a capital of £10,000, in £100 shares, to carry on the business of cotton cloth merchants and agents, dealers in cloth, linen and other fabrics, cotton spinners and doublers, flax, hemp and jute spinners, linen manufacturers, wool combers, worsted and woollen spinners, etc. No initial public issue. The number of directors is not to be less than five nor more than seven; the subscribers are to appoint the first; qualification, £300; remuneration, as fixed by the company. Registered office, 10, West Mosley-street, Manchester.

Roberts and Co. (Clitheroe) Limited.

Registered April 23, with a capital of £4000, in £10 shares, to acquire the business of cotton manufacturers carried on by R. B. Wood and R. Thistlethwaite, trading as Roberts and Co., at Salford Bridge Mill, Clitheroe, and to carry on the business of weavers of cotton, woollen, silk, and other fibrous substances, cloth manufacturers and merchants, commission agents, etc. No initial public issue. The first directors are R. B. Wood, R. Thistlethwaite, and T. Thistlethwaite; qualification, 10 shares; remuneration, as fixed by the company. Registered by Jordan and Sons Limited, 120, Chancery-lane, London, W.C. Registered office, Salford Bridge Mill, Clitheroe.

A. J. King and Co. Limited.

Registered April 20, with a capital of £100, in £1 shares, to acquire the goodwill and trade marks of the business of A. J. King and Co., of Ingersley Vale, Bollington, near Macclesfield, to adopt two agreements with the Bleachers' Association Limited, and to carry on the business of bleachers, dyers, finishers, chemical manufacturers, textile manufacturers and printers, etc. No initial public issue. The general managers of the Bleachers' Association Limited shall be the directors or director of the company, with power to appoint others. Registered by Patersons, Snow and Co., 25, Lincoln's Inn Fields, London, W.C.

Eccles Bleaching Company Limited.

Registered April 20, with a capital of £100, in £1 shares, to acquire the goodwill and trade marks of the business of the Eccles Bleaching Company Limited (in liquidation). All other particulars are the same as in A. J. King and Co. Limited (q.v.).

Forrest, Gillies and Co. Limited.

Registered April 20, with a capital of £100, in £1 shares, to acquire the goodwill and trade marks of the business of Forrest, Gillies and Co., of Lanfine Bleachworks, Newmilns, Ayrshire. All other particulars are the same as in A. J. King and Co Limited (q.v.).

G. and J. Slater Limited.

Registered April 20, with a capital of £100, in £1 shares, to acquire the goodwill and trade marks of the business of G. and J. Slater, of Dunscar, Bolton. All other particulars are the same as in A. J. King and Co. Limited (q.v.).

George Murton and Co. Limited.

Registered April 20, with a capital of £100, in £1 shares, to acquire the goodwill and trade marks of the business of George Murton and Co., of Sharples Bleachworks, Bolton. All other particulars are the same as in A. J. King and Co. Limited (q.v.).

Irkdale Bleachworks Company Limited.

Registered April 20, with a capital of £100, in £1 shares, to acquire the goodwill and trade marks of the business of the Irkdale Bleachworks Company Limited (now wound up). All other particulars are the same as in A. J. King and Co. Limited (q.v.).

James McHaffie and Son Limited.

Registered April 20, with a capital of £100, in £1 shares, to acquire the goodwill and trade marks of the business of James McHaffie and Son, of Kirtonfield, Neilston. All other particulars are the same as in A. J. King and Co. Limited (q.v.).

John McNab and Co. Limited.

Registered April 20, with a capital of £100, in £1 shares, to acquire the goodwill and trade marks of the business of John McNab and Co., of Midtownfield, Howwood. All other particulars are the same as in A. J. King and Co. Limited (q.v.).

John Smith, jun., and Co. Limited.

Registered April 20, with a capital of £100, in £1 shares, to acquire the goodwill and trade marks of the business of John Smith, jun., and Co., of Great Lever Works, Bolton. All other particulars are the same as in A. J. King and Co. Limited (q.v.).

Handforth Bleaching Company Limited.

Registered April 20, with a capital of £100, in £1 shares, to acquire the goodwill and trade marks of the business of the Handforth Bleaching Company Limited. All other particulars are the same as in A. J. King and Co. Limited (q.v.).

Horridge and Co. Limited.

Registered April 20, with a capital of £100, in £1 shares, to acquire the goodwill and trade marks of the business of Horridge and Co., of Raikes Bleachworks, Bolton. All other particulars are the same as in A. J. King and Co. Limited (q.v.).

John Stanning and Son Limited.

Registered April 20, with a capital of £100, in £1 shares, to acquire the goodwill and trade marks of the business of John Stanning and Son Limited (in liquidation). All other particulars are the same as in A. J. King and Co. Limited (q.v.).

John Waterhouse and Co. Limited.

Registered April 20, with a capital of £100, in £1 shares, to acquire the goodwill and trade marks of the business of John Waterhouse and Co., of Tootel Bleachworks, Breightmet, Bolton. All other particulars are the same as in A. J. King and Co. Limited (q.v.).

John Young and Co. (Crumpsall) Limited.

Registered April 20, with a capital of £100, in £1 shares, to acquire the goodwill and trade marks of the business of John Young and Co. (Crumpsall) Limited (in liquidation). All other particulars are the same as in A. J. King and Co. Limited (q.v.).

Kay and Smith Limited.

Registered April 20, with a capital of £100, in £1 shares, to acquire the goodwill and trade marks of the business of Kay and Smith, of Land's End Works, Middleton. All other particulars are the same as in A. J. King and Co. Limited (q.v.).

Kersal Bleaching Company Limited.

Registered April 20, with a capital of £100, in £1 shares, to acquire the goodwill and trade marks of the business of the Kersal Bleaching Company, of Kersal Vale Bleachworks, near Manchester. All other particulars are the same as in A. J. King and Co. Limited (q.v.).

Kirkpatrick Brothers Limited.

Registered April 20, with a capital of £100, in £1 shares, to acquire the goodwill and trade marks of the business of Kirkpatrick Brothers, of Ballyclare Bleachworks, Ballyclare, Antrim. All other particulars are the same as in A. J. King and Co. Limited (q.v.).

Knowles and Green Limited.

Registered April 20, with a capital of £100, in £1 shares, to acquire the goodwill and trade marks of the business of Knowles and Green, of Undershore Bleachworks, Bolton. All other particulars are the same as in A. J. King and Co. Limited (q.v.).

R. and A. Chambers Limited.

Registered April 20, with a capital of £100, in £1 shares, to acquire the goodwill and trade marks of the business of R. and A. Chambers Limited (in liquidation). All other particulars are the same as in A. J. King and Co. Limited (q.v.).

Richard Ainsworth, Son and Co. Limited.

Registered April 20, with a capital of £100, in £1 shares, to acquire the goodwill and trade marks of the business of Richard Ainsworth, Son and Co., of Halliwell Bleachworks, Bolton. All other particulars are the same as in A. J. King and Co. Limited (q.v.).

Sykes and Co. Limited.

Registered April 20, with a capital of £100, in £1 shares, to acquire the goodwill and trade marks of the business of Sykes and Co. Limited (in liquidation). All other particulars are the same as in A. J. King and Co. Limited (q.v.).

Samuel Rothwell Limited.

Registered April 20, with a capital of £100, in £1 shares, to acquire the goodwill and trade marks of the business of the executors of the late Samuel Rothwell, of Woodhill Bleachworks, Elton, near Bury. All other particulars are the same as in A. J. King and Co. Limited (q.v.).

Thomas Cross and Co. Limited.

Registered April 20, with a capital of £100, in £1 shares, to acquire the goodwill and trade marks of the business of Thomas Cross and Co. Limited (in liquidation). All other particulars are the same as in A. J. King and Co. Limited (q.v.).

Thomas Hardcastle and Son Limited.

Registered April 20, with a capital of £100, in £1 shares, to acquire the goodwill and trade marks of the business of Thomas Hardcastle and Son, of Firwood Works, Bolton. All other particulars are the same as in A. J. King and Co. Limited (q.v.).

Simpson and Jackson Limited.

Registered April 20, with a capital of £100, in £1 shares, to acquire the goodwill and trade marks of the business of Simpson and Jackson, of Street Bridge Bleachworks, Royton, near Oldham. All other particulars are the same as in A. J. King and Co. Limited (q.v.).

Thomas Lewis Livesey Limited.

Registered April 20, with a capital of £100, in £1 shares, to acquire the goodwill and trade marks of the business of Thomas Lewis Livesey, of Hollins Vale Bleachworks, Whitefield. All other particulars are the same as in A. J. King and Co. Limited (q.v.).

Thomas Ridgway and Co. Limited.

Registered April 20, with a capital of £100, in £1 shares, to acquire the goodwill and trade marks of the business of Thomas Ridgway and Co., of Wallsuches Bleachworks, Norwich. All other particulars are the same as in A. J. King and Co. Limited (q.v.).

William Mosley Limited.

Registered April 20, with a capital of £100, in £1 shares, to acquire the goodwill and trade marks of the business of William Mosley, of Cheadle Bleachworks, Cheadle. All other particulars are the same as in A. J. King and Co. Limited (q.v.).

THE GAZETTE.

ENGLAND.

Partnerships Dissolved.

A. Moore and T. Wright, stuff merchants, Leeds-road, Bradford.

Henry Robert Twyford, Isaac Hanson, John Scott, and John Henry Mallard, manufacturers of hosiery and warehousemen, 119, Wood-street, London, and Belper, as George Brettle and Co., as regards I. Hanson.

H. D. Knight, N. D. Knight, and T. E. Knight, stuff merchants, Booth-street, Bradford; as regards N. D. Knight.

W. George, J. Francis, and J. Kerr, woollen manufacturers, Llanidloes; as regards J. Francis.

H. Firth, F. Firth, S. Firth, and C. Firth, woollen manufacturers, Colne-road Mills, Huddersfield.

J. Crowther, E. Crowther, and D. S. Crowther, woollen manufacturers, Milnsbridge, near Huddersfield, and Station-street, Huddersfield.

J. Crowther and J. E. Crowther, woollen manufacturers, Milnsbridge, near Huddersfield, and Half Moon-street, Huddersfield, or elsewhere, trading as John Crowther and Sons.

J. Newsome, G. Blacker, and A. Thompson, dyers, Batley.

Roderick Johnston and Horace Muspratt, cotton brokers, 11, Rumford-street, Liverpool, as Moffat Brothers.

Alfred Ernest Price and Arthur Clough Illingworth, wool merchants, Grattan-road, Bradford.

Voluntary Windings-up.

Henry-street Mill Company Limited. Mr. A. H. Pownall, 42, Spring Gardens, Manchester, liquidator.

Belt Manufacturing Company Limited. Mr. W. B. Keen, 3, Church Court, Old Jewry, London, liquidator.

Carruthers-street Mill Company Limited. Mr. F. Murgatroyd, Duchy Chambers, Clarence-street, Manchester, liquidator.

JOTTINGS.

The Provincial Government of Bosnia and Herzegovina are trying to find a market in England for woven and hand-knotted Oriental carpets, a speciality of the Government factories.

The total number of cotton mills in the Southern States of North America, according to the latest returns, is 663, an increase of 113 mills as compared with the previous year. The number of spindles is 6,267,163.

There are estimated to be about 400,000 Angora goats in the United States, and the annual production of mohair is about 1,000,000lb. Angora goats during the last forty years have been extensively bred in the Western States and territories, especially in Texas, New Mexico, Nevada, Florida, California, and Oregon.

The Government of Bengal have agreed to contribute £3300 per annum for three years, in aid of carrying out a scheme of experimental and scientific research in regard to indigo, provided the Amalgamated Behar Indigo Planters' Association and Indigo Improvements Syndicate contribute a sum of £5000 per annum for the same period. The expenditure of this amount will be left to the discretion of the Association and Syndicate, but there will be an official audit of the accounts.

The committee of experts appointed by the Prussian Government some time ago to report on devices for preventing or abating smoke from fires and furnaces recently concluded its inquiries, and the measure it proposes will shortly be notified. The Ministers, however, have already instructed the managers of State factories, etc., to do all they can to prevent or consume the smoke from their fires, and if necessary to have smoke-consuming appliances constructed. Municipal and provincial authorities have also been asked to do the same, and it is pointed out that, according to the report of the committee, they will not suffer any pecuniary loss. The Minister of Commerce has also instructed the presidents of all the provinces to take steps for preventing the unnecessary production of smoke, and, if need be, to issue regulations.

The first annual report of the directors of the Calico Printers' Association states that the profits, after deducting £219,334 for depreciation and maintenance, amount to £482,873. From this has to be deducted head office charges, vendors' interest, and debenture interest, leaving a net balance of £144,367, which the directors have decided to carry forward. Owing to ill-health the late chairman of directors (Mr. F. F. Grafton) was compelled to retire from the board last September, and Mr. J. H. Gartside, of Gartside and Co. Limited, Manchester, was unanimously elected to the chairmanship. In addition to the businesses mentioned in the prospectus the association has acquired the businesses of John Hill and Co. Limited, Crumpsall; of Kershaw, Whittam and Taylor Limited, Chorley; of Syddall Brothers Limited, Chadkirk; and of J. C. Semple and Co., Glasgow.

Mr. B. F. Stone, the American Consul at Huddersfield, has issued his returns of trade with the United States for the past month. The total value of the exports from the Huddersfield consular district was £11,825, a decrease of £277 on March last, and a decrease of £2961 on April, 1900, but an increase of £1679 on April, 1899. During the month the woollens exported were valued at £2055, or £1148 less than in March, and £86 less than April, 1900. Worsted goods were represented by the figures £2939, or £678 less than the value of similar goods sent out in March, and a decrease of £802 on April, 1900. Yarns showed a decrease from £1046 last year to £62. Wools were represented by the figures £665, rugs £348, and woollen thread waste £320; against nil in the previous year. No sewing thread was sent this year, as against £1384 in the corresponding month last year. Card clothing fell from £2117 to £964, and chemicals from £3157 to £2793.

The death occurred, very suddenly, on the 15th ult. of Mr. John Butterworth, a member of the firm of Messrs. Butterworth and Dickinson, loom makers and machinists, Globe and Saunder Bank Ironworks, Burnley. Mr. John Butterworth was the second son of the late Mr. James Butterworth. When a boy he was apprenticed to the trade of an ironworker with his uncle, the late Mr. Samuel Wilkinson—the founder of the business now carried on under the name of Messrs. Butterworth and Dickinson,—and on the death of Mr. Wilkinson in 1870, Mr. John Butterworth, along with Alderman William Dickinson, J.P., who was also a nephew, and an apprentice at Saunder Bank Ironworks, succeeded to the business. About five years later Messrs. Butterworth and Dickinson acquired the Globe Ironworks, formerly occupied by Messrs. Bracewell and Griffiths, and transferred part of their business there, and in the year 1884 they commenced the business of cotton manufacturing at Westgate Shed. It is, however, principally as loom makers that the firm are best known. The deceased gentleman was sixty-one years of age.

The annual statement of the trade of the United Kingdom with foreign countries and British Possessions states that the total value of imports and exports of merchandise during 1900 was £877,448,917, as against £814,570,241 for the preceding year. For 1898 the figures were £764,558,690, for 1897 £745,203,078, and for 1896 £738,188,118. The imports last year were £523,075,163, and the figures for the preceding years were:—1899, £485,035,583; 1898, £470,544,702; 1897, £451,028,960; and 1896, £441,808,904. Of last year's imports, £413,544,528 worth came from foreign countries, and £109,530,635 from British Possessions, including protectorates. In 1896 the proportions were—foreign, £348,600,875; and British Possessions and Protectorates, £93,208,029. The total exports last year were £354,373,754, of which produce and goods to the value of £252,349,700 went to foreign countries and £102,024,054 to British Possessions. The total exports for the previous four years were:—1899, £329,534,658; 1898, £294,013,988; 1897, £294,174,118; and 1896, £296,379,214. In the last-named year the exports were divided as follows:—To British Possessions and Protectorates, £90,650,001; and to foreign countries, £205,729,213. Of last year's exports £291,191,996 worth represented British produce and manufactures, and £63,181,758 foreign and colonial merchandise.

THE TEXTILE COLOURIST:

DEVOTED TO

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

The Detection of Indigo.

Specially Contributed.

