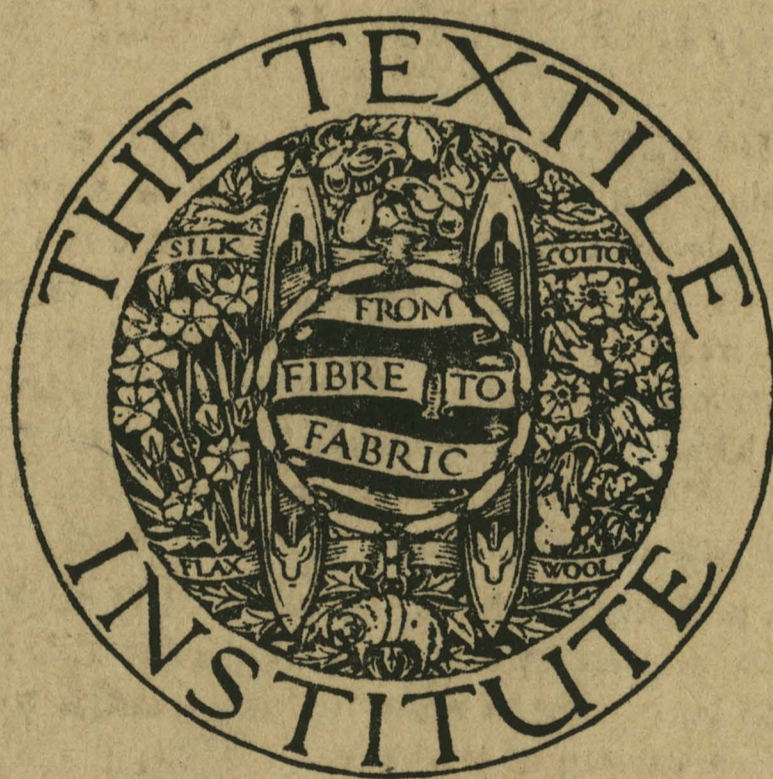


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JULY 1927

The Journal of the
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Research Association, British Research Association for
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The Sections will be in session severally or jointly throughout the Meeting for the hearing of papers on many other subjects within their various departments.

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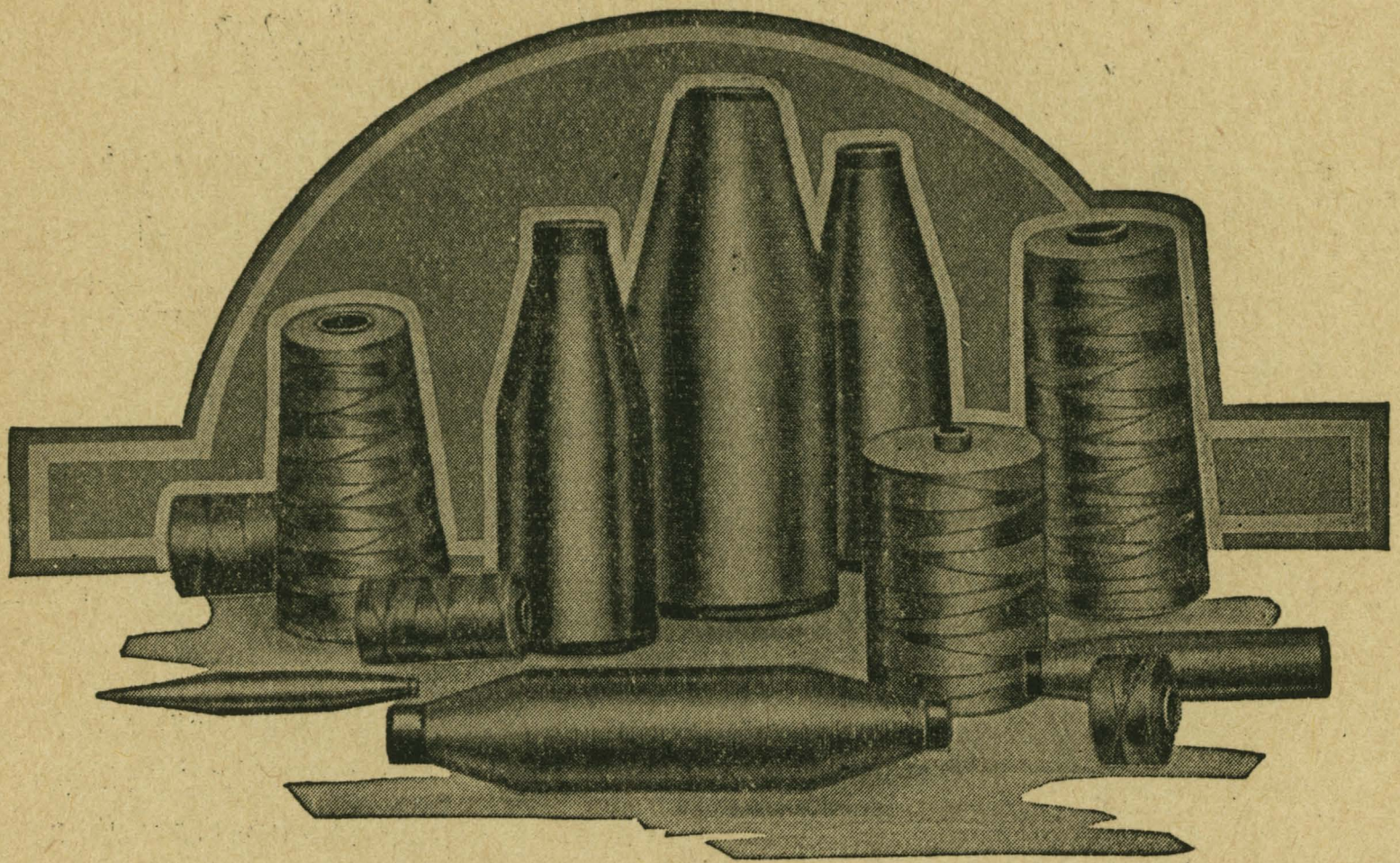
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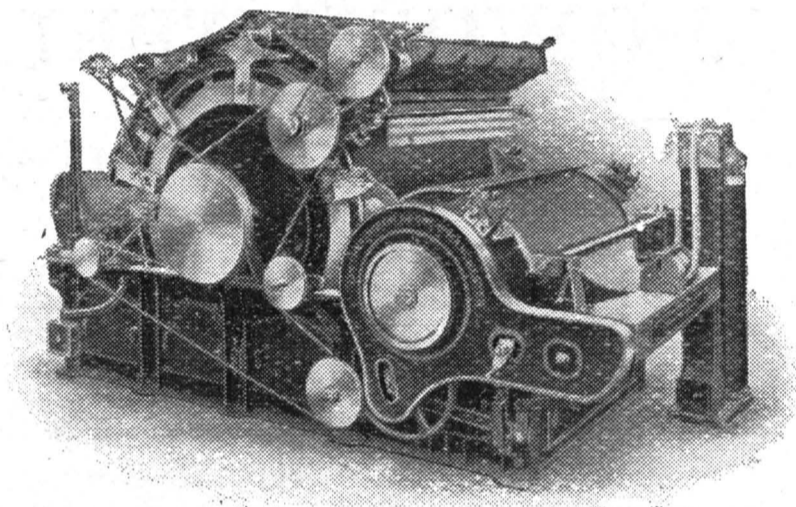
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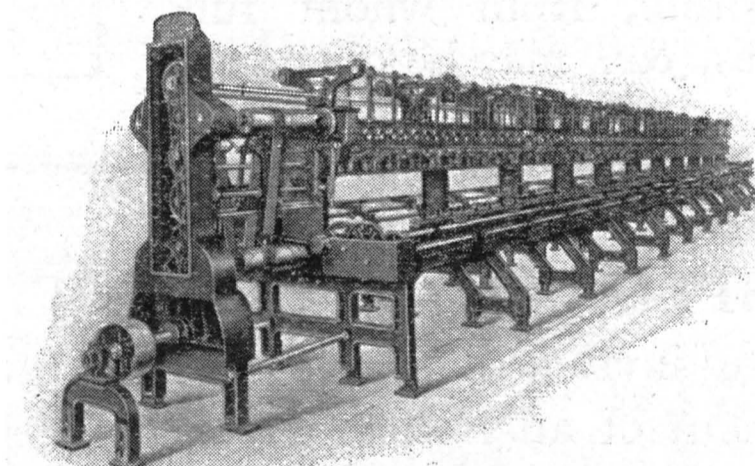


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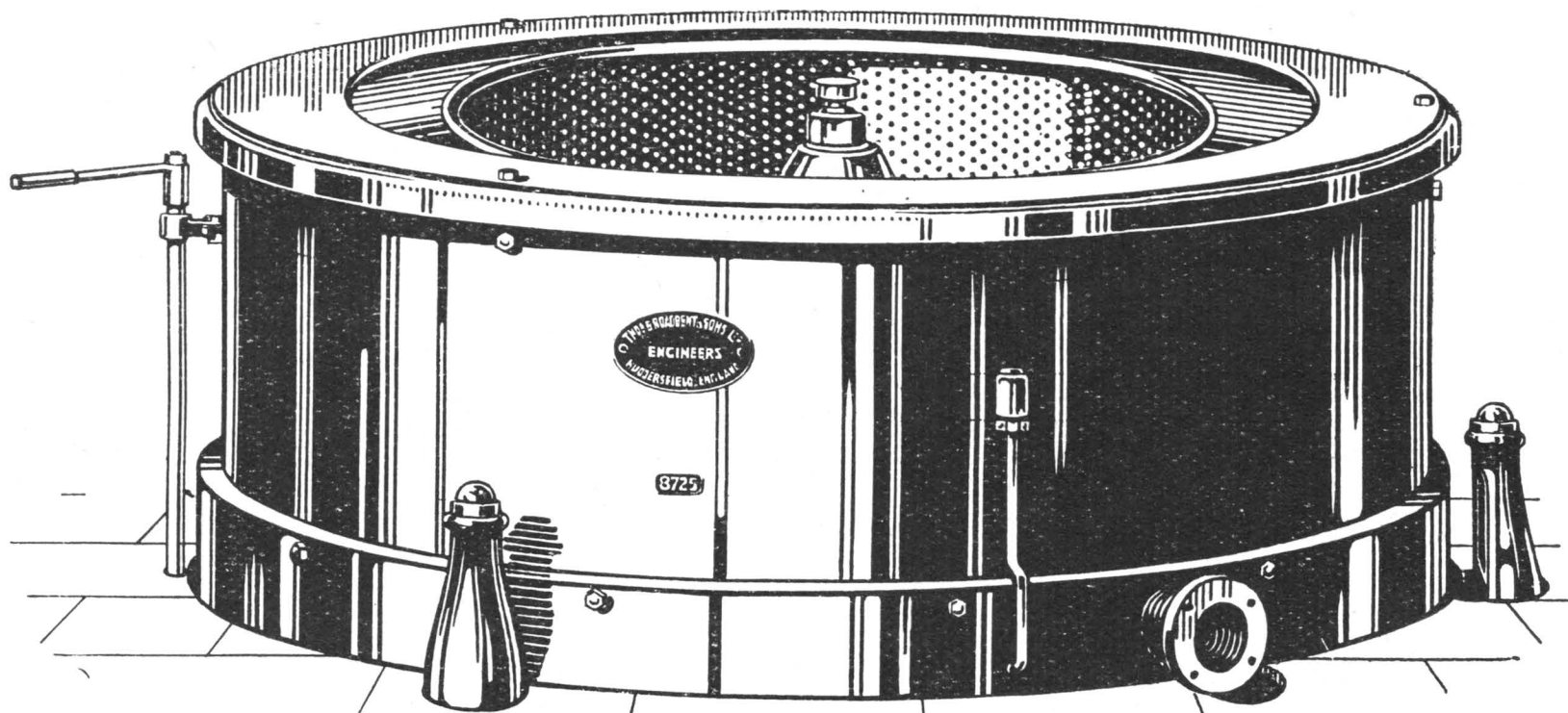
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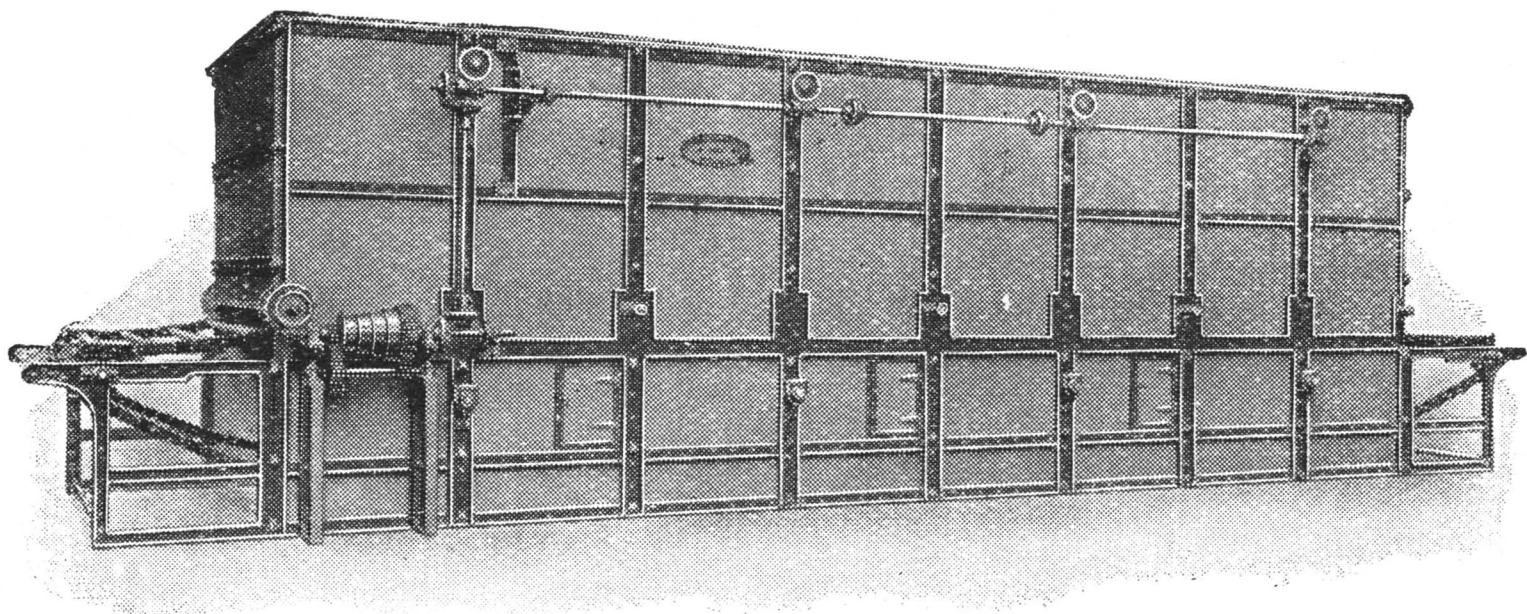
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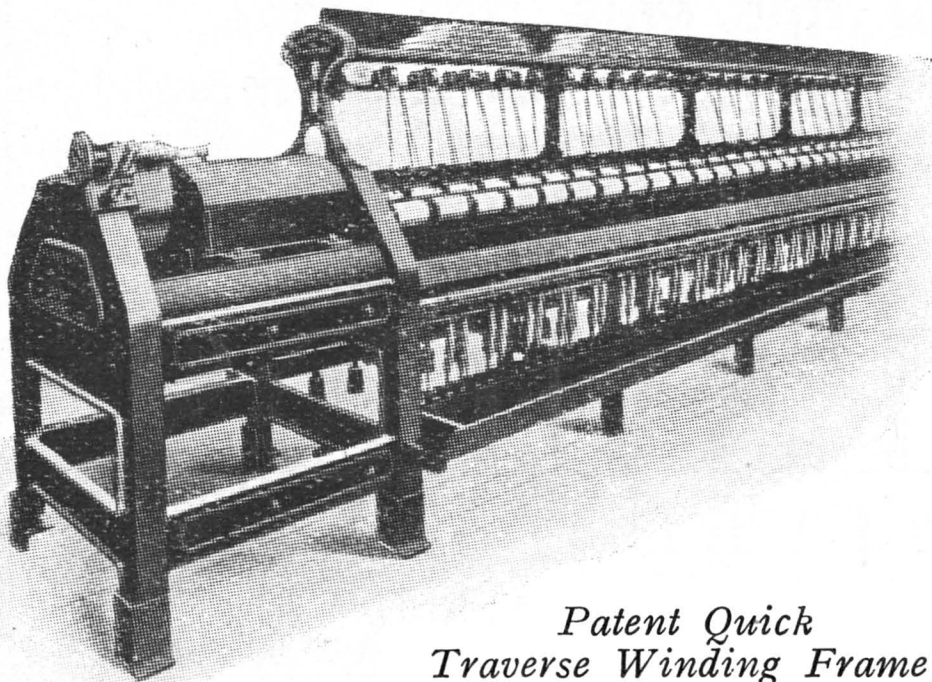
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THE JOURNAL OF THE TEXTILE INSTITUTE

Vol. XVIII

JULY

No. 7

PROCEEDINGS

Lancashire Section

Meeting at the Institute, Friday, 27th May, 1927: Mr. W. P. Crankshaw in the Chair.

THE INFLUENCE OF COTTON PRICES ON AMERICAN SECTION MARKETS AND THE RECONSTRUCTION NECESSARY FOR TRADE RECOVERY

By E. E. CANNEY, M.A.

The Lancashire cotton trade in 1913 was the product of 150 years of almost uninterrupted development along lines assuming increasing prosperity. Though highly specialised and most intricate in its working, it was nevertheless in perfect balance in all its parts. Whilst coherent enough, it was yet sufficiently fluid to be adaptable along cautiously progressive lines. Through its shippers it was intimately conversant with the circumstances of its millions of customers and sensitive to their needs; and it set an example to all industries in methods of economical production.

Great changes have taken place since 1913. That part of the organisation devoted to American section trade is no longer well-balanced, coherent, adaptable, sensitive to markets, or economical in production. During the war the nation provided a priority market, enforcing neglect of the old indispensable markets. Receipts on a basis of "costs plus percentage," and "control," dissociated the industry from the economic realities of peace; and a thriftless, though necessary, expenditure of national savings and borrowings supported the cotton industry, along with other industries, at a fantastic level of unreal, high values. By the end of the war, control, though profitable, had grown irksome to the cotton trade; the world lay empty of cotton goods, and with the expectation of high profits, the old individualism reasserted itself, and demanded decontrol. With control restrictions, however, went the support of national borrowings; and the industry was left to maintain its position on its self-confidence and its expectations. From its position of inflated hopes the industry invited the cotton consumers of the world to render the necessary support. Though the consumers perhaps had the will they had not the means; the response was inadequate; the structure collapsed; and the industry was precipitated to a level far below the old pre-war level, and at the same time its coherence and balance were lost.

Unequal opportunity for recovery during the depression has further unbalanced the organisation. Only slowly has the American Spinning Section come to realise the extent of its fall in 1920; and in none of its relations with other branches within the trade, with cotton supplies, and with its markets, has there been a semblance of the old unanimity of purpose that characterised the pre-war trade. Can this unanimity be restored?

Many now believe that the American Section trade was permanently injured by the fall, and they have the six years of fruitless effort behind us to support their view. But this period has suffered abnormalities that have been recently

corrected, and up to the present time the trade as a whole has not attempted what combined effort will do. Though before the war, in a slowly developing industry, Lancashire individualism was its greatest strength, since the war individualism has been an element of weakness, for it has been proved that what a world upheaval had undermined the disunited efforts of individual members of the trade could not possibly reconstruct.

Successful reconstruction, even from co-ordinated effort, however, must have the favourable opportunity, and it must be guided by sound principles. A search for these has involved a careful study of every aspect of the medium-quality trade, including the history of its development. I have followed this inquiry in not quite such detail as I should have desired, but thoroughly enough, I believe, to render a statement that may be of value to the trade. To cover the whole subject in a short lecture, however, is impossible, and I have had therefore to concentrate on the more vital points on which difference of opinion is most in evidence.

In an earlier paper on "The American Section and Necessity Fabrics," which appeared in the February and March numbers of the *Textile Recorder*, I examined the influence of cotton prices on American Section markets, and came to the conclusions that the foreign manufacturers had had the abnormal advantage, during the depression, of a coarse trade over a higher-quality trade where cotton prices were inordinately dear, and that cheap cotton had now deprived the coarse trade of this advantage. Dear cotton, moreover, had hitherto remained an impassable obstacle to a general reconstruction of the industry on its old level of efficiency. Now that the obstacle was removed, however, and if all branches of the trade would combine efforts in making a strong bid for the lost medium quality trade, there was every prospect of success.

I am now taking the opportunity afforded by the invitation of your Chairman to reinforce the significance of cotton price changes, and to enlarge on the advisable readjustments made possible by the change.

I wish to draw attention first to the contrasts between pre-war and post-war prices.

PRESENT COTTON PRICES CONTRASTED WITH THOSE OF THE DEPRESSION AND OF THE YEAR 1913

Relative to the purchasing power of the consumer, cotton prices have been more in favour of the American Section trade during the last six months than they were even in 1913. The following table gives the average prices of American Middling for 1912-13 and for post-war years. By means of the Wholesale Price Index for India, which is taken to represent the most important outlet for Lancashire trade, the prices are reduced to a common level, i.e., to the purchasing power of the Indian consumer.

Table I

	1927 May	1927 Feb.	1926 Nov.	1926 Oct.
American Middling	8.75	7.50	6.75	6.70
Wholesale Price Index, India	140	144	150	150
Adjusted Prices	6.25	5.21	4.50	4.50

	1925/26	1924/25	1923/24	1922/23	1921/22	1920/21	1919/20	1913 Nov.	1912/13
American Middling	10.77	13.76	17.66	14.92	11.37	11.89	25.31	7.50	6.76
Wholesale Price Index, India ...	159	159	173	176	180	184	204	100	100
Adjusted Prices ...	6.77	8.65	10.02	8.46	6.32	6.57	12.41	7.50	6.76

To attach much importance to the cotton price level, it has been recently said, is mistaken; but as the first and uncontrollable item in spinners' costs, it has always exerted just as great influence as is ascribed to it in this analysis. If you will compare the costs of production and the price of 32's twist in November 1913, for instance, you will find that the raw cotton cost at least 7½d. a lb., leaving only 3½d. to meet the spinner's costs and profit. In many finished fabrics, also, the raw cotton item amounted to as much as 60 per cent. of the wholesale selling price.

Such examples partly explain why every cotton interest closely follows the fluctuations in raw cotton prices, but their full significance is best appreciated if the special necessity character of the old trade is perceived. According to various standards, mankind the world over tends to buy the best wearing apparel he can afford, and to regard it as necessary to his comfort. Thus every class of cotton goods has a large market in which the particular quality may be regarded, not indeed as an absolute necessary, but as a *contingent* or *permissive* necessary. At a pinch the consumer can do without the better quality, but he will do so with the utmost reluctance, and only under absolute necessity. The Lancashire cotton industry formerly exploited this characteristic to the full by reducing unit costs and profit to the absolute minimum, so that in 1913 it had a *vast and profitable connection among people who were just able to afford its goods.*

To preserve the bulk of trade at any one time, it was obviously essential to keep prices steadily at the low level, to which they had been brought by efficient manufacture and organisation, otherwise quite disproportionate loss of trade would result. But every factor, apart from cotton cost, was already keyed down to the finest possible margin of costs and profit, and the market therefore was naturally hyper-sensitive to cotton price changes.

What then would have happened in 1913 if from one cause or another the price of Middling American had risen to the average prices of 1923-24, i.e., in real values to 10d. a lb. and more? An appalling dislocation of trade would have undoubtedly ensued, resulting in serious depression in Lancashire; and the industry would have been helpless to prevent it.

Such an increase in cotton prices in 1913 would have been straightway reflected in the complete failure of demand from the poorest Lancashire customers, and in a much reduced demand among the less impoverished customers. Though Lancashire goods would remain no less desirable, the poorest of its customers would of necessity have turned to the cheap coarse goods produced by other manufacturers; and all interests in the American Section would have been compelled to adapt themselves to a reduced turnover. With enforced short-time and reduced business in bulk, costs and margins must necessarily have risen. These in turn, added to dear cotton, would have driven still more of the customers out of the market, reacting again on costs and margins, and thus establishing a cycle of accumulating dearness until only the relatively wealthy customers remained. Cotton goods would then have been at relatively luxury prices, and the whole American Section would have been organised to supply a comparatively luxury trade. Needless to say, the aggregate profit accruing to the whole trade must have been much reduced under these circumstances, and the interests with the greatest fixed stake in the industry would have suffered most.

The adverse effects of 10d. cotton in 1913, it is here important to note, would have been independent of foreign competition in the same class of goods, because foreign goods of the same quality would have been affected in the same way. Manufacturers of coarse goods, however, would have had an abnormal advantage, and loss of Lancashire trade would have been associated with the *substitution* of coarse for fine fabrics, not with underselling in the same trade. Attention will be drawn to the importance of this distinction at a later stage.

If 10d. cotton would have so disturbed the market in 1913, it must have exerted just as adverse an influence in the depths of the depression. The fact that other adverse changes from pre-war conditions have interposed more obvious causes does not therefore detract from the overwhelming importance of dear cotton; and no analysis of depression conditions that ignores this factor can illuminate the present situation.

Cotton prices were bound eventually to come down from that high level; and the two years period ending in October 1926, suffered the further complication of rapidly falling prices, in preventing trade recovery.

The combined influence of other adverse factors was and is very serious; but it is reasonable to claim that they could have been largely overcome by now had the industry been relieved of high raw-material costs. That is not for a moment to suggest that we might have had a general return to 1913 prosperity; but already retribution might have been paid without excessive hardships for the mistakes of the boom, and, with a clean financial slate, real prosperity for the spinners might now have been in sight.

The years 1921-26 would have been relieved of much of their uncertainty. The great financial losses of this period, as distinct from mere absence of profit, could have been largely saved. The disproportionate sharing of profit among the various interests would have been less in evidence, and there would have been less recrimination and an outlet for more reconstructive thought and action. There would have been some distress, but none of the bewilderment and demoralising anxiety that has sapped the confidence and the courage of the industry. With immoderately dear cotton, however, all these signs of dislocation had to be, for the industry was practically helpless in other directions until the raw material price situation was corrected.

Another practical illustration of cotton price influence will considerably assist in making the present situation clear. What would have happened in 1913-14 if cotton prices had fallen by from 1½d. to 2¼d. a lb., with the prospects ahead for a year or two of maintaining a fairly steady level? There is no need to trace the resulting course of events in detail, for it will be generally agreed that a boom in cotton manufacturing would certainly have followed. The number of consumers with sufficient means to pay for better quality goods was being well maintained on 7d. cotton; on 5d. cotton a large increase in trade was assured.

The influence of dear and cheap cotton thus perceived, the opportunity now presented to the industry may be appreciated. Whether the industry will make full use of the opportunity depends on its fully realising the change that has taken place since September last, and on the confidence and vigour with which it is now ready to cope with the problems created by the depression and by the war.

THE SUBSIDY TO RECONSTRUCTION FROM SUB-NORMAL COTTON PRICES

Though Mississippi floods and rains seem to have deprived the industry of nearly the whole advantage of abnormally cheap cotton, it yet remains possible that a 7 million bale carry-over and a good cotton year otherwise may bring prices back again to the cheaper level. With this possibility in view the special advantage of sub-normal prices deserves emphasis.

As has been seen, dear cotton set up a cycle of accumulating dearness during the depression that was bound to reduce markets and throw equipment out of running. During the last six months, however, cotton has been actually one-third cheaper than in 1913; so that if the trade organisation had been able to utilise this advantage to the utmost, the cycle should have been reversed. Cheap cotton can be conveniently regarded as having contributed a subsidy of about 2d. towards reconstruction on every lb. of cotton manufactured and sold.

We may therefore inquire what might have been done with its assistance. The subsidy, of course, was presented to any branch of the trade, from the

spinners onwards, that could secure it. Which interest was it desirable should profit most by it?

If we can regard the recovery of the Lancashire trade as of vital importance to the nation, and judge from this point of view, it may be generally agreed that the subsidy should have been apportioned in the manner most likely to restore the trade to full production, for therein would lie the certainty of increased employment, in other industries as well as the cotton industry, and a great relief in national finance. But it is apparent that only the spinners' recovery could effect this; and for this reason alone it would have been well if the spinners could have had the full benefit.

This would have also been an equitable allocation for the reason that the spinners, through no fault of their own, i.e., in addition to the financial burdens resulting from boom speculation, have suffered disproportionately from the adverse effects of the war and of dear and unstable cotton prices, which have so depreciated the strength of the spinners that they could hardly recuperate on normal margins. Moreover, if demand had been properly stimulated, the spinners might have secured the subsidy without loss to other branches of the trade.

In this connection a properly stimulated demand requires emphasis, for very little advantage would be derived from the subsidy by the trade except on a full-production basis. But a full-production demand could only come from a near approach to the old necessity level of prices for finished goods; making allowances for increased world wealth and population, and, I should say, finished fabrics placed at the door of the consumer up to 180 per cent. above pre-war actual prices, given the necessary contact with the markets, should meet the purpose.

Let us turn from hypothetical considerations to inquire what has actually happened. First, it is clear that the spinners have not had the subsidy, as the following table will show, otherwise yarns relative to the purchasing power of the Indian consumer should have been no cheaper than pre-war yarns. On the 5th of February, 32's twist yarn at 15·84d. a lb. would not in itself have injured the capacity of the market to purchase. Prices, however, were only at 13·50d., and the subsidy was obviously going elsewhere. The present yarn quotation of 14¼-15¾d. is still under the contingent necessity price level.

Table II
Market Quotations for 32's Yarn and American Middling in Pence a Lb.
WHOLESALE INDEX PRICE, INDIA

Date	Yarn	Cotton	Margin
100, 30th Nov. 1913	11	7·50	3·50
5th Feb. 1927, prices adjusted to 1913 values	9·37	5·31	4·06
11th May 1927, prices adjusted to 1913 values	10·00	6·25	3·75
30th Nov. 1913, prices adjusted to 1927 values	15·84	10·80	5·04
144, 5th Feb. 1927	13·50	7·65	5·85
140, 11th May 1927	14·00	8·76	5·24
24th May 1927	15·00	9·06	5·94

Despite cheap yarns, a full-production demand has not arisen. Nothing betrays more clearly the inadequacy of the present cotton trade organisation as an instrument for recovery in the medium quality trade. An unparalleled opportunity has been missed, and readjustments in other branches of the trade are therefore undoubtedly necessary before the spinners can derive an advantage from cheap cotton. But as the spinners are dependent upon the collaboration of other interests, the profits of the other interests must not be prejudiced.

The price of yarns during the last six months has not been the cause of insufficient demand, and the causes must therefore lie somewhere between the spinners and the potential consumers. They are to be ascribed partly to the increased costs of manufacture, finishing and packing, partly to high merchanting costs and percentages, but mainly, there is good reason to believe, to lost contact

with the old markets. As the spinners' weakness in bargaining arises principally from inadequate demand, the last cause, namely, lost contact, should be considered first.

Lost Contact with Markets

The fact that 40 per cent. of the old American Section customers have been out of touch with American Section goods since 1913 must be regarded as the most serious feature of the situation, and most energetic measures will be required to regain their custom.

Pre-war trade increased by about 2 per cent. per annum, and there is now a leeway of 40 per cent. to make up. Fortunately, however, it is probable that the old reputation of Lancashire has not been forgotten in the lost markets, and Lancashire can again bring the fabric prices within their reach. No ordinary trading measures, however, will restore trade quickly enough to save the spinners, and it is incumbent upon merchanting organisation to rise to the occasion with extraordinary measures. The anxieties and the losses of the shippers during the last six years have been only second to those of the spinners, and they have deserved the sympathy of all. With unstable and high cotton prices, with a compulsorily restricted market and turnover, the marketing organisation was entirely justified in modifying its methods and charges accordingly. Now, however, a call is made for them to show a corresponding and enlightened adaptability in the opposite direction.

High Finishing Charges &c.

Second in importance to loss of contact is the influence of high costs and profits per unit in marketing, finishing, and packing. The respective interests are all organised on a depression trade basis (as far as the American Section goods are concerned), an adaptation fully justified during the high and unstable cotton price years, but now requiring reconsideration. Obviously, however, whilst these interests continue to believe that the 1921-26 trade is the new normal, there is little hope of their voluntary collaboration.

MISCONCEPTIONS OF FUTURE TRADE PROSPECTS

This belief arises from the prevailing misconceptions on the subjects of surplus capacity in the American Section and of the strength of foreign competition. Whilst they persist no one will have faith in trade recovery, and their inaccuracy must therefore be exposed. In arriving at them the following argument was confidently employed.

All cotton industries during the depression have been equally affected by dear cotton. Foreign manufacture and the Egyptian Section have been relatively prosperous; and therefore dear cotton has not been so important a reason for the depressed trade of the American Section. Naturally it follows, because all industries equally benefit from a fall in prices, that the recent change makes no significant difference to prospects. On this argument, the growth of foreign competition—without any abnormal advantage—is advanced as the reason for the decline; and the 1921-26 level of trade represents the new normal. We are to regard the Japanese as impregnably established in part of the old American Section market; and the American Section is to reconcile itself to a permanent loss of about 30% of its normal trade.

The International Economic Conference at Geneva has just had before it a memorandum on cotton which contains this statement relative to the redistribution of the world cotton trade.

“The reduction in total trade was accompanied by a change in the shares of the various exporting countries. While Great Britain, Poland, and Germany have lost part of their markets, the United States of America, Japan, and China have profited. Many of these changes had begun to make themselves felt before the war; they were accelerated during the war, and some of them are likely to prove permanent in character.”

A less warranted statement than the latter half of this finding, and one more sinister in its effects on the mind of the members of the trade and of its markets, would be hard to find. I can find no sign at all of these changes in pre-war conditions with respect to Lancashire trade. Lancashire showed a steadily increasing trade of 2 per cent. per annum before the war. In 1905 there were about 46 million spindles employed; in 1913 there were 55½ millions. Was there any sign of decadence or decline with a 9½ million spindleage increase in eight years? What if the foreign spindles had doubled, trebled, or quadrupled in that time? Lancashire's position was sure; for as long as the world increased its wealth, and as long as there was sufficient cotton, there was no limit to the market for cotton goods.

A prominent Lancashire authority has recently expressed this view—

“For six years the demand for cotton goods from Lancashire has remained at a stationary figure, which will not ensure more than 70 per cent. employment for the American mills. So much is admitted. The prospects do not show anything which will immediately alter this position, either materially or permanently.”

So much, however, cannot be admitted. The analyses leading to this conclusion took no account of most important considerations. The influence of a complex cotton price situation, relative to the changed purchasing power of the various markets, was entirely ignored, and their conclusions as to future prospects were consequently unreliable.

To premise that all cotton industries are equally affected by an all-round increase in raw cotton prices is incorrect. Dear cotton will only affect the world cotton industries equally where their respective markets are all proportionately impoverished, and where there is no possibility of substitution. Where cotton consumers as a whole are all proportionately impoverished, high quality manufacture is bound to suffer through the substitution of poorer quality goods. With part of the market proportionately enriched and the remainder impoverished, then the suppliers of commodities to the highest grade of impoverished consumers are bound to suffer most. The American Section was in the last position during the depression. Relative to the price of cotton its particular class of consumers was much impoverished, and quite incapable of paying the enhanced prices of medium quality goods. The existence of the war profiteering countries and classes is quite sufficient to account for the relative prosperity of the still higher quality Egyptian Section, much of whose trade would have fallen to the American Section had the peoples of the world been uniformly impoverished relative to the price of cotton.

The manufacturers whose products displaced American Section goods during the depression have had the advantage of a coarse trade over a fine trade, where, relative to the price of cotton, the consumers were greatly impoverished. Therefore the change to the existing level of prices makes a *vital* difference to American Section prospects.

To controvert these misconceptions is almost a public duty, because if they persist as the working basis for reorganisation, as they threaten to do, the future of the industry is greatly endangered. Certain branches of the trade are already established on a 70% of trade basis, and spinners are urged to fall back to the same position. Yet it must be obvious that an American Section established permanently on a 60 to 70 per cent. basis will be nothing short of a national calamity; and in the end no artificial adjustment will save a large percentage of failure among his spinners.

THE MERITS OF REORGANISATION PROJECTS

With respect to reorganisation, there are three main schools of thought. The first argues that the existing organisation is inherently constituted to make the best of any situation, and advocates leaving things to right themselves. Were the present organisation as well balanced as was the old cotton trade

organisation in 1913, the advice of the first school might be safely relied upon. Whereas, however, practically a complete 1913 equipment and organisation exists in spinning and weaving, both the *personnel* and the scope of operations in merchanting are seriously depleted; and though finishing and packing have perhaps the pre-war capacity, they are profitably organised on a depression turnover in trade. To this volume in trade the spinners especially cannot possibly adapt themselves, and as an early recovery is essential, readjustments cannot be left to arise naturally without prejudicing spinners' recovery.

The Price-Fixing and Yarn-Output Control School

The second school seeks to emulate the finishing and packing combines by fixing margins, and commands a large following, which is committed to the attempt of putting price-fixing policy into practice. How will this course of action affect the prospects of final recovery?

Two of the chief arguments in favour of price-fixing and yarn control are (1) that the 1921-26 trade represents approximately the normal for the future, and (2) that there is permanent surplus capacity in the American Section amounting to about 30 per cent. of total capacity. By accepting these, as the basis for their own organisation, the spinners are placing their seal of approval on all organisation adjusted to the same standards. They will thus effectually consolidate the finishers and packers in their present monopolistic scales of charges, and will disarm themselves in negotiations for the much-needed reductions. They will also justify the existing inadequate marketing organisation, thus leaving high marketing costs and percentages as an obstacle to trade recovery. Foreign shipping firms, also, that are waiting for the opportunity to re-establish their branches in Manchester, will be discouraged by an alliance in Lancashire to keep up prices at an uneconomic level. Moreover, if whilst adopting this defensive measure they succeed in convincing the bankers that the outlook is so poor, the cheap and generous finance required for a greatly expanded trade will be withheld. The last, and possibly in the long run the most serious result, is the influence on foreign manufacture.

Foreign competition with medium quality goods in world export trade was almost negligible before the war; and since the war there has been only a little effective competition from the Continent, mainly due to the transitory advantages of depreciating currency. Now, however, cheap American cotton will prove attractive in greater quantities to foreign spinners, who will thereby be encouraged to explore the possibilities of securing a market for higher quality manufacture should they expand in that direction. With existing cotton prices the consumers will also be justified in expecting better quality goods at satisfactory prices, and undoubtedly the venturesome foreign manufacturer will find all the encouragement he wants if American Section products remain at artificially high prices. There is hardly any question that if England alone combines to hold up prices, a premium will be placed on European manufacture for export; but the chief danger lies in Japan, which, having acquired a facility and once established in higher quality manufacture, may prove extremely difficult to cope with. The danger is all the greater because Japan has been cultivating old Lancashire markets, and has the present advantage of a personal contact that Lancashire no longer possesses.

Competition in medium quality goods is the only competition the American Section has permanently to fear. When the Asiatic can supply them at lower prices, then there is direct competition, not merely substitution, and a decline may then indeed be foreshadowed. Whilst, therefore, the prospects of recovery are made possible by cheap cotton, price fixing is suicidal policy for the spinners.

It is also doubtful that the spinners can assure greater profits in this way, even temporarily. Though a small turnover at high margins makes finishing and merchanting profitable enough, it will not suffice for spinning. Twenty eight million spindles (i.e., 70% of 39,000,000 to 40,000,000), no matter how efficiently run, cannot support a white elephant of 12 million idle spindles.

Furthermore, yarn output control is ostensibly designed to secure a fairer share of total available profits for the spinners. The finishers, however, will not be induced by this means to give up anything; for whether trade declines or improves, they have the means of assuring steady profit. Neither will the merchants be harmed. Trade is bound to improve somewhat in spite of misdirected action, and export figures will appear satisfactory to those whose actions are based on gloomy predictions. Shippers, therefore, will have no incentive to exert themselves in expanding the market and in reducing percentages more than is to their own interest.

Thus what higher level of prices the spinners can enforce by price fixing will be deflected from the finishing and merchanting interests against the consumer, provoking the natural response of restricted demand. Increased margins may look satisfactory, but without an enormous increase in sales, they will not save the spinners. Though it seems that the merchants have had the greater advantage of the subsidy up to the present moment, price fixing is hardly the way to assure a different distribution.

The question of the loyalty that a price-fixing organisation can expect is a delicate one, and I shall only point to the facts that there are about 39,000,000 spindles on American quality cottons, and that a 21,000,000 spindleage cartel leaves 18,000,000 outside, the product of which, whether as yarn or as cloth, will compete with controlled yarn.

Had it been practicable to enrol all the American Section firms, irrespective of varied competitive strength and marketing interests, in a price-fixing cartel during the years of high unstable cotton prices, output control would undoubtedly have saved a large percentage of the capital that has been lost to the Section as a whole. To have been effective, however, it must have been complete, even involving, perhaps, continental medium spinning. Under the actual circumstances, however, no one, I believe, could have done better than the Federation with their short-time scheme.

It is acknowledged that output control may save capital losses; but for an industry with 39,000,000 spindles to employ, with markets that have already shown a capacity to restrict consumption, and with foreign manufacture ready to take advantage of cheap American cotton, it is not a profit-making device. A great change has taken place in the last six months, opening up brighter prospects and suggesting the need for different measures. The appropriate action for May 1927 would seem that best suited to May 1927 conditions, not to those of May 1923 or 1924.

The Cotton Yarn Association, which is here under consideration, is nevertheless the type of organisation that appears essential for the spinners' recovery. It holds out, in its possibilities, a prospect of again restoring balance to the industry. Such facilities as complete manufacturing statistics and yarn grading should prove a boon to management. In the adaptation of scientific costings to the different styles of mill organisation, and as an intermediary in promoting small group combinations, it could render unique and invaluable service. A united American Section could also effectively negotiate in matters not common to all Lancashire spinners, for their relations with home and foreign markets, with foreign manufacture and with cotton supply, are in many ways distinct. The suggested readjustments in the conclusion to this paper would also require the weight of the combined spinners behind them.

There are already signs that the Cotton Yarn Association is inclined to face the need for offensive as well as defensive measures. It was recently announced, for instance, that the C.Y.A. stood for full-time production and the removal of any hindrances to that possibility. But if it confines its efforts to output control and neglects the hindrances, then output control is merely another hindrance, for it supports a high price *régime* that is largely responsible for checking expansion in trade.

The weakness of the position is in demand, and to concentrate on adjusting supplies, instead of removing the obstacles against increasing demand is to establish these obstacles more firmly. Moreover, when the Cotton Yarn Association justifies output control by subscribing to misconceptions as to foreign competition and surplus capacity, it is undermining confidence and defeating its own ends.

At this juncture the Cotton Yarn Association might well abandon these gloomy predictions as justifying output control; and if this measure is nevertheless thought useful as a rallying point, at which forces can be assembled for positive action, then it would do no harm to say so. My own view is that if the American Section spinners tackled the demand end of the problem with sufficient energy, the high margins that they are now seeking artificially to enforce by control at the expense of checking trade expansion could be secured naturally in normal business, and that on a full production demand. Furthermore, many spinners who now remain aloof would no doubt co-operate in carrying reconstructive measures through, for none is so well off that his position may not be bettered.

READJUSTMENTS REQUIRED FOR THE RECOVERY OF TRADE

There is no longer any necessity to regard short time and small turnover as the permanent and normal state of affairs, and no branch of the trade can now justify an unaccommodating adherence to luxury margins and profits. The following reconstructive measures may therefore be advocated.

First, it is obvious, as the foundation for any decisive and bold enough action, that a big psychological push is absolutely necessary. Nothing is possible without renewed confidence. Confidence, however, only arises from a knowledge of power and opportunity; and at present, due to the depression and to misinterpretations of its causes, a majority of the American Section spinners imagines itself powerless to recover the old trade. This is a delusion pregnant with missed opportunities and eventual disaster.

The secret, however, of successful and speedy reconstruction is a recognition of mutual dependence among the various branches of the trade, a spirit of partnership, and a willingness to co-operate in restoring an organisation as complete and efficient as that of 1913. Whole-hearted co-operation means a reasonably prosperous future as well for the spinners as for the merchants and finishers, whose prosperity is already assured. Those who from all sides are pleading for co-operative effort, in seeking trade recovery, are, however, pleading in vain if their object is to maintain the *status quo* in any branch of the trade.

Restoring Confidence

It is therefore an essentially practical suggestion that the spinners' representatives should inaugurate a confidence campaign first among the spinners, for it is obvious that they must take the lead.

The Bankers

The spinners will then require to approach the bankers. The unstinted help of cheap finance is required in all renewed activities; and the opportunity has now come for the bankers to bring to fruition the steady forbearance they have shown on the whole under the hopeless outlook of the depression. Whether 95% or 70% of the existing American Section survives is very largely dependent upon the bankers' renewed faith and confidence in its future.

Restoring Contact with Lost Markets

The inspiring source of trade prosperity lies in demand from the actual consumer. For 13 years the American Section has been practically out of touch with 40% of its old clientele. That is the significant fact; and it seems impossible that the old process of infiltration from existing marketing channels can re-establish the old connection quickly enough. There is room here for

wide publicity throughout the Asiatic markets aimed to attract the attention of the multitude of large and small merchanting interests, who once swarmed in the Manchester market, and to vitalise the potential demand among the consumers. All the traders who have ceased to call for Lancashire qualities since 1914 should be canvassed, and especially those who have transferred their attention to the coarse trade. A great deal might also be made of the film screen, native trade journals, and the press. A simple slogan such as "Lancashire fabrics at pre-war values" would serve as an aim for internal reconstruction, and if broadly advertised it would probably also arouse the potential market to the realities of the situation.

Merchanting Readjustments

The times also call for pre-war marketing enterprise in other directions. Owing to the stability of prices, a readier granting of credit to foreign buyers with reasonable credentials, among both old and new customers, is justified. The dangers of default in a steady trade should be small. Default, in 1920-21, and during periods of tumbling prices from 1921-26, came probably rather of necessity than of deliberate dishonesty; and a long period of steady prices should conduce to the commercial probity of pre-war business dealings. The situation seems also to warrant a great volume of consignment trade, especially to the poorer markets, where connection has been largely lost through dear goods. This is probably also one of the best forms of advertisement.

Pending a marketing organisation of adequate proportions, spinners and manufacturers may resort, co-operatively or individually, to direct marketing, especially in staple yarns and cloths. Under the prospective demand, the dangers of such operations will be abnormally small if wisely directed. Goods consigned for up-country auctions, in India particularly, would usefully serve the purposes of attracting the consumers' notice again to American Section goods, of encouraging more merchants to do business in person or by representation in Manchester, and of also encouraging perhaps the present organisation. This expedient could be safely employed as a temporary measure, though a separate marketing organisation, especially in the staple quality trade, is undoubtedly an efficient means of distribution when it fulfils its function adequately.

Finishing Readjustments

Whilst the finishing trades can say "We are organised on the basis of 1921-26 trade, and prominent authorities agree that you cannot hope for much better," the spinners can hardly expect their collaboration in bringing back prices to the necessity level. Once this impression is disproved, however, the only equitable excuse for unyielding adherence to luxury trade charges is removed. But their support is rightly conditional on proportionately increased business, for otherwise the reduction is not being utilised in expanding trade; and demand therefore is again the key to readjustment. It is, however, undoubtedly to the future advantage of the finishers to give to wide publicity, in restoring contract, the additional fillip of reduced charges.

Spinners and manufacturers, moreover, can assist in reducing finishing costs. Finishing raw materials are excessively dear owing to protective duties, which have the need of the nation for a strongly established chemical industry as their excuse. Only those industries that utilise chemicals in manufacture for export, however, are paying the duties without compensation, and a campaign for substituting a national subsidy for the duties is one that the spinners could press forward to their advantage.

Unemployment, armaments, other causes of ungainful national expenditure, and all protective duties also are particularly harmful to the cotton trade, and whilst on the subject of political action a word might perhaps be said about them. The burden of rates and taxes is only too obvious, but it is perhaps not generally recognised to what greater extent the cotton industry suffers more than other industries. Whereas battleship construction and the dole bring trade to the

home supplier, who pays with the right hand and receives probably more back in the left, practically no compensation exists in the export trade. Markets are lost through dear goods; and an industry like the cotton industry, with 80% of its manufactures exported, bears the brunt of the burden. A fairer distribution of taxation, a positive redistribution policy with regard to surplus man-power, world disarmament, and an international policy devoted to furthering the prosperity and the good will of the foreigner, are points deserving Lancashire's special attention.

Stabilising Cotton Prices

Spinners need finally to seek the help of the cotton marketing associations in assuring a steady level of prices and as cheap cotton for as long time ahead as improved marketing organisation can make possible. This is the secret of steady trade, and is an all-important consideration. The present system has failed badly during recent years, and it is obviously insufficient. The extension of the futures cover deserves special consideration.

THE CHIEF DANGERS AHEAD

The immediate danger is that the industry may not unite its efforts and act resolutely and quickly enough to take advantage of cheap cotton in re-establishing the old trade. The correlative of this danger is that it may allow foreign manufacture to establish itself firmly in the medium quality trade.

Wars are also dangerous, whether the British Empire is involved or not. They breed poverty and disorganisation, both causes of lost trade.

The biggest danger ahead, the nightmare to the trade, is the possible repetition of the 1921-26 course of cotton prices, which will inevitably unbalance the industry again. The necessary precautions associated with the various aspects of cotton supply, however, are too numerous for discussion in this paper.

Yorkshire Section

Meeting held conjointly with Bradford Textile Society at Bradford, 28th February 1927, Mr. Arthur Hitt in the Chair.

ADDRESS BY MR. W. HOWARTH, J.P., PRESIDENT OF THE INSTITUTE

In connection with the above meeting the Yorkshire Section Committee of the Institute invited the Council to hold its February meeting at Bradford on the afternoon of the same day, thus ensuring special representation of the Institute at the joint meeting. Prior to the evening meeting, members of the Council accepted an invitation to dinner to meet the Yorkshire Section Committee and representatives of the local Textile Society. Mr. Henry Binns occupied the chair, and was supported by Messrs. W. Howarth, A. Hitt (President of Bradford Textile Society), John Emsley (Past President of the Institute), J. Crompton (Chairman of Council), W. A. Elliott (Chairman of the Textile Society), T. Fletcher Robinson (Institute Hon. Treasurer), G. Garnett, G. A. Barnes (Bolton), and others.

Mr. Henry Binns (Chairman of the Yorkshire Section Committee) welcomed the visitors, and congratulated Mr. Howarth on his safe return from his visit to Egypt. Alluding to the variety of interests represented, he said it was fitting that the Institute should take a warm interest in the Textile Society movement. The annual conference of representatives of these societies, promoted by the Institute, now stood for a total membership of about 10,000. The most cordial friendship existed between all the organisations, whilst individual freedom was not interfered with.

Mr. W. Howarth congratulated Mr. Binns on his efforts generally in the interests of the textile industry, and said the meeting together of representatives of various bodies must be of inestimable value.

Mr. J. Crompton and Mr. T. Fletcher Robinson expressed appreciation of the invitation and hospitality on the part of the Yorkshire Section Committee, Mr. Crompton stating that interchange of visits was highly desirable.

Mr. John Emsley also spoke, and congratulated Mr. Howarth on the able manner in which he was fulfilling the duties of President of the Institute. Personally he regarded any movement which brought the various sections of the industry together as of extreme importance. The Institute provided a platform common to all branches, and he believed it was now permanently established and would develop successfully as a result of the devoted service of many of its supporters.

The conjoint meeting followed, when there was an excellent attendance, Mr. Arthur Hitt occupying the chair.

Mr. Howarth, in the course of his address, said—

I am conscious that it is in the nature of an adventure for a Lancastrian to cross the Pennines and endeavour to talk on a plain subject to an audience of Yorkshiremen. When, however, pleasure and duty are in unison the risk of criticism as to the county of one's birth must necessarily be faced. I accepted the invitation to address you as part of the duty devolving upon me as President of the Textile Institute. I come with pleasure as an individual realising that I come into a community where I have an opportunity of learning many things, for what is there of present day knowledge and of those things which relate to a live community that is not fully known and efficiently practised in this broad county.

Your history is replete with instances of men who have given a tone to the world's life. No wonder that your woollen and worsted cloths, your dress goods and other products, are known for quality and finish in every civilised country? You have been quick to take up new ideas and to translate them into practical shapes, witness artificial silk as an instance; and to blend originality of design with skilful practice in order to utilise new textiles to their fullest extent. Why, then, in this great county, where matters are managed so admirably, should it be deemed necessary to discuss a subject such as we have before us to-night? It is obvious that business men in this part of the world take an interest in technology. The youths who won the Crompton prizes were not trained for the special purpose of winning those prizes. To the youths themselves, the prizes, valuable though they were, were not in any sense the true reward they reaped. If the teachers of the Technical Schools and the students thought mainly of prizes they would be of the tribe whose motto was and may be is, "If tha does owt for nowt, do it for thysen." But no, in years to come the work of the lads will bring credit and reward to themselves, preserve the trade of this area, help to keep the community prosperous, and be of great strength in developing whatever opportunities may be afforded to a progressive people.

To be in that position is the reward of the students, and to have built the ladder or to have constructed the road is the reward of the teacher. It is easy to see that in connection with business and technology duties devolve upon each one of us, and it is because the leaders of commerce recognise their duty that we foregather to-night. They know that genius and ability are qualities restricted to no class, and that if the world is to make free progress the brains, the executive ability, and the goodwill of all sections of the community must be developed and harnessed for the general good.

The business man has to furnish the means for building the road or the ladder of progress, and maybe to give ideas as to direction and shape. The teacher is to teach the student the mechanical use of the road and to impart to him those moral qualities which will enable him to be of maximum use to the world. The

research worker will indicate to the business man the paths to different destinations, and the student himself will progress according to merit and ability, and the road which is right and serviceable in one part of the world will not necessarily suit another part. Even in a logical world with free intercommunication of knowledge and adequate developments in transit arrangements we shall find that what makes for progress in one part of the world is being discarded in another. There are parts of Africa where human labour is yet wasted in carrying goods, as head packages, for days on end. In such a community the man who could make a narrow hard road and build a wheelbarrow to enable four times the weight and bulk of goods to be transported with the expenditure of the same amount of human energy as is now used for the lesser weight would be a public benefactor. He would be exhibiting business acumen conjointly with that which is the main end of technology, and it is that end and purpose and the ways and means that concern us to-night.

To many people the word business suggests something not far removed from dishonour. Sometimes we find distinctions even in the same trade. To the minds of some people it is honourable to sell beer by the barrel, but dishonourable to sell it by the pint. To the business man is attributed qualities and instincts of low degree. Nor can we wonder when we read the history of mankind as portrayed in the literature of the world. There the heroic age of any country is pictured as the period when warriors are adventuring to seize power and authority either from a numerically weaker clan or from a race that, having played its part in helping forward the progress of humanity, has become effete and corrupt. The warrior is placed ahead of all types of men. When agriculture rather than the practice of arms becomes the national career the agriculturist is despised by the warrior, whilst on the other hand the warrior is looked upon as a semi-barbarian by the agriculturist. In the same way when business men take hold of the industries and stretch out for a fuller life for the masses the business man is pilloried by the agriculturist, and the agriculturist is looked down upon by the industrialist, and yet I have no hesitation in saying that the period which, for want of a better word, I call the period of plutocracy, that is when trade and commerce, national and international, are fully flowing, is the period when the greatest happiness and contentment are within the reach of the bulk of the population, and their economic status is at its highest. But happiness and contentment being products of a state of mind are not, however, the regular resultant. On the other hand, unhappiness and general discontent have hitherto often been phases of the plutocratic ages of this and other countries, and criticism is always directed against the business man when the resultant is not in accord with opportunity. I want to put the business man before you in a better light, and to claim that he plays a worthy part in a nation's life. No one who has attained to authority and power in the business and industrial life in this free country can be a fool—the sifting process is too keen. If he makes a mistake the full penalty of the mistake falls upon himself. His failure may hurt others somewhat, but he himself must take the final and the greatest shocks. If, on the other hand, his business is successful, the Government, expressing the will of the people, is ready and anxious to relieve him of a very large portion of the material products of success. A business cannot live on past successes, but must be continuously progressive.

All history teaches us that when plutocracy built upon business efficiency breaks down, not merely the business, but the nation built upon its work, falls behind in the race. We as a nation are at a point where our foreign competitors think we are on the downward grade. The problem the business men of our time have to solve is to how to maintain the economic prosperity of our country. Can we devise the right form of management and line of progress to suit our race and escape the fate of past leaders of commerce. We all believe that the laws of national growth are so formed that the Government should assume at

each period the outward shape most suited to the period of native life, as a man or a plant, each in every particular adapts its outward form to the inward growth. But for this to prove true and workable those upon whom the responsibility is thrust must have authority in shaping the native life. In times not far remote the successful business man, when the time came for him to retire from the practical side of business life, often entered into the field of politics, and gave from his experiences whatever he could for the public good. Oftentimes he became a patron of the arts or of literature, and a very large proportion of our heritage in these directions had their origin in such benefactions. Can we do better than our forbears did? I am sanguine that we can. But to ensure that betterment we must study causation as well as effect. For thousands of years farmers planted clover or berseem or plants of a similar nature with their corn. They knew that as the outcome their crop would be improved, and yet it is in the life of this generation that the cause was discovered and declared. If men had been strenuously looking for causation through the centuries probably agriculture would by now have been upon a more efficient plane than it is to-day. In business the pressure of competition and of criticism has acted as a compelling force upon those employers who were determined to make progress to keep their plant in proper shape. In connection with this matter I try to visualise the potential brain power of the multitude of workers in our different establishments. When we take the trouble to talk to our adult workmen we find most of them men of sound common sense with an intimate and expert knowledge of the machinery they tend, many of them with artistic and musical capacity, men who are capable, if they so desired, of improving efficiency and promoting the betterment of all. And yet how few theoretical or practical suggestions emanate from the mill. Each man knows and will not argue to the contrary that you cannot take more out of a bucket than you put into it. And yet the same men, in mass, whilst desiring a fuller and wider life, often combine and strenuously work to build up systems which impose limitations on output and which impede the refilling of the bucket. No business or country can progress where such limitations exist. I would suggest to you that dead flat rates of remuneration for workmen is one of the causes of the attitude I have described. It is the duty of the employer to eliminate the tendency to limit production. First of all we must get rid of the suspicion sedulously fostered by some politicians that an increase in production from a given plant is against the interest of the workman, and that it is sought solely for the employers' good. We of the Textile Institute have a duty in correcting the atmosphere of distrust.

I remember talking to a well-educated Chinaman some thirty years ago whose advice I have found invaluable. He told me that in China they had been ruling a vast mass of humanity for centuries, and that their political philosophy in dealing with men was this. You must treat them as you would fry a small fish—gently. We see the outcome of a change in this policy in the China of to-day. Is it too much to suggest that whilst it is impossible in the great businesses of our time that the directors shall have an intimate acquaintance with all the workpeople, it shall be possible to think and act towards them as partners in the business and as friends? I am not thinking of any system of economic co-partnership, because I have found that workmen desire to be paid week by week the maximum amount that a business can afford to pay. I am thinking of the co-partnership of spirit and intent, which, by making production on fuller and better lines adds to the welfare and economic betterment of all.

I would like to see the whole of our workpeople technologists in the real sense of the term. That is to say, that each individual should understand something of the why and wherefore of the trade in which he is employed, that he should have a view of the beginning and the end, and a very particular knowledge as to the part he plays in the programme. This would widen not merely his outlook but his interests, add to his content, and make him a better citizen from every point of view. To this end we must work. And it may be that

if a successful business man desires to give to posterity something of worth, his mind may be directed to the fact that whilst churches and chapels, libraries and art galleries are desirable and necessary, the premier obligation is to feed and clothe the bodies of humanity. He may be shown that the problem is an increasingly difficult one, but we have men in our midst who, if properly supported, are capable of measuring the opportunities of our time, and by analysis, deduction, and inference can show us how the difficulties can best be overcome.

I trust you will pardon me for inverting the usual order upon which an address of this character is framed, and placing an analysis of the human problem in the foremost place. But my excuse is this—I feel that whatever we do in other directions, unless we work together as a team, the business men and the manual workers, tolerating neither laziness nor slackness in either section, cultivating the idea that to sit at the banquet of life and to rise without paying a proper price is immoral, we shall in no wise solve the problem of again welding our race into a harmonious whole.

DISCUSSION

Mr. John Crompton, Chairman of the Institute, in opening the discussion, said he found very little to criticise in Mr. Howarth's views as expressed in the paper. With regard to the statement that the operatives failed to make any contribution towards improvement, however, that had not been his own experience. In his own firm very valuable contributions had been made by the operatives. In his opinion the work that had been done in the Technical Schools of Lancashire during the last twenty years had helped very largely towards the salvation of the cotton industry during its recent trying times. It had enabled them, for instance, to take up successfully the making of fancy goods when plain goods went out of fashion.

Mr. John Emsley, in moving a vote of thanks to Mr. Howarth, said that a cheap and abundant supply of raw material was the first essential to industry. Lancashire in recent years had been cursed with dear raw material, but now cotton had become a very cheap commodity, it was on the eve of an era of greater prosperity. In the wool industry they had not the quantity of wool they would like to see, nor did they think it was as cheap as it ought to be. By scientific methods sufficient wool should be produced so that the producer could get a fair reward for his labour. Having got the raw material, the next thing was to have a factory equipped with machinery capable of dealing with it efficiently, so that the physical toil of the employee could be lessened as far as possible. When they had got the raw material and the machinery, they were still dependent on the human element, and unless they had well-educated and contented workers, they could not get the best out of raw material and machinery. Even when they had all those three things, it was still necessary to sell what was made. That had been a problem for a long time in Bradford, but it was a problem which was being tackled. The Bradford Technical College had been asked to undertake the training of salesmen. The magnificent Scholarship scheme of the Bradford Chamber of Commerce also helped in that direction by enabling young men to perfect their knowledge of foreign languages.