BEFORE the introduction of artificial dyestuffs it was very easy for manufacturers and merchants to decide whether cloth was dyed with indigo. By simply putting a drop of hydrochloric acid on the cloth, a red spot showed the presence of logwood; then another spotting with a drop of strong nitric acid gave a bright yellow spot, surrounded by a distinct green ring if the cloth was dyed a good indigo; an orange spot with a light-brown rim indicated logwood, and a green spot indicated Prussian blue. In spite of the fact that about twenty common blue dyestuffs will give a yellow spot, in many cases accompanied by a green rim, it is well known that very frequently merchants still demand that a blue cloth shall show the yellow spot with nitric acid. The result is that thousands of pieces go into the market, to be passed off as indigo-dyed on customers who really want a fast-dyed cloth. If these substitutes were fast, or even fairly fast, the case would not be very serious, but many of them are far from being so. The nitric-acid test is almost valueless, for it is very seldom that pieces dyed with indigo alone are required, the appearance of a cloth dyed simply with indigo being in most cases dull and far from pleasing. As a matter of fact, the writer has tested many cloths for Government use which, although dyed a very dark shade with indigo, have been topped with dyestuffs which prevented the well-known spot appearing.

Most cloths which really have a basis of indigo are heavily topped or bottomed, or both, with such dyes as logwood, alizarin blue, sulphoncyanine, alizarin cyanine, soluble blue, alizarin orange, alizarin red, azo acid magenta, patent blue, indigo extract, cyanin gallocyanine, fast acid violet or lanacyl violet, acid violet or cyanole. The acid violets supply the green rim. Then there is the case of woaded blacks—that is, a logwood black dyed on the top of a deep indigo bottom. A woaded black gives with nitric acid a yellow spot with a reddish rim. The writer examined only lately eight cloths, all sold as woaded blacks, and in only two cases was there any indigo present at all.

It may be said at once that the detection of indigo in some cases is very difficult, but in the majority of instances the following procedure will be found simple and conclusive:—Take a piece of the dried cloth about ¼in. square, press it close against the bottom of a dry test-tube, and heat it quickly over a good bunsen or spirit lamp flame. Have a white piece of paper for a background. Before the cloth begins to melt, a violet vapour will be seen to rise and condense in the upper part of the tube as a greenish-blue powder. The violet vapours are the vapours of indigo, and the deposit is slightly impure indigo. This test is done very quickly, and is a safe one. No other dye gives such a reaction. The violet vapour is best seen if the test is performed in the absence of strong sunlight.

Another method is to cut a strip of cloth about 1 by ½in. and place it in a dry test tube 6in. long. Add chloroform to a depth of ¾in., and gently boil for about five minutes, using a very small flame, and occasionally removing from the flame if the boiling is too vigorous. A clear, colourless solution proves absence of indigo; a deep-blue solution, red when a gas flame is looked at through it, shows the almost certain presence of indigo. Alizarin blue gives a pink colour which turns blue on the addition of ammonia.

This result can be confirmed by boiling in a similar manner with aniline or glacial acetic acid (*i.e.*, the strongest acetic acid) or with phenol (carbolic acid). Two or three repetitions with any of these three substances will remove all the indigo, and in the case of aniline and phenol very few other dyestuffs are affected. The solutions have a deep-blue colour, with a coppery reflection, and on standing often deposit small coppery crystals. To make quite sure of the presence of indigo, either of the two following plans gives good results:—

1. Boil up a piece of cloth (about 1½in. square, and cut into strips) with aniline in a large test-tube (boiling tube size). Continue the boiling, with slight intervals, for ten minutes. Pour off the solution whilst still hot into a beaker containing a mixture of 1 part of strong hydrochloric acid to 2 parts of water. There should be no drops of aniline remaining after stirring; if so, the addition of more acid will dissolve it. Filter through a filter paper, and rinse the blue particles of indigo to the tip of the filter with hot water. Dry the paper, and make a taper of it. Light the paper, and hold just over the flame, and just touching it, a white plate. There will be a greenish-blue deposit of indigo on the plate. All other dyestuffs are destroyed by this treatment.

2. By the alternative method, boil the cloth exactly as before, using glacial acetic acid; repeat this twice. The cloth will be nearly decolorised. Place the cold blue solution in a separating funnel, add twice the volume of ether or chloroform, and gently shake. Then add two or three volumes of cold water, and again gently shake. The indigo will be chiefly dissolved in the ether (or chloroform), but as it is not very soluble there will also be a layer of indigo floating where the ether (or chloroform) touches the water. The watery solution will contain other dyes, if present. If chloroform has been used, run off the bottom blue layer shown in Fig. 1 into a porcelain basin about 3in. in diameter. Put in a warm place till most of the chloroform has evaporated, and then heat the dish to a red heat. The deposited indigo will be turned into a beautiful reddish-violet vapour like that of iodine. If ether has been used, it will of course be floating on the surface of the watery layer, which is run off and thrown away, and the ethereal solution must be caught in a dish, as shown in Fig. 2, and treated like the chloroform extract, except that one must be careful to evaporate off the ether where there is no flame or fire or gaslight, say on a steampipe. This method is much simpler than it seems from

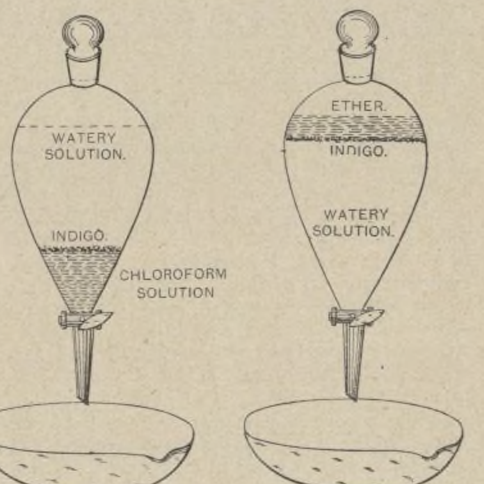


Fig. 1.—The Detection of Indigo.—Fig. 2.

the description, and does not take very long. Instead of heating the dish, the deposit could be wiped off on a bit of asbestos and the asbestos heated in a test-tube. The vapours are easier to see.

The following test should never be omitted, as its results are very important, in most cases, in giving a clue to the amount of indigo, and the nature of the other dyestuffs present. Place a piece of cloth in a beaker about one-third filled with a mixture of 1 part strong hydrochloric acid to 2 of water; boil for five minutes. A deep-red solution, quickly appearing, is obtained when logwood (the commonest dye used in topping) is present. Repeat the boiling with fresh acid till no more colour is extracted. The cloth taken out, rinsed, and dried, will show what depth of shade is due to indigo in the case of woaded blacks or blues topped with logwood. A wine red solution, slowly appearing, is due in most cases to alizarin blue or alizarin cyanine. In this case it is almost impossible to remove all the dyestuff accompanying the indigo. The cloth is next boiled with a very weak solution of sodium carbonate and ammonia, which removes many aniline colours. The cloth is then rinsed well in water, squeezed, and dried. It will still be blue, but probably much lighter. Place the cloth in a small evaporating basin, pour on to it about a thimbleful of the strongest sulphuric acid (D.O.V. will do), and rub with a glass rod. The acid dissolves out the indigo to a fine olive-green solution, which goes pure blue on warming or on diluting with much water. These results are very characteristic, but are interfered with if much of any other dye is present.

Soluble blue, a very commonly-used dye, gives a brown colour with the strong acid, and a dirty blue on diluting. Alizarin blue gives a deep blue solution with strong acid, and deep pink on dilution. Gallocyanine gives deep purple with strong acid, and bright-red violet on diluting. The sulphuric-acid test should never be applied without previous treatment with hydrochloric acid, etc., as described, as this treatment removes many of the commonly-occurring dyes which would mask the test. With a little practice this test gives very reliable results. With a decent indigo-dyed cloth there is an abundance of olive-green and blue solution, which leaves no doubt as to the quality of the dye. This test, combined with the chloroform test, can be done within twenty minutes, and furnishes very decisive evidence.

In the detection of indigo-dyed shoddy cloths, the shoddy often contains indigo from the rags. There may be only a little, or there may be so much that it is difficult to decide whether the cloth is indigo dyed or not. The chloroform test is liable to be misleading. Of course, if no blue colour is obtained, indigo is absent, but a faint blue colour may be due to indigo-dyed rags having been used. A deep blue colour may indicate an indigo-dyed cloth or a large proportion of indigo rags. The best evidence is furnished by boiling several times with weak hydrochloric acid, then by very weak soda-ash solution or with acid and alcohol, drying the cloth and examining, if necessary, with a good lens or microscope.

Bleaching Vegetable Fibres.

By E. Tassel.

(*Continued from page* 102.)

BLEACHING LINEN GOODS.—The main point the author desires to examine in this section is not the various methods of performing the operation of bleaching the fabric, but the reactions occurring in the several stages of the process, so as to be able to ascertain the best agents to employ. What has already been stated with reference to the different grades of whiteness obtainable by bleaching, also applies here. To produce a full (or Irish) white, the whole of the colouring matter has to be dissolved, leaving the cellulose in a state of purity; whereas for ordinary grades of white the decolorisation and solution of the pigmentary matters will be more or less extensive according to the results in view. The chemical composition of the flax fibre has already been discussed, and the knowledge so acquired will facilitate the examination of the various operations in the bleaching process.

Steeping.—The object of this first operation is to develop a partial fermentation by means of which the gums, starch, flour, etc., contained in the dressing, and which resist the action of boiling alkalies, are rendered soluble. It should be observed that this fermentation proceeds not only on the surface, but even in the recesses of the fibre, the latter being thereby opened and brought into better condition for exposure to the subsequent influence of chemical reagents. This fermentation transforms the starch and insoluble amylaceous matters into dextrines which are soluble in alkalies. Dust particles are removed mechanically, and the antiseptics (zinc chloride or sulphate, sodium phosphate, etc.) added to the dressing preparation are dissolved. Their disappearance is the more important since they would be capable of reacting on the bleaching chemicals and attacking the fabric. Steeping is performed in warm water alone, in water containing malt, or in old soda lye. In the first-named case the temperature should not be too high—from 40 to 60° C. at the maximum,—or else the dressing material would be rendered insoluble.

The fermentation is necessarily produced by a ferment contained either in the starchy matters present, or more probably in the flax fibre itself, since goods that have not been dressed will ferment spontaneously when damp. The steeping should not be too prolonged, ten hours at the most being sufficient. It is, moreover, necessary to change the water when it begins to give off an evil smell, since prolonged exposure might injure the fibre. It should not be forgotten that even a simple immersion in water may result in the corrosion of the fibre, and the author has seen goods that have got damp in transit (ten days) altogether spoilt on arriving at their destination, owing to the rotting effect of fermentation. The use of malt has been advocated for preparing the steeping liquor, the fermentation in this case being brought about by the diastase in the grain. The operation is then very rapid, an immersion of about twenty minutes' duration in the steeping liquor being sufficient to solubilise all the starch, etc., in the dressing preparation, all the impurities being then removable by a good rinsing with water. This treatment, however, presents no advantages over the preceding one, so far as flax is concerned, and is, moreover, somewhat expensive; but, on the other hand, it is extremely useful in the case of cotton, this fibre not containing in itself any fermentative principle—or, at any rate, more than a very small quantity,—and being therefere incapable of spontaneous fermentation.

The use of old bleaching lyes can be recommended for steeps; in fact, it has been conclusively proved that a once-used lye possesses, even in the cold, superior solvent powers to those of the same lye when fresh. The chemical reason for this activity is difficult to find, though perhaps it may rightly be sought in the soaps formed during the previous operations through which the lye has passed. In addition to its action on the starchy matters, the steeping process is of great service as a cleansing agent when dealing with fabrics woven from creamed yarns. We have already seen that creaming entails the use of very concentrated chemicking liquors; hence, if not thoroughly washed, the yarns may retain a certain quantity of chlorine or acid, which would act injuriously on the fabric when exposed to heat during the bleaching process.

When the pieces are to be bleached under high pressure, and especially with lime, steeping may be abolished as useless—except when treating creamed goods,—owing to the fact that the lime acts rapidly on the dressing present. As regards the actual performance of the steep, a heated pan or ordinary bleaching kier will do very well, and the sole attention necessary will be to see that the action goes on uniformly.

First Lye-boil: Liming.—The object of this operation is (1) to attack the fatty matters present and convert them into lime salts, at the same time eliminating the glycerine; (2) to rapidly and cheaply transform the bulk of the pectin bodies into calcium pectates, which are then either washed away or decomposed by acids. The utility of liming is a vexed question, and some bleachers find it injurious, blaming it for causing the material to look hungry and thin. No danger need, however, be apprehended from the use of lime, provided only the action of air be completely excluded. As we have already seen in the section dealing with the chemical composition of cellulose, energetic bases act strongly on cellulose when brought into contact with air or oxidising agents, whereas if air be excluded lime is quite innocuous. Concerning the alleged attenuation of the fabric by lime, it is certain that this reagent, by virtue of its great saponifying power, rapidly attacks the pectic colouring matters, and thus produces a loss in weight. Lime also acts similarly on the fatty matters (adipocelluloses) constituting part of the fibre, and thus deprives the latter of the bodies which render it supple. Therefore it is certain that for low degrees of whiteness lime should be proscribed. On the other hand, it may be recommended for fine whites and ordinary whites that require strong lyes. Were soda employed to produce the same degree of saponification, it would be necessary to repeat the operation several times; but the fats also would disappear—and besides, the treatment would be more expensive and the goods more exposed to wear and tear by the repeated working and washings.

Now, although lime is only very slightly soluble in water, this behaviour, far from being a defect, is really an advantage, since the action of the lime is less injurious than that of soda, inasmuch as in order to obtain the same degree of saponification with soda the reagent would have to be employed in such large proportion as to certainly injure the fibre. Lime may be used in two ways: either as a solution (lime water) or in the state of milk of lime. In the former case, only the dissolved portion of the lime is employed, whereas in the latter event the lime held in suspension in the water acts by contact.

The use of lime water is advisable when the reaction is carried on under high pressure, since the solution penetrates throughout the fibre and is perfectly uniform in its action, there being no solid particles of lime present. On the other hand, when open kiers are used or coarse goods are being treated, milk of lime is invariably employed. To prepare lime water, freshly-burned lime is required, the operations of quenching and dissolving the lime being effected at the same time, the solubility being greatest at the moment of hydration. Stale slaked lime is unsuitable, except for the preparation of milk of lime. The mother-liquor for the lye baths is prepared in a wooden or sheet-iron tank holding about 220gals. and mounted high enough above the floor to enable the liquor to run down direct into the saturator. The tank is generally about 48in. long by 40in. high and 31in. wide, and contains a wire-cloth basket to hold the quicklime, the meshes of this cloth being sufficiently fine to prevent the escape of any solid particles of quicklime, since these would corrode the fabric. The supernatant liquid is poured off for use as lime water, but if the preparation of milk of lime is in question, the whole is stirred up vigorously.

The action of the lime being energetic, it is necessary that the fabric should be uniformly impregnated with the solution. For this purpose a saturating machine is employed, consisting of a tank about the same size as that mentioned above, but containing down at the bottom a pair of rollers which force the fabric to enter the liquor, whilst a pair of rollers at the top express the surplus liquor from the goods. Another form of this machine consists of two horizontal rollers from 10 to 12ft. long and 16 to 20in. in diameter, mounted one above the other over a cast-iron vat of triangular cross section, and about 30in. deep, a similar roller to the upper pair being mounted near the bottom of the vat. The piece of fabric is entered between the upper rollers, and after passing down under the lower roller, is led back up through the upper pair, and so out of the machine, having in its passage been thoroughly impregnated with the liquor in the vat. On emerging from the saturator the piece is led over rollers direct to the boiling kiers. The quantity of lime required varies according to the degree of whiteness desired, and to the form in which the lime is used (lime water or milk of lime). With lime water, the weight of lime ranges from 5 to 15 per cent. of that of the goods to be treated; while as much as 15 per cent. of lime is taken when milk of lime is to be used.

(*To be continued.*)

The Temperature of the Dyebath.

BY R. B. BROWN.

(*Concluded from page 139.*)

IN the mordanting of cotton, and usually with silk also, it is found that the greatest mordanting effect is obtained by employing a low temperature, usually the ordinary cold-water temperature. An apparent exception is the mordanting of cotton with tannin for basic colours, which, as I have already said, is often carried out by entering the cotton at the boil and allowing it to remain for some hours in this cooling bath; but the actual mordanting in this case takes place at the lower temperature, the previous heating of the bath being rather to cause the mordant liquor to thoroughly penetrate to every portion of the fibre, and the same object may be achieved by mordanting in the cold and causing the goods to continually pass between squeezing rollers. In the dyeing of silk, except with the mordant dyestuffs, a moderate temperature is usually employed, since boiling frequently destroys the lustre of the silk and impoverishes the colour.