Mr. W. A. Elliott, Chairman of the Bradford Textile Society, seconded the vote of thanks, which was heartily accorded.

NOTES AND NOTICES

Institute's Annual Conference, 1928

At the September meeting of the Council, consideration is to be given to the question of the locale of next year's Annual Conference of the Institute. It has been felt that arrangements have not always been considered sufficiently far in advance. For next year's fixture, therefore, it is regarded as desirable that not only should there be early consideration of the matter, but that ample opportunity be given for suggestions. Section Committees have been invited to offer recommendations. The Lancashire Section Committee has recommended a Continental visit—preferably Germany, with Cologne as centre—whilst the Irish Section Committee also supports a visit to the Continent. It is, of course, open to any individual member to send in a suggestion before the September meeting of Council.

Diplomas of the Institute : Regulations

For several months past a Sub-committee of the Selection (Diplomas) Committee has been engaged on the preparation of regulations concerning applications for the Fellowship and Associateship of the Institute. The regulations, which will be supplementary to the by-laws, are to be accompanied by a syllabus for the Institute's examination in General Textile Technology—an examination in connection with applications for the Associateship. The new regulations have yet to be considered by the full Selection Committee, prior to presentation to Council for final sanction; therefore they are not likely to be available until somewhat late in the present year. The Selection Committee deliberately delayed the framing of regulations until they had secured a reasonable measure of experience in dealing with applications and in conducting examinations. The announcement may be usefully recorded here that the next examination under the direction of the Selection Committee has been fixed to take place at the Institute headquarters on the 5th October.

Lancashire Section of the Institute

The programme of meetings of this Section for the next winter session was considered at a recent meeting, when it was agreed to aim at the provision of a short series of papers on the subject of Colour Fastness—from the point of view of the maker, the user, the merchant, and the launderer. The meetings for these contributions will take place at the Institute headquarters, during luncheon interval, at 1.15 p.m., for the most part on Fridays. It has also been decided, owing to representations from members, that two or three meetings shall be held in the evening in the course of the session. Regarding the promotion of meetings in various districts, the Propaganda Committee has considered arrangements for these events, and agreed to hold meetings at Nottingham, Rochdale, Bolton, and Edinburgh, the last-named to be in connection with a visit to the Textile Exhibition to be held from the 5th to the 15th October.

Special Issues of this Journal

This year, a change has been effected in the method of publication of the Papers presented at the Institute's Annual Conference. The record of the proceedings at Bolton, during Whit-week, has been placed in a special issue of the *Journal*, supplied free to Members. A limited number of copies of this particular issue are available for general subscribers at 5s. each. Members may secure additional copies at half the subscription named, whilst special rates can be quoted for supplies to colleges and schools for distribution to students. The Institute has taken a leading interest this year in the arrangement for the contribution of Papers of textile interest to be delivered in connection with the Annual Meeting of the British Association at Leeds during August, and it is expected that arrangements may be effected whereby the Papers can be published

by the Institute. If so, a further special issue of the *Journal* is contemplated, to cover the whole of the contributions—about sixteen in all. Similar facilities will be offered as to extra or additional copies, but further announcement as to the publication will appear in a later issue.

Textile Institute Diplomas

Election to Fellowships and Associateships of the Institute have been completed as follows since the publication of the previous list—

Fellowships

ANDERSON, Francis (Portadown, Co. Armagh)
 BUCKLEY, Charles Kendrick (India)
 DOBSON, Benjamin Palin (Bolton).
 LEE, Harold (Manchester).
 OLLERENSHAW, Arthur (Halifax).
 PRESTON, Robert Smith (Simonstone, near Burnley).

Corrigendum

Owing to a printers' error a mistake has arisen in the paper by Mr. T. M. Lawson in the June issue of this *Journal*. On page 1246, line 10, the denominator in the equation $x = \frac{wv^2}{64 \cdot 4}$; should read as given here, and not as printed. Members are asked to make the correction, and regret is expressed that this error should have occurred.

Institute Membership

At the June meeting of the Council of the Institute, the following were elected to membership—Percy Addison, 3 Fishwick View, Preston, Lancs. (Designer); John Ainscow, Bee Hive Mills, Lostock, Bolton (Chairman, Bolton and District Manufacturers' Association); George A. Armett, 341 Manchester Road, Walkden, nr. Manchester (Assistant Weaving Manager); Herbert Barker, 52 Bradshawgate, Bolton, Lancs. (Secretary, Bolton and District Engineering Employers' Association); Sydney G. Barker, British Research Association for the Woollen and Worsted Industries, Torridon, Headingley, Leeds (Director of Research); Burjar P. Bharucha, c/o H. N. Wadia, Esq., No. 71, 10th Lane, Khetwadi, Bombay, India (Assistant Spinning Master); Garrod Bennett, Eden & Thwaites Ltd., Waters Meeting Bleach Works, Bolton (Bleachers' Manager); James W. L. Brooks, "Brooklyn," Shipley, Yorks. (Textile Designer); William H. Catterall, The Croft, "Heyhouses," St. Annes-on-Sea (Cotton Spinner); Herbert John Davys, c/o Davys Proprietary, Ltd., Phillip House, Phillip Street, Sydney, New South Wales, Australia (Sewing Cotton Manufacturer); John Adam Dawson, 158 Walmersley Road, Bury, Lancs. (Textile Traveller); Charles A. Fromings, 17 Philpot Lane, E.C.3 (Export and Import Merchant); Henry S. Golland Dunstan, Eccles, Lancs. (Cotton Manufacturer); James Hill, 112 Hulton Lane, Bolton, Lancs. (Manager, Howe Bridge Spinning Co. Ltd.); Sir George Holden, Bart., "The Firs," Leigh, Lancs. (Cotton Spinner); Charles H. Holgate, c/o Cannon Bros. Ltd., Stanley Mills, Bolton (Director); George Isherwood, Grecian Mills, Lever Street, Bolton (General Manager); Stanley Isherwood, 3 Singleton Avenue, Brightmet, Bolton (Spinning Overlooker); Joseph Mitchell, 21 Deepdale Road, Preston (Winding Master); John A. Nuttall, Marklands, Markland Hill Lane, Bolton (Director, Cotton Spinning Co.); Arnold C. Openshaw, 39 Harpers Lane, Bolton (Cotton Spinner); Wm. Orrell, 18 Crompton Way, Bolton (General Secretary, Managers', Carders', and Overlookers' Association); W. Postlethwaite, 137 Deane Church Lane, Bolton (Head Carder); E. R. Schwarz, 167 Ferry St., Lawrence, Mass., U.S.A. (Instructor); William Sever, Textile Department, The University, Leeds (Independent Research); E. M. Shelton,

c/o Cheney Bros., So. Manchester, Conn., U.S.A. (Chief Chemist); K. Z. George Soung, John Hetherington & Sons, 7, Hankow Road, Shanghai, China (Manager); B. Tayabali, Bhuidi Bazar, Dhaboo St., Bombay-9, India (Assistant in Textile Department); S. H. Taylor, Begg, Sutherland & Co., Cawnpore, India (Merchant); E. Ashmore Thompson, Robert Broadbent & Sons, Ltd., Phoenix Works, Stalybridge (Engineer); O. E. Unruh, 12 Clarendon Place, Manningham, Bradford (Textile Designer); J. A. Walsh, Manor House, Brightmet, Bolton (Manager); W. H. White, c/o Carboniser Pty. Ltd., Henty House, 501 Little Collins Street, Melbourne, Australia (Wool Scourer and Carboniser); J. G. Whitehead, Brooklands, Swinton, Lancs. (Secretary and Director, Cotton Spinning); Joseph Wild, 17 Grosvenor Road, Birkdale, Southport (Cotton Spinner); W. H. Wilkinson, 41 Shirley Road, Gomersal, nr. Leeds (Chemist); C. U. Reynolds, Alderley, South Drive, St. Annes-on-Sea (Director and General Manager, Stockport Doubling Co.).

REVIEWS

Ueber die Herstellung und physikalischen Eigenschaften der Cellulose-Acetate. By Victor E. Yarsley. (Berlin, Julius Springer, 1927, 47 pages, 3 gold marks.) Dr. Yarsley rightly states in this dissertation that it is impossible to obtain a clear insight from the published literature, especially the patents specifications, into the chemistry of acetate silks. He gives a useful summary of this literature and sets out to answer these questions, (1) how is the primary tri-acetate obtained, and particularly which of the patents are workable? and (2) how may the tri-acetate be converted into an acetate which can be spun? His experimental evidence on these points is most valuable and fills a conspicuous gap in our knowledge of cellulose acetate artificial silk. The pamphlet describes the successful production of the primary acetate starting with 200 gram batches of cotton, the partial hydrolysis of this with 95 per cent. acetic acid to the spinnable secondary acetate, and the control of the products by analytical and viscometric methods. —J.C.W.

The Wool Year Book, 1927. Compiled by the Editor of *The Textile Mercury* and various contributors. Published by Industrial Newspapers Ltd., London and Manchester (640 pp. and Index, 7s. 6d. nett).

This is the nineteenth edition of what may justifiably be described as a well-known annual. It has been enlarged both in page size and in contents and the additions have both improved the appearance of the book as well as its subject matter. Among the additions made are a review of wool research contributed by the British Research Association for the Woollen and Worsted Industries; an article on winding of woollen and worsted yarns and several additional sections to that part of the book dealing with hosiery. A complete section has been added dealing with artificial silk. The statistical sections have been revised and brought as far up to date as the exigencies of printing so large a volume permit. One good feature of the book is the list of technical colleges and schools supplied and a similar list would be valuable if included in the companion volume —The Cotton Year Book. This annual in its new form undoubtedly maintains its reputation and should be in general distribution throughout the wool textile industry. —H.L.R.

Journal of the Bradford Textile Society. Session 1926-1927. Published by the Society (price to non-members, 10s. 6d.).

Though, throughout the course of the year, many of the lectures delivered to the Bradford Textile Society are reported in the pages of the *Journal* of the Institute, the issue of the annual volume of the Society cannot pass unnoticed. The volume is attractively produced and well printed, while the practice of providing a full list of lecturers and their subjects since the foundation of the Society is extremely praiseworthy. Members of this Institute will note with distinct satisfaction that the Chairman of our Yorkshire Section for the 1926-27 session is for the following session President of the Bradford Textile Society; Mr. Henry Binns, F.T.I., is to be heartily congratulated. There can be little doubt that his

year of Presidency will deserve to rank with those of the distinguished gentlemen who have preceded him. The Society may feel justly proud of the series of volumes recording their annual proceedings which have been issued.

H.L.R.

Index Generalis, 1926-1927. Editions Spes, Paris:

This directory which, with the exception of 1920, has appeared annually since 1919, is devoted to the constitution of the universities, technical schools and educational institutions of the world. The names of professors and their subjects are also given. Particulars of academies, astronomical observatories, scientific and learned societies are supplied, while information is given concerning the more important libraries, dealing with such subjects as days and hours of admission, and any special feature for which they are notable. The book also contains a list of writers who are willing to exchange publications with fellow workers and the hope is expressed that this list will bring together research workers in a way that may prove mutually valuable. This latest edition has been presented to the Institute by the Publishers and constitutes a valuable addition to the library.

H.L.R.

GENERAL ITEMS AND REPORTS

The Colour Users' Association Annual Meeting

Addressing the gathering, Mr. H. Sutcliffe Smith, the Chairman, said that the Dyestuffs (Import) Regulation Act had still $3\frac{1}{2}$ years to run, and that the Association was still necessary to safeguard the interests of colour users. During the year 5,800 applications for licenses had been dealt with, and the number granted was an increase over the two previous years. It was a matter for serious consideration by British manufacturers of dyestuffs that it was yet necessary to license the import of nearly 1,900 tons of colour, value £944,000. From certain statistics he deduced that the general level of dyeware prices was considerably higher than pre-war, and that the type of colour which was now being used was of a much better quality, with a consequently higher price. The textile trade to-day was giving a much higher standard in dyeing and finishing than before the war. The "Joint Technical Committee" had done useful work in revising the "non-contentious" list, i.e. the list of colours for which no adequate substitutes were made in this country. Upwards of 2,000 products had come under review. With regard to the formation of Imperial Chemical Industries, Ltd., the general views of users were that large combinations gave the best economic results. The fear was that by the elimination of selling competition the users might be exploited, not only nationally, but internationally. On the whole, however, the new combination should prove beneficial. The British dyestuffs industry was now producing 10 per cent. of the world's output as against 3 per cent. in pre-war days. The range of dyestuffs produced was steadily extending, and technical services offered to consumers were better to-day than ever. He gave figures to show that the export of British dyestuffs had increased very much since the war, but that the figures for 1926 were much below those of 1925. Until we could produce on an adequate scale prices would not be brought down to their lowest level. There was need for the establishment of a scheme whereby the expert knowledge and power for research embodied in our University organisations might be utilised to the fullest extent in the practical laboratories of manufacturers. There was considerable scope for close liaison between academic and practical institutions. They had only to consider the great progress made in the German chemical industry by arrangements of this nature. With regard to research work, he suggested that more emphasis should be laid on the possibilities of a closer relationship being established between manufacturers, universities, and research institutions. This would lead to a more economical use of the services and would prevent overlapping. In conclusion, he directed the attention of his audience to the necessity for continued combined effort, vigilance, and wise policy. The Association's efforts and energies must not be allowed to decrease. It had been gratifying to him during the past six strenuous years as Chairman, to have seen many signs of an increasing goodwill and helpfulness between dyemakers and users, whose interests were so indissolubly interwoven.

21.—THE INFLUENCE OF HUMIDITY ON THE ELASTIC PROPERTIES OF COTTON ON THE BREAKING LOAD AT 20° C.

By JAMES CAMERON MANN, M.A., B.Sc., A.Inst.P.
(The British Cotton Industry Research Association)

INTRODUCTION AND SUMMARY

An investigation into the effect of humidity on the breaking load of single hairs is a necessary preliminary to any attempt to explain humidity effects on the strength of yarns. The importance of humidity in affecting the physical properties of cotton has long been recognised by the industry, but although it is generally known that the strength of yarns increases with increasing humidity, the effect does not admit of an immediate, simple explanation, as it may be due to one or other, or both, of two main causes. This strengthening of the yarn may be produced by an actual increase in the strength of the single hairs, the individual units of which the yarn is built up; it may, on the other hand, be caused rather by a change in the structure of the yarn, that is, although the actual strength of the material may not increase, a strengthening of the yarn may result from the increased clinging power of the hairs due to changes in their elastic properties. It seems more probable, however, that the complete explanation will be found in a combination of the two effects and it was as a first step in the elucidation of this problem that the present investigation was undertaken.

Willkomm (quoted by Heermann²) has investigated the effect of humidity on the strength of cotton hairs, and has shown not only that the strength of the hairs increases in general with increasing humidity, but that the hairs attain a maximum strength in the neighbourhood of 80 per cent. R.H., the strength again falling off as saturation is approached. His results were obtained, not by breaking the hairs individually, but by breaking them in bundles, and he estimates that from 40-80 per cent. R.H. the strength of cotton hairs increases by about 30 per cent.

During the course of the present research, a paper was published by Obermiller and Goertz³ on the strength of textile fibres when wet. They demonstrated the increased strength of cotton at saturation by comparing the breaking load of a sample broken when thoroughly wet and actually immersed in water, with the breaking load of a sample broken at ordinary humidities. They give the "relative wet strength" of cotton as 110-120 per cent., where by "relative wet strength," they mean the wet strength expressed as a percentage of the "dry strength" of the cotton. (By "dry strength" they appear to mean merely the strength at atmospheric humidities and not the strength at dryness, as might be expected.) Their range of ordinary humidities, and hence of "dry strengths," was limited, so that their results give practically no information as to how the strength of cotton hairs varies continuously over a definite range of humidities. They do point out, however, that atmospheric humidity influences the "relative wet strength," but

that for cotton and wool the effect is not clearly defined. As only 100 observations, at most, were made at each humidity and no special precautions taken in preparing the samples, it is just possible that the resulting rather large probable error of the breaking loads and the possible random variations from sample to sample may have obscured any general tendencies in the effect. They state that Willkomm's claim for a maximum strength about 80 per cent. R.H. requires further demonstration, although from the table of results published no attempt seems yet to have been made by them to verify the claim, as no humidity in the neighbourhood of 80 per cent. R.H. is mentioned.

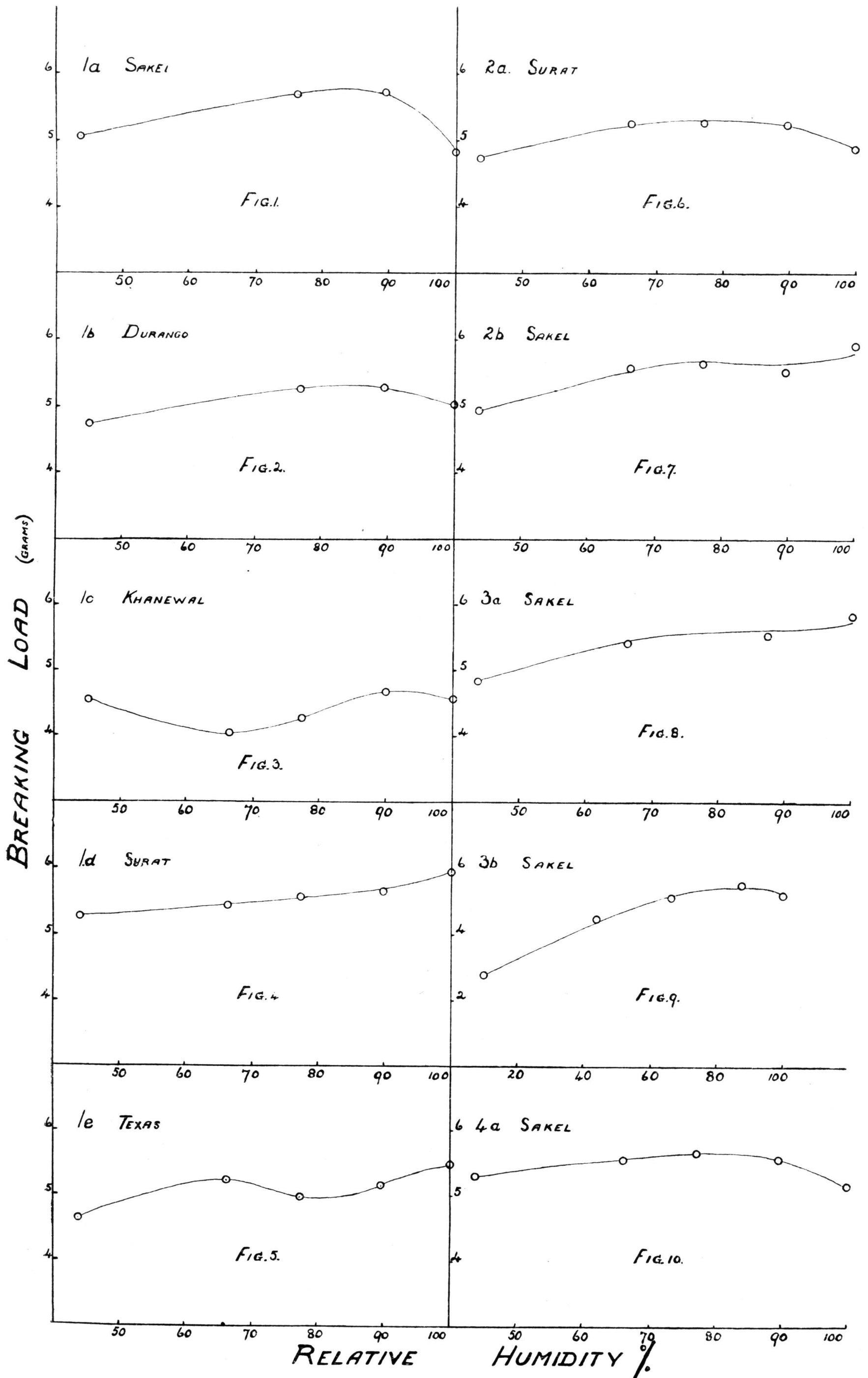
In the present research, the hairs were mounted on paper grips and broken at different humidities on an improved type of O'Neill apparatus¹ at a rate of loading of 0.1 gm. per sec. One series was carried out at a higher rate of loading on a torsion balance hair tester.

Solutions of calcium chloride of various concentrations were used for conditioning the hairs and the same solutions were used in the O'Neill apparatus, so that the hairs were broken over the same solution as had been used to condition them. To obtain results at saturation, the hairs were mounted on torsion pendulums, immersed in distilled water, and broken on an O'Neill apparatus which also contained distilled water.

Of the first five cottons tested, the samples broken at each humidity were a random selection from a carefully prepared small sample of the variety, but although this method of sampling was sufficient to show a general increase in strength with increasing humidity, it was not stringent enough to show any general tendencies in the form of the relationship between the two factors. In fact, one of the greatest difficulties to be overcome in such an investigation is to avoid the introduction of spurious results due to imperfections in sampling. This difficulty in single hair work cannot be over-emphasised and it is discussed fully in the text. It is shown that where it is desired to reveal an effect and not to obtain a representative value of the breaking load of a sample, the most satisfactory method of sampling is to use median hairs from a Baer diagram and to render the samples as similar as possible by hair weight determinations. It is further shown that consistent and reliable results can only be obtained when the various samples to be tested under various conditions are prepared at the same time from the same small sample. This method of sampling was therefore carried out in all the subsequent series and more consistent results obtained.

Absolute control of the humidity conditions was not claimed, so long as the hairs were conditioned in a conditioning chamber, removed through the atmosphere of the laboratory to the O'Neill apparatus and broken there with the top of the O'Neill instrument enclosed, but an attempt to attain absolute control was made by testing the hairs in the same atmosphere as that in which they were conditioned. A convenient humidity control box for this purpose is described. It is designed to take several types of instruments, access to them being obtained through two arm-holes in the front of the box. Two series were carried out in this way and they showed close agreement with previous series, done under less stringent conditions.

A convenient method of determining the humidity conditions in a conditioning chamber which does not allow of the use of the ordinary methods is described, in which use is made of the sensitivity of the rigidity of cotton hairs to changes in humidity⁵.



The variety tested most thoroughly was a high-grade Egyptian, Govt. No. 30 Ex. Super Sakel, but series were also carried out on New Guinea Durango, Khanewal, Surat 1027 A.L.F., and Texas, at a range of humidities of from 44 per cent. R.H. to saturation. To bring out more definitely the effect at low humidities, one series on Sakel, carried out in the humidity control box, was extended to include a value of the breaking load at 10 per cent. R.H.

The curves of breaking load plotted against R.H. per cent. for the individual series are given in Figs. 1-10, for the range 44 per cent. R.H. to saturation, with the exception of Fig. 9 which shows the series on Sakel extended to include a value of the breaking load at a very low humidity. A curve of more general significance, however, was drawn from the collected results of the nine series, by plotting the mean values of D/σ against the corresponding R.H. per cent., where D is the deviation of each mean breaking load from the grand mean of its own series and σ is the standard deviation of the individual results of the series. (Fig. 11.)

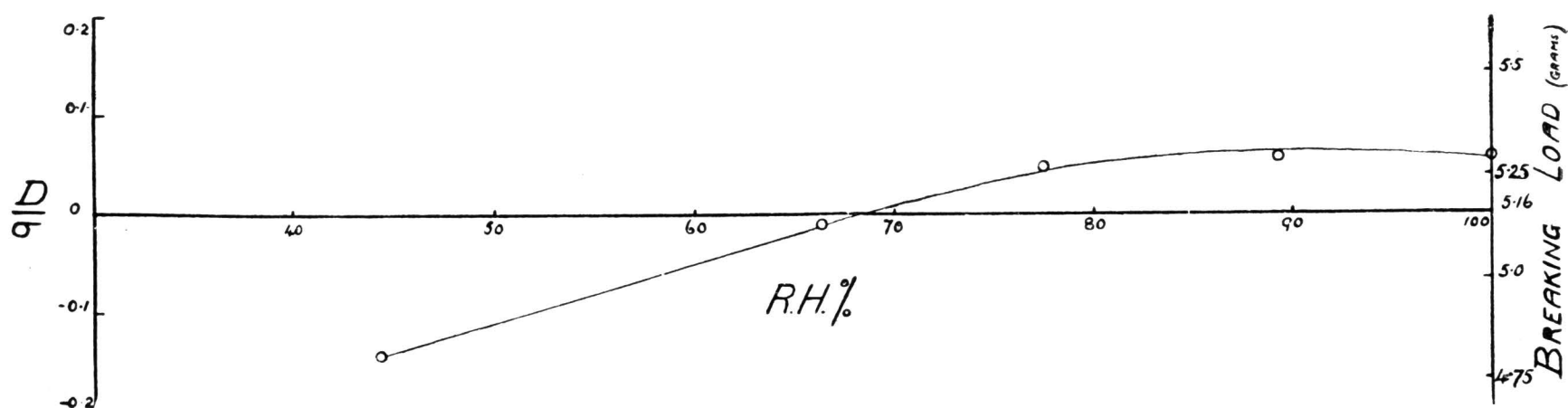


FIG. 11

The results of nine series are analysed in detail individually and statistically, and it is shown that the strength of single hairs does increase with increasing humidity, the increase being of the order 10-15 per cent. of the breaking load at 44 per cent. R.H., in fairly good agreement with the results of Obermiller and Goertz³ for the magnitude of the effect, but a much smaller estimate than that given by Willkomm². The relationship between strength and humidity is not linear, the curve flattening out above 66 per cent. R.H. but showing no conclusive evidence of a maximum in the neighbourhood of 80 per cent. as claimed by Willkomm². It is further shown that at low humidities up to 66 per cent. R.H., humidity plays an important part in determining the strength of a sample of single hairs, but that above 66 per cent. R.H. the effect is negligible.

EXPERIMENTAL METHODS

Instruments and Control Solutions

The instrument used for the determination of breaking load was an improved type of O'Neill apparatus¹, the hairs being broken at a rate of loading of 0.1 gm. per sec. In a previous paper¹, a rate of loading of 0.5 gm. per sec. was suggested as being more suitable for use with the O'Neill tester, but the present investigation having been commenced before that earlier work was completed, the lower rate of loading was adhered to throughout, so that all the results would be comparable and capable of collection for statistical analysis.

The hairs were conditioned over solutions of calcium chloride, whose concentration varied according to the R.H. per cent. required. The solutions

were standardised by means of density measurements, according to the following table—

Gms. CaCl ₂ per 100 gms. water	...	...	15	20	30	40	60
Density at 15° C.	...	...	1.115	1.150	1.213	1.272	1.374
R.H. per cent. at 20° C.	...	...	89.7	87.5	77.4	66.3	43.9

Method of Testing

The hairs of the first five varieties tested, viz., Sakel, New Guinea Durango, Khanewal, Surat, and Texas, were mounted on paper grips—except those tested at saturation—and were conditioned in a desiccator for about sixteen hours over a solution of calcium chloride, whose concentration depended on the R.H. per cent. required. To obtain results at saturation, the hairs were mounted on torsion pendulums, soaked in distilled water overnight and broken on an O'Neill tester in which the liquid was also distilled water.

No special precautions were taken in sampling, beyond trying to obtain at each humidity the breaking load of a perfectly random selection of hairs. A small sample was prepared from the larger sample available in each case and, after thorough mixing by repeated drawing and doubling, five groups of 200 hairs each were selected at random, each group being broken at a different humidity. The only precautions taken to ensure that the hairs were broken at the same humidity as that in which they were conditioned, were to have the same liquid in the O'Neill apparatus as was in the desiccator and to break the hairs as quickly as possible after transference to the tester, with the top enclosed while the hair was being broken. It was not found convenient to control the temperature by enclosing the apparatus in a thermostat, but by careful manipulation of the windows and radiators in the laboratory, it was found possible to maintain the laboratory at approximately 20° C. with a variation of less than a degree on either side. In this way, absolute control of the conditions could not be claimed, as the hair had to be transferred from the conditioning chamber, through the atmosphere of the laboratory, to the O'Neill apparatus, but it seemed that the conditions were sufficiently accurate to give a true indication of the effect of humidity on breaking load.

The results on the five cottons tested are given below—Series Ia-Ie—while the curves obtained by plotting breaking load against R.H. per cent. are shown in Figs. 1-5. These curves show definitely that the breaking load of single hairs increases with increasing humidity, but that, in the range studied (44 per cent. R.H. to saturation), the increase is small. A lack of consistency in the shape of the curve prevents any conclusions being drawn at this stage as to the form of the relationship between breaking load and humidity, and this is almost certainly due to imperfections in the method of sampling. The effect studied being small and the probable variations of the individual means relatively large, any general tendencies are liable to be obscured by the random variations from sample to sample. To obtain more precise information as to the magnitude and nature of the effect, stringent precautions in the method of sampling would therefore seem to be necessary to render the various samples as similar as possible.

One point in particular was brought out clearly. The value of the breaking load of Sakel and New Guinea Durango cottons had previously been determined at 66.3 per cent. R.H. when considering "*The Time Factor in Hair Testing*"¹—i.e., the results at this humidity were obtained several months previously from the same large sample of the cottons, but from a different

final sample. When these results were incorporated in the present series, the curves for Sakel and Durango showed a decided minimum at 66.3 per cent. R.H., a feature which was shown to a less degree with Khanewal, but was altogether absent with Surat and Texas. If, however, these previous results were not accepted, the curves obtained for Sakel, Durango, Surat, and Texas were more or less consistent, the curve for Khanewal alone showing signs of a minimum at 66.3 per cent. R.H. It was thus shown once more that, when dealing with a property of single hairs such as breaking load—which depends to a large extent on the abnormalities in the individual hairs—consistent and reliable results can only be obtained when the various samples to be tested under various conditions are prepared at the same time and precautions taken to render the samples as similar as possible.

Improved Method of Sampling

The main object in any investigation such as the present, is not to obtain the actual magnitude of the breaking load at each humidity of the particular variety of cotton under test—which is what is being done when the hairs broken at each humidity are a perfectly random selection from the larger sample available—but rather to reveal any differences in the values of the breaking load at different humidities. This can only be done by so choosing the groups as to reduce the possibility of variation from group to group and thereby sacrificing their value as perfectly random samples of the cotton tested. The ideal method would be to test the same hairs at each humidity, but, of course, with a destructive test such as the determination of breaking load, this is impossible.

The method adopted in later series to render the groups as similar as possible was to prepare a small sample as before, cut the hairs to a length of 15 mms. and to count out 25 bundles of 40 hairs each. These bundles were weighed on a sensitive micro-balance (1 cm. deflection = 0.0115 mgm.) and grouped into five groups of five bundles each (200 hairs), so that the mean hair weight per cm. was the same for each group. This method of sampling was described in a previous publication¹, where rigidity measurements were made as a control test. As paper grips were being used for mounting the hairs, these rigidity measurements were dispensed with in the present investigation.

Without the above precaution in grouping, the variation inherent in the cotton shows itself in two ways, (a) a variation from group to group, and (b) a variation within each group itself. By seeking to make the groups as similar as possible, the first type of variation has not been eliminated, but has merely been transferred elsewhere. It goes to increase the variation in the groups themselves and so tends to increase the probable variation of the mean value of the breaking load of each group. This result is not desirable in itself, although it is less objectionable than a variation from group to group, but it would be an obvious advantage if some method of sampling could be adopted which would tend actually to reduce the variation in the original hairs selected before grouping. An attempt was made to do this by preparing a Baer diagram of a small sample and selecting the median hairs. It seems reasonable to expect that these hairs being developed to a similar extent, will show less variability in their properties than the same number of hairs of greatly varying lengths and development. That this is the case in rigidity measurements has already been shown by Peirce.⁴

Hence, in the case of a second series on Sakel and a second series on Surat, both the above precautions in sampling were adopted and the procedure was therefore to prepare a Baer diagram, select the median hairs, cut them to a length of 15 mms., count out 25 bundles of 40 hairs each, weigh the bundles and group them into five groups, so that the mean hair weight per cm. for each group was approximately the same. Each group was broken at a separate humidity, the results of the series being given below—Series *2a* and *2b*—while the curves showing the relationship between humidity and breaking load are given in Figs. 6 and 7.

These two curves confirm the deduction made from the previous results, that the effect of humidity on breaking load is small in the range of humidities studied. They also bring out one new feature, in that they tend to show that above 66 per cent. R.H. the effect of humidity on strength is negligible. The fact that one curve shows a decrease in strength between 90 per cent. and 100 per cent. R.H., while the other shows an increase, is not a serious inconsistency, as in neither case is the difference in strength at these humidities significant.

Improved Control of Humidity Conditions

In connection with another test, a change was found when measuring the rigidity of hairs first, after conditioning them above phosphorus pentoxide in a desiccator, and secondly after transference to an O'Neill apparatus above a solution of calcium chloride giving a R.H. of 44 per cent. at 20° C., the second measurement being made about a minute after transference, that is, as nearly as could be estimated just at the time the hair would have broken if tested on the O'Neill apparatus. The change was quite definite and the speed at which it must have taken place such as to suggest the possibility of the humidity conditions changing even when the liquid in the O'Neill apparatus was the same as that over which the hairs had been conditioned in the desiccator.

An attempt was therefore made to investigate this point for the solutions used in the above series, but difficulty was found in obtaining accurate measurements of rigidity on the O'Neill apparatus and carrying out these measurements under exactly the same conditions as those under which the hairs had been broken. What results were obtained were reassuring, but as the control of the humidity conditions during the investigation might be open to question, an attempt was made to carry out a series on Sakel under the most stringent conditions possible, both as regards sampling and control of conditions.

This was done by sampling the hairs as described above and breaking them in a humidity control box, the hairs having been previously conditioned in the same box; in this way, all necessity of transferring the hairs from a conditioning chamber, through the atmosphere of the laboratory, to the O'Neill apparatus was avoided. The humidity box was a wooden box 24 in. × 22 in. × 12 in., a size which enables it to be used with various types of instruments. The front of the box was in the form of a sliding panel, which could be removed when instruments, conditioning solutions, samples, &c., were being introduced, and the whole of the inside of the box was coated with paraffin wax to prevent the absorption of moisture by the wood when high humidities were being used. There was a circular hole cut in the bottom of the box to take an O'Neill tube, the hole being provided with an annulus of thin sheet rubber, the smaller diameter of which was slightly less than

the diameter of the O'Neill tube, so that the rubber was stretched and made close contact with the glass. The box was mounted about a foot above the bench on a wooden stand, so that, although the hairs were mounted on the apparatus inside the box, the outlet of the O'Neill tube was manipulated underneath and the liquid collected in a measuring glass as usual. The reservoir of liquid for the O'Neill tube was also outside the box.

The samples were mounted on paper grips and placed in the box over one of two large dishes containing calcium chloride solution to give the required humidity conditions. As the box was not absolutely airtight, a stream of compressed air was passed into the box after passing through three wash-bottles containing a similar solution of calcium chloride, so that a slight excess pressure was set up in the box. In this way alteration of humidity conditions due to diffusion, especially when the hairs were being manipulated inside the box, was prevented as far as possible.

Access to the O'Neill apparatus was obtained by two arm-holes provided with long oiled-silk sleeves fitting tightly round the operator's wrists. To prevent any alteration of the humidity conditions in the box as a result of moisture exuding from the operator's hands, rubber gloves were worn. The arm-holes were fitted with spring doors, so that, after mounting the hair on the O'Neill apparatus and withdrawing the hands from the interior of the box, the doors closed automatically. The use of such a humidity control box does not present any real difficulty or inconvenience and so does not greatly decrease the speed of testing. With one person mounting the specimens on the apparatus and another manipulating the O'Neill apparatus outside the box, the speed of testing is greater than when the tests are carried out by one person on an O'Neill apparatus not enclosed in a humidity control box.

The humidity conditions in the box were carefully tested in each case, to ensure that the required conditions were actually being obtained. Several Sakel hairs were mounted on torsion pendulums and the period of oscillation of the pendulums determined after the hairs had been conditioned in a desiccator above a solution of calcium chloride to give the required humidity. They were then transferred to the humidity box and conditioned there along with the sample to be tested. Before starting to test, the periods of oscillation of the pendulums were again determined. If these periods were the same as in the desiccator, it was assumed that the required humidity conditions were being obtained. This timing of the pendulums was done several times during the period of test, thus indicating the constancy of the conditions in the box.

Two series on Sakel cotton were carried out in this way in the humidified box and consistent results obtained for the magnitude of the effect. The results also agreed very well with the second series of Sakel done without the box, showing that the previous results, obtained under less stringent conditions, were reliable. These results are given below—Series 3*a* and 3*b*—and the curves in Figs. 8 and 9.

The second series on Sakel done in the box was extended so as to include the value of the breaking load at a humidity below 44 per cent. R.H. The hairs were mounted as before and conditioned in the box over phosphorus pentoxide, the O'Neill apparatus containing a 60 per cent. solution of calcium chloride, with a thin layer of B.P. paraffin on the surface of the liquid to reduce the R.H. above the O'Neill apparatus. (A 60 per cent. solution gives a

R.H. of 43.9 per cent., but was used here in preference to liquids giving very low humidity conditions, as these are unsuitable for use in the O'Neill apparatus, usually owing to their high viscosity.) A stream of air was passed into the box through three wash-bottles containing concentrated sulphuric acid.

The humidity at which the hairs were broken was estimated by rigidity measurements. The rigidity of a few Sakel hairs was determined in a desiccator at dryness and at 43.9 per cent. R.H. Their rigidity was then found after conditioning in the box, when suspended from the lever of the O'Neill apparatus. To obtain a good estimate of their rigidity in the box and as a test of the constancy of the condition, the rigidity measurements were made six times during the period of test, that is, before and after each of three spells of breaking. Their rigidity was afterwards found in a desiccator at 20 per cent., 66.3 per cent., and 87.5 per cent. R.H. By plotting l/T^2 (where l is length of hair in cms. and T period of one oscillation in secs.) an estimate of the R.H. at which the hairs were broken was obtained from the curve. This was estimated to be about 10 per cent. R.H.

Series at High Rate of Loading

All the above tests were done on an O'Neill apparatus at a rate of loading of 0.1 gm. per sec. One series was now carried out on Sakel at a higher rate of loading (2.0 gm. per sec.) on a torsion balance hair tester, to determine if rate of loading had any effect on the relationship between strength and humidity. The results (Series 4a) are shown plotted in Fig. 10, but the curve does not present any new features and is essentially the same as that obtained at the lower rate of loading.

EXPERIMENTAL RESULTS

The following tables show the mean values of breaking loads obtained at various humidities.

Table I.

Random sampling. Hairs conditioned in desiccator and broken on O'Neill apparatus. Two hundred observations at each humidity. Rate of loading = 0.1 gm. per sec.

No. of Series	Sample	Breaking Load (gms.) at				
		44.4 per cent. R.H.	66.4 per cent. R.H.	77.1 per cent. R.H.	89.7 per cent. R.H.	100.0 per cent. R.H.
1 (a)	Govt. No. 30 Ex. Super Sakel ...	5.06 ± 0.10	—	5.68 ± 0.11	5.71 ± 0.12	4.81 ± 0.10
(b)	N. Guinea Durango	4.72 ± 0.12	—	5.27 ± 0.13	5.28 ± 0.14	5.01 ± 0.13
(c)	Khanewal ...	4.55 ± 0.09	4.02 ± 0.09	4.28 ± 0.10	4.68 ± 0.10	4.59 ± 0.10
(d)	Surat 1027 A.L.F....	5.29 ± 0.12	5.41 ± 0.13	5.56 ± 0.13	5.63 ± 0.12	5.96 ± 0.13
(e)	Texas ...	4.64 ± 0.11	5.22 ± 0.12	4.99 ± 0.12	5.16 ± 0.13	5.49 ± 0.12

Table II.

Sampling controlled by weighing bundles of median hairs. Hairs conditioned in desiccator and broken on O'Neill apparatus. Two hundred observations at each humidity. Rate of loading = 0.1 gm. per sec.

No. of Series	Sample	Breaking Load (gms.) at				
		43.9 per cent. R.H.	66.3 per cent. R.H.	77.4 per cent. R.H.	89.7 per cent. R.H.	100.0 per cent. R.H.
2 (a)	Surat 1027 A.L.F.	4.71 ± 0.11	5.26 ± 0.13	5.27 ± 0.12	5.22 ± 0.13	4.88 ± 0.13
(b)	Govt. No. 30 Ex. Super Sakel ...	4.92 ± 0.09	5.59 ± 0.11	5.64 ± 0.11	5.52 ± 0.12	5.91 ± 0.11

Table III.

Sampling controlled by weighing bundles of median hairs. Hairs conditioned and broken (on O'Neill) in humidity box. Two hundred observations at each humidity. Rate of loading = 0.1 gm. per sec.

No. of Series	Sample	Breaking Load (gms.) at				
		10.0 per cent. R.H.	43.9 per cent. R.H.	66.3 per cent. R.H.	87.5 per cent. R.H.	100.0 per cent. R.H.
3 (a)	Govt. No. 30 Ex. Super Sakel ...	—	4.84 ± 0.10	5.42 ± 0.11	5.53 ± 0.12	5.84 ± 0.12
(b)	Do. (2nd Series) ...	2.77 ± 0.07	4.49 ± 0.09	5.13 ± 0.11	5.56 ± 0.15	5.20 ± 0.11

Table IV.

Sampling controlled by weighing bundles of median hairs. Hairs conditioned in desiccator and broken on torsion balance hair tester. Four hundred observations at each humidity. Rate of loading = 2.0 gms. per sec.

No. of Series	Sample	Breaking Load (gms.) at				
		44.0 per cent. R.H.	66.2 per cent. R.H.	77.4 per cent. R.H.	89.7 per cent. R.H.	100.0 per cent. R.H.
4 (a)	Govt. No. 30 Ex. Super Sakel ...	5.30 ± 0.08	5.57 ± 0.09	5.68 ± 0.08	5.58 ± 0.09	5.16 ± 0.09

Table V.**Generalised Results (Series 1 (a) to 3 (b).)**

Grand Mean Breaking Load = 5.16 gms. Mean σ = 2.38 gms.							
R.H. per cent.	44.2	66.3	77.2	89.2	100.0
D/ σ	-0.141	-0.011	0.048	0.056	0.056

DISCUSSION OF RESULTS

That the breaking load of single hairs does in general increase with increasing humidity can be seen from the curves obtained by plotting breaking load against R.H. per cent., but these curves also show that, in the range of humidities studied (44 per cent. to saturation), the effect is comparatively small. The curve obtained from results at a high rate of loading on a torsion balance hair tester, shows essentially the same characteristics as the other curves, so that rate of loading does not seem to play an important part in the effect. The detailed discussion of results will therefore be confined to an examination of the results obtained on the O'Neill apparatus.

Although there is a general increase in strength with increased humidity, the curves seem to indicate that the relationship is not linear, but, owing to the smallness of the effect and the fact that the probable variation of each breaking load is of the order ± 0.1 gm., they do not exhibit any consistent form, especially at the higher humidities. Five of the curves show a maximum strength at about 80 per cent. R.H., but the other four do not—all, however, seem to show a flattening out above 66 per cent. R.H. Willkomm² has already brought forward evidence of a maximum strength of cotton hairs in the neighbourhood of 80 per cent. R.H., although in a recent paper Obermiller and Goertz³ suggest that this claim for a maximum requires further proof. The results of the present investigation fail to establish the existence of this maximum, although as many as 8,200 observations were made. Only five out of nine individual curves show it, and when the results of all the series are collected and analysed generally, no evidence is obtained on which to base any support for Willkomm's contention. It will be shown later that above 70 per cent. R.H. the effect of humidity on strength is negligible, so that, in any case, the question of a maximum in the neighbourhood of 80 per cent. R.H. is of no practical importance.

With the exception of Khanewal, which shows a decrease, all the series show an increase in strength from 44 per cent. to 66 per cent. R.H., and of these increases, seven are statistically significant. (In the case of series 1*a* and 1*b*, no result being available at 66 per cent. R.H., the difference between the results at 44 per cent. and 77 per cent. R.H. were taken.) If all possible differences between any pair of values of breaking load at humidities between 66 per cent. and 100 per cent. R.H. inclusive are found, forty-two such differences are obtained and of these only six are statistically significant, two of the latter being negative. This in itself is not sufficient evidence to warrant any definite statement, but it would seem to suggest that below 66 per cent. R.H. there is a real increase in breaking load with increase in R.H., but that above 66 per cent. R.H. the effect is negligible.

That the effect of humidity above 66 per cent. R.H., if not actually negligible, is certainly smaller than the effect at lower humidities, can be shown by calculating the correlation ratio (η) for series 3*b* first for the range 44 per cent. R.H. to saturation, and then including the value of the breaking load at 10 per cent. R.H. The value of η increases from 0.166 ± 0.023 to 0.425 ± 0.017 . This increase is simply due to the fact that the portion of the curve at which the effect of humidity is greatest has been extended by increasing the range to include the lower humidities and the flattening out of the curve above 66 per cent. R.H. has become relatively less important. The low values of η show how small is the effect of humidity in comparison with the other random variations which affect the strength.

The results of the nine series (excluding the result at a low humidity in series 3*b*) were collected, and the total number of observations thus obtained analysed statistically. As the series had not all been carried out on the same cotton, the various results were made comparable by expressing each as a deviation (D) from the mean of its own series and dividing each of these deviations by the standard deviation (σ) of all the individual results of that series. In this way the values of the correlation ratio and coefficient, r , were determined for the 8,200 observations available and found to be—

$$\eta = 0.0805 \pm 0.0074$$

$$r = 0.0728 \pm 0.0074$$

These values are again small, and although η is greater than r , the difference is not significant. The value of η obtained, however, is more than ten times its probable variation ($p.v.$), thus showing the significance of the effect of humidity on strength between 44 per cent. R.H. and saturation.

A determination of the value of the correlation ratio was now made for the 6,400 observations at humidities varying from 66 per cent. to saturation, the value obtained being—

$$\eta = 0.0270 \pm 0.0084.$$

As this value of η is only just over three times its $p.v.$, the question of its significance was investigated more fully. In his "Statistical Methods for Research Workers" (p. 219), Fisher states that "to test if an observed value of the correlation ratio is significant is to test if the variation between arrays is significantly greater than is to be expected without correlation, from the variation within arrays." This was done by calculating the variance within and between arrays, and then evaluating half the difference between the natural logarithms of these variations, giving the value $Z = 0.221$, while the 5 per cent. level of significance as obtained from a table of values of Z is 0.479. It is thus shown that the value of η is not statistically significant, and hence the effect of humidity on strength, significant between 44 per cent. R.H. and saturation, is negligible above 66 per cent. R.H.

As the differences in breaking load at humidities above 66 per cent. R.H. are not significant, an idea of the magnitude of the effect can be obtained by comparing the breaking load of each cotton at 44 per cent. R.H. with the mean breaking load of that cotton at humidities of 66 per cent. R.H. and above. If this is done, the mean percentage increase in strength is shown to be 10.0 per cent. of the value at 44 per cent. R.H. The values given by series 3*a* and 3*b*, however, are somewhat higher, and as these series were carried out under the most stringent conditions of sampling and humidity control, these latter values are probably more reliable. Hence, a cotton tested above 66 per cent. R.H. shows an increase of from 10-15 per cent. of its strength at 44 per cent. R.H. A similar treatment of the results of

series 3*b*, extended to include the value of the breaking load at 10 per cent. R.H., gives a clear idea of the importance of humidity in determining the strength of single hairs at low humidities, as the increase in strength can now be shown to be of the order 120 per cent. of the dry strength, an estimate of the dry strength being obtained from the curve by extrapolation.

A curve of general significance was drawn from the collected results of the nine series, by plotting the mean values of D/σ against the corresponding R.H. per cent. This curve (Fig. 11) confirms the conclusions arrived at from the above detailed study of the results and shows that the breaking load of single hairs increases in general with increasing humidity, but that the effect, appreciable below 66 per cent. R.H., is insignificant above that humidity.

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22—A NEW TYPE OF FIBRE IN THE MERINO

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The new-born merino lamb has the entire body covered with fibres of different kinds, a marked contrast with the uniformity of the later fleece. Most are fine wool fibres, grouped in close spiral tufts, the foundations of the later staples; others, mainly over the lower part of the limbs, are straight, coarse, and overlapping, more like hair. In addition to these two main groups are others scattered singly among the spiral tufts, and much coarser than wool. Some of them are true kemp, the nature of which has been frequently described.^{1,4} They are a dull, opaque white, irregularly wavy in form, and since they extend above the woolly tufts, they give a loose,

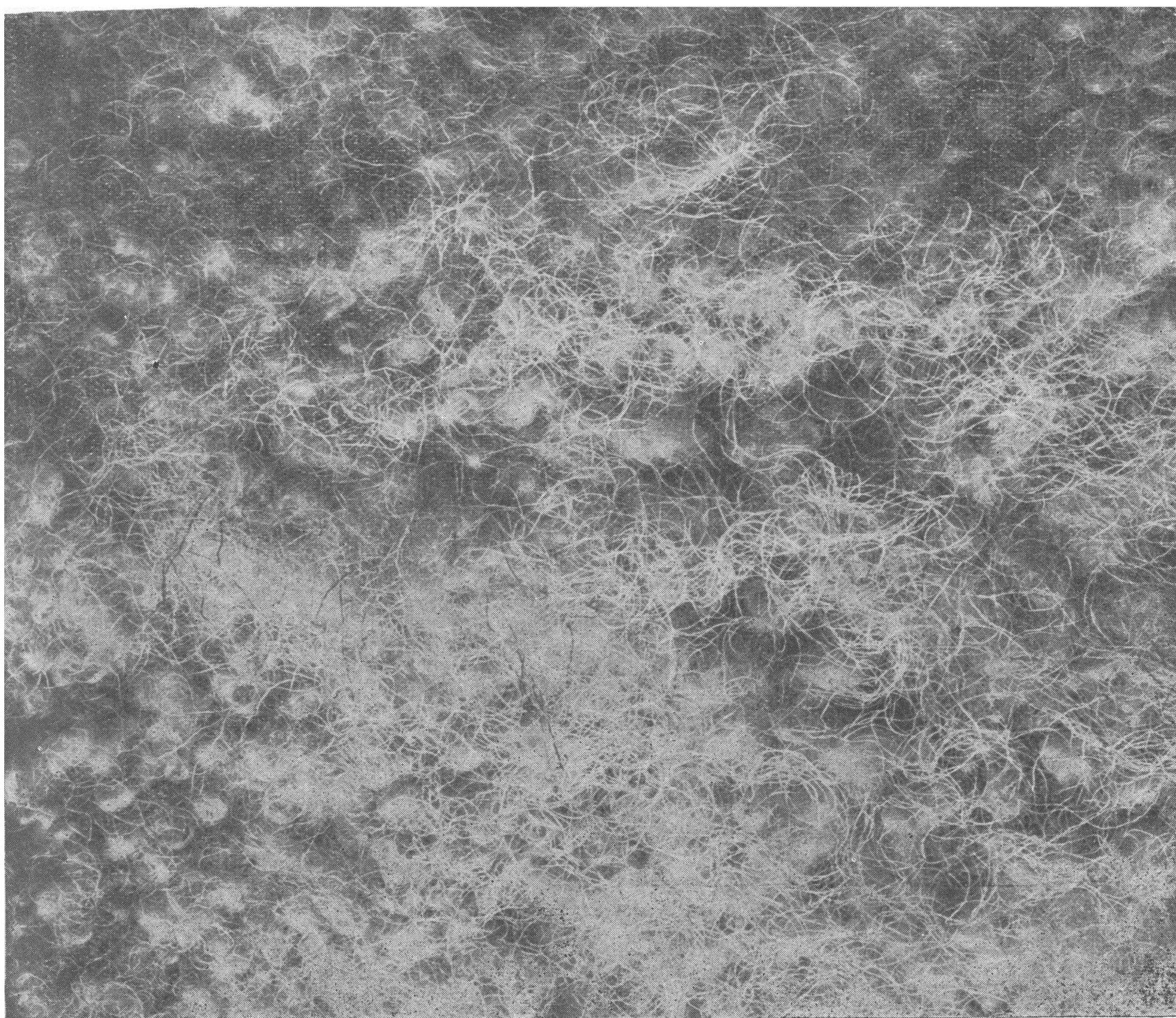


FIG. 1

Portion of fleece of Merino lamb showing the coarse medullated fibres, kemp, and heterotypes, almost covering the curly tufts of wool beneath. (The photograph, and also that of Figs. 5 and 6, were taken by Mr. J. M. A. Chisholm, of the Animal Breeding Research Department of the University of Edinburgh, through the kind permission of the Director, Dr. F. A. E. Crew.)

hairy appearance to the coat as a whole (Fig. 1). Other fibres are kempy in their upper part, in the sense that they are coarse and medullated, but are woolly below; that is, are fine and non-medullated. On account of the two wholly different types of structure, medullated and non-medullated, combined in the one fibre, they will be spoken of as *heterotypes*. They are smaller and less prominent than kemp fibres, but are intermingled with them and with the wool. Apparently they have hitherto been overlooked in studies of the merino, or confused with the kemp. In a general way they are known to the wool manufacturer, since they are a constituent of the noil from lamb's wool.

Typical heterotypic fibres from the fleece of a merino lamb are represented in Fig. 2. The apex is pointed, solid, and tapering for some distance, as in all newly-extruded hairs. The fibre gradually enlarges in diameter until it exhibits a well-developed medulla, black when viewed by transmitted light, owing to the presence of the minute air inclusions in the otherwise empty cells. The inclusions usually become discontinuous towards each end of the medullated streak. After a varying distance the fibre again narrows, the medulla disappears, and for the rest of its course it is indistinguishable from a true wool fibre, being constituted only of cortex and cuticle, the cells of which are all solid keratin. The kempy part has usually a definite sickle shape, while the woolly part is wavy, like the true wool fibres with which it is intermingled.

The degree of development of the heterotype fibres varies greatly in different lambs, usually in close correlation with the kemp. Sometimes the two will occur almost uniformly over the whole body of the lamb, and are so dense as to hide the spiral tufts of wool below (Fig. 1); at other times they are very sparse, and the tufts show up distinctly. Between these extremes are all intermediate conditions. Again, they may vary in their amount and distribution in the individual lamb; usually they are at a minimum over the shoulder, and at a maximum over the extremities—head, legs, and tail. Occasionally they show a patchy distribution.

The real distinction of the heterotypes from true kemp and wool is well shown when comparison is made of the diameter measurements. Two hundred and fifty fibres of each kind have been measured. The arithmetical means are given in the table below, and the entire series arranged in graphic form in Fig. 3. In the case of the heterotypes the measurements have been taken through the kempy part at its thickest, and separately through the woolly part.

MEASUREMENTS OF WOOL, KEMP AND HETEROTYPE FIBRES FROM MERINO LAMB. MEAN OF 250 FIBRES OF EACH KIND

Wool fibres	...	...	...	...	...	...	17.8 μ
Kemp fibres	...	...	...	...	...	...	54.4 μ
Heterotype fibres—(a) Kempy part	...	...	...	...	...	...	34.4 μ
(b) Woolly part	...	...	...	...	...	...	18.5 μ

The true wool fibres, measuring 17.8 μ , indicate a fleece of quality counts about 70's. The kemp fibres (54.4 μ) are over three times the thickness of the wool, while the kempy portion of the heterotypes (34.4 μ) is nearly twice this thickness, the woolly portion (18.5 μ) about the same as the true wool, and nearly half the thickness of the kempy. The graph shows a great lack of homogeneity in the medullated fibres (C, D) as compared with the non-medullated (A, B), a feature we find in kemp generally.

FATE OF THE HETEROTYPE FIBRES

Fortunately for the wool manufacturer, the heterotype fibres are restricted to the first few months of the lamb's existence, not having been found in the adult fleece of well-bred sheep. In general, they disappear with the typical kemp within the first three to five months. They are therefore of little direct concern to the manufacturer except in the early lamb's wool, where they are regarded with the same disfavour as kemp. In some cases the farming practice is followed of "topping" the lamb's fleece, when most of the objectionable kemp and heterotypes will be shorn off; and buyers frequently stipulate topped lamb's wool in order to avoid the coarse medullated fibres of the natal fleece. Ordinarily the heterotype fibres are shed

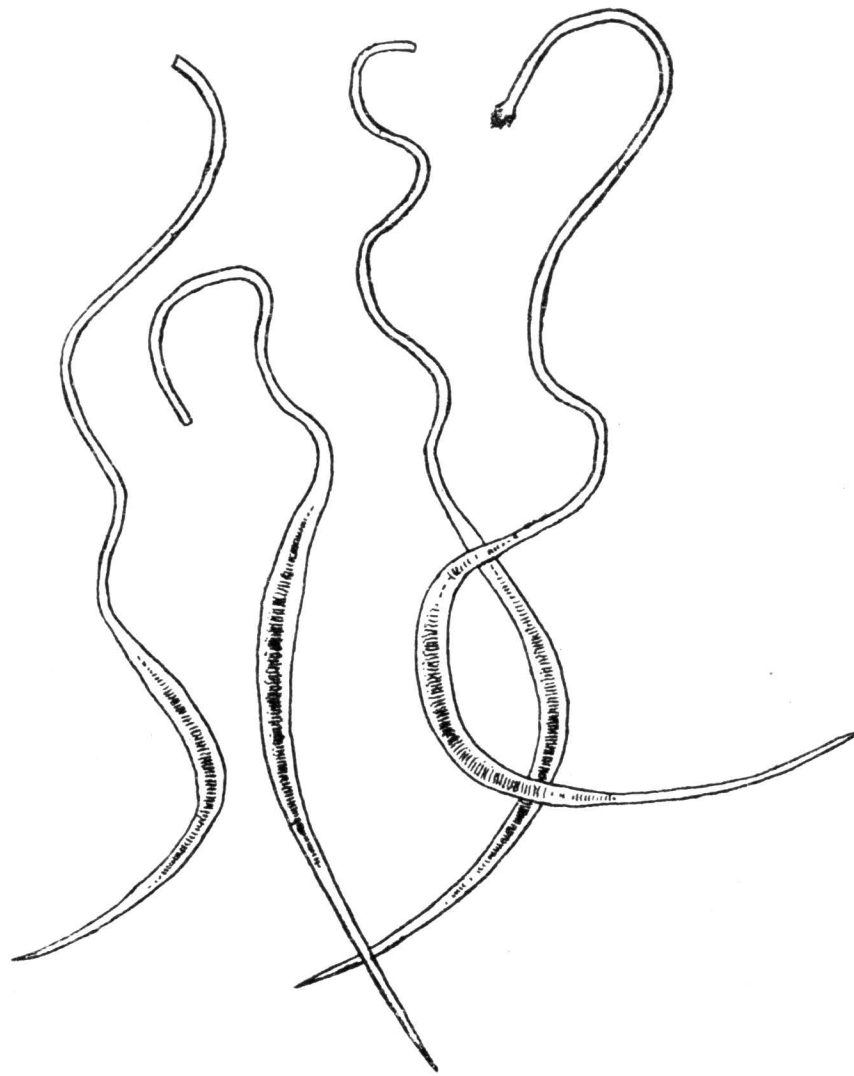


FIG. 2

Groups of magnified heterotype fibres from Merino lamb, showing the kempy part above and the woolly part below. The one to the left is naturally shed, and bears the typical brush-like ending; the others are shorn, with truncate ends.

from about three months onwards, and numbers can be found loosely intermingled with the wool, each with the lower, brush-like, club end characteristic of all fibres which have been naturally shed (Fig. 2). Others again are continuous in their growth, like wool fibres generally; for some have been found in staples two to three inches long and still growing. It is, however, difficult to establish continuity of growth for certain, since we have found that the free tapering end of all fibres—wool, kemp, and heterotype—in the lamb's coat tends to break off after the first few months; and once the upper medullated part of the heterotype disappears, the rest is indistinguishable from a wool fibre. Loose broken ends are frequently found in combings from the outer zone of a lamb's fleece. As will be shown later, similar heterotype fibres may be continuous from one shearing to another in certain British breeds, and repeat the kempy part; hence it is more likely that continuity of growth occurs in the merino. No evidence has been obtained that in the merino the medullated part of the heterotype is ever renewed beyond the lamb. Like true kemp, the coarse part occurs

only in the early lamb, and after shedding is not renewed in well-bred sheep. Where continuous and not shed it is only the woolly part which persists.