I will now pass on to a number of cases in which for some particular reason it is necessary to dye either at a given temperature or to keep the dyebath below a certain maximum temperature. This may depend either upon the colouring matter or upon the nature of the material under treatment. There are certain colours, for instance, which cannot be boiled in solution without decomposition; auramine I have already mentioned, turquoise blue is another example. Other colours, again, can be boiled for a short period, but will not stand long boiling, an instance being Brilliant Benzo Green B, which dyes a bluish-green after half-an-hour's boiling, but on continuation of the boiling turns to a dull red or brown, and finally to a nondescript grey colour. It has also been stated that this phenomenon of "overboiling" is exhibited by the sulphoncyanin group of dyestuffs, especially in the presence of organic matter in the water.

Reference has already been made to those cases in which a very high temperature must be attained, such as felt and straw dyeing. At the opposite extreme we have a number of instances of the necessity of dyeing at a low temperature in order to preserve intact the useful qualities of the material. An important case is in the dyeing of leather. If an ordinary vegetable-tanned leather is steeped in a solution heated above 50° C., it is practically reduced to the condition of skin again, and on drying it shrinks and becomes extremely brittle. Leather is consequently dyed at a temperature of 45° or less, and a considerable amount of colouring matter is therefore usually left in the dyebath. It is also obviously impossible to dye with colouring matters such as alizarins, which are not dissolved at this temperature. When dyeing chrome leather—*i.e.*, leather which has been produced by the chemical action of chromium salts—it is possible to raise the temperature to 80 or 90°, or even to the boil, without injury to the leather, so that for this product there is a much wider choice of dyestuffs, and the dyebath may be more completely exhausted.

In the dyeing of sheepskins we have a more complicated case, for the problem is two-fold: the wool must be dyed a full and even colour, and the leather must not be injured. The wool does not dye well at a low temperature, and the leather is destroyed at a high temperature. If dyed at 45° the wool is very unevenly coloured, the tips of the fibres being, as a rule, very much deeper than the roots. If the temperature is too high, the leather is made very hard and brittle, and cracks on drying. The remedy in this case lies in the chlorination of the wool before dyeing. By treatment with a dilute solution of bleaching powder the wool acquires a greatly-increased capacity for dyeing at a low temperature, and on subsequently dyeing at 45° C. with acid or basic colours, or with dyewood extracts, it is possible to obtain full and even colours without the slightest risk of injury to the skin, or pelt, as it is usually termed. This property of chlorinated wool has other applications. If woollen materials are printed with bleaching powder and then dyed at a low temperature, the printed portions are much more deeply coloured than the rest, and the effect is thus produced of a dark pattern on a paler ground.

In the dyeing of artificial silks made from nitrocellulose and by other processes, the fibre is greatly weakened by treatment with hot solutions, and it is therefore necessary to dye in a lukewarm bath, for which purpose the basic colours are the most suitable. In the so-called Vanduara silk, made from gelatine, a great defect is the tendering action of water upon the fibre, and on this account dyeing of the fibre has been avoided, and the colouring matter incorporated with the gelatine previous to the spinning process. In the manufacture of straw hats an artificial substitute for straw has been frequently plaited together with the natural product. This material is known as satin-straw or satin-chip, and is employed on account of its high lustre. It is made from fine threads of natural or artificial silk, or sometimes hemp or cotton, laid side by side, and caused to adhere together in the form of a band or ribbon by being pasted over with a solution of gum or gelatine. This material is not, as a rule, dyed after manufacture, but if coloured satin straw is required, coloured threads are employed in making it. It is sometimes dyed, however, by garment dyers in the re-dyeing of hats, and for a long time it offered considerable difficulty, since on steeping in water the gum is dissolved out, the fibres separate, and the plait falls to pieces. It is quite possible, however, to dye this plait with success by subjecting it before dyeing to the action of the vapour of formaldehyde for some hours, whereby the gelatine is rendered much less soluble, and the hats can then be dyed at a fairly high temperature. The satin straw is usually plaited together with "chip" (shavings of willow wood), and the problem arises of dyeing the two dissimilar substances to the same shade. By carefully regulating the temperature this may be done, for it is found that in solutions of certain basic colours at from 60—70° C. the two materials are dyed alike. This leads us directly to what are perhaps the most important phenomena connected with temperature in dyeing—those, namely, which admit of the possibility of dyeing piece goods composed of two or more different fibres in any desired shade or shades by the proper selection of dyestuffs, and the careful adjustment of temperature. Wool, as we have seen, usually requires a boiling dyebath, silk a hot one, whilst cotton can be dyed at a lower temperature. Combining this fact with a knowledge of the suitability of the different classes of colouring matters for the different fibres, we soon arrive at the methods to be practically adopted in the dyeing of union goods. The most frequent case is the dyeing of material consisting of wool and cotton where the fibres are woven in the undyed condition, and this branch of dyeing has been greatly simplified since the introduction of the direct cotton colours. Before this time the method adopted was almost invariably that still employed for very full and bright colours and in the dyeing of low-class unions, to dye the wool with acid colours at the boil, mordant the cotton with tannin and antimony or tin, and finally dye the cotton with a basic colour at a low temperature either to match the wool, or in the case of "shots" to some other desired shade. In this process it has always to be taken into account that although the cotton remains white or is very slightly stained after dyeing with the acid colour, in the second dyebath even when quite cold the wool is considerably stained. This must always be allowed for in choosing the acid dyestuff for the wool—for instance, by dyeing the wool with a bright acid blue and the cotton with a yellow such as auramine, the colours obtained are green wool and yellow cotton. The variety of shades is limited by this fact, but by keeping the basic dyebath quite cold and very fully mordanting the cotton, the attraction of the wool for the colour may be rendered as slight as possible.

When we study the effects of temperature in dyeing wool and cotton unions with the direct cotton colours we find a wide diversity of behaviour. Some colours of this class in a boiling bath dye the wool only, and merely tint the cotton—such are the Sulphon group of colours; whilst with others, the exact reverse takes place—for example with the Mikado colours. It is therefore possible by mixing two colours of opposite tendency to produce shot effects in a single boiling bath, but the shades are not remarkable for brilliancy or purity of tone. The method might be used for dyeing full solid shades by mixing two dyestuffs of similar colour but opposite properties; but this is seldom done, since we have now a large number of direct dyestuffs capable of yielding solid colours in a boiling dyebath.

In the production of shot effects it is sometimes advisable to dye the cotton in the cold with a direct colour after the wool has been dyed with an acid colour. The four operations of the older process are thus reduced to two, but a somewhat concentrated dyebath is required in order to obtain a full shade on the cotton, and it is necessary to carefully select the direct colour to be used. As I have said, the properties of these colours vary considerably. All, with few exceptions, dye cotton more deeply than wool in the cold, but the depth of colour on the cotton is very different with different dyestuffs. It is possible to choose a number of colours which dye a full shade on cotton and leave the wool but little affected. Among them I may mention:—

Diamine Rose B extra (C.).	Columbia Black B (Ber.).
Chloramine Orange (Bayer).	Diamine Black R M W (C.).
Mikado Oranges and Yellows (L.).	Diamine Milling Black B (C.).
	Direct Grey B (S.C.I.).
Direct Yellow R (Bayer).	Toluylene Brown R (Bayer).
Diamine Fast Yellow C (C.).	Cotton Dark Brown B M (C).
Columbia Green (Ber.).	Congo Brown R (Ber.).
Chicago Blue 4 B (Ber.).	

Benzocyanin 3B (Bayer).

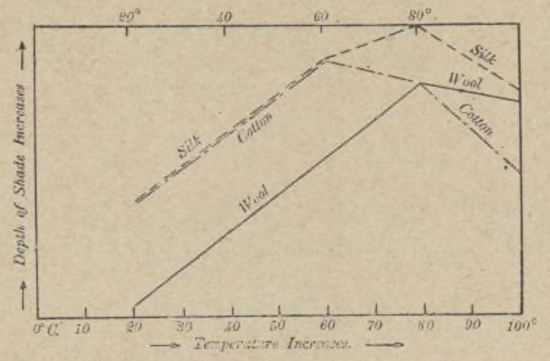
Certain of these blacks are recommended for replacing the treatment with tannin and iron—the so-called "burl-dyeing" process for unions,—and in several works they are now employed for this purpose.

In dyeing with the Janus colours of Messrs. Meister, Lucius and Brüning, the temperature of the dyebath plays a very important part. These colours are dyed on union fabrics in an ordinary acid bath, and the wool and cotton are dyed alike if the temperature is carefully regulated. Some of these dyestuffs—*e.g.*, Janus Claret Red—can be safely dyed at the boil, but with others—*e.g.*, Janus Yellow G—a solid colour is only obtained at from 80—90° C., and with Janus Red B at 60° C. It is recommended by the makers, instead of dyeing below the boil, to first boil the dyebath to cause the wool to take up colour, and then to cool down the bath in order that the cotton may be dyed.

Passing on now to fabrics which contain silk, we find the temperature largely affecting the results. For dyeing unions of cotton and silk the direct colours are chiefly employed, and the temperature at which the cotton and silk are dyed alike varies with the colour, but is very frequently about 80° C. Many of the direct cotton colours are, however, quite unsuitable for this purpose, and experiments should always be made or pattern cards consulted before attempting to dye on the large scale. To produce shot effects on fabrics of this class the silk is first dyed with acid colouring matters at a temperature slightly below the boil, and the cotton subsequently dyed with direct colours in the cold. If basic colours are used for the cotton, the silk is affected even more strongly than is the wool in wool and cotton unions. I may here mention a method which I have found useful for illustrating the dyeing properties of a colouring matter with respect to union fabrics. The relative dyeing powers of each fibre are represented on a diagram by ordinates, and the temperatures by abscissæ. By joining the points thus found a series of lines are drawn representing change of dyeing power of the fibres with change of temperature. I have usually only drawn the lines for temperatures between 20 and 100° C., the practical limits of dyehouse work without the use of ice, and the experiments from the results of which the diagrams are drawn were made at intervals of 20° C. If the differences of temperature between successive experiments were very close, no doubt the straight lines would reduce to curves. As examples of these colour diagrams three are shown representing the dyeing of equal weights of wool, silk, and cotton in the same dyebath with three of the Congo dyestuffs. The wool is represented by a continuous line, silk by a dotted line, and cotton by a broken line, but it would be found more effective to draw the lines in differently coloured inks. (See Figs. 1, 2, and 3.)

Such diagrams are, of course, only roughly approximate, since the relative depth of colour is only measured with the eye, but they serve to illustrate the suitability of the colouring matter for a particular class of fabric.

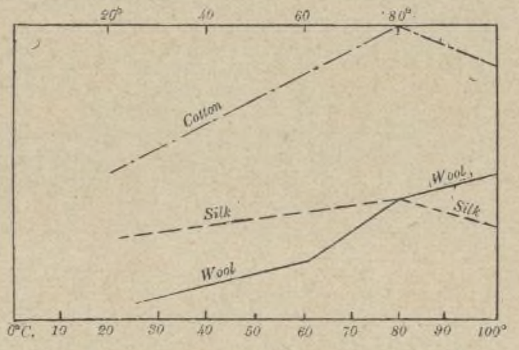
In Fig. 1 we see that at low temperatures the wool is very pale indeed, the silk and cotton being much deeper, and similar to one another. The two last fibres remain alike up to 60°; the silk then continues to increase in depth up to 80°, whilst the cotton falls rapidly to 100°. The colour on the wool increases gradually up to 80°, at which temperature wool and cotton are alike, and then falls slightly to 100°. We conclude from the diagram that in the presence of all three fibres (and the results are not relatively very different if only two fibres are present) the silk and cotton require a temperature of 60° for the deepest shade at which they are alike, whilst the wool and cotton are "solid" at 80°. The second colour shows a colour which dyes the cotton much more deeply



THE TEMPERATURE OF THE DYEBATH.—FIG. 1.

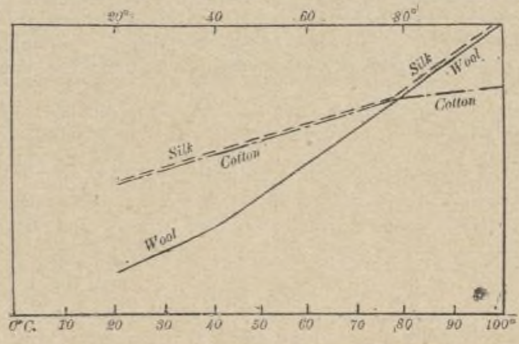
than the animal fibres at all temperatures, and one well suited, therefore, for dyeing the cotton only in a union fabric. The third dyestuff does not show such great differences, and is suited for dyeing goods composed of all three materials, the temperature required being 80° C. This method of representing the properties of dyestuffs is capable of much greater exactness and of wide extension, but I do not propose to go into it more fully in the present paper.

Fabrics composed of wool and silk probably offer the best illustrations of the effect of temperature; both are animal products, and having many properties in common, we might reasonably expect them to behave similarly in the dyebath. To



THE TEMPERATURE OF THE DYEBATH.—FIG. 2.

a certain extent this is indeed the case, but the resemblance is only a partial one. Silk may often be successfully mordanted by a mere steeping in cold solutions, which have no such effect on wool, and in dyeing it is generally true that the maximum dyeing effect of a given colouring matter takes place at a lower temperature on silk than on wool. This is the fact which chiefly determines the methods for dyeing unions composed of wool and silk, a subject which we are at present investigating in some detail at the Yorkshire College. Here I shall only say that a few acid dyestuffs will dye both fibres alike



THE TEMPERATURE OF THE DYEBATH.—FIG. 3.

at or near the boil, but it is usually necessary, both for solid shades and for two-colour effects, to dye the wool first at the boil and afterwards dye the silk in a cold or lukewarm bath with the same or different dyestuffs. A few colours, notably Rhodamine, are attracted by silk very much more than by wool even in a boiling solution, and "shots" may sometimes be dyed in this way in a single boiling dyebath. By making application of the effects of temperature which I have summarised almost any desired shade or shades may be obtained on union fabrics of all descriptions. It is even possible to dye fabrics containing wool, silk, and cotton in three different shades. The wool is first dyed with one acid colour at the boil, the silk with another acid colour at 40° C., and a third and cold dyebath of a direct colouring matter, such as a "Mikado" colour, imparts a distinct shade to the cotton.

It must be remembered that a considerable variation of results may be caused by varying proportions of different fibres in the fabrics, or by variations in the quality of one or other fibre; the results may also be affected by the addition of varying quantities of acid or other assistant to the dyebath. These points, however, fall outside the scope of this paper, in which I have endeavoured to keep to my text, and only to describe the manner in which the dyeing properties of various materials are affected by the temperature of the dyebath.

Some one or more of the facts which I have mentioned must always be taken into account by the dyer of union fabrics, and to the garment dyer the subject is of supreme importance, since to him it is an everyday requirement to dye goods consisting of the most dissimilar materials, and without a full and practical knowledge of the behaviour of each fibre under all conditions it is impossible to be entirely successful in this branch of dyeing.

If I have brought before you in this paper little or nothing possessing the interest and value of novelty or discovery, I can only plead that my endeavour has been rather to co-ordinate and exhibit the relations to one another of a number of facts bearing upon an extremely important aspect of the dyeing process, and if I have done nothing else I trust that I have convinced you that no dyer can afford to entirely dispense with that most useful instrument—the thermometer.

Direct Alizarin Dyeing.

MANY endeavours have been made during recent years to simplify the existing methods of dyeing, and to reduce the operations necessary in that process. Attempts have been made, some of them successful, to facilitate the dyeing process by supplying the consumer with products necessary for the manufacture of colours in a form such as to save him the trouble of carrying out preparatory operations which are often difficult. The manufacture of "noir-réduit," of products known as carmine colours, the supply of diazo compounds in a stable form, such as nitrosamine, azophore, and nitrazols, the indigo-white products to be found on the market, the sale of bases requisite for the manufacture of quinone-imide dyestuffs on the fibre in the form of their nitroso compounds, are all examples of the endeavours above mentioned, and so far fulfil the wants of industry. The leading idea directing invention towards these products is to relieve the dyer and printer from the more difficult operations, and from the necessarily exact proportioning which is based on chemical laws, and so to simplify essentially for them the actual dyeing process with a guarantee of certain results. These endeavours, however, have not until recently been directed to that very important part of the industry—namely, the manufacture on the fibre of fast dye-lakes of alizarin dyestuffs, of which Turkey-red is the principal representative. But Messrs. Lucius and Brüning, of Hoechst-on-Main, have, after carefully studying this matter, succeeded in obtaining products which essentially simplify dyeing operations with alizarin dyestuffs, especially in the manufacture of Turkey-red. Experiments lately made have induced them to combine mordanting and dyeing by suitable mordants, absorbed by the oiled fibre simultaneously with the dyestuff, these experiments being made first, it is believed, by Knapstein, of Krefeld, in a Turkey-red dyeworks at Elberfeld.

The mordants used for this purpose, however, such as tartaric, acetic, and lactic acids, and aceto-lactates and formates of metals of the iron group—aluminium, chromium, and iron,—gave no satisfaction in directly dyeing the oiled vegetable fibre. The new method has been made possible by mixing the metallic salts of mineral acids, in the proportions required by the dyebaths, with the dyestuffs in form of powder, and adding equimolecular proportions of sulphites or bisulphites of alkalies in the form of powder. The advantage consists in obtaining uniform and homogeneous products, such as can be easily manipulated in the ball-mill. They dissolve easily in the dyebath, and the aluminium, iron, and chromium salts of mineral acids, useless as such for direct dyeing, are transformed first in the dyebath into sulphites or bisulphites, and this permits of directly dyeing. Of metallic salts of mineral acids containing metals of the iron group, the preference is given to sulphates, such as aluminium sulphate, ferrous sulphate, and chromium sulphate, because they are easily obtained and are not expensive. Great practical interest for dyeing Turkey-red is possessed by those products which are produced from aluminium sulphate, sodium bisulphite, and alizarin (flavo and anthra purpurine). The lime requisite for the formation of Turkey-red may be added to the products in the form of acetate or sulphate of lime, or may be left to the discretion of the dyer, as its quantity depends upon the water used. The process is illustrated as follows :—

I. Six hundred and sixty-six parts by weight of aluminium sulphate (free from iron), 624 parts by weight of sodium bisulphite (free from iron and containing from 63 to 64 per cent. of SO_2), and 400 parts by weight of alizarin No. 1 (of 100 per cent. strength), are thoroughly mixed in a ball-mill. From 8 to 9kilos. of this mixture suffice to dye 100kilos. of suitably-oiled cotton goods Turkey-red. The sodium bisulphite may be in excess, but it must not be below the equimolecular proportion. If the products are obtained with normal alkali sulphite, it is necessary to keep within the equimolecular proportions.

II. One thousand parts by weight of alizarin No. 1 (100 per cent.), 1335 parts by weight of aluminium sulphate, 1200 parts by weight of sodium pyrosulphite (95 per cent.), and 465 parts by weight of dry Glauber's salt, are thoroughly mixed in a ball-mill. Eight kilos. of this mixture suffice to dye 100kilos. of suitably-oiled cotton goods. The Glauber's salt employed is merely intended to produce exactly alizarin of 25 per cent. strength. This product is very stable, and may be kept for months without losing its tinctorial power.

The mixture may also be prepared for certain purposes in the form of a paste by mixing the dyestuffs as paste with strong concentrated solutions of sulphites or bisulphites of aluminium, chromium, or iron, in the proportions requisite for dyeing. In this case, however, it is necessary to prepare the mordant solutions by dissolving the freshly-precipitated and washed hydroxides in sulphurous acid. For mordanting and dyeing the vegetable fibre in one bath with alizarin dyestuffs and sulphites or bisulphites of metals of the iron group, the process is as follows :—The vegetable fibre is first oiled in the usual manner and prepared to absorb the mordant and dyestuff; it is important for the success of the process that the oiling should be done properly, and that the oil necessary for the formation of the lake on the fibre should be well fixed. If the oil or part of it be lightly fixed, so as to come off in the dyebath before the fixing of the metallic mordant is complete, then the greater part of the lake does not form on the fibre, but in the dyebath itself, the goods appearing uneven, irregularly dyed, and more liable to lose colour when rubbed. The best results have been obtained with goods oiled in the usual manner, according to the old-red or so-called mixture process. Bad results were obtained with Turkey-red oils, while good ones were obtained with such ammonia oils as, after preparing, leave on the fibre for the most part oils insoluble in water. Valuable results are obtained by this process in the formation of aluminium-lime lakes of alizarin (alizarin flavo-purpurine or anthrapurpurine) for producing Turkey-red. A further result was obtained by the lakes becoming for the most part fiery and vivid, so that steaming, soaping, or brightening, otherwise requisite, could in most cases be dispensed with. From the chromium lakes with alizarin itself not such good results were obtained, probably on account of the difficult dissociation of the chromium sulphite, whereas by dyeing the oiled fibre with alizarin blue and chromium bisulphite, very good colours were obtained. Ferrous or acid ferrous sulphite comes nearer in its behaviour to the aluminium salts, and with alizarins alone readily yields the desired formation of lake. A further advantage of this method consists in obtaining an easier and surer effect of mixed mordants by the simultaneous use of aluminium and, for instance, iron salts than was hitherto possible by the usual mordanting and dyeing methods. The application of the dyeing process is illustrated as follows :—

III. *For Dyeing 100kilos. of Yarn Turkey-red.*—(1.) The yarn is oiled and extracted with lye in the manner usual for mixed red, and is then introduced into a bath prepared with 2000 litres of water, 50 litres of aluminium bisulphite solution of 12° Bé. specific gravity, 10kilos. of alizarin No. 1 of 20 per cent. strength, and 3 litres of acetate of lime solution of 18° Bé. specific gravity. The yarn is then manipulated in the cold from a quarter to half-an-hour, brought to boil within one hour, boiled for one hour, rinsed, steamed, and soaped in the usual manner. (2.) The yarn is oiled and extracted with lye in the manner usual for old-red, and then dyed as in (1). (3.) The yarn is oiled with sulpho-ricinoleate of ammonia in the manner usual for new-red, well dried, and finished as in (1). (4.) Instead of the proportions given in (1), the dye-bath is prepared when dyeing with a pulverised alizarin product as follows :—2000 litres of water, 8·4kilos. of the product (obtained according to Example I), and 3kilos. of acetate of lime solution of 18° Bé. specific gravity, and the yarn, oiled as in (1), (2), and (3), is dyed as stated in (1).

IV. *For Dyeing 100kilos. of Yarn Iron-lilac.*—The yarn is oiled and extracted with lye in the manner usual for old-red, and is then introduced into a bath prepared with 2000 litres of water, 1·4kilos. of sulphate of iron, 3·25kilos. of sodium bisulphite, 3kilos. of acetate of lime solution 18° Bé. specific gravity, and 10kilos. of alizarin No. 1 of 20 per cent. strength, and dyed as stated in Example III.

V. The yarn is oiled and extracted with lye in the manner usual for old-red, and is then introduced into a bath prepared with 2000 litres of water, 1·4kilo. of chromium sulphate, 4·7kilos. of sodium bisulphite, and 5kilos. of alizarin blue S B, and dyed as stated in Example III.

Dyed Yarns.*

I AM sure you will readily agree with me that in the manufacture of cotton cloth in the grey there are troubles enough constantly cropping up, but when you proceed to the colouring of your yarns for stripes and checks these troubles materially increase, because you have added a number of elements, each involving a process of its own. There are various methods or systems of yarn dyeing, which require different preparations for the handling of the yarn in the dyehouse, as, for instance :—

(*a*) Skein dyeing, which involves reeling, kier boiling, vat or hand dyeing, hot-room drying and skein winding.

(*b*) Scotch system or long-chain dyeing, which requires chain warping or balling machinery, boiling, dyeing, drying by can or hot air, and beaming.

(*c*) Bradford's system, which in principle is like the Scotch, but is used mostly for short chains, the main difference being in the tub having three compartments.

(*d*) Then there is raw cotton dyeing, which has been developed largely in the last few years, on account of the vast progress made in producing one-dip dyes, and where these can be used a great saving is made over yarn dyeing, as the number of operations is reduced.

(*e*) Again, we have piece-goods dyeing, or dyeing of the manufactured product, either in jiggers or compartment boxes.

Each of these, as the saying is, has "troubles of its own," but the subject is very extensive, and we will confine ourselves in this paper to some of the troubles arising from long-chain dyeing.

One of the most difficult problems manufacturers of yarn-dyed goods have to solve, is to have piece after piece of cloth of the same pattern come out, to all intents and purposes, of uniform shade, and principally for the reason that the long chain system effects this, it has come into favour. By it, in most cases, all the separate colours forming the pattern can be dyed at one time, and the weft, even if solid, can be dyed in one set, as from 400 to about 600 or 700lb. can be dyed together. With your foreman dyer rests the responsibility of matching the shades, but such a combination of elements enters into even one shade, that sometimes his is a most arduous task, for you will often find that a certain shade has been dyed satisfactorily seven or eight times, then without any apparent cause the shade will get off. Now, were all the ingredients that go to make up a specific shade chemically pure and uniformly manufactured, and were you to use H_2O and have your cotton all one shade, then the dyer would be at fault and might be justly blamed, but it is impossible to procure in commerce all these things, nor is it practicable to test chemically every dyestuff and drug that your dyer uses, and return those in which a variation is found. Most colours require what your dyer calls a bottom—viz., tannin, usually in the form of sumac,—then he fastens the sumac with, say, tartar emetic, washes off the free acid, and then puts on his colour. Now, as we have said before, he may have dyed the same shade seven or eight times, and had them all match, but the next time his colour gets off, and he may find that a new barrel of some drug has been opened, or, if he gets his water for dyeing from a river, it may be that the water, if analysed, shows an increase of lime, and he has now got to patch up the colour to get it to shade. This almost in every case requires the adding of some dye not used in the former shade. Then, too, the drying or sizing of the yarn may affect it differently, so that the colours in the finished goods fail to match the original. And let us say, the skill of your dyer will be shown in such cases, as the most difficult part of this trade is to "doctor a shade."

Another cause for non-uniformity of shade is met with in matching and drying a sample on a hot pipe. The drying of the bulk on dry cans or a hot-air dryer often gives a different cast, and it is the practice of most dyers to match their shades a second time after the chains have been dried and aired.

The standard shades by which the various colours are matched should have systematic care bestowed on them, as they will fade and become dirty by handling; and if your standard changes, how can you hope to keep a uniform shade in your goods? Many mills make it a practice to have all standard shades emanate from the designing-room, as the sample of cloth made by the designer is the accepted pattern. The shades are taken from the same yarns as in the sample, and given to the dyer and beamer, and the latter is instructed to match every chain before beaming, as should an off shade, by carelessness or any other cause, get into the beaming-room, it may yet be saved and touched up if caught before being put on the beam.

Again, you are liable on your slasher to meet with another element of change in shade, for should the size be on the acid side you will find it will affect many colours, especially those made from an alkaline basis. It is very essential, therefore, that the overseer of your dress-room should be supplied with litmus so that he can keep his size neutral. If the goods are finished after weaving, the same care must be used there as in the dress-room.

This is a source of great trouble to many an overseer of dressing, and can be greatly remedied, if not altogether eliminated, by the dyer having an intelligent knowledge of the composition of each pattern—that is, he should have a list sent him showing which colours go together to make up each and every pattern. In this age of keen competition it is the constant aim of every overseer to run his department with the strictest economy. Should he, therefore, not know which colours are run together on the slasher, he may be tempted to cheapen some one of them by making it less fast, thereby wrecking the whole pattern. This is a common case in black, which will bleed into the white and destroy the brilliancy of the pattern when finished. The slasherman may again obviate some of this by a careful study of the acid or alkaline condition of the size. In this connection we have known of puzzling problems arising from very simple causes—as, for instance, a mill dyeing cotton in the piece with benzopurpurine (an alkaline colour) had their goods all turned black at the selvages, and they spent many an anxious hour before ascertaining the cause, which at last proved to be due to the wet goods, after dyeing and before drying, being placed in close proximity to some acid, the fumes of which acted upon the exposed parts and turned the red black.

The chains when prepared on the chain warper for the dyehouse are leased to facilitate rebeaming. In the dyehouse, also, in most cases the chains are doubled together before dyeing, and are leased by the dyer to facilitate splitting them down again to their original size. In both these leasings care must be exercised, for if they are put in too tightly they will prevent the dyestuff from penetrating at this point, and your goods will show a white mark across them, which is very puzzling to anyone not familiar with the process of long-chain dyeing.

Every thread broken in the warp not only requires time to repair it in the beaming-room, but of necessity adds another knot to go through the harness eye and the reed, and increases the liability of hitchbacks in the cloth, or the stoppage of looms for warp repairs. Careless handling in the dyehouse will therefore react to a considerable extent on your production. The dyer usually doubles four or five chains together to reduce the length of run in dyestuff, and tangles frequently occur, which require patience and skill to unravel successfully. Another source of trouble is the top squeeze roll on the dye tub. This is manipulated by hand leverage, and a careless workman may fail to lift the roll in time to let the end of the yarn enter. As a result, the yarn is bruised, and will often fall apart when stretched on the beaming frame, and the dyer will hear the complaint that the yarn was "acid-burned" in dyeing, or was made tender by chemicals used, when the real cause may often be traced to the bruising at the squeeze roll. When splitting the warp so as to reduce the bulk to the original chains, unless intelligently done, a great many ends will be broken. You will readily see, therefore, that it is of the greatest importance that while in the dyehouse the yarn should be handled with the greatest care.

As all threads broken, from whatever cause, have to be pieced up in beaming, the operator must needs have spools of the same number and colour as the yarn he is working on, and these colours must be constantly renewed and rematched, else you will find a solid beam streaked by threads of different shade, caused by the bitten yarn being a shade darker or lighter, as the case may be. Electricity is another source of annoyance, but can be readily overcome by ageing the yarn.

The sizing of coloured warps is a subject too comprehensive, both in the composition of the sizes used and in the effect of size on different-coloured yarns, to go deeply into in this paper. Let us but state that the effect of the sizing compound on grey work is entirely different from coloured work, and that each colour takes the size in a different degree. This is caused by the

* A paper read by F. P. Muir before the New England Cotton Manufacturers' Association.

nature of the dye used, or its chemical action on the cell walls of the cotton fibres. For example, if we have a pattern to dress composed of dark indigo blue, a light aniline shade of blue and grey yarns, and we size these in one box on the slasher as we would a grey warp, we shall find that the light blue shade will be smooth and wiry, because the yarn being first bleached before dyeing, the cells of the fibre absorb a large quantity of the size. The grey yarn will have the proper amount of size necessary for good weaving, while the dark indigo blue will be soft and fuzzy and probably chafe in the harnesses and reed, because indigo being a surface dye has already filled up the cells, and the yarn resists the size. The effect of this on the weaving will be readily understood. These are some of the difficulties of coloured work, and although we have not attempted to provide the cures for the many ills, yet we trust the mere detailing of them may be of interest.

Sulpho Acid for Milling.

AFTER dyes and mordants, soap plays a very prominent part in a wool factory. It has to be used in large quantities, even for articles for which milling with sulphuric acid is advantageously substituted for milling with soap. The fact that certain light articles are milled with fuller's earth or with water alone does not diminish the use of soap perceptibly. When used for washing and milling wools, soaps are largely made from oleine, either alone or in combination with other fats. The chief requisite for textile soap is neutrality, and although oleic acid is very easily saponifiable, it requires a good deal of care and experience to make from it a good textile soap. The process of making Turkey-red oil is well known, says the "Leipziger Färber Zeitung," and an exactly similar product can be used for it which is made by the same process from oleic acid. Concentrated sulphuric acid is stirred in a little at a time until a sample of the mass shaken up with water no longer gives a milky emulsion, but a clear solution. Much heat is evolved during the process, so that the additions of sulphuric acid must be regulated as to quantity and as to the intervals at which they are added. The temperature must not be allowed to exceed 40° C. The liquid is then run into a strong solution of Glauber's salt, and after well stirring is left to stand for twenty-four hours, until the salt solution can be run off from below the oily layer of sulpho acid. The acid salt solution is used for dyeing purposes.

The sulpho acid dissolved in water is used for milling parti-coloured aniline dyed goods. The bleeding often caused by sulphuric-acid milling is thus avoided, and the sulpho acid has enough of the properties of soap to replace a soap milling. The metal parts of the machinery, too, are much less attacked than in vitriol milling. The sulpho-acid solution should be nearly but not quite neutralised with soda or ammonia. For milling dyewood colours and indigo and alizarin dyes, the sulpho acid is fully neutralised, being first diluted sufficiently to prevent any soap from separating out in a solid form. If the dyes will stand a slight excess of alkali, the acid may be somewhat over-neutralised. Such a solution also serves for washing acid-milled goods. It is true that the preparation of the sulpho acid is somewhat more troublesome than simply saponifying the oleic acid or alkali, but, on the other hand, the product is more easily rinsed out than ordinary soap, and its manufacture requires no heating. Then, again, if any ordinary soap is decomposed on the goods with acid, insoluble matter is produced which clings closely to the fibre. The sulpho-acid soap, on the other hand, yields soluble products which are easily rinsed out. On the whole, too, the total consumption of oleine, soda, etc., is less for any given amount of goods than when ordinary soap is used, and the results are certainly more satisfactory.

Dyeing Under Pressure.