HISTORY OF HETEROTYPE FIBRES

Fibres similar to those here described have been known only within the past few years, having been found by Dr. F. A. E. Crew and his associates in their studies of sheep and wool at the Animal Breeding Research Department of the University of Edinburgh. They were first observed by Crew

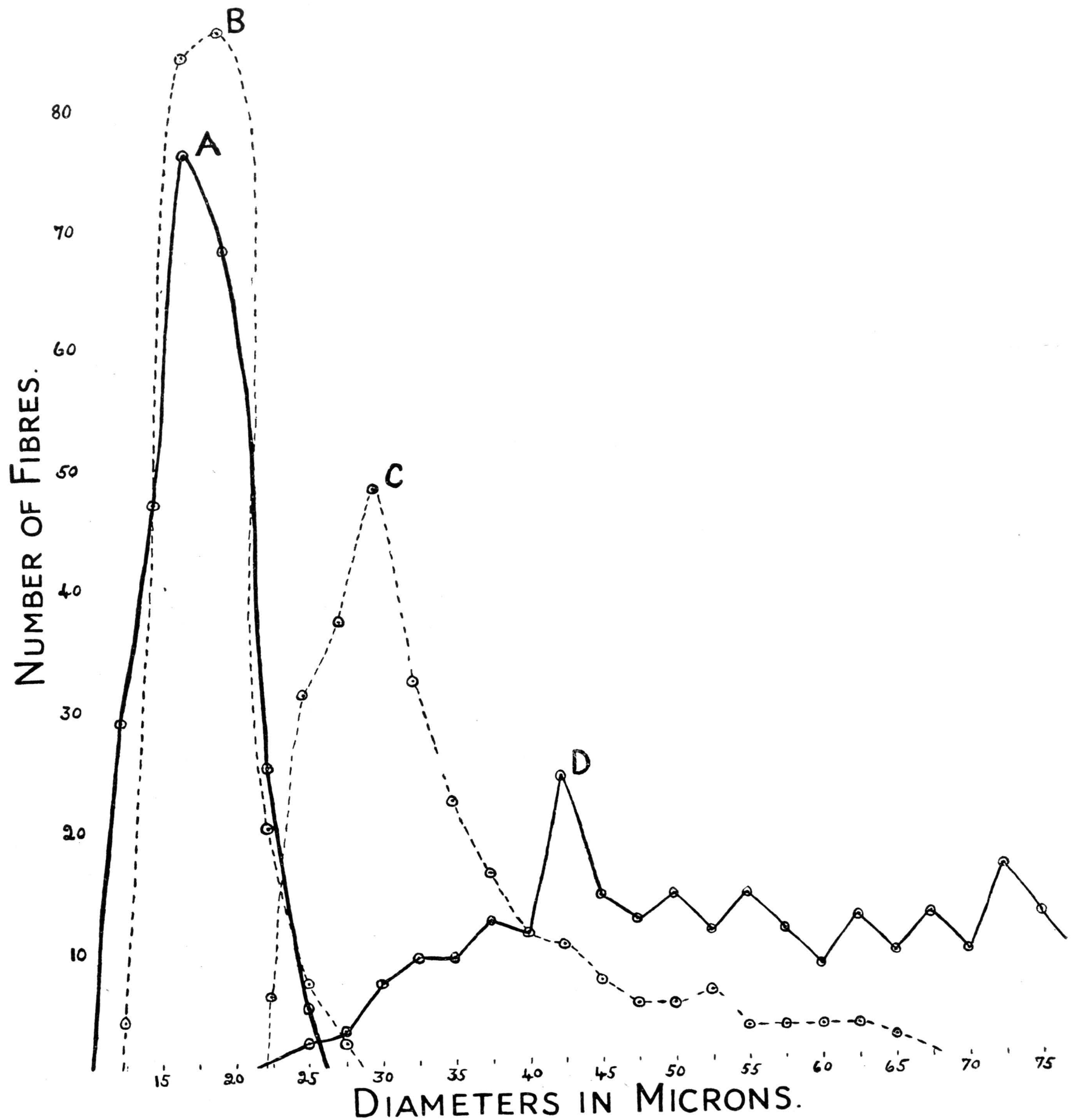


FIG. 3

Graph of measurements of diameter of wool, kemp and heterotype fibres from Merino lamb. A. True wool Fibres; B. Woolly part of heterotypes; C. Kempy part of heterotypes; D. True Kemp.

and Blyth³ in the fleece of *Ovis vignei*. In this wild sheep, as well as in the mouflon, *Ovis musimon*, they found fibres of a character intermediate between the usual coarse kemp and the wool. "These fibres could be divided between into two classes—(a) those which looked like hair but were shorter, less stiff, distinctly finer, and always pointed; and (b) those which were indistinguishable from wool in their fine, curly, proximal part, but showed a stiff, straight distal portion, white or pale brown in colour." It is these "Intermediate (b)"

fibres which most closely resemble those met with in the merino, the only difference being in the greater length of the coarse, medullated, distal part (Fig. 6). Dr. Blyth² refers again to similar fibres in her paper, "Micrological Analysis of Two Fleeces from Blackface Sheep." Mr. J. A. Fraser

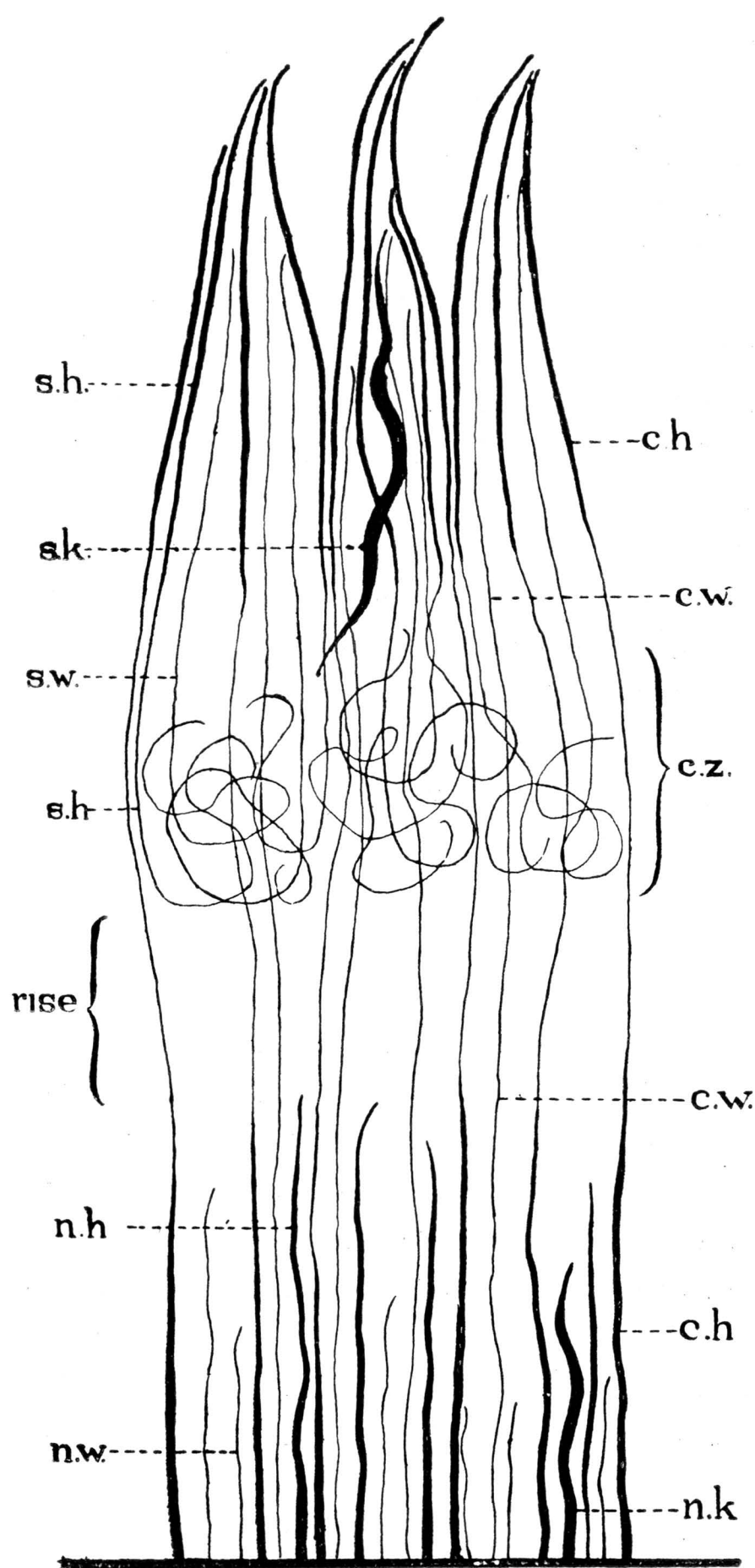


FIG. 4

Diagram of fibres in fleece of long-woolled British mountain breeds, representing the old coat before shearing, and the new coat, which is not yet fully grown. Three staples are represented, distinct above but intermingled below. The old wool is above the rise, the new coat is below. Some of the fibres are continued from the old coat into the new, while others have been shed, and largely constitute the matt towards the base of the old coat. The new coat is made up of fibres continued from the old, and fresh ones grown from the follicles of the old shed fibres (cf. Fig. 5).

c.h., Continuous heterotype fibre; *c.w.*, continuous wool fibre; *c.z.*, cotted or matted zone; *n.h.*, new heterotype fibre; *n.k.*, new kemp; *n.w.*, new wool fibres; *s.h.*, shed heterotype fibre; *s.k.*, shed kemp; *s.w.*, shed wool fibre.

Roberts⁵, in his paper, "Kemp in the Fleece of the Welsh Mountain Sheep," speaks of fibres which "appear to be wool fibres for the greater part of their length, but exhibit portions (usually tip) of a kemp-like nature." He applies to them the term "anomalous." Neither the term "intermediate" nor "anomalous" appears to be appropriate for fibres which are so obviously

a distinctive constituent of the fleece of sheep, while the term "heterotype," here employed, emphasises their dual structural character. Since they are found in the lamb stage of the most highly specialised of fleeces, that of the merino, it seems likely that they will occur in other domestic sheep, if not in the adult, yet in the young.*

HETEROTYPE FIBRES IN BRITISH BREEDS

The fibres met with in the merino lamb can be fully understood only when comparison is made with the fleece of the long-woolled British mountain breeds, such as the Shetland, Scotch Blackface, and Swaledale. Fig. 4 is a diagrammatic representation of the component fibres of the fleece of the Shetland, a portion of which is shown in Fig. 5. The old season's fleece, not yet shorn, comprises all above the "rise," and the new fleece, not yet fully grown, all below it. The outer part of the old fleece is divided into wavy staples, the so-called "tails," while below it is cotted or matted, the fibres intertwined to form a fairly compact mass. In the staples the fibres are mostly coarse, straight, and medullated, while in the cotted zone the same fibres are transformed into non-medullated, wavy, woolly fibres, which mingle with the true wool also present (Fig. 6). A number of the heterotype fibres, as well as of the wool, are shed naturally, and end in a curled intertwined manner in the cotted zone; others, however, are unshed, and, becoming finer, continue straight through the old fleece and constitute the rise. Below the rise, however, that is, in the new season's fleece, the continuous heterotype fibres again change their nature, this time from the woolly to the kempy phase, becoming coarse and medullated; and still further down they revert to the woolly state, thus repeating in the new fleece the dual structure characteristic of the old fleece. Some of the true wool fibres also continue into the new fleece without undergoing any marked change. Additional heterotype and wool fibres appear in the new fleece, doubtless coming from the same follicles as those from which the shed fibres in the old fleece were extruded. Shed homotypic kemp fibres likewise occur loose in the old fleece, and renewals appear in the new, true kemp being everywhere shed annually (Fig. 6).

As regards the occurrence of heterotype fibres and true kemp, the fleece of the mountain breeds and of the merino lamb can therefore be compared as follows—

Homotypic Kemp Fibres occur in both, and are normally shed, never continuous, but remain for a time intermingled with the wool. In the mountain breeds they are renewed each year with the fleece, and the wool has always a certain admixture of kemp. In well-bred merinos the shed kemp fibres of the lamb are not ordinarily renewed, but may be so in indifferently bred individuals.

Heterotypic Discontinuous Fibres occur in both the merino lamb and the lambs of mountain breeds, and for a time may be found naturally shed and loose in the fleece. They are renewed as heterotypes in later coats of mountain sheep, but not in the merino; medullated fibres do not occur in well-bred, adult merino wool.

* In the fleece of a new-born, pure-bred, Wensleydale lamb, given us by Dr. F. W. Dry, Leeds University, we have been unable to find any heterotype fibres, or any kemp apart from the extremities; in the fleece of a Suffolk lamb from the University of Cambridge Experiment Farm heterotypes are plentiful. We have also found them in the shed coat of the musk ox, *Obibos moschatus*, obtained from the Director of the Edinburgh Zoological Society, and from shed camel's hair kindly sent us by Messrs. Joseph Dawson, Cashmere Works, Bradford.

Heterotypic Continuous Fibres are found in both. In the mountain breeds the medullated, kempy phase and the non-medullated, woolly phase are repeated in each season's fleece; whereas in the merino the woolly phase only is continued, the kempy not reappearing after the first shearing, the entire fleece being produced from "persistent" germs.

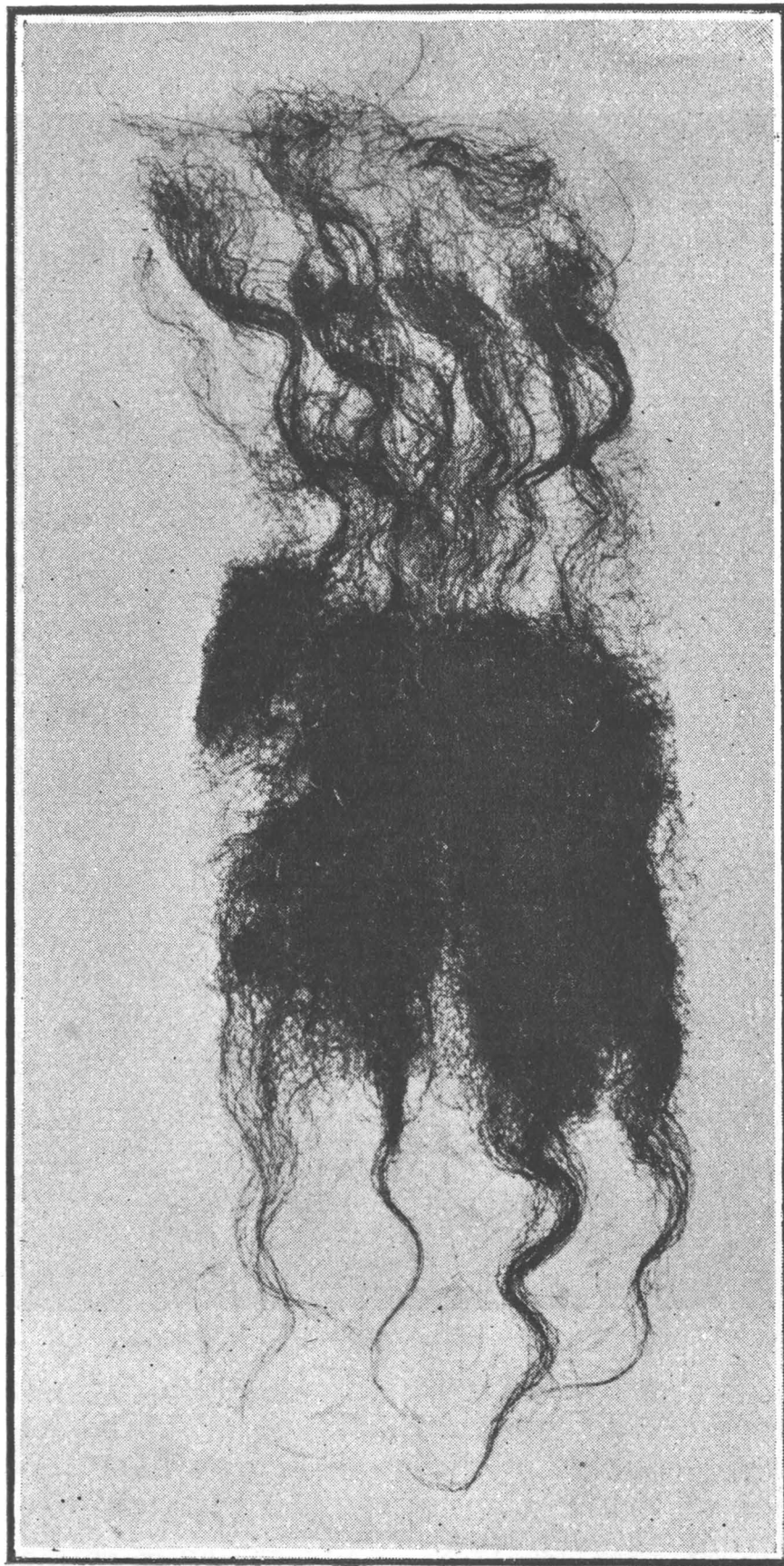


FIG. 5

Portion of fleece from Shetland ewe. The upper dark mass of four staples represents the old season's growth, which is strongly cotted in its lower part. The thin middle portion represents the "rise," and below this is the new season's growth, not yet completed (cf. Fig. 4).

The above differences can be more fully appreciated when it is recalled that in the ancestral wild sheep all the fibres, both kemp and wool are shed annually. The adult merino has reached the extreme evolutionary stage, where all its fibres are wool, and are continuous in their growth; both kemp and heterotype fibres occur only in the lamb. The mountain breeds are in an intermediate evolutionary stage, where some fibres are shed and others are continuous; and both kemp and heterotype are continued beyond the lamb, appearing year by year in each successive fleece.

ORIGIN AND NATURE OF HETEROTYPE FIBRES

Doctors Crew and Blyth are unable to assign any definite origin or significance to the heterotype fibres, their *intermediate* (*b*). They remark—“It would seem improbable that the intermediate type is a modification of only one type of fibre—only hair or only wool—though it would seem possible that it is a modification of both.” The two coats—kemp and wool—would appear to be the primitive condition of sheep, the heterotype a later introduction. The present writers are inclined to regard them as associated

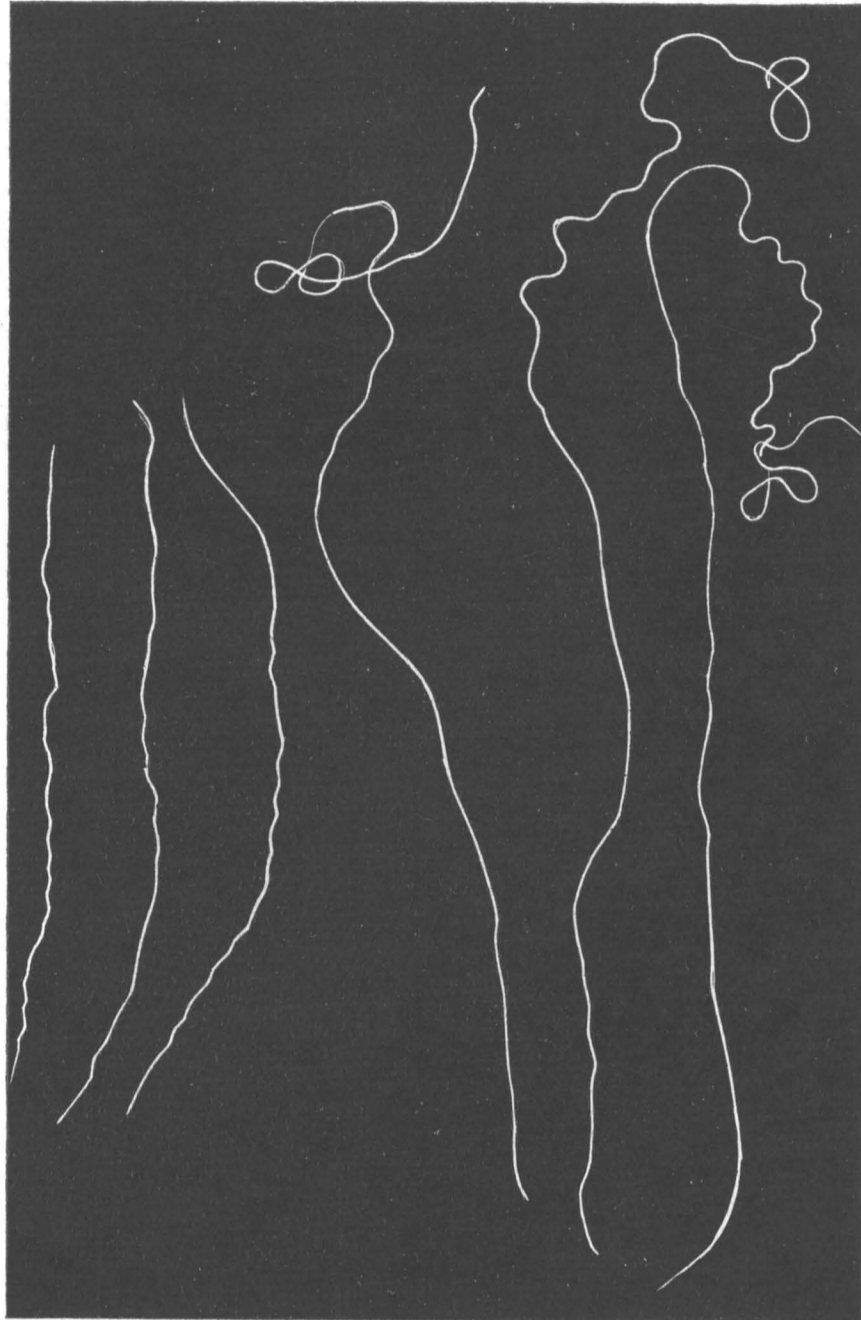


FIG. 6

Fibres from the fleece of the Scotch Blackface. To the left are three heterotype fibres showing the coarse, straight, medullated, kempy part above, and the fine wavy, non-medullated, woolly part below (cf. Fig. 2). To the right are three true kemp, shed fibres, wavy, and tapering at each end.

with the disappearance of the kemp in the evolution of the woolled sheep. As our observations show, the fibres are entirely absent from the wild sheep, *Ovis ammon*, and also from the primitively-coated, blackhead, fat-rumped Persian. It is true that Crew and Blyth found “a few fibres” in *Ovis vignei* and *Ovis musimon*, but one might well desire further evidence as to how far they are characteristic of these two wild species, in which the outer kempy coat is so well developed. They are most abundant and best developed in the British mountain breeds, and are a permanent feature of the fleece, appearing from season to season. It is also true that kemp occurs in plenty in these breeds, but in no sense does it form a definitive protective coat. It is suggested that when the kempy coat practically disappeared in the evolution of woolled sheep, that the woolly coat of itself was an insufficient protection under the rigorous northern conditions, and that the outermost fibres coarsened and developed a medulla distally, leaving the proximal part

of the fibre still woolly. This gave rise to a covering of coarse, medullated fibres which to a large degree took the place of the kempy coat of the primitive sheep. If this interpretation should prove to be correct, namely, that heterotypes are an attempt on the part of the wool to make up for the loss of the kemp, we shall have an interesting example of later adaptation to an evolutionary loss.

It is manifest that a coat composed wholly of heterotypes would serve the same purposes as one of separate kemp and wool. In both we should have the protective, coarse, medullated fibres above, and the fine, wool fibres beneath; but in the one case the kemp and wool would be modifications of the one fibre from the same follicle, whereas in the other they would come from separate follicles.

The presence of heterotype fibres in the highly specialised merino during the early lamb stage is doubtless a legacy from the introduction of northern blood at various periods in its history. The tendency in highly-bred merinos is undoubtedly towards their elimination. As already shown, they occur in varying amounts, according to the breeding of the individual, and only persist for the first few months of post-natal life. The coarse medullated portion is in most cases very limited in extent, and in passing towards the shoulder its reduction to the merest trace of a medulla can be followed, leaving the whole fibre a true wool.

The fact that heterotype fibres tend to revert to wool fibres may be regarded as some evidence in favour of their origin as modifications of wool fibres.

It seems not unlikely that we may come across mammals in which both the protective and heat-retaining parts of the coat are provided by the same fibre (heterotypes), in contrast to those, like wild sheep, in which the two functions are discharged by separate coats of kemp and wool.

Some sheep farmers have a preference for lambs showing a strong development of kemp and heterotypic fibres, "hairy" as they are termed, believing them to be indications of a vigorous constitution, from which a fleece of a strong, robust character may be expected. Lambs almost free of the fibres are expected to grow a fine fleece, perhaps lacking in robustness. How far the correlation holds has not yet been experimentally determined.

I am under obligation to the British Research Association for the Woollen and Worsted Industries, Leeds, for seeing the paper through the press.

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- ² Blyth, J. S. S., "Micrological Analysis of Two Fleeces from Blackface Sheep." *Ann. App. Biol.*, 1923, Vol. X.
- ³ Crew, F. A. E., and Blyth, J. S. S. "On Fibres of 'Intermediate' Character Found in the Fleece of *Ovis vignei*." *Ann. App. Biol.*, 1923, Vol. X.
- ⁴ Duerden, J. E., and Ritchie, M. "Kemp Fibres in the Merino Sheep." *Science Bull.*, No. 34, 1924. Dept. of Agric., Union of South Africa, Pretoria.
- ⁵ Roberts, J. A. F. "Kemp in the Fleece of the Welsh Mountain Sheep." *J. Text. Inst.*, 1926, Vol. XVII.

23—THE SPECIFIC VOLUMES OF COTTON AND WOOL

By A. T. KING, B.Sc., F.I.C.

(British Research Association for the Woollen and Worsted Industries)

In the paper by G. F. Davidson on the specific volume of cotton cellulose, which appeared in the May issue (p. 1175), work on sorption by charcoal is referred to, but the present writer's work on the relations between the specific volume, swelling, and sorption of wool (*J. Text. Inst.*, 1926, p. 153) appears to offer more interesting comparisons with cotton, especially from the textile standpoint. It may therefore be pointed out that in that paper the conclusion was drawn that the density of wool as determined in benzene (toluene giving similar results) represents its true density, for the following reasons—

- (1) The calculated swelling in water, assuming this density, agrees with the observed value.
- (2) The observed swellings in saturated air and in liquid water being practically identical, the saturation (vapour) and soaking (liquid) regains are the same.
- (3) There is no observable swelling in dry benzene, and negligible regain in dry benzene vapour.

Davidson finds the specific volume of cotton in toluene to be only slightly different from that in helium. This is in line with the above conclusion regarding wool, though no determinations for the latter were made in helium. Further, the general expression deduced by the writer for the relation between apparent specific volume, swelling, and sorption in liquid media is substantially identical with that employed by Davidson for calculating the swelling of cotton in water. Also the value of $0.621/25^{\circ}\text{C}$. for the apparent specific volume of cotton in water, employed in the density method which the writer suggested for determining regain, and for estimating wool-cotton mixtures, is in good agreement with Davidson's value.

Davidson's work raises several interesting points of comparison between cotton and wool. The difference between the apparent (in water) and true specific volumes of wool, which are 0.718 and 0.769 respectively, is much greater than that between the corresponding values of 0.622 and 0.640 for cotton. The apparent specific volume of wool is still lower (0.7097) in methyl alcohol, and it would be of interest to know if the same is the case for cotton. This low value hardly supports Davidson's suggestion as to molecule and pore dimensions, assuming no molecular association. The similarity of behaviour in water, ethyl, and methyl alcohols, and to a less extent in amyl alcohol, is suggestive rather of some specific affinity towards hydroxyl groups. The small difference in the above specific volumes of cotton does not appear to leave room for an increase in its true specific volume with low regain, such as is the case with wool, which rises to a maximum at about 5% regain, and then falls again, giving the same value at about 19% regain as at zero regain. Moreover, the apparent density of the sorbed water in saturated wool being 1.18, its specific volume is thus 0.83, compared with 0.925 in saturated cotton, and involves a far greater effective compressive force than that of 2,000 kgm. cm^2 which Davidson gives for cotton. This greater apparent compression entails a smaller swelling coefficient for wool, and also accords with its much greater heat of wetting,

as measured by J. J. Hedges (Trans. Faraday Soc., XXII. (4) (1926). Further, with wool the apparent compression is confined to the lower regains. In fact, from 25% regain upwards there is no contraction in common volume, which again is in line with Hedges' results, the heat evolved on wetting wool at 25% regain being only 3% of the total heat of wetting. Thus the specific volume of the sorbed water giving 25% regain is only 0.793. There are no similar figures available for the contraction in common volume and heat of wetting of cotton at various regains, but if cotton at all resembles wool in these respects it is doubtful if the effective compressive force at saturation given by Davidson can have any real significance, since enormously greater pressures than this would then be required to explain the common volume contraction on the compression factor alone.

Chemical Department,
 "Torridon,"
 Headingley,
 Leeds, 13th June 1927.

THE SPECIFIC VOLUMES OF COTTON AND WOOL

A Reply by G. F. DAVIDSON, B.Sc.

In the above note there are several points which call for comment.

The reasons given by King for assuming that the specific volume of wool as determined in benzene represents the true specific volume are not conclusive. Reasons (1) and (3) merely set an upper limit to the true specific volume; if there were pores inaccessible to benzene and water, but accessible to some other medium, say helium, the statements contained in (1) and (3) would still be true, but the specific volume given by benzene would be greater than the true specific volume. Reason (2) is quite irrelevant.

It is difficult to understand why King considers that the low value of the apparent specific volume of wool in methyl alcohol "hardly supports" my views. Considering that methyl alcohol is absorbed to the extent of 26.3 per cent. as against 33 per cent. for water (King, this *Journal*, 1926, 17, T53), and that it is much more compressible than water, it is not surprising that the apparent specific volume in methyl alcohol is found to be slightly less than that in water. If the factor of incomplete penetration is present, its effect will be masked by the great apparent compression of the sorbed liquid, which takes place in a sorption of this magnitude. The specific volumes of sorbed water and methyl alcohol, and the effective compressive forces at saturation calculated therefrom are given in the following table. The values of the specific volumes and regains are those given by King, and the compressive forces are obtained from the compressibility data of Bridgman (*Z. anorg. Chemie*, 1912, 77, 384, and Proc. Am. Acad., 49, 3).

Liquid	App. s.v. of Wool at 25° C.	Saturation Regain	App. s.v. of Sorbed Liquid	This s.v. divided by true s.v. of Liquid in Bulk	Effective Compressive Force kgm./sq. cm.
Water ...	0.718	33%	0.845	0.845	6,800
Methyl alcohol	0.7097	26.3%	1.041	0.822	4,500

The table shows that both sorbed liquids are compressed to nearly the same extent, but that owing to the greater compressibility of methyl alcohol, the compressive force is smaller than for water.

The existence of a minimum in the true s.v. of wool containing varying amounts of water is due to the fact that at low regains the sorbed water has an apparent specific volume less than the true specific volume of dry wool. As the apparent specific volume of the sorbed water increases with the regain, a point is reached at which the specific volume of the sorbed water is equal to that of the dry wool. At this regain, the specific volume of the wool is, of course, equal to that of the dry wool, so that there must be a minimum between this regain and zero regain. According to King this minimum is at 5 per cent. regain, but in the table in his original paper giving his results, several of the specific gravities are incorrectly calculated (assuming the experimental data to be correctly given), and the best curve through his points gives the minimum between 10 and 15 per cent. regain. In the case of cotton, where the compression of the sorbed water is less, it is unlikely that any considerable portion of the sorbed water will have an apparent s.v. less than 0.64 (the s.v. of cotton). Thus, if a minimum exists it must be at a very low regain, and consequently must differ little from the s.v. of dry cotton.

In my paper I suggest that "there is a compression of the liquid adsorbed, under the influence of the attractive forces between the liquid and the adsorbing surface, the layer next to the adsorbent being the most highly compressed, and the compression falling off rapidly to zero as the distance from the attractive surface increases." I am therefore well aware that the explanation of the great apparent compression of the adsorbed water at low regains must entail pressures much greater than those given as the effective compressive force at saturation. This latter concept was employed for the purpose of comparing the attraction for water of various unmercerised cottons, mercerised cottons, and artificial silks. It has also proved useful in this note for comparing the attraction of wool for water with that for methyl alcohol.

Shirley Institute,

Didsbury,

8th July 1927.

ABSTRACTS

1—FIBRES AND THEIR PRODUCTION

(B)—ANIMAL

Silk Culture. *Silk J.*, 1926, 3, No. 29, p. 43. There are four kinds of mulberry trees used for feeding silkworms; they are white, red, black, or many-stalked. They are grown from seed, cuttings or layers, or by grafting. The soil should be dry and free from clay. *Morus alba* (white) is considered the best variety, having the most tender and juicy leaves. *M. nigra* is the hardiest and can be grown where *alba* and *rubra* would fail. *Rubra* is preferable in some places as the buds appear two weeks later and so avoid late frosts. 100 trees will produce 7,000 lb. of leaves, sufficient for 200,000 worms. These are raised from 5 oz. of seed, and will yield 500 lb. of cocoons. This will provide 100 lb. of silk, or say, one tree per pound of silk. If mature leaves are fed to young worms they must be cut to prevent loss and give more edges for biting. Leaves gathered in damp weather need drying as stale leaves are less harmful than wet ones. Fog-damped leaves are fatal. —F.G.P.