THE advantages of dyeing under pressure are becoming more recognised for certain kinds of work, with the result that more attention has recently been devoted to perfecting the apparatus employed therefor. The Dumons machine, of French origin, was introduced about two years ago, and has since been undergoing an extended series of tests, the results of which are now published.

The old system of colouring in open tubs has to a great extent been supplanted by modifications of these methods, but none of them solve the question completely, although many are excellent devices. What must a perfect dyeing machine be able to do? It must enable the dyer, says "L'Industrie Textile," to subject the raw material to a regular uniform treatment; it must give solid, permanent colours; it must enable the material to be coloured without injury to the fibre. To obtain solid, uniform colours, it is plainly necessary to secure a uniform circulation of the liquor through the material to be coloured, in order to distribute the dyestuff uniformly. It is also necessary that the temperature of the liquor may be regulated in order to assure the solidity and uniformity of colour; too rapid or too slow heating, or an insufficient heating of the liquor may be the cause of failure.

Dyeing is the result of three processes: First, chemical action; second, the action of heat; third, mechanical action. It is evident that if the dyer be able to duplicate the conditions, he will be able to match the shades of different dips. Now the chemical action is independent of the kind of apparatus employed; it belongs purely to the domain of the chemist. The thermal and mechanical actions are, however, dependent upon the machinery or apparatus. It follows, therefore, that a perfect dyeing machine should give an absolutely regular circulation of the colouring liquor, and a uniform penetration of the fibre; it should permit of an exact regularity of the temperature, and should enable the dyer to duplicate these conditions at different times.

The best-known dyeing machines in Europe are based upon the action of the centrifugal pump. The current obtained from these pumps is very far from being regular. It is more of a boiling, tumultuous action. There are places in the material which a current produced by the pump fails to effect, and this results in irregularity of shade, and consequently the dyer is not able to determine, even in an approximate manner, the quantity of liquor that is circulated through the material in a certain time. Besides this, the temperature of the liquor is liable to be changed by the variations in the weather, and under certain circumstances, where a temperature above boiling is necessary, it is impossible to obtain it when a pump is employed.

It was to obviate these objections that the Dumons machine was invented, which enables the dyer to subject all parts of the mass of textile material to like action from the dyeing liquor, independent of the variations in the pressure under which the material is placed in the tub. These objects are attained by substituting air pressure for the pressure obtained from a pump. In this machine the speed of the circulation and the pressure of the dyeing material can be regulated by increasing or decreasing the air pressure. The change in the direction of the current is made at regular intervals, and by automatic means. The colouring is done in a dye vessel, and the material is kept in an immovable position, which prevents any injury by felting, and the liquor is uniformly circulated through the entire mass of material to be coloured.

Soluble Indigo Paste.

THE various kinds of indigo paste at present on the market contain either a relatively small percentage of indigo white or are very much charged with a fixed alkali, chiefly sodium hydrate, or they require for dissolving and preparing the indigo vat such vast quantities of caustic alkali that the subsequent dyeing process of the fibre is greatly interfered with Fixed alkalies attack textile fabrics very strongly, and the presence of large quantities of caustic alkalies in the vat also prevents the fixation of indigo on the fibre. For that reason it is a matter of great difficulty to dye dark shades even if great quantities of reducing agents—hydrosulphites, for instance—are added to the vat, and the light and medium shades show a lack in brilliancy of colour. The shades obtained are rather dull and greyish-blue, and do not adhere fast to the fibre after all. To avoid all those drawbacks, a Cologne firm have introduced a preparation of indigo paste which contains no fixed alkali at all, and shows a large percentage in effective indigo white.

The process depends on the reduction of indigotine by metals in a state of fine division in the presence of concentrated ammonia. The metals employed for the reduction may be zinc, tin, or iron, although tin and iron do not act so energetically as zinc, and should therefore not be used unless zinc dust be not available. Since the reduction of indigo by means of zinc dust and ammonia proceeds very quickly and energetically, the ammonia is preferably added very gradually to the intimate mixture of indigo and zinc dust. The process is carried out thus:—In a covered pot provided with an agitator, 10kilos. of indigo pure B.A.S.F., or the equivalent quantity of natural indigo, are intimately mixed with from 4 to 5kilos. of zinc dust. After the mixture has become uniform and homogeneous from 10 to 12 litres of 25 per cent. ammonia liquor are added very gradually and slowly, the agitating being continued all the while. When all the ammonia has been added, the agitator is worked for some time longer—say one hour or so. The process of reduction is then finished. The pot is opened and the product of reaction quickly pressed, in order to free it from the adhering liquor. If all has been carefully done, and pure indigo B.A.S.F. has been employed to start with, the paste obtained will contain somewhat like 75 per cent. of indigo white. As previously mentioned, the zinc dust may be replaced by tin or iron in a finely-divided state. But in that case equal weights of tin or iron and indigo should be taken, and the quantity of concentrated ammonia liquor required will have to be greatly increased to somewhat like four times the weight of the indigo employed. As a consequence, the paste obtained is not so rich in indigo white.

An indigo-paste prepared in the manner described is not only suitable for the preparation of an indigo vat, but may also be used for printing purposes in combination with the usual thickening. The indigo vat needs no addition of fixed alkalies, whereby any injury to the textile fabrics to be dyed is avoided, as a matter of course. Furthermore, owing to the absence of fixed alkalies the indigo adheres much faster to the fibre, and there is no difficulty in producing dark shades of colour by one single draw through the vat. There is therefore not only a great saving in time, but also in dyestuff. An indigo vat prepared with a paste made according to the manner stated is also suitable for the dyeing of silk, which is altogether out of the question when fixed alkalies are present in the vat. The colours and shades obtained in dyeing silk show a great brilliancy and adhere fast to the fibre. Such indigo paste may also be employed in combination with other dyestuffs. Gallocyanine B S and R S produce with indigo paste, red shades, both in dyeing and in printing.

NOTES ON DYEING, BLEACHING, FINISHING, &c.

Specially compiled for THE TEXTILE MANUFACTURER.

RHODULINE HELIOTROPE 3 B AND RHODULINE BLUE R.—The former of these new dyestuffs is very similar to, but a little bluer than, the older B brand (Bayer), whilst Rhoduline Blue R produces a bright blue shade of a reddish hue, being fast to light, alkalies, washing, and acids. Both colours are adapted for printing in all its branches, but especially for the printing of oiled and unoiled cotton cloth, on which they yield shades fast to soap and light, and fairly fast to chemic. They are also useful for top-dyeing aniline black prints or for discharging the same. Good results are obtained in dyeing cotton cloth which has previously been treated with tannic acid and discharged with caustic soda.

BLEACHING OF COTTON WITH SULPHUROUS ACID.—Sulphurous acid in the form of an alkaline sulphite or bisulphite can be employed along with Turkey-red oil in the bleaching of cotton. Its decolourising action is not apparent until the goods are soured, after which they are allowed to lie in heaps for two or three hours. If they are then washed and slightly chemicked a good white results. The sulphite is added to the milk of lime. This is done as follows: To the lime, which has been slaked, an equal weight of Turkey-red oil is added along with the necessary quantity of water, and then an equal weight of bisulphite of soda at 30°. The resulting liquor is milky, and settles but slowly. The pieces are passed through this at from 50 to 60° C. After boiling, the goods are washed in hot water, and are soured with hydrochloric acid. They are then allowed to remain in boxes, care being taken to exclude draughts of air. A weak chemic bath completes the bleaching. The process may be used for rapid bleaching (one day) as follows: The pieces are padded in the alkaline sulphite liquor, after which they are steamed from an hour and a half to two hours without previous washing. They are then washed in hot water, soured tepid for one hour with hydrochloric acid, opened out, washed, given a weak chemic, washed, and dried.

NEW COLOURING PROCESS.—It has recently been suggested that fabrics may be coloured without resorting to the usual dyeing processes by what may be called the printing process in dilute form. Viscose (cellulose sulpho-carbonate dissolved in water) is mixed with coal, gas, or other tar, and the requisite colouring materials, which are applied by means of mangling or squeezing rollers. The process for cotton consists in: The impregnation of the fabric; the drying up of the same; a treatment of steaming for from one to two hours at about 5lb. pressure of steam, or boiling in concentrated brine for from ten to fifteen minutes; washing with, if necessary, a bleaching or oxidising treatment, and finally drying and finishing. The process for wool consists in: The impregnation of the wool, followed immediately by saturation in a solution of ammonium chloride, whereby the caustic soda in the viscose is replaced by free ammonia; boiling in concentrated brine; washing, drying, and finishing. For certain shades, ferrous or ferric hydrate is added to the tar and viscose mixture.

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.

1st April.

6774 F. HAIGH, Huddersfield. Roller carriages and rollers for rag-pulling machines.

2nd April.

6843 R. H. B. THOMPSON and W. HANCOCK, Manchester. Guards for the wheels of spinning mules

6844 J. ERSKINE, Halifax. Machines for rolling felt.

6845 G. SMITH, Manchester. Shuttles.

6850 W. RIGBY, Manchester. Looms.

6878 T. R. SHILLITO, London. Manufacture of artificial indigo from alpha-isatineanilide. (*J. R. Geigy and Co., Switzerland.*)

6916 W. R. LAKE, London. Card clothing for carding engines.* (*Saco and Pettee Machine Shops, United States.*)

6926 W. H. BAKER and F. E. KIP, Liverpool. Weft-replenishing mechanism for looms.*

3rd April.

6983 J WADDINGTON, Bradford. Weaving shuttles.

6991 E. JOHNSON, Manchester. Apparatus for threading loom shuttles.

6992 E. MOHLAU, Berlin. Process for manufacturing cloth embossed on one side and raised on the other side.*

7011 J. FARIGOULE, London. Supporting the catch-bars of machines employed in the manufacture of tulle, lace, and the like.

7024 L. V. DIEDERICHS, London. Supports for textile goods when being treated by a liquid.

7048 B SALZER and G. WALTHER, London. Straight-bar knitting machines.*

7049 H. J. HADDAN, London. Mechanism for automatically stopping mechanical looms on the breakage of one or more warp threads.* (*J. B. and J. B. y Dalman, Spain.*)

4th April.

7071 T. E. MITCHELL, Dundee. Loom shuttles.

7077 J. H. SCHOFIELD, Manchester. Cross feeds for carding engines.

7095 J. DRONSFIELD, Manchester. Apparatus for grinding, trueing, or surfacing leather-covered rollers employed in machines for preparing and spinning textile fibres.

7124 R. PRAUSE, London. Spinning-machine spindles.

7132 A. and H RYO, London. Winding machines.

7152 G. C. MARKS, London. Support for the thread guide of spinning or twisting machines. (*L. T. Houghton, United States.*)

7194 J. Y. JOHNSON, London. Production of colouring matters of the anthracene series. (*The Badische Anilin and Soda Fabrik, Germany.*)

6th April.

7212 J. NASMITH, Manchester. Method of applying the spindle bands of spinning machines. (*J. Silberzahn, Austria.*)

7225 W. CLEGG and J. S HARGREAVES, Manchester. Winding yarn and other material on beams.

7229 H. NABHOLZ, Manchester. Production of an improved knitted fabric.*

7250 O. IMRAY, London. Process for the manufacture of new azo-components and azo-dyestuffs. (*Farbwerke vormals Meister, Lucius and Brüning, Germany.*)

9th April.

7263 J. KAY, Bolton. Jacquard machines, dobbies, and the like

7273 A. MIDDLETON, Nottingham. Circular knitting machines.

7318 S. A. DUDLEY, London. Loom shuttles.*

7319 H. H. LAKE, London. Plaiting machines.* (*G. J. Burns, United States.*)

10th April.

7355 C. WHALLEY, Manchester. Lappet looms for weaving lappet cloths, muslins, and the like.

7365 J. G. BARNES, Manchester. Weaving.

7384 E. GULICA and C SCHULZE, London. Loom shuttles.

7391 B J. B MILLS, London. Automatic embroidery machine. (*La Société Anonyme de Broderie Automatique, France.*)

7403 J. POYSER, London. Battens or reeds for looms.

11th April.

7449 E. TAYLOR, Manchester. Sectional warping and beaming machines.

7450 A. J. TONGE and E. TAYLOR, Manchester. Apparatus for producing drag or tension in winding, doubling, gassing, and other similar machines.

7451 N. RAMBERG, Manchester. Ring spindles.*

7473 G. JOSEPHY, London. Ring-spinning frames for short-staple wools.*

7480 H. H. LAKE, London. Apparatus for use in the mercerisation of yarn.* (*K. Weldon, United States.*)

7491 C. SELLA, London. The fulling and oiling of woven fibres.

7500 W. H. L. ALFRED, London. Apparatus for manufacturing solid cords, lines, ropes, and the like.

7501 W. J. ARMITAGE, London. Machines for ironing, calendering, and drying fabrics for laundry and other purposes.

12th April.

7530 J. CLAYTON and OTHERS, London. Winding frames.

7541 O. IMRAY, London. Dyestuffs of the anthracene series. (*The Farbwerke vormals Meister, Lucius and Brüning, Germany.*)

7560 A. HAAGEN, London. Colouring matters.*

13th April.

7588 THE FRASER AUTOMATIC ROVE STOP COMPANY LIMITED and J. FRASER, Glasgow. Rove stop mechanism for spinning machines.

7604 R. HADFIELD and A. WARRINGTON, Manchester. Jacquard mechanism for weaving terry fabrics.

7621 J. SPENLE, London. Printing on fabrics.

7632 J. Y. JOHNSON, London. Production of azo colouring matters, and their after-treatment on the fibre. (*Badische Anilin and Soda Fabrik, Germany.*)

7649 H. H. LAKE, London. Apparatus for increasing the strength of the slivers in carding engines and drawing frames.* (*G Patrone, Italy.*)

15th April.

7661 H. PARR, Heywood. Apparatus for regulating the working of dobbies on weaving looms.

7680 R. CHWALLA, London. Gobelin and like woven fabrics.

7688 R. MEYER and W. C. FOULDS, London. Tom-toms for dyeing works.

7726 R. B. RANSFORD, London. Dialkylamido oxydiphenylamines, and dyestuffs therefrom. (*L. Cassella and Co., Germany.*)

7737 E. J. and S. TAYLOR, London. The treatment of raw or manufactured wool, cotton, and other fibres or fibrous materials.

16th April.

7769 A. J. TONGE and E. TAYLOR, Manchester. Thread and yarn winding, clearing, gassing, doubling, and other similar machines.

7776 W. HARDAKER, Bradford. Jacquards.

7797 W. H. HARRAP, London. Scroll opening machines and the like for textile fabrics.

7830 J. C. FELL, London. Machine for defibrating ramie and other fibrous plants.* (*The Eyssen-Packer Defibrating Company, United States.*)

7854 B. SALZER and G. WALTHER, London. Method of producing "ring goods" with coloured longitudinal stripes by means of circular knitting machines.*

17th April

7883 F. G. GERLI, London. Textile fabric.

7913 L. VEYRON, London. Looms.

7915 E. E PRESTON and G. D. KENDRICK, London. Machines for producing rubber fabrics.

7917 T. BURGESS and OTHERS, Manchester. Smallware looms.

7919 R. B. RANSFORD, London. Paramonoalkylamido para-oxydiphenylamines, and dyestuffs therefrom. (*L Cassella and Co., Germany.*)

7923 P. BARBOUTAU, London. Xylographical printing of colours in graduation on textile fabrics.

18th April.

7929 J. MACKIE and OTHERS, Belfast. Machinery for preparing flax, hemp, jute, and other fibrous substances.

7933 M. E HODGSON and OTHERS. Halifax. Looms.

7936 I. HEY, Bolton. Machines for combing wool and other fibrous substances.

7994 F. B COMINS, London. Spraying apparatus for use in moistening textile fabrics *

19th April.

8070 W. RINTOUL and A. S. MACPHERSON. Attachment of flyers to their spindles.

8076 A. J. E. HILL, London. Process for giving cotton yarns and fabrics certain silk-like properties

8120 R. B. RANSFORD, London. 2·7 amidonaphtholmonosulpho-acid, and dyestuffs therefrom. (*L. Cassella and Co., Germany.*)

20th April.

8126 E. ALLEN, Manchester. Apparatus for effecting the continuous spinning and doubling of cotton and other fibrous materials.

8147 W. H HOYLE and T. BARKER, Bolton Machinery for the production of fibrous material known as condenser yarn

8156 J. C. HAMER, Manchester. Apparatus for dyeing and otherwise treating fibrous material.*

8161 A. DUCHEMIN, London. Centrifugal drying machines

8167 W. P. THOMPSON, Liverpool. Machines for winding wire or thread on bobbins. (*C. Felsing, Germany.*)

22nd April.

8210 R. F. AND J. ALEXANDER AND CO. LIMITED and J. MACKIE, Glasgow. Machinery for winding thread, yarn, twine, and the like into balls.

8213 J. MACKIE and J. O. MCCLEERY, Belfast. Wet or dry spinning machinery for flax, hemp, jute, etc.

8223 F PARK and H. FELL, Manchester. Weft forks.

8225 P. KINTSCHEL, Paris. Method of manufacturing endless ropes.

8240 J HILDEBRANDT, London. Spindles for ring spinning frames and ring doubling and twisting frames.

23rd April.

8296 T. E. MITCHELL, Dundee. Means of actuating shuttles of looms.

8307 J. COOPER and OTHERS, Manchester. Machines for folding and measuring fabrics.

24th April.

8425 E. J. LISTER and H. KERSHAW, Huddersfield. Bottom rim for walrus fibre card cans.

8434 S. ENTWISTLE, London. Flyer spinning frames.

8445 V. BELANGER, London. Spinning or twisting machines.*

25th April.

8471 T. BOWKER and W. GYTE, Settle. Automatic top roller stop motion for doubling and twisting machines.

8473 J. T. PEARSON, Burnley. Treatment and packing of silk, wool, cotton, etc.

8489 A SPEDDING, Halifax. Card clothing for carding engines.

8490 W. THOMPSON and A. W. GLOVER, Leeds. Drawing and sliver apparatus for use in connection with carding engine condensing apparatus.

8494 JEREMIAH AMBLER AND SONS LIMITED and T. SHACKLETON, Bradford. Ball-feed mechanism of Noble combing machines.

8513 E NIERHAUS, Barmen, Germany. Looms.*

8525 C. F. SCHARRER, Liverpool. Gas-singeing machines for fabrics.

8528 H. H. LAKE, London. Colouring matters. (*Farbwerke Mühlheim vorm. A Leonhardt and Co., Germany.*)

26th April.

8574 W. TOWNEND, Keighley. Thread guide for use in machinery for producing and treating yarns or threads of fibrous substances.

8577 DOBSON AND BARLOW LIMITED and T. H. RUSHTON, Manchester. Gassing frames.

8586 J. W. HYATT, New York City, United States. Sewed warp fabric.

8590 J. R. TETLOW and A. BLACKBURN, London. Card-setting machines.

8591 S. H. ASHCROFT, Manchester Loom shuttles.

8594 E. MUNDORF, London. Preparation of wool and hair for weaving.

8636 O. IMRAY, London. Directly dyeing sulphurised dyestuffs from 1 : 8 - dinitronaphthalene. (*The Farbwerke vormals Meister, Lucius and Brüning, Germany.*)

8643 A. H. MARTIN and OTHERS, London. Process for preparing and manipulating fibrous material.*

27th April.

8656 M. E. FRAM and M. SHUTTLEWORTH, London. Hosiery and other knitted garments.

8670 D. N. BERTRAM and P. CRUICKSHANK, Manchester. Machine for doubling waterproof cloth.

29th April.

8759 F. FEENEY, Manchester. Sliver cans.

8760 G. HOVE, Glasgow. Damask weaving.

8800 C. D. ABEL, London. Mordant-dyeing monoazo dyestuffs. (*Actien Gesellschaft für Anilin Fabrikation, Germany.*)

8801 G. SCHWABE, London. Appliance for releasing the shuttle-box tongues from the pressure of the feeler lever during the changing of the shuttle boxes in power looms.

8802 G. SCHWABE, London. Device for releasing the shuttle from the pressure of the breaking tongue during the beat of the shuttle in power looms.

8804 W. GIHON, London. Spindles for use in spinning, spooling, warping, and twisting threads or yarn.

8816 A. J. BOULT, London. Block calenders. (*E. Timling, Germany.*)

8828 J. GEBAUER, London. Apparatus for washing or bleaching fabrics.

30th April.

8869 F. WATSON, Great Harwood. Appliance for regulating the temperature and humidity of places used for the spinning and weaving of textile fabrics *

8889 L. A. PORRITT and OTHERS, Manchester. Machines for automatically drilling holes in wood lags for cylinders used in machines for breaking up cotton waste and other fibres.

8924 H. E. NEWTON, London. Production of anthracene derivatives. (*The Farbenfabriken vormals F. Bayer and Co., Germany.*)

1st May.

8945 J. ZIMMERMANN, Barmen, Germany. Weaving Genoa cords.

8952 S. SMITH, Leicester Circular knitted fabrics.

8980 J. JACKSON, Manchester. Self-acting mules.

2nd May.

9029 H. CLARKE, Leicester. Knitting machines.

9042 J. WALTON and OTHERS, Bradford Loom dobbies.

9045 E. CRITCHLEY, Manchester. Winding, gassing, warping, and reeling frames.

9046 J. H. PARK and W. BARTON, Manchester. Faller weight levers for spinning mules.

9064 J. and J MILLER, London. Suction tubes for extracting liquid or moisture from fabrics.*

9074 P. DUXBURY, Burnley. Measuring and stopping mechanism for looms for weaving handkerchiefs, scarfs, towels, and like fabrics.

9088 O IMRAY, London. Manufacture of disazo dyestuffs from ortho-ortho-diamidophenol-para-sulphonic acid. (*The Farbwerke vormals Meister, Lucius and Brüning, Germany.*)

9126 R. G. CAMPBELL, London. Treatment of fibrous materials such as flax, hemp, and the like, for spinning.

3rd May.

9140 W. KAY, Darwen. Healds.

9184 C D. ABEL, London. Process for producing red shades on wool. (*Actien-Gesellschaft für Anilin Fabrikation, Germany.*)

4th May.

9232 J. BOYD, Duneluttha, Bothwell, N.B. Improvements in self-contained and other spindles for spinning and doubling.

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:—

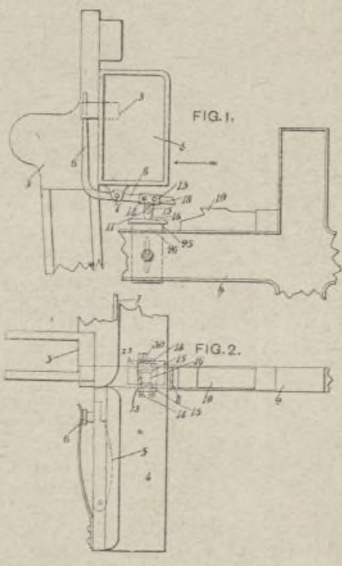
1899.

24,803. Fabric for pneumatic tyres. Dec 13 C. K. Welch, Park House, Coventry. Relates to the manufacture of a textile fabric adapted for use in pneumatic tyres for cycles or motor and other vehicles. The inextensible jackets (or casings) of the best pneumatic tyres are constructed with a fabric consisting of parallel threads closely packed together, which threads are covered and held in place by a film or solution of rubber deposited on both sides. Two strips or layers or series of this fabric are usually used in the construction of a tyre, and are so arranged that the threads in one series are at an angle with the threads in the other series, as described in Patents Nos 13,391 (1893) and 4751 (1894). The object is to produce a textile fabric that will be free from liability to distortion.—March 13, 1901.

1900.

5141. Guiding and driving shuttles. March 17. P Schmidt, 11, Bartensteingasse, Vienna. In weaving looms, the guiding of the shuttle is effected by providing rollers arranged in an inclined position, so that the shuttle is forced to run along the race of the batten, or the rollers may be omitted and the shuttle simply be operated by the blow from one shuttle box to the other across the warp threads. According to this invention, two wire coils—or, instead of coils, combs may be substituted therefor—are suitably secured to the batten in such a manner that the shuttle runs between these coils or combs, and is thus firmly guided so that it cannot be brought out of its path without the application of some external force.—March 16, 1901.

5233. Shuttle-easing devices. March 20. H. Rycroft, Cross-lane Mills, Great Horton, Bradford. Relates to improvements in and appertaining to devices for relieving the pressure of the swell upon the back of the shuttle immediately before each pick is made. An attachment 13 is secured by the set screws 14 upon the tongue 8, and a couple of lugs 15 project from its underside. The pendant piece 16 is pivoted by the pin 17 between the



lugs 15, and the top of such pendant piece is provided with a projection 18 which abuts against the end 20 of the recess 21 in the underside of the attachment 13. This entirely prevents the pendant piece being swung on its pivot 17 in one direction, but leaves it free to be swung in the opposite direction. The plane or lifting face 25 is connected by its downwardly-projecting limb 26 to the end frame 2 in such a position that whilst the pendant piece is moving over the plane in the direction shown by the arrow, Fig. 1, its lower end bears upon the plane and lifts the tongue 8 sufficiently to relieve the pressure of the swell upon the shuttle just before the pick is made. Before, however, the shuttle reaches the opposite box, the movement of the going part is reversed as usual, and the pendant piece 16 then immediately takes an inclined position, thus allowing the stop-rod tongue to assume any required position, the same as if such inclined piece and plane 25 were not present.—March 16, 1901.

6523. Dyeing and bleaching fabrics. April 7. H. R. Armitage, Thornton-road, Bradford. Relates to improvements in the method of dyeing or bleaching fabrics, and has for its object the construction of a dyevat and arrangement of rollers in such a manner that fabrics may be dyed or bleached at full width so that when the fabric has passed from one beaming roller to another, the roller may be automatically reversed in the direction of rotation or stopped when the dyeing or bleaching operation has been completed.—March 16, 1901.

6789. Knitting machines. April 11. G. Sowter, 88, Robin Hood Chase, Nottingham, and W. I. James. Relates to a knitting machine having a revolving conical needle cylinder horizontally divided and having the upper portion vertically adjustable for the purpose of adjusting the length of the needle loops; a stationary conical cam cylinder containing two or more sets of cams for operating the cylinder needles; stationary yarn feeders, corresponding in number to the number of the needle cams; a rotating take-up for taking up the work as it is produced, and an automatic arrangement whereby the breaking of a yarn stops the machine.—March 23, 1901.

7281. Blue sulphurised dyestuff. April 19. O. Imray, London (communicated by Meister, Lucius and Brüning, Hoechst-a-Main). It is f und that a blue dyestuff for cotton of great fastness may be obtained if para-amido-para-oxydiphenylaminecarboxylic acid is obtained by heating para-amido-para-oxydiphenylaminesulphocarboxylic acid with dilute acids under pressure be heated together with sulphur and sulphides of alkali metals.—March 23, 1901.

7332. Black colouring matter. April 20. C. D. Abel, London (communicated by Actien-Gesellschaft für Anilin-Fabrikation, Berlin). Relates to the manufacture of a black colouring matter directly dyeing cotton, and is based on the observation that when picramic acid is boiled with an aqueous solution of sulphur and sulphides of alkali metals, a sulphurised dyestuff is obtained. The process essentially differs f om that hitherto generally employed for the production of sulphurised dyestuffs—namely, heating aromatic nitro compounds or other suitable parent compounds with sulphur and sulphides of alkali metals at high temperatures until the mass loses all its water and becomes a hard mass. From such heating processes, however, this new process is clearly distinguished in that it is carried out at very much lower temperature, which fact is to be regarded as a technical advantage of great importance for the following reasons: As the mixture remains liquid throughout the reaction, the latter can be kept up by continual stirring, which would not be possible if the product of the reaction formed a thick and, finally, even solid mass; further, all the inconveniences and dangers connected with the manipulation of a fused mass caused by the presence of alkali sulphide and sulphuretted hydrogen are avoided in this new process, the dyestuff being directly obtained in the form of an aqueous solution from which it can easily be isolated without any trouble.—March 16, 1901.

7333. Black colouring matter. April 20. C. D. Abel, London (communicated by Actien-Gesellschaft für Anilin-Fabrikation, Berlin). Relates to the manufacture of a black colouring matter directly dyeing cotton, and is based on the observation that when it is heated with sulphur and sulphides of alkali metals, amido-oxy-phenazine-sulphonic acid is transformed into a sulphurised dyestuff.—March 23, 1901.

7477. Black colouring matter. April 23. 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 dinitro-oxydiphenylamine is boiled with sulphur and sulphides of alkali metals, it yields a sulphurised dyestuff.—March 23, 1901.

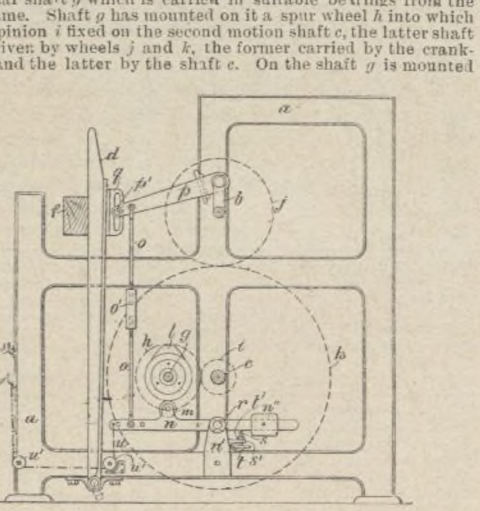
7680. Material carriers. April 25. R. Bernheim, Pfersee, Augsburg, Germany. Relates to a material carrier for mordanting, dyeing, impregnating, washing, rinsing, and the like apparatus in which the bath is passed through the material, consisting of a revolubly-mounted cylinder, the casing of which, with the object both of reducing the space for the bath and more evenly treating the material, is formed of pipes perforated externally, closed at one end, and connected at the other through the trunnion of the cylinder with a pump, vacuum chamber, or liquid reservoir.—March 16, 1901.

7686. Dyeing. April 25. H. E. Newton, London (communicated by the Farbenfabriken vormals Friedrich Bayer and Co., Elberfeld). It is known that several derivatives of anthraquinone are capable of dyeing unmordanted wool in acid baths. Among these products certain amido-oxyanthraquinone sulphonic acids, such as the mono and disulphonic acids of paradiamidoanthrarufine and paradiamidochrysazine, the diamidoanthrachrysazonedisulphonic acid, or the like, are of special value, from the fact that they yield on unmordanted wool from violet to blue shades. On using these dyestuffs on a large scale for dyeing it has been found that they have the disadvantage of not always producing the same shades. For instance, if diamidoanthrachrysone disulphonic acid is dyed in acid baths on unmordanted wool, sometimes blue, and sometimes from yellowish blue to red shades are obtained. The other dyestuffs above mentioned show, though in a small degree, a similar behaviour. It is now found that on dyeing with the above-mentioned amido-oxyanthraquinonesulphonic acids, the production of such reddish shades can be avoided, if small quantities of suitable reducing agents, such as sulphurous acid, or salts of sulphurous acid, such as sodium bisulphite, potassium bisulphite, or the like are added to the dyebaths.—March 16, 1901.

8229. Substantive dyes. May 3. G. W. Johnson, London (communicated by Kalle and Co., Biebrich-on-Rhine). Relates to the manufacture from the waste lyes resulting in the manufacture of sulphite-cellulose of substantive dyes or colouring matters containing sulphur, and suitable for dyeing cotton. The neutralised and highly concentrated sulphite waste lyes are fused together with an alkaline sulphide and sulphur, and the mass so obtained is heated until it is perfectly dry and friable. The formation of the new dyestuff takes place at temperatures between 150 and 280° C. If the process be carried out at a temperature above 200°, it is advisable to exclude air during the latter part of the operation and during the cooling of the product.—March 23, 1901.

8237. Blue to black-blue dyes. May 3. O. Imray, London (communicated by Meister, Lucius and Brüning, Hoechst-a-Main). It is found that the mono-azo dyestuffs obtained by combining diazotised ortho-oxyamido compounds with 1:8-amidonaphthol-sulphonic acids and with alkylated 1:8-amidonaphthol-sulphonic acids are changed with advantage on wool fibre by the action of copper salts. The tint of the dyestuff is transformed, according to the components of the dyestuff, from red, violet, or black into a valuable blue, green-blue, black-blue, or blue-green, and instead of the shades which were before for the most part very sensitive to acid and alkali, little fast to light and washing, dyes ranging from blue to black-blue are obtained, very fast to acid, washing, alkali, and especially to light.—March 23, 1901.