Silk and Artificial Silk. *Silk J.*, 1926, 3, No. 29, p. 50.

Comparisons of the properties of silk with viscose and cellulose acetate are made. Silk has high insulating capacity with acetate as a good second. Silk may contain as much as 40% of moisture before it feels damp, but the others are wet to the touch with much less. A large number of various comparisons are given of the fibres. It is stated that the acetate fibre is transparent to ultra-violet rays.

—F.G.P.

Increasing Italian Raw Silk Production.

W. Whittam. *Silk J.*, 1926, 3, 29, p. 53. There is a movement afoot to improve the Italian output in order to get more firmly into the American market. It will be necessary to remodel the filatures to produce the standard skein. Seed production should be put under Government control, and the number of breeds reduced to a minimum. Bales should be altered in shape to enable them to be more easily sampled, as in Asiatic bales. Increased co-operation among producers is desirable to secure general improvement in quality. Italy should take the lead in Asia Minor and the Balkans where silk raising is very promising. Better information as to American requirements should be distributed. —F.G.P.

(C)—VEGETABLE

Pink Bollworm Occurrence in New Guinea.

E. Ballard. *Exp. Sta. Rec.*, 1926, 55, 257 (from *Queensland Agric. J.*, 1926, 25, 23-30).

The pest is present in the dry belt of New Guinea, 50 miles east and west of Port Moresby and in and round Rabaul.

—B.C.I.R.A.

Nettle Fibre and Yarns. A. Herzog.

Melliand Textilber., 1927, 8, 233-237.

The botanical and microscopical characters of nettle fibre are described and an account is given of the tissues which accompany the fibre-strands in the raw fibre. Figures found for the strength and extensibility of a number of yarns made from cottonised nettle fibre are tabulated. In the case of one 48 lea yarn the breaking strength (20 in. test piece) was about 12 ozs., while a 54.5 lea yarn had a breaking strength of about 8 ozs.

—L.I.R.A.

Anthracnose-infected Cotton Seed: Storing.

C. A. Ludwig. *Rev. Appl. Mycol.*, 1926, 5, 737 (from *S. Carolina Agric. Exper. Sta. Bull.* No. 252, 52 pp., 1925).

A study of methods of reducing the infection of cotton seed by anthracnose (*Glomerella gossypii*) is reported. The storage of the seed in a very moist atmosphere produced the most rapid results but the seed soon became musty and failed to germinate. Of the other methods of ordinary storage tried, location over a radiator seemed to be the most effective in getting rid of the fungus, and outdoor storage under a shelter least so.

—B.C.I.R.A.

Cotton Cultivation in S. Carolina. Rev.

Appl. Mycol., 1926, 5, 722 (from 38th *Ann. Rep. S. Carolina Agric. Exper. Sta.*, 1925, pp. 51-55).

"Dixie Triumph" is recommended as a wilt-resistant strain.

—B.C.I.R.A.

Cotton Variety Trials in Florida. O. F.

Burger. *Rev. Appl. Mycol.*, 1926, 5, 718 (from *Rept. Florida Agric. Exper. Sta.*, 1925).

"Cooke 307-6" and "Council Toole" were found to be most resistant to wilt. "Lightning Express" is also highly resistant and has been selected for breeding because of its advantages of earliness and length of staple.

—B.C.I.R.A.

Cotton Insect Pests in Uganda. G. L. R.

Hancock. *Rev. Appl. Entomol.*, 1926, 14, Ser. A, 553-554 (from *Ann. Rep. Dept. Agric. Uganda*, for 1925, pp. 25-28).

Millepedes cause considerable damage to the roots of cotton, particularly seedlings

growing in soil that retains little moisture. The Chrysomelid, *Syagrus calcaratus* is a serious pest of cotton in some districts, 1-3 larvæ being found at one root, but the damage is not apparent until the plant is 6-8 inches high or has come into flower. Pupation occurs in the soil near the root of the plant attacked. The adults feed on the leaves. This beetle is particularly troublesome where cotton has been grown for two successive years. An aphid, *Geoica* sp., is a newly observed minor pest of cotton. A number of other pests are reported. *Platyedra gossypiella* is recorded for the first time in Uganda. Other bollworms are a Tineid, *Earias* sp., *Heliothis obsoleta*, and an unidentified reddish species which is the most abundant.

—B.C.I.R.A.

Cotton Insect Pests Control in West Indies (S. Vincent). T. P. Jackson. *Rev. Appl. Entomol.*, 1927, 15, Ser. A, 51 (from *Rep. Agric. Dept. St. Vincent*, 1925, pp. 13-18).

Measures employed against cotton stainer and pink bollworm in 1925 are described. In one of the islands of the Grenadines difficulty was experienced in establishing the cotton crop owing to an earwig which attacked the leaves of the very young plants.

—B.C.I.R.A.

Cotton-stainer Control on the Gold Coast.

G. S. Cotterell. *Rev. Appl. Entomol.*, 1927, 15, Ser. A, 23-24 (from *Gold Coast Rep. Agric. Dept.*, 1925-26, p. 39).

Control measures against *Dysdercus* spp. in the Gold Coast should be carried out at the beginning of the season if it is impracticable to introduce a close season. As adult cotton-stainers are attracted in immense numbers shortly after the flowering of the cotton, it is suggested that the damage may be effectively reduced by planting a variety of cotton with short flowering and fruiting seasons and using traps. Late planting may also reduce the percentage of stained cotton as the numbers of stainers decrease considerably after the commencement of the dry season.

—B.C.I.R.A.

Cotton Bollworm Control. D. Isley.

Rev. Appl. Entomol., 1927, 15, Ser. A, 91 (from *Univ. Arkansas Coll. Agric. Extens. Circ.*, 218, 2 pp.).

The most effective means of protecting cotton from bollworm attack is to use late maize that comes into silk about two weeks after the main crop of maize has hardened. If June maize is not planted, it is advisable to plant a trap-crop, 5-10 rows being sufficient to attract the moths from a field of cotton 300 ft. wide. The trap-crop should be planted on two dates so that it comes into silk two and four weeks after the main crop of maize hardens. Though it will not entirely protect the cotton, it will greatly reduce the damage. Maize should not be planted amongst cotton, as it serves as a source of infestation. Dusting with

calcium arsenate at the rate of 5-7 lb. to the acre will kill newly hatched larvæ, but can only be recommended as an emergency measure.

—B.C.I.R.A.

Cotton Yellow Stain Disease in Tanganyika Territory: Causes. H. Wolfe. *Exper. Sta. Rec.*, 1926, 55, 245 (from *Tanganyika Ter. Dept. Agric. Rep.*, 1923-24, 20-21).

Cotton yellow stain (internal boll disease), now fairly widespread in Tanganyika Territory, is due, on the side of infection, to a fungus, probably *Eremothecium* sp., introduced by a so-called stainer bug. Favouring conditions include dull weather and damp conditions inside the boll, causing it to open slowly.

—B.C.I.R.A.

Cotton Insect Pest Occurrence in Sierra Leone. E. Hargreaves. *Rev. Appl. Entomol.*, 1927, 15, Ser. A, 22 (from *Sierra Leone: Ann. Rep. Lands and Forests Dept.*, 1925, pp. 16-18).

Many cotton plants were severely attacked by a leaf-miner, the larva of the moth, *Acrocercops bifasciata*.

—B.C.I.R.A.

Cotton Fungoid Diseases in S. Nigeria.

T. Laycock. *Nigeria: 5th Ann. Bull. Agric. Dept.*, 1926, 17-23.

A summary of knowledge of the fungoid pests of cotton in Southern Nigeria, indicating the extent of the damage for which each is responsible.

—B.C.I.R.A.

American Cotton Cultivation in N. Nigeria.

J. K. Mayo. *Nigeria: 5th Ann. Bull. Agric. Dept.*, 1926, 72-76.

Selection work begun in 1923 with Allen cotton was continued in 1924 and 1925. Other varieties were grown of which Hartsville promised well, being similar to Allen in most respects but more vigorous and probably more productive. Considerable progress has been made in increasing lint length and ginning percentage. Yield has not been improved directly but characters correlated positively with yield such as lint index and weight of lint per boll had higher values in 1925 than in 1923. It seems doubtful whether a strain of Allen cotton can be grown in Northern Nigeria to yield a longer staple than 35 mm. (mean maximum), though single plants are commonly found with longer lint. Values for lint index, lint per boll, lint length, seed weight and ginning percentage are tabulated.

—B.C.I.R.A.

Cotton Cultivation in Nigeria (Ibadan).

H. B. Waters. *Nigeria: 5th Ann. Bull. Agric. Dept. (Ann. Rep. Moor Plantation, Ibadan)*, 1925, 77-117.

In variety tests of the two main native varieties, Ishan and Meko, against Allen, the native cotton gave an increased yield of at least 50% and Meko and Ishan yielded equally well. Ishan yielded a lint containing a higher percentage of clean cotton than either Allen or Meko cotton. The results of native cotton spacing tests

and yield tests with Allen cotton following Mucuna (green manure) against inter-planting with groundnuts are tabulated.

—B.C.I.R.A.

Cotton Cultivation in Nigeria (Zaria). O. S. Swainson. *Nigeria: 5th Ann. Bull. Agric. Dept. (Ann. Rep. 1925, Samaru Agric. Sta., Zaria, Northern Provinces)* 1926, 118-142.

The variety grown throughout was Allen, of which three selections, Maigana Nos. 1, 5, and 13 were used in experiments. The crop was picked in very fair condition but was less clean and "bright" than that of the previous year, chiefly owing to late rains and slightly increased bollworm attack; lint strength was up to the average, whilst lint length and ginning percentage showed a distinct improvement. The percentages of the grades over all the pickings were Grade I., 89.5%, and Grade II., 10.5%. Lint length averaged 31.6 mm. and ginning percentage 32%. The highest yield on the farm on a quarter acre plot was 556 lb. of seed cotton per acre and yields all over were better than in the previous year. Boll-shedding was fairly general but not very severe, whilst boll-worm attacks were rather above the average. The results of selection, manuring, date of planting and cultivation tests are tabulated.

—B.C.I.R.A.

Cotton Cultivation in Nigeria (Kano). J. W. R. Pedder. *Nigeria: 5th Ann. Bull. Agric. Dept. (Ann. Rep. 1925, Kano Agric. Sta., Northern Provinces)*, 1926, 143-167.

In a date of planting test, a marked superiority in yield was shown in the earliest sown plot but this was more affected by cotton stainers. Four methods of cultivation were tested and gave no significant difference in yields, that without mulching giving as good a yield as the other more laborious methods. Variety tests with Allen No. 1, Allen No. 5, and Maigana No. 13 gave no significant difference in yields. There was no significant difference in yield between plots planted single and those planted double row.

—B.C.I.R.A.

Cotton Cultivation in Nigeria (Maigana). A. H. S. Vigo. *Nigeria: 5th Ann. Bull. Agric. Dept. (Ann. Rep. Maigana Seed Farm, 1926)*, 1926, 168-169, and 172.

Experiments on the relative value of Mucuna (green manure) alone and in conjunction with cattle manure are to be continued before final conclusions are drawn. The average yield per acre over a total of 58 acres was 412 lb. of seed cotton, the highest yield being 611 lb.

—B.C.I.R.A.

Cotton Cultivation in Nigeria (Ilorin). T. Thornton. *Nigeria: 5th Ann. Bull. Agric. Dept. (Ann. Rep. Ilorin, 1925)*, 1926, 182-191.

The results of variety tests are recorded. Allen gave as good a return as Ilorin native only when grown with groundnuts. It is

not able to compete as well as the native varieties when grown with yams. Kabba variety did not yield quite as well as Ilorin native and was more affected by *Helopeltis* than the other varieties. The pest delayed the crop considerably. Groundnuts do not appear to affect cotton yields adversely when the cotton is sown in the furrows between the nuts some weeks before the nuts are dug, although the growth of the cotton is retarded in its early stage. Moulding up cotton grown through yams after the yams were reaped appeared to have an adverse effect on the cotton. There is little advantage in growing two rows of cotton instead of the usual one row between each pair of rows of yams.

—B.C.I.R.A.

Cicadas Cotton Pest. *Rev. Appl. Entomol.*, 1927, 15, Ser. A, 74 (from *Qtrly. Bull. State Plant Bd. Mississippi*, 1926, 6, No. 2, p. 15).

Tibicen vitripennis caused serious injury to cotton in June in a field in northern Mississippi. The females split the stalks and smaller branches during oviposition, destroying many of them. Almost 90% of the plants were injured and one-quarter of the stand was destroyed.

—B.C.I.R.A.

Tarnished Plant Bug: Occurrence and Control. C. Lyle. *Rev. Appl. Entomol.*, 1927, 15, Ser. A, 74 (from *Qtrly. Bull. State Plant Bd. Mississippi*, 1926, 6, No. 2, 7-10).

During 1926, cotton in parts of Mississippi was attacked by *Lygus pratensis*, tarnished plant bug, which caused an injury almost indistinguishable from that caused by the cotton hopper. It is probable that both Capsids transmit a virus that is the direct cause of the injury, more especially as *L. pratensis* causes injuries of a similar or related nature to many plants. In controlling this pest on cotton, good results were obtained by two or three applications of superfine sulphur at the rate of 10 lb. per acre.

—B.C.I.R.A.

Cotton Hopper: Control. C. Lyle. *Rev. Appl. Entomol.*, 1927, 15, Ser. A, 73 (from *Qtrly. Bull. State Plant Bd. Mississippi*, 1926, 6, No. 2, 1-4).

The cotton hopper, *Psallus seriatus*, and the damage it does to cotton are briefly described. Dusting with 10 lb. of superfine sulphur to the acre, making two or more applications at intervals of four days, is recommended as a control measure. Cotton treated in this way after considerable injury had already taken place was found, two weeks after the second application, to have 60% more squares and 23% more bolls to each stalk than cotton in adjacent plots that were not dusted. If the boll weevil is also causing serious damage, a dust of two parts of superfine sulphur and one part of calcium arsenate, 12 lb. to the acre, can be used to control both pests.

—B.C.I.R.A.

Pink Bollworm Occurrence in Nyasaland.

C. Smee. *Rev. Appl. Entomol.*, 1926, 14, Ser. A, 622 (from *Nyasaland: Ann. Rept. Dept. Agric.*, 1925, pp. 9-10).

Owing to the discovery of *Platyedra gossypiella* in North Nyasa the growing of cotton there has been prohibited.

—B.C.I.R.A.

Cotton Insect Pests Occurrence in Malay.

F. W. South. *Rev. Appl. Entomol.*, 1926, 14, Ser. A, 557 (from *Malayan Agric. J.*, 1926, 14, 146-159).

Sylepta derogata (leaf-roller) and *Dysdercus cingulatus* (cotton stainer) are reported as additional pests of cotton. —B.C.I.R.A.

Flax in Wisconsin. A. H. Wright. *Exper. Sta. Rec.*, 1927, 55, 829 (from *Wisconsin Agric. Col. Ext. Circ.*, 203, 1926).

This account of seed flax culture in the State outlines cultural methods and harvesting practices and indicates the merits of flax-grain mixtures from results obtained at the Wisconsin Experiment Station.

—L.I.R.A.

Cotton Variety Tests in Arkansas. M. Nelson and J. O. Ware. *Exper. Sta. Rec.*, 1926, 55, 638 (from *Arkansas Sta. Bull.*, 210, 1926, 3-23).

Tests in different localities in Arkansas during the years 1920-1924 inclusive, showed that in most of the tests, particularly those in northern Arkansas, early varieties such as Trice, Express, and Delfos have given good results. In central and southern Arkansas medium early sorts represented by Acala and Cleveland have usually outyielded such later types as Mebane, Triumph, and Lone Star.

—B.C.I.R.A.

Cotton Plant in Mississippi: Manuring Tests. J. F. O'Kelly. *Exper. Sta. Rec.*, 1926, 55, 624 (from *Mississippi Sta. Rep.*, 1925, 11).

The average result of a four years' test of nitrogen sources showed that sodium nitrate and ammonium sulphate are about equal. Calcium cyanamide was not so efficient, and cottonseed meal was even less so. It is considered to be definitely determined that soils where cotton rusts need potash. Other tests of fertilisers are briefly described. —B.C.I.R.A.

Cotton in S. Carolina: Variety Trials.

T. S. Buie. *Exper. Sta. Rec.*, 1926, 55, 230-231 (from *Clemson Agric. Coll. S.C., Ext. Circ.*, 75, 1926, 8 pp.).

The significance of earliness, wilt resistance, and lint length in cotton varieties is indicated briefly, and based on experiments at the South Carolina Experiment Station, and the experience of farmers in the State, Cleveland cotton is recommended for short staple production on wilt-free land and Dixie-Triumph on wilt-infested land, and Lightning Express, Deltatype Webber, or Carolina Foster for long staple production. —B.C.I.R.A.

Boll Weevil Control in Oklahoma. C. E. Sanborn. *Exper. Sta. Rec.*, 1926, 55, 158 (from *Oklahoma Sta. Bull.*, No. 157, 1926, 32 pp.).

A three-year test with calcium arsenate as a dust spray indicates that this is not a satisfactory control in Oklahoma. Molasses-arsenate treatment gave favourable results.

—B.C.I.R.A.

Cotton Hopper ("Cotton Flea"): Control.

W. D. Hunter. *U.S. Dept. Agric., Dept. Circ.* No. 361, 1926, 15 pp.

For a number of years a disease marked by the blasting of the very small squares, an abnormal type of growth and often excessive growth of the main stem has occurred in certain localities in southern Texas. In the last few years it appears to have spread to central and northern Texas and in 1924 what appears to be the same disease occurred for the first time in South Carolina and Georgia. The preliminary experiments reported, though not conclusive in showing that the cotton hopper is the cause or the transmitting agent of the disorder, rather strongly suggest that the insect is the vector of a virus and two of the experiments in cages may constitute definite proof. By far the most effective material found for destroying the hopper was sulphur, which apparently can be applied in unlimited quantities to cotton without injury to the plants. Free nicotine and nicotine sulphate showed comparatively little effect. Bordeaux mixture had practically no effect.

—B.C.I.R.A.

Structure of Egyptian Cotton. W. L. Balls.

M/cr Guard. Comm. (Egyptian Cotton Suppl.), 1927, 14, 10.

Egyptian cotton hairs consist each of about 30 concentric growth rings which further consist of parallel strands of fibrils. A single hair corresponds to a yarn count of 4,000, and a fibril to a count of 10,000,000. The fibrils are separated by air spaces so that the whole hair is spongy. Each fibril runs continuously in spiral form from end to end of the hair, there being about 100 fibrils in each growth ring. A fibril makes one complete turn round the hair in about three diameters, the direction of the spiral form being reversed periodically. The fibrils of nearly all types of cotton commence growing in a left hand spiral. Each fibril has a tensile strength equal to that of mild steel. —A.J.H.

Elastic Properties of Cotton. See Section 1D

(D)—ARTIFICIAL

Esparto as a Raw Material. *Text. Argus.*, 1927, 3, 20th April, p. 3.

Esparto fibre for artificial silk is obtained from North Africa and treated with chlorine obtained from artificial silk and other chemical works at nominal rates. This is an especially economical proposition for producers in Southern Europe. Electrolytic caustic makers have made

special endeavours to produce good pulp, and big contracts have been made in Italy. The Dutch Enka Co. is said to be interested in similar production at Valencia.—F.G.P.

Hollow Artificial Silk Filaments. *M/cr*

Guard. Comm., 1927, 14, No. 362, p. 627. Hollow artificial silk filaments are produced by causing a gas to be liberated within the filaments during the process of spinning and coagulation, it being found that viscose solutions containing 6-8% of cellulose and 3-6% of caustic soda, and about 2.5% of sodium carbonate yield satisfactory filaments when spun in an acid coagulating liquor. Several varieties of hollow filaments known as Celta, Luftseide, and Soie nouvelle have a density of 1.37 (normal viscose and natural silks have densities of 1.53 respectively), and therefore have greater covering power than other artificial silks when woven or knitted.—A.J.H.

Wood Pulp: Preservation. C. A. Richards.

Expèr. Sta. Rec., 1927, 55, 757 (from *Tech. Assoc. (Pulp and Paper Indus.) Papers*, 1924, Ser. 7, No. 1, 94-99).

Methods of dealing with organisms deteriorating wood pulp, including pulp rot fungi, discoloring mould fungi and one bacterium found in river water where the correlated brown spot occurs, are discussed. It is stated that sodium fluoride and combinations of cymene and naphthalene with beta-naphthol or paradichlorobenzene will give more satisfactory results than any other chemical treatments tested as ground-wood pulp preservatives. Except in the case of severe conditions, sodium fluoride at 16 lb. per ton of air dry pulp is sufficient.

—B.C.I.R.A.

Artificial Silk; Matt and Lustre Effects on—. F. Scholefield. *M/cr Guard. Comm.*, 1927, 14, 402.

Non-desulphurised viscose silk containing up to 4% of sulphur may be used with advantage for the production of woven and knitted materials, since it is tougher and more resistant to mechanical damage and also because it may be subsequently coloured by treatment with metallic salts. Textile materials consisting wholly or partly of non-desulphurised viscose silk may be afterwards desulphurised by treatment with a sulphide or similar agent, the silk having an increased lustre after removal of the sulphur; matt and lustre pattern effects may be produced by printing with a suitable desulphurising agent (sodium sulphide is not satisfactory since it attacks copper rollers). Fabrics made from non-desulphurised viscose silk have a soft smooth handle and are particularly suitable for lining materials since they do not "pluck." "Matrix" yarn manufactured by Messrs. Harbens, Ltd., is non-desulphurised.

—A.J.H.

Artificial Silks: Identification. C. E. Mullin.

Amer. Dyestuff Rep., 1927, 16, 145-152.

A summary and discussion of available tests.

—B.C.I.R.A.

General Properties of Acetate Silk. C. E.

Mullin. *Silk J.*, 1926, 3, No. 29, p. 64. Tells of the difficulty of wetting out and how this may be overcome by the addition of oleic acid, phenols or cresols. In consequence of this low permeability it is customary to use more concentrated solutions than with other fibres. The strength of other artificial fibres falls to about one-third when wetted, that of acetate falls to two-thirds.

—F.G.P.

Centrifugal Spinning. *Silk J.*, 1926, 3, No. 29, p. 62.

In the machine described, which is said to be a great improvement, the precipitating baths are made of lead-lined iron; wood has been abandoned. The spinning cans are placed above the baths and are readily accessible from three sides. These are made of a special non-metallic composition and are pressed in one piece instead of being made of aluminium lined with ebonite, which soon deteriorates. Special attention has been paid to the thread guides for on their accuracy the quality of the fibre depends.

—F.G.P.

Viscose Artificial Silk; Mznufacture of—.

A. J. Hall. *Dyer and Cal. Printer*, 1927, 57, 192-194.

A discussion of details of processes for manufacturing viscose artificial silk indicating how variations influence the resulting silk and may possibly allow the production of newer types of cellulose silk having some of the present desirable properties of cellulose acetate silk. Reference is made to chemical and physical changes which occur in cellulose during its transformations through alkali-cellulose and cellulose xanthate to regenerated cellulose. The viscosity of cellulose regenerated from alkali-cellulose after ageing for 73 hours, changed from 74.0 to 12.3. It is suggested that its resistance to cotton dyes is of cellulose acetate silk which is likely to maintain its position as a rival to the more serviceable cellulose artificial silk.

—A.J.H.

Rayon from Cornstalk Cellulose. *Chem.*

Age, 1927, 16, No. 411 (Suppt.), p. 37.

Dr. Bela Dorner, a Hungarian chemist in America, has discovered and perfected a process for making rayon economically from corn stalks. Two factories are contemplated in Illinois to deal with the vast quantities of straw produced in the Middle West. The cellulose is found suitable for all purposes as well as for rayon. The process is said to have overcome the difficulty of dealing with the pith and knuckle of the corn straw. The corn belt annually destroys sufficient straw to supply the pulp requirements of the country. Three tons of corn stalks will give one ton of the highest grade chemical pulp at a cost well under that of wood pulp. The rayon produced in this way is said to be finer than that from wood pulp. Ordinary chemical

pulp contains 75-80% pure cellulose, but the Dorner pulp is said to be 95-99% pure.
—F.G.P.

Alkali Cellulose: Composition. E. Heuser.
Cellulosechem., 1927, 8, 31-32.

A further contribution to the question of the existence of an alkali cellulose compound in alcoholic caustic soda solution. The author's view that even with considerable proportions of alcohol present sufficient swelling occurs for the chemical reaction to take place, receives support from the fact that the potassium compound is formed at 64% swelling, the rubidium compound at 53% and the caesium compound at 47% swelling. On the other hand, the whole research supports the assumption that the formation of the compound is the primary process and the swelling the secondary.
—B.C.I.R.A.

Experimental Viscose Plant. A. Lehner.
Leipziger Monats. Text.-Ind., 1927, 42, 95-96.

An experimental installation of machines for viscose artificial silk manufacture and winding, designed by Oscar Kohorn and Company, Chemnitz, is described.

—B.C.I.R.A.

Artificial Silk and Cotton: Elastic Properties. R. O. Herzog. *Leipziger Monats. Text.-Ind.*, 1927, 42, 93-94.

The author discusses the position reached as regards technical development and scientific understanding of the artificial silk fibre. Leick's equation (*Ann. d. Phys.*, 1904, (4), 14, 139) for swollen substances connecting extension modulus E , with the quantity of solid f , and of swelling medium w , namely—

$$E = 1/k(f/(f+w))^2$$

is converted into a similar equation

$$D = k(1+w/f)^2$$

where D is the extension at break, f is the fibre mass and w the moisture regain. Calculated values of D for cotton ($k=5.9$), wool ($k=27$), natural silk ($k=20.5$) and viscose ($k=9.9$) are shown to agree very closely with observed values at 50, 70, and 97 R.H.
—B.C.I.R.A.

Artificial Silk Spinning Nozzles. R. Glafey.
Melliand Textilber., 1927, 8, 7-9, 128-129, and 214-215.

A general article describing the various types of nozzles, their manufacture, arrangement in spinning machines and cleansing.
—B.C.I.R.A.

Viscose Artificial Silk: Manufacture. E. Wurtz. *Chem. Abs.*, 1926, 20, 3819 (from *Z. Ver. deut. Ing.*, 1925, 69, 1581-1588).

An illustrated description of the practice of viscose artificial silk manufacture, with considerable detail as to design, productivity and power requirements of machinery.
—B.C.I.R.A.

Cellulose Acetate Silk: Properties. L. Kirberger. *Melliand Textilber.*, 1927, 8, 261-262.

A brief general outline of the manufacture, physical and dyeing properties, and uses of cellulose acetate silk, with a pattern of a milanese fabric made from it. Cellulose acetate silk in Germany is made by the Aceta G.m.b.H. which is affiliated to the Vereinigten Glanzstoff-Fabriken A.-G. and the I.G. Farbenindustrie A.-G.—B.C.I.R.A.

Artificial Silk: Strength and Extensibility. L. A. v. Bergen. *Melliand Textilber.*, 1927, 8, 250-251.

Durability and washing properties, two of the properties of artificial silk of most importance to the consumer, depend on the strength and extensibility of the artificial silk in the dry and the wet states. These are the most important properties of the product and a special material has been produced by the N. V. Hollandsche Kunstzijde Industrie, Breda, which has a tensile strength, in the wet state of 70 grams and over, calculated on the basis of 100 deniers. In the author's opinion, the relative strength in the wet and dry states is of secondary importance only and the actual strengths, wet and dry, are of primary importance.
—B.C.I.R.A.

Artificial Silks; Developments in Manufacture of—. W. P. Dreaper. *Times Trade and Engineering Suppl. (Artificial Silk Number)*, 1927, 20, 3.

The differences between artificial and natural silks is not dependent on the denier and tensile strength alone. For instance, natural silk yarn of 14 denier and having a breaking strain of 36 g., may give more trouble in working than 150 denier viscose yarn having a breaking strain of 250 g. The average breaking strain of viscose yarn now being produced is 1.4 g. per denier, but smaller improved qualities having a breaking strain of 1.8 g. per denier are available. In working viscose yarns a difference of 2% in moisture content is sufficient to influence its tensile strength and elastic properties so as to cause subsequent difficulties.
—A.J.H.

Comparison of Silk and Artificial Silk Properties. See Section IB.

PATENTS

Automatic Spreading Machine for Raw Fibres. J. J. Marx. F.P.607,909.

In this machine, the feed lattice comprises a double lattice running with an accentuated inclination and composed of endless and smooth bands with pins, running alternately. These bands withdraw at the point of delivery owing to a progressive retirement under the bearing front of the smooth lattice.
—Bur. Text.

Machine for Treating Ramie. De Lens, Sol et Nicota. F.P.607,919.

This machine forces the fibre to fold up and submits it to friction, both on itself

and on the organs provided. These organs are movable fluted nippers with an alternate motion between fixed fluted nippers cooled by the circulation of cold water. This machine comprises, besides, a feeder on which are borne the sheaves of fibres to the nippers and rollers, which continuously push forward the fibres. The forward motion of the table actuates the lifting up of the nippers and rollers and the backward motion drives the organs to their original position. —Bur. Text.

Depolymerised Cellulose Acetates: Preparation. H. Pringsheim, Berlin. E.P. 267,569.

Cellulose acetates of high molecular weight are depolymerised, without hydrolysis, by heating, suitably in inert liquids such as naphthalene or its hydrogenised derivatives. In an example, the acetate as prepared by acetylation with the use of sulphuric acid as a catalyst, is heated in tetrahydro-naphthalene at 208° C. The depolymerised products show improved solubility, while the viscosity characteristics of the products are lowered. —B.C.I.R.A.

Artificial Silk Spinning Spindle. A. E. O'Dell, London (Berlin-Karlsruher Industrie-werke A.-G.). E.P.267,727.

To obviate whipping, a spindle for spinning artificial silk and having a cup yarn-holder is formed in two parts, coupled by a flexible member formed of helical springs closely wound and telescoped oppositely. The lower portion is directly driven, for instance by an electric motor. —B.C.I.R.A.

Cellulose Esters: Preparation. I. G. Farbenindustrie A.-G., Frankfort-on-Main. E.P.268,289.

The process for the manufacture of cellulose esters, described in Specification 263,128, is modified by penetrating the cellulose with lactic acid in place of formic acid. The process may be applied to cotton and to any cell material which is free from lignin. In an example, cotton is treated at 80° C. with 80% lactic acid. After pressing, the fibre is washed and dried; the expressed acid may be used for the treatment of a fresh batch of material. —B.C.I.R.A.

Cellulose Acetate Silk: Preparation. Soc. of Chemical Industry in Basle, Switzerland. E.P.268,363.

The dyeing properties of cellulose acetate threads, &c., are improved by adding to the spinning solution a proportion, for example, 5-20%, of nitrocellulose, and subjecting the spun or formed threads, &c., to a denitrating process more energetic than that to which nitrocellulose products are ordinarily subjected. In an example, the threads are treated with 10-12% alkali or alkaline earth hydrosulphide solution at 65° C. The denitrated products show an excellent affinity for acid, basic, mordant dyeing, direct dyeing and vat dyes, including sulphur dyes. —B.C.I.R.A.

Cuprammonium Silk Stretch Spinning Apparatus. J. P. Bemberg A.-G., Barmen-Rittershausen, Germany. E.P.268,393.

To ensure the proper action of the drawing roller when spinning cuprammonium silk by the stretch spinning process described in Specification 260,564, in which method the silk is collected in a centrifuge, the grip of the roller on the thread is increased by increasing the arc of contact between the thread and roller, or a plurality of gripping rollers, each suitably driven, are employed, or the thread is held on to the roller by a pressure roller, or the diameter of the drawing roller is increased. The roller may be ribbed or smooth and may be made of glass or indiarubber. The thread after leaving the spinning funnel may be acidified by passage over a channel or through a bath. —B.C.I.R.A.

Artificial Silk Dry Spinning Apparatus.

Courtaulds Ltd., London, W. H. Glover, Leamington, and C. F. Topham, Coventry. E.P.268,455.

In the dry spinning of cellulose acetate, &c., or cellulose ether artificial silk, the dried threads leaving the warm spinning chamber are collected in a rapidly rotating spinning box. The end of the thread is conveniently introduced into the box by means of a current of air or other gas. It is convenient to moisten the thread on its way to the spinning box by passage over a damped brush, and the thread may also be sized as by passage over a suitable surface or through a brush moistened with a solution of size such as gelatin. The cake may be removed bodily from the box, preferably after heating for a short time. Alternatively, it may be wound out of the box through a guide funnel which is then held stationary with its end opposite the centre of the cake. During winding-off, the box may be held stationary or it may rotate, in which case an additional twist may be put on the thread. —B.C.I.R.A.

Ethylcellulose Acetate: Preparation.

Courtaulds Ltd., London, W. H. Glover, Leamington, and C. Diamond, Coventry. E.P.268,552.

Cellulose acetates very suitable for the manufacture of filaments, films, &c., are prepared by treating with acetic anhydride an ethylcellulose which is insoluble in water, dilute alkali, and the common organic solvents, and contains not more than one ethyl group to each cellulose molecule ($C_6H_{10}O_5$), but not less than 4% of ethyl. Such an ethyl cellulose is prepared by treating alkali cellulose with a restricted quantity of di-ethyl sulphate at temperatures not substantially exceeding the normal temperature, the product being finally washed and dried. The process is particularly applicable to wood pulp as the starting material, but other forms of cellulose may be employed. In examples, the ethylcellulose is prepared from sulphite wood pulp by the following sequence of

operations—treatment with caustic soda solution, pressing, milling, addition of a restricted quantity of di-ethyl sulphate with continued milling or mixing, storage for 3-5 days preferably in an inert atmosphere such as nitrogen, washing, and finally drying until the moisture content is not more than 3%; acetylation is effected by employing with every 100 parts of the cellulose ether, 200 or 225 parts of acetic anhydride, 500 parts of acetic acid and 2 or 2.5 parts of sulphuric acid, the acetate being precipitated at once by the addition of water or being treated before its precipitation in order to vary its solubility.

—B.C.I.R.A.

Artificial Silk Spinning Head. L. A. Levy, Cricklewood, Middlesex. E.P.268,652.

An extrusion head for use in the spinning of artificial silk, &c., comprises a pair of plates provided with opposed cavities and suitably bolted together, filtering material secured between the plates, and a series of outlet passages in the lower plate each leading to a spinning nozzle but controlled by a screw-down valve or other adjustable device in such manner that the amount of solution passing to the nozzle may be regulated or even cut off. As an alternative, the amount of solution passing may be regulated by providing a greater or shorter length of a narrow passage, for which purpose the threaded portion of the valve is extended so as to overlap the outlet passage, and the crests of the threaded portion are removed to form a narrow passage. The spinning nozzles are mounted on joint pieces screwed in the lower plate and are secured thereto by screwed caps; the nozzles are flanged, being supported, together with discs of filtering material, between rubber washers and secured in the caps by means of screwed collars. A piece of metallic gauze supports the filtering material.

—B.C.I.R.A.

Artificial Wool: Preparation. Comptoir des Textiles Artificiels Soc. Anon. and H. Chavassieu, Paris. E.P.268,734.

Threads, fibres, filaments, &c., having the dull and opaque appearance, feel and insulating properties of wool, are prepared from viscose by introducing into the filaments, &c., during manufacture, a proportion of sulphur approximating to or greater than the proportion present in wool. Thus, there may be added to or formed in the coagulating bath, sulphur in very finely dispersed condition; or there may be added to the viscose, substances which at the time of coagulation precipitate sulphur in finely dispersed condition, or, according to a third method applicable to natural and artificial fibres in general, these are first treated with alkali sulphides or other salts rich in sulphur, preferably in the presence of caustic soda or other substances which will cause the fibres to swell, and then with an acid bath in order to release the sulphur. Examples are given of the several methods.

—B.C.I.R.A.

Cellulose Acetate Acetic Acid Solution: Concentration. Verein für Chemische Industrie A.-G., Frankfort-on-Main. E.P.268,778.

Part of the acetic acid is recovered from solutions of cellulose acetate in acetic acid without causing gelatinisation by subjecting the solution at 90-100° C. to distillation, preferably with a reduced pressure, the vacuum being preferably increased as the distillation proceeds so as to maintain lively boiling until the temperature falls to about 50° C., when about 20% of the acetic acid will have evaporated. The solution may then be heated to 90-110° C., and the process repeated, when about the same amount of acetic acid is again recovered. The acetic acid is condensed to about 92-93% strength. The viscous solution of cellulose acetate remaining is precipitated with water or aqueous solutions and yields a product of satisfactory properties. The cellulose acetate in the initial solution may be in the acetone-soluble state, or, since saponification occurs during the process, it may be insoluble in acetone, or may be in a state in which the saponification has not progressed to the desired final acetic acid content.

—B.C.I.R.A.

Viscose Silk Spools. Deutsche Zellstoff-Textilwerke Ges., Elberfeld. E.P.268,783.

In the manufacture of viscose silk, transference of the material from the original collecting spools is avoided by employing a foraminated spool made from a material which resists the action of the desulphurising medium, and subjecting the silk whilst on this spool to the several baths required for the purpose of removing acid, bleaching, desulphurising, soaping, &c., the baths being caused to flow through the material. Suitable materials for the spools are stainless steel and ceramic materials. As a modification, the material is partly treated on the original foraminous spool, thereafter transferred to a foraminated twisting spool, whereupon the treatment of the silk is completed whilst the silk is on the second spool. By forcing the baths through the material the duration of the treatment is appreciably shortened. A suitable arrangement comprises a spool of stainless steel covered with a layer of felt, and on this a mass of silk is spun; the treatments are carried out in a vat provided with pipe connections to an exhaust pump, the pipes leading from seatings on which the spools are piled up; packing pieces are placed between their ends and the exposed end of the uppermost spool is closed by a stopper.

—B.C.I.R.A.

Cellulose Acetate: Preparation. Courtaulds Ltd., London, and C. Diamond, Coventry. E.P.269,012

Cellulose such as cotton or wood pulp, which is not amenable to acetylation by reason of treatment with caustic alkali, is rendered susceptible of satisfactory

acetylation by a subsequent treatment with a phenolic body such as phenol, *m*-cresol, or a mixture of cresols. The treatment with the phenolic body may be carried out at raised temperatures, for example, 50-60° C., or at normal temperatures, particularly if the mixture is continuously stirred or mixed in a rotating barrel. The excess of phenolic body may be removed previous to acetylation. Acetylation may be carried out as described in Specification 21,628/01. —B.C.I.R.A.

2—CONVERSION OF FIBRES INTO FINISHED YARNS

(A)—PREPARATORY PROCESSES

Flax Retting Studies in Michigan: Aerobic Spore-bearing Bacteria Isolated from Retted Flax. A. Trevithick. *Exper. Sta. Rec.*, 1927, **55**, 896 (from *Michigan Sta. Rep.*, 1925, pp. 203-206).

The predominating organisms found on flax fibre appeared to be Gram positive spore-bearing rods, although some coccus forms were also present. The *subtilis*, *mycoides*, and *mesentericus*-like organisms predominated. They were found to attack the common carbohydrates and most of them to attack starch. The *clostridium*-shaped organisms found may be the same as Ruschmann's "potentially anærobic" forms. Since these organisms attack carbohydrates and starch it seemed possible that during storage they aid in the deterioration of flax fibre and linen materials.

—L.I.R.A.

Jute Batching. H. Rudolph. *Melliand Textilber.*, 1927, **8**, 141-143.

A comparison of the results obtained in batching jute with water, mineral oil, train oil, and various mixtures of these. Best appearance, strength, and regularity in the yarn produced, was obtained by using a mixture of water (17%) and train oil and mineral oil in the proportion 1 : 2 (3%). The train oil is regarded as the most important ingredient of the mixture, the water and mineral oil merely helping to secure a uniform distribution of the former.

—L.I.R.A.

Artificial Silk Drying Apparatus. E. Belani. *Leipziger Monats. Text.-Ind.*, 1927, **42**, 104-105.

A new form of turbo-canal-dryer constructed under Haas patents and suitable for drying artificial silk in hanks or wound on creels is described. In common with other drying apparatus made by the Haas firm, the drying, cooling, and conditioning is done by stages in one process.

—B.C.I.R.A.

Artificial Silk Hank Spraying Machine. Ges. für Kunstseiden Apparatebau. *Leipziger Monats. Text.-Ind.*, 1927, **42**, 104.

An improved spray washing machine for the treatment of artificial silk in hank form is described. The yarn is hung in a

special wash-carriage which conveys it automatically through the different liquid treatments, and the method ensures good penetration of the liquid into the yarn. There is less friction of the yarn than with the usual porcelain roller washing apparatus. The machine may also be used for hank dyeing. —B.C.I.R.A.

Viscose Filaments: Washing. *Leipziger Monats. Text.-Ind.*, 1927, **42**, 103-104.

A review of the methods in use for washing viscose artificial silk at the stage of emergence from the precipitation bath.

—B.C.I.R.A.

Beater Pedal Regulator: Theory. A. Brignardello. *Boll. Cotoniera*, 1924, **19**, 129-130.

The theory of the pedal feed regulator mechanism of the beater is discussed.

—B.C.I.R.A.

Fly Frame Gear: Theory. A. Brignardello. *Boll. Cotoniera*, 1923, **18**, 301-304.

The action of the ratchet wheel and cones of the gearing of the fly frame is treated theoretically.

—B.C.I.R.A.

Carding Engines and Condensers. —. Reed. *Scotch Tweed*, April, 1927, p. 236.

For completely automatic sets modern Continental custom has (1) the diagonal broad band delivery and feeder between scribber and intermediate; (2) the straight fibre broad band delivery and feeder between intermediate and carder. These are described in detail. The condensers are almost invariably leather tape, but some are "Bolette" steel blade condensers. Ring doffer condensers are never used. Another important matter which bears directly on the production of cheap yarns of low to medium counts from inferior materials, is that a maximum output is a first consideration. The "Gessner" system, developed by a Continental inventor and machinist, and an arrangement with similar objects, but for producing finer yarns, introduced by Josephy, is described in detail.

B.R.A.W. & W.I.

(B)—SPINNING AND DOUBLING

High Draft Systems: Application. *Internat. Cotton Bull.*, 1927, **5**, 254-269.

The reports of the English, Belgian, Italian, and Spanish sub-committees appointed by the International Federation of Master Cotton Spinners to examine the subject of high drafts in spinning are given. The reports indicate successful application of high drafts in all countries except Belgium.

—B.C.I.R.A.

Pressing Rollers and Gill Leathers. "Spool." *Text. Argus*, 1927, **3**, 11th May, p. 2.

Pressing rollers and gilling leathers have a very important influence upon the drafting of the wool fibres; rollers are used on all machines where drafting takes place in worsted drawing and spinning, but gill leathers are only used in the gilling of wool.

During drafting the fibres have to pass between two pairs of metal rollers, the front rollers having a greater surface speed than the back rollers. In gill boxes each of these rollers are fluted, and the pressure on them, required to grip the fibres to draw them through the pins of the fallers, is so great that the metal rollers chop the sliver into small lengths: in order to overcome this difficulty, gill leathers are introduced which pass between the rollers with the sliver, and so act as a cushion. Different types of leathers are employed for different qualities of material, and the draft is influenced by different leathers. In drawing and spinning the type of pressing rollers used should receive more attention. Different types of rollers for the quality of the material to be used are given, and the effect upon the output on altering the size of the pressing rollers is discussed.

B.R.A.W. & W.I.

Fibre Drafting. "Blasius." *Text. Argus*, 1927, 3, 18th May, p. 2.

The ancient method of drafting was spindle draft; the material being made into yarn, was held by a cleft stick called a distaff, and the fibres were attenuated by hand and twisted into a yarn by a spindle. The spindle draft system of sliver attenuation is still retained in the modern woollen mule. The chief difficulty in both spindle and roller drafting is that of fibre control; in spindle drafting the control of the fibres is maintained by the use of twist. The twist inserted in a sliver during drafting has the effect of holding the shorter fibres in their relative positions during the redistribution of all the fibres. On roller drafting, the impetus of attenuation is one of increasing roller speeds, and the control of the fibres during the fibre movement is also one of a roller control. Spindle and roller drafting are described in detail.—B.R.A.W. & W.I.

Basso-Masneri High Draft System. G.

Bertuletti, E. Brunner, and A. Brignardello. *Boll. Cotoniera*, 1921, 16, 241-246. In the Basso-Masneri system, used in Italy for American good middling and full middling cotton, the distance between the middle roller and the back roller is immaterial, and with distances much greater than the hair length there can be effected a considerable draft, up to 2.5. The possibility of obtaining the draft lies in the fact that by means of the appropriate torsion given to the rovings the limits between which the draft occurs are absolutely independent of the distance, and are strictly governed by the helices of torsion of the rovings, helices which only permit the operation of the draft at a distance of the middle roller greater than the length of the hair worked.

—B.C.I.R.A.

Spinning. A. Brignardello. *Boll. Cotoniera*, 1923, 18, 360-362.

The author derives a formula by which the proportion of fly frame spindles required

at each passage of the sliver can be obtained in terms of the draft which it is desired to attain in the different passages, and in terms of such general characters of the frame as speed and coefficient of twist.

—B.C.I.R.A.

Liebscher Stretch Spinning Head. E. A. Anke. *Leipziger Monats. Text.-Ind.*, 1927, 42, 58-59.

The Liebscher stretch spinning apparatus is described and is suitable for spinning cuprammonium artificial silk of great fineness. The spinning head is designed to avoid the occurrence of air bubbles in the spinning-mass and to supply the "stretch" water in an undisturbed condition, so that its action on the filament is regular.

—B.C.I.R.A.

Weco High Draft System. H. Langen. *Leipziger Monats. Text.-Ind.*, 1927, 42, 65.

With reference to a previous article the author points out that in three roller drafting systems with light rollers, the drawing field extends beyond the space between the front and middle rollers to that between the front and back rollers. This leads to a large proportion of floating fibres and consequent roving irregularity. The Weco high draft system is claimed to be the only three roller system in which this defect is overcome. The pressure of the middle roller, due to its own weight, is sufficient to prevent drafting being continued up to the back roller. The extreme flexibility of the roller casing allows of the passage of the fibres already nipped by the front rollers. The draft occurs over a very small distance between front and middle roller pairs, thus ensuring regularity.

—B.C.I.R.A.

High Draft Systems: Review. *Leipziger Monats. Text.-Ind.*, 1927, 42, 9-10 and 66-67.

The author discusses the requirements of high draft systems generally, and compares the advantages of the systems designed by Casablancas, Vanni, Jannink, Trümbach, Toenniessen, and Ferrand.

—B.C.I.R.A.

Ring Frame Eccentric: Theory. F. Engelmann. *Leipziger Monats. Text.-Ind.*, 1927, 42, 26-30 and 85-86.

A theoretical treatment of the construction and functioning of the eccentric of a Howard & Bullough ring frame.

—B.C.I.R.A.

(C)—SUBSEQUENT PROCESSES

Artificial Silk Yarns and their After-treatment. W. Bennett. *Silk J.*, 1926, 3, No. 29, p. 61.

To produce scroop it is recommended that either tartaric acid or alum be used with an addition of olive-oil emulsion. Sized yarns need to be softened if they are to be used for handwork such as knitting or crochet; yarns must also be lubricated if

they are being prepared for machine knitting. In America mineral oils are used for this purpose but are not in favour elsewhere. —F.G.P.

Yarn Paraffining Device. Schemag Maschinen-u. Apparate-Fabrik. *Leipziger Monats. Text.-Ind.*, 1927, 42, 72. The Schemag device described is one for applying the paraffin wax to the yarn not dry but dissolved in oil, so as to ensure penetration. The yarn tensioning device is efficient; the apparatus possesses only a single pivot, protected from dirt, inside the paraffin wax candle carrier, and runs practically without friction on a point under oil. The most delicate yarns can therefore be treated without damage. —B.C.I.R.A.

(D)—YARNS AND CORDS

Artificial Silk Yarn; Twist and Take-Up in— F. W. Fearnside. *Text. Argus*, 1927, 3, 30th March, p. 5.

Artificial silk yarns contain very little twist since such twist imparts no increased strength to the yarn while it reduces the lustre; an artificial silk yarn has increased lustre in proportion to the parallelism of its constituent filaments. In preparing union yarns containing artificial silk and cotton or wool yarns (such yarns form an important outlet for artificial silk, being largely used for both woven and knitted materials) it is essential to avoid imparting additional twist to the artificial silk yarn. In many instances it is advisable to insert extra twist into the artificial silk yarn so that during doubling with the second yarn, this twist is removed and the artificial silk yarn left in the doubled yarn without twist and therefore having the maximum lustre. A fuller investigation of the take-up of twist by the component yarns during doubling is necessary. —A.J.H.

Artificial Ribbon Straw. *Silk J.*, 1926, 3, No. 29, p. 41.

A type of artificial silk that is not being largely made in this country, in spite of a considerable demand, is rayon raffia or ribbon for hat-making. It is sold in shops by the hank for home makers and hat manufacturers are taking large quantities, practically all from the Continent.

—F.G.P.

Elastic Yarns and Fabrics. *Text. Argus*, 1927, 3, 1st June, p. 2.

Elastic fabric and ribbon usually consists of cotton, linen, worsted, or silk weft yarns and rubber and other warp yarns, the extensibility of the material being determined by the length of those yarns other than of rubber in the warp. Rubber yarns may be cut from rubber sheet or formed by the extrusion of a plastic solution of rubber in carbon bisulphide and alcohol through suitable perforated steel plates. Before weaving, the rubber yarn is stretched in hot water (the extensibility is thereby increased considerably) and cooled while maintained stretched, so that it temporarily

remains extended and inelastic. After weaving, the rubber is annealed by treatment with hot irons at about 160° F., whereby the rubber regains its elasticity and contracts so that the fabric becomes elastic. —A.J.H.

Artificial Silk Yarns: Properties. P. Gräbner. *Leipziger Monats. Text.-Ind.*, 1927, 42, 67-69.

The author discusses general properties of artificial silk yarns, such as decrease of tensile strength on wetting, covering power, extensibility, "feel," &c., which must be tested for and taken into account before weaving, knitting, or dyeing the yarns. —B.C.I.R.A.

Staple (Artificial) Fibres: Uses and Possibilities. E. Midgley. *Times Tr. and Eng. Suppl. (Artificial Silk Number)*, 1927, 20, 8-9.

Staple artificial silk fibres are obtainable in tops (combed sliver), or in cut lengths (4 in. and upwards), or in a form similar to that of raw wool. Comparison of Botany and staple fibre yarns of equal counts shows that the former yarn is stronger and much more elastic; in the wet state the Botany yarn is 4½ times stronger and 6½ times more extensible, whereas under similar conditions the staple fibre yarn loses 75% of its normal strength. Staple artificial fibres combine better with wools suitable for manipulation on the "combed" principle than with any other fibre, the properties of the two fibres being complementary. The lack of elasticity of artificial staple fibres will prevent their extensive use with cotton. —A.J.H.

PATENTS

Process of Flax Spinning. Alexeieff et Pétroff. F.P.607,983.

The slubbing used for wet spinning is spun not in hot water but in water at the ordinary temperature of spinning rooms. This water contains in solution salts of sulphonic acids, naphtha, sulphonic fatty aromatic acids or other suitable materials taking the place of these salts. —Bur. Text.

Cage Stripping Mechanism. J. Hetherington and Sons, Ltd., Manchester, and E. V. Haigh, Buxton. E.P.267,581.

Cotton is stripped from the surface of the rotating perforated cage, upon which it has been deposited in a textile machine, and thrown downwards in a scattered condition by an endless band, which forms a nip with the cage, the speed of the band being greater than the peripheral speed of the cage. —B.C.I.R.A.

Spinning Frame Roller. M. Leopizzi, Milan, Italy. E.P.267,785.

The drawing rollers of ring and like spinning machines are formed in sections connected by members provided with bearing collars and engaging in cavities, the working portions of the rollers consisting of ribbed sleeves fixed at intervals along the roller. —B.C.I.R.A.

Carding Engine. G. C. Laurency, Twickenham, and G. McLean, Dieppe, France. E.P.267,834.

A number of rollers or cylinders carried by endless chains are provided under the doffer. The rollers rotate freely and roll over the surface of the doffer at a speed greater than the circumferential speed of the doffer. The contact between the rollers and the doffer can be limited to the ends of the rollers. The chains are tensioned by a brake on the spindle of the sprockets. —B.C.I.R.A.

Spinning Spindle Apparatus. Howard and Bullough, Ltd., and J. Bancroft, Accrington. E.P.267,839.

The patent relates to a device for imparting more than one twist to yarn for each revolution of the spindle, or equivalent of the kind, in which a tube carrying a frame is mounted loosely on a hollow-ended driven spindle and the yarn passes from a container carried by the tube over the frame, through the spindle, and after emerging passes over a disc fixed on the spindle to drag or draw rollers. The tube, freely mounted on a rotary spindle, is made of self-lubricating or friction-reducing material, such as vulcanite, ebonite, or of compressed paper or fibre with soft metal inserts, and a disc or like member, carried by the tube and suitably constructed or weighted so that it does not rotate, is provided with a guide and a pulley, by which the yarn is led to the bore of the spindle from which it emerges through a hole and passes over the edge of a disc secured to the spindle to nip rollers or like means. The device may be adapted to accommodate two packages or bobbins, whereby yarns may be doubled and twisted without preliminary doubling-winding. When yarn guides are provided between the twisting devices and the nip rollers, they are hinged to facilitate the attachment and removal of the tube. —B.C.I.R.A.

Yarn Delivery Regulating Device. J. D. Joyce, Philadelphia. E.P.267,872.

In a device for regulating the delivery of yarn from a rotating spool, of the type in which the amount of lap of the brake-band on the drum is varied by a compensator arm supporting a yarn guide, the compensator arm is mounted on a rod which is in substantially vertical alignment with the axis of the spool. The rod is under the control of a spring and carries a collar from which is suspended the hook supporting the brake-band. The band passes through a slot in an arm and the lap of the band on the drum is initially set by adjusting the arm. If the tension in the thread increases during unwinding the compensator arm is flexed and the rod partially rotated against the spring to diminish the lap of the band. If the tension decreases, the spring will tend to

rotate the rod in the opposite direction to increase the lap of the band and prevent over-running. —B.C.I.R.A.

Skein Holder. J. W. Clarke, Heanor, Derbyshire. E.P.268,094.

A skein holder, which may be associated with a spool or bobbin carrier provided with a handle for winding the yarn thereon, comprises flanged discs on a spindle and telescopically adjustable yarn-carrying arms, which can be folded together. The diametrically opposite arms are connected together and engage in notches formed in the flanges of the discs, the arms being bent to accommodate the spindle and again to engage holes. Two opposite notches and the aligned holes are enlarged to permit the other arms to be released from position and received in the enlarged notches and holes. The standards may be foldable on to the base. —B.C.I.R.A.

Spinning Frame Rollers. W. Leeming and E. Drake, Accrington. E.P.268,108.

Each self weighted top roller, driven frictionally by the fluted bottom roller, is formed with a central boss which serves to open the nip. Alternatively, each top roller is plain and the long bottom roller is provided with bosses in positions corresponding to the middle of the length of each top roller. —B.C.I.R.A.

Cheese Winding Machine. E. J. Abbott, Wilton, New Hampshire. E.P.268,161.

In a yarn winding machine for winding headless cheeses comprised of over-lapped layers of reversed spiral windings, the winding and corresponding unwinding yarn masses are travelled in succession continuously along a predetermined path during winding, the winding being temporarily discontinued at one point in the path to enable fresh unwinding yarn masses to be placed in the machine and pieced by an operative stationed at that point. The path travelled by the cheeses is preferably endless or circulatory. —B.C.I.R.A.

Spinning Mule Winding Chain. E. Hunter, Patricroft, Manchester. E.P.268,230.

Means are provided to deflect the winding chain and vary its effective length during the movement of the carriage relatively to slow down the speed of the spindles as the down coils are being wound, so that fewer and steeper down coils are wound. —B.C.I.R.A.

Spinning Frame Thread Guards. J. Gul-long, South Hadley Falls, and E. Brault, Holyoke, Mass. E.P.268,233.

The guard blades are carried on a bar and adapted to be moved backwards and forwards into and out of position between the bobbins. —B.C.I.R.A.

Yarn-clearing Device. Cook & Co. (Manchester) Ltd., Manchester, and T. Sefton, Bury. E.P.268,270.

The slits through which the yarns pass are formed of two flanges, the size of the slits

being adjustable. The flanges have a cutting edge and project at an angle greater than a right angle, and are non-rigid, whereby a slub on the yarn will draw the flange down and cause it to sever the yarn. The flanges are formed by the turned edges of plate members mounted on a bar or rod, the central member being fixed and the outer members being adjustable. The top of each plate adjacent to the cutting flange is curved downwardly as a guide edge. —B.C.I.R.A.

Winding Frame Spindle. H. Klötzer, Meisatal, Saxony, Germany. E.P. 268,351.

In spinning, twisting, and winding machines, of the kind in which the cop is displaced along the spindle, the cop carrier, which is provided with a contracting spring sleeve for gripping the driven spindle, engages by means of a projection on the sleeve a helical groove in the spindle of such pitch as to prevent the sinking of large cops by reason of their weight. The invention is applicable to ring and traveller spindles, and to spindles of that kind comprising a driven tube surrounding an axially movable spindle. —B.C.I.R.A.

Yarn Cheese Holder. J. Brandwood, Birkdale, Southport. E.P. 268,435.

A holder block for yarn cheeses comprises a central portion which may be tapered at the top and has a flared base, the whole being bored centrally to receive a spindle. The base may be detachably secured, an exteriorly threaded tube mounted on the base screwing into a tapped hole in the central portion. The holder is particularly suitable for use with the process described in Specification 190,760 in which the cheeses are removed from holders to be treated with fluids. —B.C.I.R.A.

Ring Doffer Condenser. W. Tatham Ltd., Rochdale, and F. Moss, Heaton Chapel. E.P. 268,449.

In an arrangement for removing the outside faulty slivers in a ring doffer condenser, guard plates, which may be adjustable, are fixed between the outside sliver and the adjacent sliver, near the dividing roller. The doffing comb is divided, the sections for removing the outside slivers being separate from the central portion. The outside slivers passed down the usual exhaust pipes. Where the doffed web passes forward as a whole to the draw-box, &c., the doffer is provided with spaced rings at each end. The guard plates may be in two portions or two or more plates separately supported may be used at each end. —B.C.I.R.A.

Roving Delivery Stopping Device. G., N., and J. Fraser, Arbroath. E.P. 268,460.

A device for stopping the delivery of roving in spinning and like frames comprises a pair of nipping pins adapted to nip the roving preliminarily to the relief of the pressing

roller, and to release the roving when the pressing roller is reset in position, the pins acting as a fulcrum when relieving the pressing roller and the roller affording a fulcrum when releasing the nipping members, the device being operated by a lever serving exclusively for this purpose.

—B.C.I.R.A.

Ring Spinning Spindle. A. W. Edwards, Oldham. E.P. 268,493.

In a ring spinning and twisting frame of the kind in which the upper part of the spindle is formed as a thin tubular casing rotating inside the ring and formed with a slot or opening through which the yarn passes in being wound on the skewer, the skewer and its bearings are carried by and revolve with the casing. —B.C.I.R.A.

Yarn Clearing Device. F. Valleley, Salford. E.P. 268,502.

Yarns or threads are cleared of slubs by passing between a revolving roller having axial or spiral grooves, and coacting blade members carried by brackets on a coaxial rod. Each blade member is adjusted relatively to the revolving roller by feeding a ball carried by a bracket on the coaxial rod along an incline, and when set the rod is locked in position by suitable link members. —B.C.I.R.A.

Carding Engine. British Cotton Industry Research Association, Didsbury, A. E. Oxley, and Platt Bros. & Co. Ltd. E.P. 268,511.

In a carding engine of the kind described in Specification 237,013, the material is fed from a lap over a dish plate to a single cleaning or combing device, such as a taker-in arranged above the level of the centre of the main cylinder. The arrangement allows a narrow back-plate to be used between the taker-in and the reduced chain of flats and provides an augmented free space for dirt, &c., below the knives and grid associated with the taker-in. A reserve lap can be mounted in bearings in the frame of the carding engine, which is strengthened by two sets of cross rails. The feed roller is driven from the cross shaft by a vertical shaft and bevel gearing. The doffer is driven from the taker-in by a vertical belt passing over a pulley near the floor and a second belt passing over this pulley and the usual pulley on the barrow lever. —B.C.I.R.A.

Warp Beam. E. Oldham, Rochdale. E.P. 268,567.

A warp beam comprises a shaft of three diameters, rollers, packing pieces, and flanges threaded thereon, and collars or ruffles sliding but not rotating on the shaft, and recessed to accommodate the nuts for tightening the whole together.

—B.C.I.R.A.

Creel Frame. Howard & Bullough, Ltd., and J. Calvert, Accrington. E.P. 268,574.

In creel frames for intermediate, roving, and ring frames, ring doublers, and like

machines, and mules of the kind provided with slotted extensions, the guide or roving rods are adjustably secured in the slots by means of bushes or thimbles which are provided with a flange adapted to be engaged by a tool and are secured by a nut engaging a tapered portion which may be split. The tapered form of bush may be dispensed with, means of ordinary character being then fitted at the ends of the frame, or as suitable, to prevent longitudinal movement of the rods. The Provisional Specification states that some or all of the slots may be arranged otherwise than vertical. —B.C.I.R.A.

Skein Winding Machine. A. Zanchi, Milan, Italy. E.P.268,583.

For convenience in inspecting yarns, especially artificial silk, in order to remove imperfect yarns as regards structure and colour, the yarns are wound in skeins in 8-form in a single layer on two parallel rods. The mechanism for winding such skeins is detailed. —B.C.I.R.A.