8687. Weaving Turkish towels. May 11. T. Holden, 28, Park-street, Patricroft. Relates to improvements in looms for weaving Turkish towels and other terry fabrics, and the object is to weave such fabrics by a modified construction of an ordinary fast reed loom. *a* is the loom frame, *b* the ordinary crankshaft, *c* the second motion shaft, *d* the lathe sword pivoted at *e*, and *f* the slay beam, all of which are of ordinary construction. In convenient proximity to the second motion shaft *c* is mounted an additional shaft *g* which is carried in suitable bearings from the loom frame. Shaft *g* has mounted on it a spur wheel *h* into which gears a pinion *i* fixed on the second motion shaft *c*, the latter shaft being driven by wheels *j* and *k*, the former carried by the crankshaft *b* and the latter by the shaft *c*. On the shaft *g* is mounted



one or more cams *l* arranged to come in contact during its revolution with a bowl *m* carried by a lever *n* pivoted to a bracket n^1 or to the loom frame, the said lever *n* having at one end a weight n^{11} whilst at the other end it is provided with holes or slots to enable it to be coupled to an adjustable rod *o*, the upper end of which is coupled to the connecting rod *p*. The latter in its extreme end is fitted with a pin p^1 projecting into a slot in the bracket *g* attached to the lathe sword, and to minimise wear the pin p^1 may carry a small anti-friction bowl. The rod *o* is provided with a coupling o^1 by means of which the distance between the points of attachment of the rod with the connecting rod and lever *n* may be regulated as desired. The means just described enable the pin p^1 to have its position regulated in the slot in bracket q^1 so that by raising it the distance between the slay beam and the crankshaft is increased, whilst by lowering it the distance is decreased, and it will therefore be obvious that in accordance with the amount of the adjustment, so will the beating-up of the weft and warp to form the terry pile be regulated.—March 23, 1901.

8703. Temples. May 11. C. H. Kaye and H. Haigh, Edgefield Terrace, Milnsbridge. Relates to self-acting temples, particularly ring temples employed in looms for maintaining an even tension on the cloth while weaving. In the temples generally employed, the edges of the cloth are held firmly in contact with the temples by a curved hinged cap, which, when the cloth is impaled on the spiked rings of the temple, is closed down over same and causes the cloth to be tightly drawn against the upper part of the temple. The tension placed on the cloth by the guard or cap causes the edges of the cap, especially when worn, to cut or shear the surface or nap off the cloth as it is drawn against them in passing over the temple, the marks thus made showing when the fabric is finished, and depreciating the value of the piece. The object is to dispense with the hinged caps, shields or guards, and to employ in lieu thereof means which will effectually avoid the marking or shearing of the surface of the cloth. There is hinged to the ordinary temple bracket, in a similar manner to the usual cap or guard, a bracket which extends to each side of the temple and carries at each extremity studs arranged parallel with the axis of the temple, and joined together at their outer ends by an arm suitably shaped to clear the cloth. On each of the studs is placed a roller, free to rotate thereon. The hinged bracket, with its roller, is raised up out of the way to admit of the cloth being passed over the temple, and is then lowered into position and secured by a thumb screw, the rollers engaging the cloth at each side of the temple, and depressing it at the points of contact to draw it tightly over the spiked rings. As the cloth travels to and from the temple it is thus caused to pass under the rollers or studs, and, whatever the tension on the cloth may be, there is no liability of the surface or nap of the cloth being sheared or shaved off, or otherwise cut or damaged.—March 16, 1901.

8873. Brown dyestuff. Jan. 30. O. Imray, London (communicated by Meister, Lucius and Brüning, Hoechst-a-Main). By the action of different reducing agents on 1:8-dinitro-naphthalene, dyestuffs for directly dyeing cotton may be obtained, of which only blue violet to black tints have hitherto become known (see "Friedlander," vol. iv., p. 349, etc.). It is now found that under certain conditions—for instance, heating with sodium sulphide to a high temperature—a brown dyestuff for cotton may likewise be obtained, characterised by the great fastness of its dyes.—March 23, 1901.

9140. Traverse guides. May 17. J. Burtinshaw, Lever-street, Manchester. In the making of traverse guides for rovings and thread it has been customary to build them up of several parts soldered together, and these are now made more efficient and durable by stamping the same from one piece of sheet metal. Fig. 1 is a perspective view of the improved construction of traverse guide, while Fig. 2 is a perspective view of same showing modification. The guide bracket is formed with a base A, by which it is attached to the traverse rod by a bolt or set screw and two upwardly projecting lugs B, in which the thread eyes C are cut. These are formed as shown, in one piece, stamped from a single

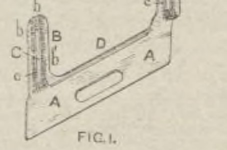


FIG. 1.

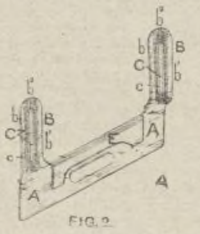


FIG. 2.

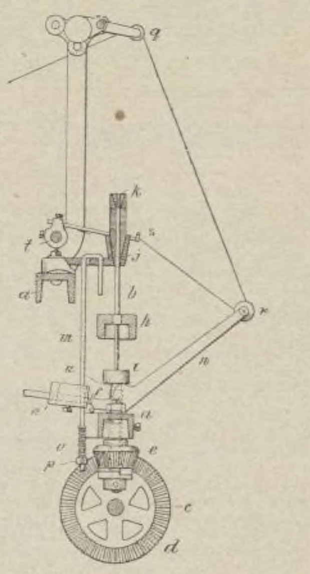
blank of metal, preferably of sheet steel. The traverse bracket may first be stamped in blank by one die, and then by a second or third die stamped to the precise form required, the dies being of the proper size and shape for the purpose. The sides of the lugs B are so that there is a back strip *b* and a front strip b^1 parallel with the base A, the front strip b^1 in the same plane, and the back strip *b* some distance behind with a connecting feather or strip b^2 in a plane at an angle thereto. In the inclined central feather or strip is punched out the thread eyes C, so that the two edges thereof are placed very nearly in a line behind one another. The edges of the eyes C are covered with a beading or eyelet *c* to present a perfectly smooth surface to the thread of yarn as it passes through.—March 23, 1901.

9287. Mixed disazo colouring matters. May 19. J. Y. Johnson, London (communicated by the Badische Anilin and Soda Fabrik, Ludwigshafen-on-Rhine). The tetrazo compound of 1:5 naphthylene-diamine has prior to this invention only been used for the manufacture of a series of substantive azo colouring matters for cotton. It is now discovered that the mixed disazo dyes that can be obtained from this tetrazo compound, and which contain salicylic acid as one component, are excellent dyes for use in connection with metallic mordants.—March 30, 1901.

10,127. Substantive dyestuffs. June 1. O. Imray, London (communicated by Meister, Lucius and Brüning, Hoechst-a-Main). Beautiful dyestuffs for cotton may be obtained with good yield by combining diazotised primuline with 5-pyrazolone derivatives, the methylene group of these not being substituted in the fourth position.—March 30, 1901.

10,293. Para-amidophenol. June 5. C. Rudolph, Goethestrasse 16, Offenbach-on-Main, Germany. Certain hitherto unknown condensation products derived from para-amidophenol are transformed by action of sulphur in presence of alkali sulphides into new colouring matters directly dyeing cotton.—March 30, 1901.

10,820. Winding yarn. June 14. R. Hall and Sons, Bury, Limited, Hope Foundry, Bury (communicated by V. Willers, Borghorst, Germany). Relates to improvements in machines for winding yarn, and particularly cops to be used in shuttles of looms for weaving, and the object of the invention is to build a cop and to doff the same without removing the spindle from its bearing. *a* designates the frame of the machine, *b* the spindles, *c* the driving shaft, *d* the bevel gears thereon, *e* the bevel gears, each formed with a half clutch and mounted loosely on a long collar *f*; *g* the other half clutch secured on a hollow shaft *u* which rotates in the long collar *f*. A collar *h* is fixed upon the spindle *b* near its middle, and this collar *h* rests when the spindle is empty upon the driving boss *i* which is secured to the hollow shaft *u*; the boss *i* has a square hole to receive the squared lower portion of the spindle *b*, which is thus rotated when the clutches *e* and *g* are in gear. The top of the spindle *b* is surrounded by an inverted cone *j* slotted in front, and secured to the frame *a*. On the extreme end of the spindle is mounted, so as to be easily released, a conical plug *k* which fits in the cone *j* without touching its sides, and has a flange at its upper end. A stop rod *m* which is hooked at the top passes through the cone bracket and through an adjustable weight n^1 fixed on the usual stop motion lever *n* to stop the spindle *b* automatically when the cop is full, and a spring *o* is coiled upon the rod *m* and confined by a nut *p*. When the spindle *b* has been started by raising the lever *n* into the position shown, the yarn, which preferably passes from an overhead guide pulley *q* over a guide pulley *r* mounted upon an arm of the stop motion lever *n*, is led to the top of the spindle under the flange upon the conical plug *k*, upon which it is wound within the inverted cone *j*, being guided by the guide *s* on the rocking shaft *t* of the usual traversing motion; the spindle *b* is gradually lifted as the yarn fills the space inside the cone *j*, and the spindle continues to rise higher and higher until the cop



is completed, when the top of the spindle collar *h* will meet the top rod *m* and lift it sufficiently to bring the spring *o* coiled thereon against the adjustable weight n^1 through which the rod *m* passes, thereby raising the weight and depressing the other end of the stop motion lever *n* which lets down the boss *i* and hollow shaft *u*, and thereby disengages the half clutch *g* fixed on the said shaft from the half clutch on the bevel wheel *e*, and so stops the spindle.—March 23, 1901.

11,244. Combing machines. June 21. W. E. Layland, 93, Belle Vue-road, Leeds. The object is to lessen the wear of the dabbing brushes of combing machines. Such brushes are found to wear out almost entirely in the lines in which the respective circular rows of pins pass beneath them; and the wear appears to be chiefly due to the dragging action of the pins against the bristles, since the comb pins move an appreciable horizontal distance during the time that the bristles are moving in and out amongst the pins. The invention consists in giving to the brush, for the time that the bristles of the brush are moving amongst the pins of the comb, a horizontal movement in the same direction and at the same speed as the movement of the comb pins.—March 30, 1901.

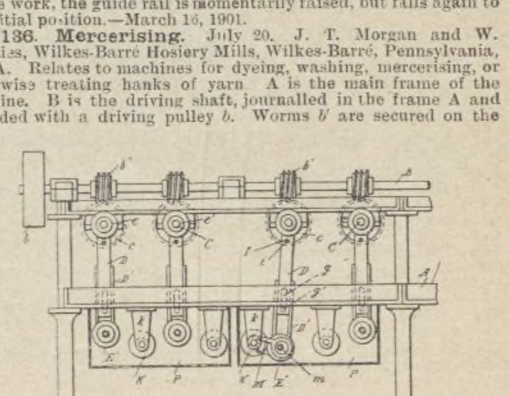
12,450. Weft-supplying mechanism. July 10. W. E. Sharpe, 524, Drexel-building, Philadelphia, U.S.A. Relates to improvements in weft-supplying mechanism for looms, having for its object to provide simple and efficient means whereby, when a shuttle thread breaks or becomes exhausted, a new shuttle is automatically shifted into position to be thrown across the lay, and the spent shuttle is simultaneously shifted out of operative position.—March 30, 1901.

14,078. Automatically changing bobbins. Aug. 7. W. H. Baker, Central Falls, U.S.A., and F. E. Kip. Relates to looms having means for replenishing weft or filling automatically, and particularly to what are known as double-shuttle looms, wherein two shuttles, one above the other, are picked simultaneously through the sheds in the warps. Two shuttle boxes are superposed and open at the sides, and the shuttles are also open at the sides instead of at the top and bottom. The weft cases or weft-holders—such as bobbins, or bobbins in bobbin cases—are mounted detachably in an upright endless chain carrier which constitutes a magazine, and are brought in front of the shuttles in the shuttle boxes, drivers being employed to drive full weft-holders laterally from the chain carrier of the magazine or holder into the shuttles as required, means for operating the drivers being controlled by the presence or absence of weft or filling on the weft-holders in the respective shuttles.—March 23, 1901.

17,078. Cutting cloth. Sept. 25. C. F. Sparks, Alton, Illinois, U.S.A. Relates to a machine for cutting strips of a predetermined length from a roll of cloth, and is especially adapted to cutting cloth for the manufacture of bags. In the combination with a rotary member around which the material passes is a cutter carried in the rotary member and adapted to project beyond the same, and means for feeding the cutter longitudinally.—March 16, 1901.

18,764. Milling machines. Oct. 26. L. P. Hemmer, Aix-la-Chapelle, Germany. Relates to a belt-shifting or stop-motion device for fulling, milling, scouring and the like machines, in which the belt in shifted from the fast and remains on the loose pulley, stopping the machine only when serious obstruction or folding of the work takes place, or when the speed of travel of the work is retarded relatively to that of the fulling cylinders, while the belt is only temporarily shifted on to the loose pulley and again returned to the fixed pulley when, owing to some minor obstruction in the work, the guide rail is momentarily raised, but falls again to its initial position.—March 16, 1901.

20,136. Mercerising. July 20. J. T. Morgan and W. Menzies, Wilkes-Barré Hosiery Mills, Wilkes-Barré, Pennsylvania, U.S.A. Relates to machines for dyeing, washing, mercerising, or otherwise treating hanks of yarn. A is the main frame of the machine. B is the driving shaft, journalled in the frame A and provided with a driving pulley *b*. Worms b' are secured on the



shaft B. C are roll shafts, the middle parts of which are journalled in the frame A crosswise under the shaft B. Worm-wheels *c* are secured on the shafts C in gear with the worms b', so that all the roll-shafts C are revolved continuously so long as the shaft B is rotated. D are extension frames which are pivotally supported by the projecting end portions of the shafts C. Each extension frame consists of two parts, of which the upper part is pivoted on the hubs *e* of the upper roll E, which is journalled on the said roll-shaft C. A collar e' is provided at the free end of the shaft to prevent the roll from sliding off it. The lower part D' of the extension frame is slideable in or on the upper part, the two parts being provided with suitable guides for retaining them in their relative positions and permitting the frame to be extended. E′ is the lower roll, which is journalled in the lower part D′ of the extension frame. A spray-pipe projects through a slot *g* in the lower part of the extension frame, and has its perforated portion *g′* arranged a short distance above the lower roll. The spray-pipe is engaged by the slot, so that the perforated portion *g′* is always held over the lower roll and moves laterally with the frame when the frame is moved pivotally.—March 23, 1901.

21,309. Reeds of looms. Nov. 24. Z. J. Des'riez, née Herchelbout, and B. Lacroix, née Dietrich, 17, Boulevard Rochechouart, Paris. Relates to improvements in weaving looms, and the object is to render it possible of producing during weaving different, indefinitely varied breadths of fabric in one piece by mechanically or automatically varying the distance between the dents of the reed.—Jan. 26, 1901.

21,693. Sizing machines. Nov. 30. J. Veevers, Lob-lane Shed, Brierfield, near Burnley. Relates to an improved means of steadying the motion of the receiving beam during the winding on of the warp in sizing machines, and is designed to enable the receiving beam to be properly adjusted in spite of the variations in the size of the beam pike, and to overcome the difficulty previously experienced in the wear of the central aperture of the headstock, whereby the revolution of the receiving beam is maintained perfectly true, steady, and central, instead of being subject to an irregular or eccentric movement, which more or less interferes with the winding on of the yarn.—Jan. 12, 1901.

21,753. Looms. Nov. 30. F. A. Mills, 203, Broadway, Methuen, Mass., U.S.A. Is designed to prevent the rebound of the shuttle in looms, and consists in the provision of pneumatic rubber buffers for the shuttle and for the picker staffs, whereby the shuttle is received in its flight against the picker without rebound, and the picker staff is cushioned in its cam-actuated throw of the shuttle.—Jan. 12, 1901.

21,956. Automatic spool-making machine. Dec. 4. E. P. Brownell, Barton, Vermont, U.S.A. Relates to automatic spool-making machines—*i.e.*, a machine which makes the spools from rough blanks previously cut the proper length, allowing for the stock wasted in finishing or facing off the ends. The objects are to simplify both the construction and operation of such machines without in any way affecting their efficiency.—Jan. 26, 1901.

22,235. Producing designs on cylindrical surfaces. Dec. 6. A. Hofmann, Altenburgerstrasse 9, Cologne. Relates to a method of producing pictures on cylindrical surfaces, such as printing rollers, by copying a design which is on an even plate—for instance, a photographic negative or diapositive, in which the surface is coated with a layer of material sensitive to light, and is rolled off on the plate, whilst at the same time a light-admitting slot is correspondingly passed over the back of the plate.—Jan. 26, 1901.

22,306. Cop-winding machines. Dec. 7. W. Reiners, München-Gladbach, Germany. Relates to a device for use in connection with cop-winding machines and the like, the object of which is to form a cop with a commencing or double cone, so that the thread can be wound directly upon a spindle, paper tube, or other core which is not provided with a conical extension. At the commencement of the winding the layers of thread wound one over the other displace a feeler bearing at this place against the spindle, and that the spindle or body receiving the coils of thread is thereby moved in an axial direction by the feeler until the commencing cone is formed, whereupon the layers of thread come into contact with a non-displaceable surface (a bevelled roller or disc) placed at an angle to the spindle, which forms the rest of the cop, in the usual manner.—March 23, 1901.

22,773. Spool carriers. Dec. 13. G. Williams, 8, Swan-street, Kidderminster. Relates to bobbin or spool carriers of looms for weaving Axminster or similar carpets, such carriers having as part thereof a system of tubes through which the yarn thread or other material wound upon a bobbin or spool is fed for use. Such tubes as ordinarily constructed are found in practice to cause a fraying of the yarn or the like as it passes therethrough by reason of the edges of the tubes at the mouths or entrances being raw or rough at the points with which the yarn or thread makes rubbing contact. With the object of overcoming these defects in the construction of these tubes, the invention consists in binding the edges of the mouths or entrances of the tubes so that the edges are on all sides or for the whole of their surface rounded and quite smooth, and this in a particular and efficient way, which materially strengthens a length of tubes and holds them more rigidly together, so that any irregularity in their shape and pitch consequent upon wear and usage is materially prevented.—Jan. 19, 1901.

23,400. Bleaching and dyeing fabrics. Dec. 21. W. Mather, Salford Ironworks, Manchester. In Specification No. 16,730 of 1899 is described means of treating fabrics, in their full width rolled upon mandrels, with liquids, gases, or vapours. Some of the operations required for bleaching and dyeing fabrics so rolled involve the use of chemicals which act upon iron vessels and apparatus, damaging them and also colouring objectionably the liquids employed. The present invention relates to apparatus made of material which is not acted on by the liquids employed. Fig. 1 is a longitudinal section, Fig. 2 is a transverse section, and

FIG. 1. FIG. 2.

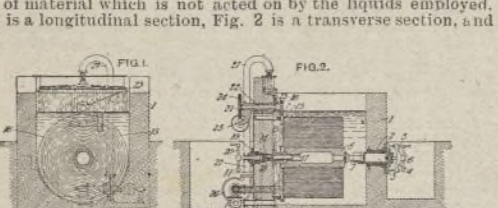


FIG. 3.

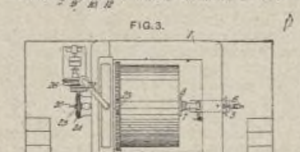


Fig. 3 is a plan of the apparatus according to the invention. There is constructed a tank 1 of cement, building into its end walls fittings for centring the mandrel on which fabric is rolled, and also communicating pipes. In the right-hand end is built a cylinder 2 which may be of iron, as no part of it is exposed to the liquid in the tank, and in this cylinder is fitted a hollow gun-metal plunger 3 which passes through a stuffing box and carries a nut 4 which engages a screw that passes through an external yoke 5 and can be turned by a handle 6 so as to slide the plunger to and fro. The front part of the plunger 3 forms a seating open on the upper side to receive a sleeve 7 fitted on the end of the mandrel 8. In the left-hand end of the tank near the bottom are built gun-metal pipes 9 and 10, an external frame 11 which may be of iron, and an internal frame 12 of gun metal which has a hollow cylindrical boss 13 projecting into the tank, and a tubular boss 14 projecting to the outside. On the boss 13 is mounted, free to revolve, a perforated disc 15 having teeth around its periphery, and having a flange 16 at its back turned true and fitting against packing held in an annular groove formed in the face of the frame 12. In the boss 13 is fitted a round-ended plunger 17 have a screw-threaded part 18 screwing through a nut 19, its outer end passing through a stuffing box to an external handle 20, by which it can be turned in either direction. In the upper part of the left-hand wall of the tank is built a box 21, in which are bearings for a spindle 22, having fixed on it a pinion 23, gearing with the teeth on the disc 15. On the outer end of the spindle 22 is fixed a worm-wheel 24, gearing with a worm 25 on a spindle worked by a belt or otherwise from any convenient motor. The pipe 9 is connected as a suction pipe to a rotary or other suitable pump 26, from which a discharge pipe 27 extends upwards and terminates in a bend, so as to deliver liquid into the upper part of the tank. The apparatus is worked in the following manner:—The plunger 3 being retracted a few inches, and the plunger 17 being fully retracted, a roll of fabric having the sleeve 7 placed on the end of its mandrel 8 is lowered by a crane or traveller into the tank until the sleeve 7 rests in its seating in the front of the plunger 3. The roll being then adjusted in position to present its mandrel central with the plunger 17, that plunger is advanced so as to enter the open end of the mandrel and form a bearing for it. The plunger 3 is then advanced so as to press the end of the roll against the perforated disc 15. The tank is then filled with suitable liquid, and, by means of the pump, this is continuously drawn lengthwise through the roll and discharged into the tank above, while the roll is slowly rotated. When the fabric has been sufficiently permeated by one liquid, the contents of the tank can be run off by the pipe 10, and the fabric can then be treated by fresh liquid. When it is desired to remove the roll, the plunger 3 is withdrawn a little so as to separate the roll from the perforated disc 15, then the plunger 17 is fully withdrawn, leaving the mandrel 8 free, whereupon the roll can be lifted from the tank.—March 2, 1901.

23,401. Bleaching and dyeing. Dec. 21. W. Mather, Salford Ironworks, Manchester. In Specification No. 16,730, of 1899, is described means of treating webs of fabric with liquids, vapours, or gases while they are rolled in their full width without any creasing, folding, or twisting by placing the roll in a vessel with its end against a perforated partition, and forcing the fluid lengthwise through and between the convolutions of the fabric, the roll being gradually turned so as to give all parts of it uniform treatment. The present invention relates to means of effecting complete bleaching and dyeing of fabrics in the rolled condition by treatment in a manner similar to that described in the former specification by means of similar apparatus suitably modified to effect the complete bleaching and dyeing treatment.—Feb. 23, 1901.

23,668. Dyeing, washing, and bleaching. Dec. 27. P. Schirp, Barmen No. 22 Alleestrasse, Rhenish Prussia. Two tubs *a* containing the material to be treated are arranged side by side, and above the tub *c* containing the dyeing liquid, in the same manner as in Patent 22,918/99, and the tubs *a* have also a false or sieve bottom *b*. A pump *e* placed into the tub *c* forces the liquid from

FIG. 1.

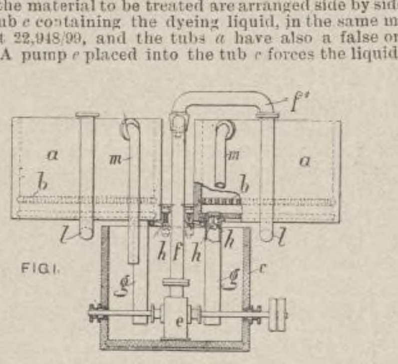
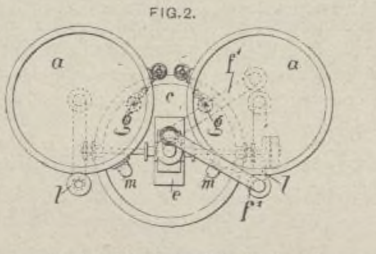


FIG. 2.



the tub *c* up through the pipe *f* into either of the tubs *a*, by turning the arm f^1 over one or the other of these tubs. *g* are the outlet pipes from the tubs *a* to the tub *c*, and *h* are the valves for closing these pipes. There is now added a pipe *l* leading by preference from the centre of the bottom of each tub *a* and going upwards, so that each of them can be connected to the swing branch f^1 of the force pipe *f* of the pump *e*.—March 30, 1901.

23,687. Triphenylmethane colouring matters. Dec. 27. G. W. Johnson, London (communicated by C. F. Boehringer and Söehne, Waldhof, near Mannheim). In Patent No. 1088 of 1900 is described a process whereby aminophenyltartronic acid $NH_2C_6H_4C(OH)(COOH)_2$ and a series of substitution products of the same can be easily prepared. These aminophenyltartronic acids have subsequently proved to be products of great value for dyeing, as by means of them triphenylmethane colouring matters can be easily prepared. These dyes are formed when a mixture of the aminophenyltartronic acids, or their alkiline salts, are subjected to oxidation with primary, secondary, or tertiary aromatic bases suitable for the production of triphenylmethane colouring matters, and with the hydrochlorates of these bases.—March 2, 1901.

23,843. Winding. Dec. 31. S. W. Wardwell, 107, Stewart-street, Providence, U.S.A. Relates particularly to the class of winding machines known as quillers or quill winders, employed to wind cops or packages of yarn, thread, or the like for use in loom shuttles, and also to that type of winding machine designed to wind various materials by the system known as the V, or "universal" wind. It consists of means whereby to economically produce a novel composite cop composed of a plurality—two or more—of component cops, each preferably wound by the V wind, and all wound from one continuous thread upon one common tube.—Feb. 16, 1901.

23,900. Thread-testing. Dec. 31. C. B. Neubauer, Pausa i/V, Bahnhofstrasse, Germany. Relates to an apparatus for testing the needle and shuttle threads of shuttle embroidery machines, whereby the control of the separate threads is so effected that in the instant in which they are pulled taut their strength is tested, and if any one thread be not capable of withstanding the tension thus applied, it breaks and causes the machine to be brought to a standstill automatically. This automatic test of each separate needle and shuttle thread is caused by two electric conductors, which, at the moment of tightening the threads by the thread guide, are switched into a circuit; one conductor energises solenoids whose cores are connected with the needle threads, whilst the second conductor causes the release of a counter balance weight or lever actuating the driving belt fork should a single thread break, thus releasing the solenoid or solenoids connected to this thread and completing the circuit of the conductor leading to the mechanism for throwing the machine out of gear.—Feb. 23, 1901.

1901.

292. Fulling machines. Jan. 4. L. P. Hemmer, 62, Krugenofen, Aix-la-Chapelle, Germany. Relates to a device to be used in connection with fulling and like machines working with at least two upper rollers arranged over the principal lower roller (or rollers as the case may be) for the purpose of protecting the work against injury by disengaging the driving gear or stopping the machine whenever the work is impeded in its passage between the rollers.—Feb 9, 1901.

438. Automatically changing shuttles. Jan. 8. H. W. Wyman, 58, West-street, Worcester, Mass., U.S.A. A normally-balanced magnetised body or feeler enters the shuttle and feels for the filling, and when said feeler by the absence of the filling from the filling carrier to a predetermined point meets the band or other magnetic body connected with the filling carrier, the feeler is drawn or moved from its normal into its abnormal position, this being due to the clinging of the magnetised feeler to the magnetic body of the filling carrier, the movement of the feeler into its abnormal position permitting suitable detecting means under the control of said feeler to act and put into operation the filling-changing means.—March 16, 1901.

514. Knitting machines. Jan. 8. C. B. Neukirchner, Thalheim, Saxony. Relates to the formation of stitches on shaft knitting machines. Fig. 1 represents that stage of the knitting process which comes into question. The nose *a* of the sinker is here below the beard *b* of the needle at the moment at which the sinker is advanced for the purpose of sinking the loop. *c* is a cam of usual construction for giving movement to the needles. Fig. 2 represents the new construction, and shows the needle in a much

FIG. 1.

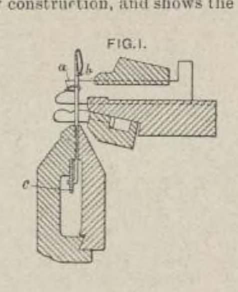
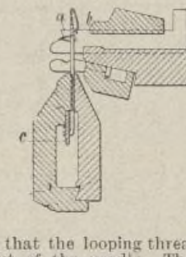


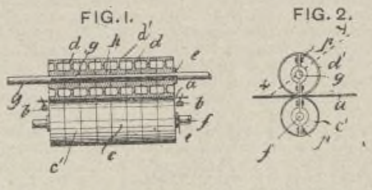
FIG. 2



lower position, so that the looping thread is applied much more closely to the point of the needle. The danger which formerly actually existed—viz., that of the nose *a* of the sinker entering the beard *b* when the sinker advances is in the new construction not taken into account at all.—March 23, 1901.

1374. Drying fabrics. Jan. 21. P. Hahn, Coblenzer-strasse, Niederlahnstein, Germany. Is an apparatus for dyeing fabrics under tension. *a* is the fabric held stretched by lateral hooks or pins *b*. *c*, *d* is the pair of rollers to press or squeeze out the moisture from the fabric, and they

FIG. 1. FIG. 2.



are formed by divided circular discs c^1, d^1 which fit close to each other without forming any groove or fissure. *h* is a feather arranged on the axle to engage with a groove or recess formed in the boss of each disc to secure the latter against movement around the axle.—March 30, 1901.

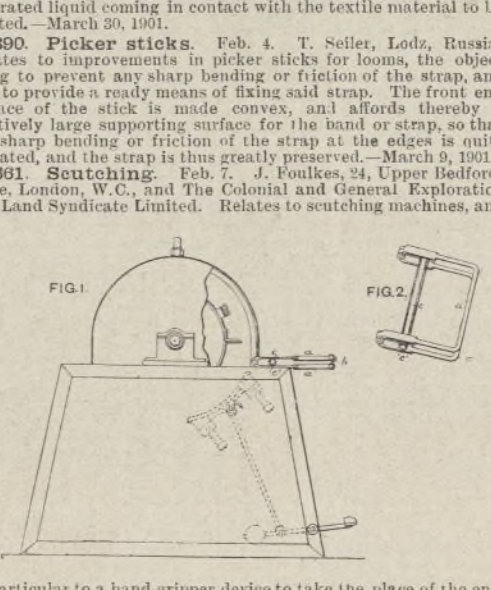
2102. Cross-winding frames. Jan. 30. R. Voigt, 36, Limbacherstrasse, Chemnitz. Is a thread-guiding mechanism for a cross-winding frame, and is based upon the idea of reducing to as great an extent as possible the thread guide, which moves quickly to and fro, in order to increase as much as possible its number of oscillations, and consequently the capacity of the machine.—March 23, 1901.

2283. Treating materials with fluids. July 3. R. Weiss, Kingersheim, Mulhouse. Relates to an apparatus for treating textile materials with superheated circulating liquids, chiefly comprising an arrangement which allows of drawing, from time to time, from the concentrated liquid contained in a vessel a measured quantity of the liquid and of introducing it into a closed vessel which is interposed in the circulating current of the liquid at a point outside the vessel designed to receive the textile materials to be treated, and each time presents, with relation to the volume of liquid which is to be introduced therein, a space such that the concentrated liquid is therein sufficiently weakened or diluted to avoid causing an unequal treatment in the vessel containing the textile material, with the object of allowing, as required, of varying the degree of concentration of the liquid under treatment, or maintaining it constant, or introducing into the liquid other chemical agents without being compelled to vary the circulating current of the liquid, the temperature of the liquid, or the pressure to which it is subjected, and without fear of the concentrated liquid coming in contact with the textile material to be treated.—March 30, 1901.

2390. Picker sticks. Feb. 4. T. Seiler, Lodz, Russia. Relates to improvements in picker sticks for looms, the object being to prevent any sharp bending or friction of the strap, and also to provide a ready means of fixing said strap. The front end surface of the stick is made convex, and affords thereby a relatively large supporting surface for the band or strap, so that any sharp bending or friction of the strap at the edges is quite obviated, and the strap is thus greatly preserved.—March 9, 1901.

2661. Scutching. Feb. 7. J. Foulkes, 24, Upper Bedford-place, London, W.C., and The Colonial and General Exploration and Land Syndicate Limited. Relates to scutching machines, and

FIG. 1. FIG. 2.



in particular to a hand-gripper device to take the place of the endless belt described and shown in the specification of prior Patent No. 16,648, of 1894. It consists of a frame or holder, in the jaws of which are secured the leaves or stems to be scutched, and which is held by the attendant in proximity to the revolving drum fitted with beaters or knives in the usual manner. Fig. 1 represents a sectional elevation of a scutching machine, the gripper being shown in position for working. Fig 2 is an isometrical view of the gripper, which consists of two metal frames *a*, a^1 hinged together, and which, while tending constantly to open apart, are kept locked together by means of a hook or similar catch device *b*. The frames are of similar shape, and may be fitted at the hinges with short coiled springs, which will cause the frames to open forcibly unless locked or secured together. The frames are preferably made tubular, and the ends of these coiled springs when used are suitably inserted in the frames. Within each frame, and nearer the hinge portion thereof, are secured meeting jaws *c*, c^1, which, when closed together, will securely hold and retain the leaves or stems of the plants to be scutched. The jaws *c*, c^1 may be adjustably secured by screws or otherwise upon the frames if desired, and for this purpose the frames may be slotted, and the screws arranged to be movable in such slots. These jaws extend across the frames and may be parallel surfaces, toothed if desired, or they may be semi-cylindrical in section, as clearly shown on the drawings.—March 23, 1901.