Spinning Spindle Driving Mechanism. J. Berlinerblau, Warsaw, Poland. E.P. 268,694.

In spinning machines having spindles provided with independent electric drives, the motor casings are supported by the spindles, means, e.g. springs, being provided to check the tendency of the spindles to rotate. Each spindle is formed with a shoulder forming a support for an axial thrust bearing by which the casing is supported. A lateral thrust bearing is provided at the lower end. If desired, the bearings may be arranged oppositely, while two or more springs may be provided. Alternatively, the casing may be held by a rod or clip. —B.C.I.R.A.

Spinning Spindle Driving Mechanism. J. Berlinerblau, Warsaw, Poland. E.P. 268,695.

In spinning machines having individual electric drives for the spindles, each spindle forming part of or being coupled to its motor shaft, the motor casings are supported independently of the spindles in the axial direction thereof on rods carried by the machine frame, the rods preventing rotation of the casings. The rods have screw-threaded ends and are adjustable in the lower frame member, the upper ends engaging in recesses in the lower plate of the casing. Alternatively, the casing may be supported from the upper rail and the screwed lower ends of the rods may serve to secure the end plate to the main casing. In a further modification, the casing is supported by rods having eyes engaging pins projecting from the casing. The spindle is supported on a ball in a footstep and in a tapered bush, but any form of bearings may be provided. The motors are preferably three-phase or other poly-phase motors with short circuited winding, ball or roller bearings supporting the casing on

the spindle. The motors may be arranged in staggered relationship as described in Specification 262,028; alternatively, the casings may be supported from the top and bottom rails alternately, while the motor casings may be of the enclosed or of the cage type, or of the lantern construction described in Specification 260,396.

—B.C.I.R.A.

Ring Traveller Testing Machine. C. Hofmann, Chemnitz, Germany. E.P. 268,731.

The traveller is first gauged for dimensions and width of gap, is then bent up within the range for forcing it on to the race ring, and then further bent up, the breakage point or point at which permanent set occurs being indicated or recorded. The machine for making the test is described.

—B.C.I.R.A.

Yarn Clearing Device. P. Daugert, H. Frey, and J. J. Dunleavy, Plymouth, Pennsylvania. E.P.269,139

Clearing apparatus for yarns, threads, and the like comprises plates provided with recessed parts of different depths, such as five, four, one, and three thousandths of an inch, and marked thereon, so that, when secured in a holder by means of a screw with edges abutting, a clearing slit of width corresponding to the particular relative disposition of the plates is obtained. The surfaces of the grooves are flat, but they may be rounded, for instance, when used for artificial silk. A guide wire with eyes over-hanging the slit is secured in the holder by a screw to lead the yarn there-through. The leading edges form a right angle when the plates are assembled.

—B.C.I.R.A.

Spinning Spindle. J. P. Bemberg A.-G., Rittershausen, Barmen, Germany. E.P. 269,144.

The flange of the driving wharfl of spinning or doubling spindles serves as a brake surface, the cap of the oil well, which also serves to hold down the spindle, being pressed against it, as by screwing it down the spigot of the well as required. A leather washer is interposed between the surfaces. —B.C.I.R.A.

The following is a list of patents of which abridgements have recently appeared in the *Illustrated Official Journal (Patents)*—

Preparatory Processes—

267,763. F. B. Dehn. Breaking and scutching apparatus.

268,524. W. Prince-Smith. Combing machines.

268,585. G., N., and J. Fraser. Softening fibres.

Spinning and Doubling—

267,682. J. E. Hoyle. Stop motions for carding engines.

268,218. A. Schweizer. Spinning: Rollers and roller heads.

268,407. A. Rhodes and C. Rhodes. Doffing arrangements and spindle apparatus.

268,949. W. C. Gaunt. Roller heads: thread guides.

3—CONVERSION OF YARNS INTO FABRICS

(A)—PREPARATORY PROCESSES

Oil Content for Rayon. *Chemicals* (N.Y.), 1927, 27, No. 13, p. 23.

The Bureau of Standards recommends 6% oil content. Rayon fibre has a tendency to stiffness and if a thread passes over an angular surface it becomes flattened and the fibres tend to separate. A similar thread oiled passes over without change. There is a wide range of amounts of oil used but it is found by analysis of a number of samples that 6% of the conditioned yarn would be a maximum. —F.G.P.

(B)—SIZING

Cotton Zephyr Warps: Sizing. *Leipziger Monats. Text.-Ind.*, 1927, 42, 82-83.

Various opinions are recorded as to the best method of sizing warps for cotton zephyrs with twist yarn effects. In some cases sizing the effect yarns in special distribution over the ordinary warp beam is recommended; in others it is thought better to size the effect yarns on an independent beam, or not to size them at all.

—B.C.I.R.A.

Size Cooking. *Leipziger Monats. Text.-Ind.*, 1927, 42, 81.

In answer to the question whether it is better to cook size in a pressure vessel or in an open vessel the concensus of opinion is that cooking in an open vessel with the addition of steeping agents such as activin, enzyme preparations, &c., is just as efficient and the less expensive method.

—B.C.I.R.A.

"Glutin" Size: Preparation. *Leipziger Monats. Text.-Ind.*, 1927, 42, 180.

"Glutin" is a water-soluble casein made by mixing dry powdered casein with a solution of sodium tungstate in water (1 : 1). The mass is heated on a water bath until a withdrawn sample is completely "melted," showing that no undissolved casein is present. Sodium salicylate is added as an antiseptic against mildew. The product must be stored so that drying is prevented, otherwise the solubility is affected.

—B.C.I.R.A.

Inletts and Bed Ticking: Warp Sizing. *Leipziger Monats. Text.-Ind.*, 1927, 42, 179-180.

Inletts or heavy sateen goods of best quality which are not finished after weaving must be more heavily sized than ordinary woven materials, and good penetration of the size is essential for obtaining the

requisite full "feel." A number of suitable size recipes are recommended.

—B.C.I.R.A.

Artificial Silk: Sizing and Desizing. J. Hausner. *Leipziger Monats. Text.-Ind.*, 1927, 42, 119-120.

A recipe is given for a potato starch size containing activin; the mixture may be modified by adding different proportions of glycerin and water for soft or more rigid warp effects. A method of desizing artificial silk with activin is described.

—B.C.I.R.A.

Starch; Constitution of—. E. Peiser. *Chem. Abs.* 1927, 21, 668 (from *Z. Physiol. Chem.*, 1926, 161, 210).

Starch is an individual substance except for about 1% of impurity contained in the outer wall of the grains, and is not a mixture of amylose and the hypothetical amylopectin. The supposed violet iodine reaction of amylopectin as contrasted with the blue reaction of amylose is merely an illusion. Starch is stained uniformly blue by iodine, the violet colour obtained with excess of reagent being merely dissolved iodine which can be removed by CHCl_3 , leaving a pure blue. The outer coating of the starch gran consists of Ca phosphate, SiO_2 , and a nitrogenous substance, probably a protein. When the grains are freed from this coating they no longer swell and form a paste, but behave like insulin. Many further statements in abstract concerning the acetylation of starch.

—B.W.R.A. & W.I.

Haake's W-starch: Application. *Melliand Textilber.*, 1927, 8, 280.

Photomicrographs are reproduced of iodine-stained cross sections of a 16's cotton warp yarn sized respectively with unhydrolysed and hydrolysed potato and wheat starches and with Haake's W-starch. The yarn is very badly coated and penetrated by the unhydrolysed starches, especially the potato starch. Better results are obtained with the hydrolysed starches, especially the wheat starch, but the penetrating power of the W-starch is particularly uniform and good. W-starch is prepared by treating potato starch in such a way that it acquires properties similar to those of wheat starch.

—B.C.I.R.A.

Aktivin Application. J. Hausner. *Melliand Textilber.*, 1927, 8, 244-245.

Some general notes on the use of Aktivin in the bleaching, sizing, desizing, and finishing of artificial silk (except acetate silk).

—B.C.I.R.A.

Testing of Flours. See Section 6.

Damage Due to Silverfish. See Section 10.

(C)—WEAVING

Artificial Silk Fabrics: Weaving. E. Ullrich. *Melliand Textilber.*, 1927, 8, 241-244
Patterns are provided of the following

fabrics woven with fine filament, slightly twisted Bemberg silk: a taffeta, a checked dress fabric, and a striped washing fabric with warp and weft of Bemberg silk, a crêpe and a ribbed cotelé with cotton weft, and an eolienne with wool weft. The fabrics show a remarkable similarity to the corresponding fabrics of natural silk. A number of important technical points in connection with the sizing, weaving, and finishing of artificial silk are discussed.

—B.C.I.R.A.

Zanit Warp Lubricating Compounds: Properties. — Franz. *Melliand Textilber.*, 1927, 8, 223.

The use of "Zanit" preparations is recommended for treatment on the loom of warps of various kinds, including cotton and artificial silk. The brands B and C are completely saponifiable and entirely removed in ordinary washing processes without the use of special chemicals. For use in weaving coloured goods the A quality is often preferred because of its lower price. The preparations were put on the market 30 years ago. All three qualities are odourless.

—B.C.I.R.A.

Jacquard and Dobby Machines: Standardisation. K. Hentschel. *Leipziger Monats. Text.-Ind.*, 1927, 42, 87-90.

The field of standardisation of jacquard and doobby machines is explored and suggestions put forward for the treatment of the main different types of machine in respect of stitch, cylinder width, card width, and length, &c.

—B.C.I.R.A.

Artificial Silk Fabrics: Weaving. R. Hünlich. *Leipziger Monats. Text.-Ind.*, 1927, 42, 69-70.

A brief note on the choice of looms and healds for weaving artificial silk yarns of different degrees of fineness or "silkeness."

—B.C.I.R.A.

Features of the Rycroft Centre Loom Fork [for Looms]. *Text. Argus*, 1927, 3, 25th May, p. 8.

A detailed description of the construction of the Rycroft weft fork which automatically stops the loom when weft breaks or runs out. The Rycroft fork is of the centre horizontal type.

—A.J.H.

Weaving of Gaberdines with Worsted Warp and Cotton Weft. "Tuner." *Text. Argus*, 1927, 3, 18th May, p. 6.

The loom most suitable for a four or eight-shaft gaberdine is a tappet loom, and it is to be preferred to any kind of doobby loom, for three reasons—

- (1) The shed may be timed sooner than in a doobby loom, this being most essential to prevent weft curl.
- (2) The shed may be broken by altering the back four shafts so that they may be a little sooner in the treading than the first four, which cannot be done with a doobby loom.

- (3) As the tappet loom is a negative one, springs and levers pull down the shafts and keep the healds more rigid as a rule than those in ordinary doobby. If worsted healds are allowed to buckle at all they snap out the threads.

The whole process of weaving gaberdines is given in detail. In the weaving of these fabrics nothing can be left to chance. No bent shafts or side-leaning can be allowed to pass to an appreciable extent. All bands and leathers have to be overhauled to prevent shafts coming down, and bowls with flats on are best left out if better ones can be obtained. Every bowl has to be made to work as near the centre as its respective tappet as possible to prevent any slipping of the side. The hooked bottom of the connecting rods are spread out at times by wearing, and these are better closed up, so as not to catch the next rod. Other essential points are given.

—B.R.A.W. & W.I.

Up-to-date [Weaving] Plant; Importance of—. *Text. Argus*, 1927, 3, 11th May, p. 6.

A discussion of the effect of adequate loom maintenance and equipment on the work of the overlooker and the costs of weaving.

—A.J.H.

New Letting-off Motion [for Looms]. *Text. Argus*, 1927, 3, 4th May, p. 6.

A description of the details of construction and performance of a letting-off motion depending neither on weights or weight levers, but which allows the satisfactory weaving of light or heavy fabrics.—A.J.H.

Weaving Fabrics containing Artificial Silk; Influence of Yarn Structure on the—.

Text. Argus, 1927, 3, 27th April, p. 2.

A discussion of adjustments and modifications of ordinary looms which assists the satisfactory weaving of materials containing artificial silk warp or weft. Friction on artificial silk yarns during weaving must be avoided; in jacquard looms the silk warp must be prevented from unduly pressing on the shuttle race. Favourable modifications of shuttles include (1) the ordinary expanding springs on the shuttle spindle are replaced by a spiral spring having a rough upper surface, and which is able to hold the cop or tube firm, (2) the provision of a very small opening at the head end (the opening being wider where nearest to the cop), for the prevention of ballooning weft, and (3) arrangement of the pot eye at an obtuse angle (instead of at right angles) to the slit through which the weft passes, so that the weft emerges nearer to the centre of the shuttle and is thereby subject to less drag.

—A.J.H.

Processing of Long Wool before Combing. *Text. Argus*, 1927, 3, 20th April, p. 2.

Long wools and hairs are made up into a sliver form by being processed through a series of strong gill boxes. These have received the names of preparing boxes. They

are divided into two groups according to the method of delivering the sliver after processing. The first two machines are known as shelter boxes, while the subsequent machines are termed can boxes. The faller action which takes place during preparing is the direct parallelisation of the fibres. The two distinct actions in preparing are a combing action and a straightening action, both of which are described. In order that efficient work may be done with preparing machines, attention must be given to the drafting arrangements for the whole set of preparers. The preparing fallers used are strongly built with very strong pins, and are described with their work in detail.

B.R.A.W. & W.I.

Automatic or Ordinary Looms? W. A. Hanton. *M/cr Guard. Comm.*, 1927, 14, p. 529.

About one-half million Northrop (automatic) looms are in use, chiefly in foreign countries. Ordinary looms are not usually fitted with warp stop motions and automatic adjustment of let-off weights which regulate the tension on the fabric, so that one weaver is able to attend to only four looms; automatic looms require one weaver for 20 or more looms. In working automatic looms, the magazines which contain supplies of weft are filled by non-skilled labour. The efficiencies (rate of actual weaving to working hours) of ordinary and automatic looms are so and 90-95% respectively, but the automatic loom runs 15% slower than an ordinary loom. In order that the efficiency of an automatic loom may be high, it must be designed to eliminate all stoppages due to breakages in warp or weft yarns; it is desirable to prepare the warp carefully, and to rewind the weft on special pirns. Automatic looms are expensive, but this is more than counterbalanced by their more economical production of fabric.

—A.J.H.

(D)—KNITTING

Silk Hose Manufacture. W. Davis. *Silk J.*, 1926, 3, No. 29, p. 44.

Manufacture is increasing in England. Full-fashioned hose with the English style of foot having seams at the sides instead of at the sole as in the French style are very popular. So much is this the case, that the American machines imported for making stockings here to avoid duty, have a special device for putting an extra thread down the back of round knitted goods in order to deceive the buyer. These machines require a very highly trained mechanic to work them; some of them have 30 latches to the inch. In some parts of the country the death-watch beetle has been playing havoc among the bobbins; fortunately it does not eat the yarn. The processes of knitting are fully described. —F.G.P.

H

Artificial Silk Knitted Goods: Dyeing. W.

Bennett. *Silk J.*, 1927, 3, No. 34, p. 54. These goods should be handled carefully in processing as they so readily lose their shape. The dyeing of cellulose acetate silk and mixtures of cotton or regenerated cellulose silks with acetate silk is briefly discussed, particulars being given for the application of the C.R. Chlorazol colours.

—B.C.I.R.A.

High Speed Knitting Machines. C. Aberle. *Melliand Textilber.*, 1927, 8, 27-28, 138-140, and 228-229.

A general account of the development of these machines. —B.C.I.R.A.

Jaspé Yarn Folding Device. K. Trissler. *Melliand Textilber.*, 1927, 8, 230.

Fancy coloured effects can be obtained on flat knitting machines by using Jaspé yarn, a folded yarn of different materials, such as wool and artificial silk, or of different colours of the same material. The device comprises essentially a spindle plate carrying up to four spindles for holding spools, and fixed below a bar and behind a winding spindle of a winding machine, from which the spindle plate is driven by a band drive. By the rotation of the plate the threads drawn from the spools are twisted to form a single thread which is carried through a hole in the bar to the paraffining device or to a spool. —B.C.I.R.A.

(G)—FABRICS

Insolated Cotton Fabric: Properties. G. Barr and I. H. Hadfield. *Aeronautical Res. Com. Repts. and Mem.*, No. 1016, 1926, 22 pp.

The effect of sunlight on cotton fabric particularly in the early stages of deterioration which are not detectable by measurements of tensile strength, has been investigated. Pieces of fabric after exposure to sunlight of periods from 3 days to 5 weeks and from 6 to 42 hours were compared by the viscosity of their solutions in cuprammonium hydroxide solution. The reducing properties and the methylene blue absorption of the fabric after the longer exposures were also compared. The use of Harrison's solution (silver nitrate, sodium thiosulphate, and sodium hydroxide) as an indicator of the reducing properties has been developed to give quantitative results. An exposure of six hours' duration to bright sunlight was found to produce a significant reduction in viscosity. Cellulose modified by exposure to sunlight and air for short periods shows increased reducing properties and an initial decrease in methylene blue absorption. It is evident that chemical and not merely physical change has taken place, but to what extent the change can be regarded simply as oxidation is doubtful from the results on fabric after such short exposures. It is probable that Harrison's solution would be valuable for measuring

the reducing power of a modified cellulose when only small samples of material are available. —B.C.I.R.A.

Artificial Silk Incandescent Mantles: Manufacture. W. Bruckhaus. *Kunstseide*, 1927, 9, 267-268.

Viscose silk is very suitable for the manufacture of incandescent mantles. The impregnated tubes are treated with ammonia or organic bases to convert the thorium nitrate to the hydrate, and washed to remove ammonium nitrate. After treatment, the tubes are not sensitive to moisture and can be stored indefinitely. The mantles can be shaped on the burners; their life is some 50-60% longer than that of ramie mantles, they are much cheaper to make, and they are resistant to breakage in transport. —B.C.I.R.A.

Artificial Silk Linings; Weft-slipping in—. *Text. Argus*, 1927, 3, 23rd March, p. 4.

The slippery character of artificial silk yarns renders them particularly liable to weft-slippage during rough handling when employed in fabrics of too light a construction; in this respect artificial silk yarn resembles mohair. Displacement of weft artificial silk yarns is especially noticeable in fabrics having a design which throws the lustrous silk yarn prominently on the face side. Hence silk yarns are more suitable for Irene, Albert, and Beatrice twills, in which the weft yarn floats over 2, 3, and 4, and 5, 6, and 7 warp ends respectively. Weft-slippage is less evident in Victoria and Princess twill fabrics. Because of the possible occurrence of weft-slippage in twill fabrics, there is now an increasing demand for firmer lining fabrics constructed with a sateen weave, using two-fold cotton warps and artificial silk wefts. —A.J.H.

Artificial Silk Goods; Durability of—.

Text. Argus, 1927, 3, 11th May, p. 4.

Artificial silk lining fabrics, consisting of a cotton warp and artificial silk weft, are considerably more durable than lining fabrics previously made and in which mohair, alpaca, lustre wool, or cotton, formed their lustrous surface. Hitherto, lining fabrics have received excessive finishing (stentering, calendering, schreiner-ing, &c.) for the purpose of increasing their lustre, that they have lost part of their durability; artificial silk lining fabrics do not require such drastic finishing treatments, and their excessive smoothness protects them from damage by friction. Formerly it was difficult even, fast shades on union lining fabrics consisting of animal and vegetable fibres, but fast shades are readily dyed on cotton and artificial silk fabrics. —A.J.H.

Satin Duchesse. J. Chittick. *Silk J.*, 1926, 3, No. 29, p. 47.

A yarn-dyed satin with a firm, leathery feel, reasonably pliable, a good face and not too much lustre. The warp is two-thread

organsine of 13/15 denier, having 16 turns per inch on each, and 14 turns reverse on the doubled thread. It is suggested that 16 to 10 would be better for filling up. As the weft does not show on the surface, a somewhat lower quality silk may be used. Usually three or four untwisted threads are doubled together with about $2\frac{1}{2}$ turns to the inch. In the majority of cases the yarn is weighted before dyeing. The weave is generally on eight to sixteen harnesses, with from 220 ends reeded 55/4, but 260 ends reeded 65/4 will give a much better face. A fair average for the shoot is 92 picks of 4-thread tram. Width shrinkage is not more than $\frac{1}{2}$ inch on 36-in. weave. Some piece-dyed fabrics are put on the market under this name. —F.G.P.

Artificial Hair; Manufacture and uses of—. D. Hunter. *Times Tr. and Eng. Suppl.* (Artificial Silk Number), 1927, 20, 10-11.

Artificial hair prepared by the processes used for artificial silk, but having a denier of 30-1,000 (single), is more suitable for the manufacture of braid and upholstery fabrics than mohair, horse, and camel hairs, are more uniform in quality, and may be dyed in any colour. The cuprammonium process is more suitable than the viscose process, since the former yields cylindrical fibres, whereas coarse viscose filaments are oval in cross section and are difficult to knot. Artificial hair is usually of constant denier within 5%, and may be used on ordinary looms; horse hairs are usually less than 20 inches in length, and, therefore, demand special adaptations of looms. Artificial hair is superior to glazed and stiffened cotton yarns, since they retain their stiffness even after boiling.

—A.J.H.

Elastic Fabrics. See Section 2D.

PATENTS

Lappet Loom. Jacques Rodier, Paris. F.P.607,676.

A jacquard mechanism drives the needle-bar displacement for embroidery, warp yarn by warp yarn; the tappet threads being engaged under these raised warp yarns, according to the raising number. This jacquard mechanism drives the needle-bar displacement either to the right or left, according to the change of pattern.

—Bur. Text.

Circular Knitting Machine Patterning Mechanism. Mellor, Bromley & Co. Ltd., T. C. Bromley, and A. Shortland, Leicester. E.P.267,661.

The needles are selected, for patterning purposes, by means of an endless band, the notched edge of which acts on the butts. Two forms are described. —B.C.I.R.A.

Parallel Knitting Machine Patterning Mechanism. G. Wilson, Fleetwood. E.P.267,675.

To facilitate the production of vertical stripes and check patterns, needles with

butts of two heights and adjustable cams by which all or either set of needles can be operated are used. —B.C.I.R.A.

Imitation Quilted Fabric. Firth & Moorhouse, Ltd., and H. Best, Skipton. E.P.267,698.

A fabric which simulates the appearance of a quilted fabric is woven with a face cloth comprising face wefts of fine cotton, artificial silk, silk or mercerised cotton, in one or more colours, and a back cloth comprising coarse soft wefts. The two fabrics are united by occasional back wefts being brought to the surface of the face cloth, thus simulating the lines of stitching. Jacquard effects may be produced and the cloth at the back may be raised. —B.C.I.R.A.

Knitting Machine Patterning Mechanism. E. U. Ames, Collingswood, New Jersey. E.P.267,876.

In a machine for knitting patterned fabrics, presser elements in front of the jacks are provided with lugs at various heights for engaging a series of cam levers pivoted on a vertical shaft and engaged in turn by lugs on tricks carried by a trick cylinder. The tricks and elements are preferably made with a whole series of lugs, those not wanted for the production of the knitted pattern being snapped off. A grooved wheel and perforated pattern band may be used instead of the trick wheel.—B.C.I.R.A.

Circular Knitting Machine. C. Terrot Söhne, Stuttgart, and E. Künemund, Würtemberg. E.P.267,895.

Circular machines with radial needles are provided with loop wheels, the sinkers in which are inclined to the axis of rotation of the loop wheel, while the axis itself is non-radial, the arrangement being such that the sinkers take up an approximately radial loop-sinking position. The contour of the cam for operating the sinkers is less abrupt than usual. —B.C.I.R.A.

Weft Changing Mechanism. G. Bertuletti, Via Principé Umberto, Italy. E.P.267,903.

The spool or cop transferring hammer is pivoted to the lay at the rear and is actuated by means of a swinging arm, which is moved into a horizontal position under the control of the weft fork or feeler mechanism, when spool transfer, &c., is to occur, so as to be in the path of a horizontal arm on the hammer. At the same time, the magazine is swung forward so as to bring the bottom spool, &c., into position over the shuttle when the lay is at the end of its forward stroke. In a modification in which a stationary spool magazine is used, a slide is used to carry the fresh spool within reach of the transfer hammer. It is stated that the "change gears" may be used in connection with chain drive systems. Shuttle feeler arrangements are described. —B.C.I.R.A.

Loom Shuttle. M. Mouradian, Manchester. E.P.268,065.

Two weft threads are laid in the shed at each pick by using a shuttle having two cops, bobbins, or pirns arranged on one spindle, or on two separate spindles which may be arranged to face one another, separate guide eyes, at opposite sides of the shuttle being used. In a modification, the spindles have their hinged ends lying side by side and engaging a hinge pin common to both, the eyes being arranged at the ends of the shuttle. The weft fork may be so weighted as to stop the loom when one of the threads breaks. According to the Provisional Specification, two weft threads may be wound on one cop, the cop spindle being rotated as the weft is drawn off, a guide for the two threads being provided. —B.C.I.R.A.

Elastic Fabric: Weaving. P. J. Laurent, St. Etienne, Loire, France. E.P.268,166.

A fabric is woven with two superposed webs which are connected together at parts so that tubular portions are formed across the fabric at equidistant parts or otherwise in the length of the fabric. Rubber warp threads and stay threads are introduced in the upper but not in the lower web. The fabric is woven under tension so that when it is removed from the loom, the elastic parts of the tubes contract and cells are formed. The weaving in the intermediate parts is such that although these parts contain rubber threads they are not elastic. The cells may be formed with narrowed portions. Metallic warp threads may be placed in the selvedge so as to give some rigidity at the entrance of the cells. The cells may be used for holding small articles such as pencils, cartridges, &c. —B.C.I.R.A.

Loom Shuttle: Description. J. G. Anderson, Bombay. E.P.268,920.

When the shuttle peg is turned into the shuttle, two spring arms secured in the usual recess by means of the usual hinge pin and stop pin engage the flange, &c., on the bobbin or pirn to prevent this from rotating. The arms have curved forward extensions bent inwardly at the ends to prevent endwise movement of the bobbins, &c., the top ends of the arms being flared outwardly to facilitate entry of the collar, &c. The inner faces of the arms may be serrated, &c. The arms may be connected by a slit web forming a spring tongue replacing the usual shuttle spring, or projections on the arms may be used in place of this spring. —B.C.I.R.A.

Loom Shuttle. F. Crossley, Todmorden (J. Crossley & Son). E.P.268,945.

The clips or holders for retaining the bobbins in position are formed with legs which are completely embedded in the shuttle by being forced into holes therein, so that they are out of contact with the peg, &c. The legs may have recesses to embrace the usual transverse pin or they

may be hooked or bent into the hole for this pin, or additional transverse holes may be bored into which the legs are bent. Split pins, &c., may be used to pin the legs in position, or glue may be used. Round, half round, doubled, or stranded wire may be used for the clips, &c. —B.C.I.R.A.

Warp Let-off Motion. K. Sakamoto, Hamamatsu, Japan. E.P.268,954.

A let-off motion designed to produce a uniform tension in the warps is controlled by a warp beam feeler and by devices controlled by the warp tension. Means for stopping the loom from the back, for indicating warp tension and for indicating lengths of warp let off are described.

—B.C.I.R.A.

Tenter Frame Clip. G. Clay, Bradford. E.P.269,009.

The face plate of the lower jaw of a tentering machine clip has its fixing rivets made integral with it. —B.C.I.R.A.

The following is a list of patents of which abridgements have recently appeared in the *Illustrated Official Journal (Patents)*—

Weaving—

268,836. W. G. Wylie. Pile-fabric looms: creel-frame arrangements.

Knitting—

268,514. G. Blackburn & Sons, Ltd., and J. H. G. Bayles. Circular knitting machines: striping attachments.

4—CHEMICAL AND OTHER PROCESSES

(A)—BOILING

Some Special Procedures with Silk. *Silk J.*, 1926, 3, No. 29, p. 49.

Describes the ordinary processes of boiling-off and lustring, with slight allusions to bleaching and softening. —F.G.P.

(B)—SCOURING AND DEGUMMING

The Constituents of Raw Wool and their Industrial Applications. E. R. Trotman.

Ind. Chem., 1927, May, p. 195.

Ordinary wool as shorn from the sheep contains a remarkable amount of impurities which fall into four groups—(1) wool fat or wax, (2) suint, (3) dirt, (4) natural colouring matter. The fat is secreted by a gland, the duct of which opens into the hair follicle. The suint consists of dried perspiration which is soluble in water and is a source of potassium carbonate. The dirt is generally adventitious, and is held on to the fibre by means of the fat so when the latter is removed it falls away. A troublesome impurity is the vegetable matter, such as burrs, the removal of which involves a process known as carbonising. Finally there is the natural

colouring matter which can only be removed by destruction with oxidising or reducing agents. All these impurities and methods of removing them are discussed in detail, also their general industrial application and use. B.R.A.W. & W.I.

Oiling of Wool. G. F. Pickering. *Scotch Tweed*, 1927, April, p. 233.

An ideal wool oil should contain as maximum figures—10% free fatty acids and 70% saponifiable matter; when less than 10% free fatty acid is present, emulsification is much more difficult. Below 70% saponifiable, the wool is certain to suffer during scouring. The oil should be as free from glycerine as possible, to be certain that oxidation films cannot form, also practically ash free, as 0.05% ash can double the rate of oxidation of the oil when spread on the fibre. A low cold test is essential; this ensures rapid spreading, allows a minimum amount of oil to be used, and is of the greatest help for easy scouring. Neutral oils are generally used, but mineral oils are equally efficient, but a difference arises. Mineral oils being hydrocarbons, possess no polar groups, and so cannot dissolve in the water film. Presence of the water film in the case of fatty oils and oleins, and its absence with mineral oils, is the reason why fatty oils are much more easily emulsified and removed from the fibre than mineral oils; because, for the formation of a perfect oil in water emulsion, it is necessary that every minute globule of oil be completely surrounded by the water phase of the emulsion.

B.R.A.W. & W.I.

Milling and Scouring. L. L. Lloyd. *Text. Argus*, 1927, 13th April, p. 7.

In scouring of woollen goods the general tendency is to use soda ash sol. of too high a concentration, which causes the washing operation to be unnecessarily long. Soap is only sparingly soluble in soda ash sols. of higher than 6° Tw., and when stronger concentrations are used the soda ash sol. reacts with the olein to produce soap which remains in the cloth. This point is very important when wool oils have been used for spinning. Solvent scourers are very useful to aid the cleansing of such material by helping to produce permanent emulsions and prevent the separations of the non-saponifiable matters. Density of the cloth is attained by milling in the grease. Improved handle is obtained by scouring and carbonising, followed by acid milling.

B.R.A.W. & W.I.

(C)—WASHING

Modern Developments in [Textile] Machinery Equipment. F. W. Fearnside. *Text. Argus*, 1927, 3, 25th May, p. 6.

The most important improvements in machinery for washing and drying loose wool, combing, doffing, piece carbonising and automatic looms, are described.

—A.J.H.

Silicate Washing Compounds. W. Kind. *Chem. Zentr.*, 1926, ii, 2757-2758 (from *Seifensieder-Ztg.*, 1926, 53, 603-605, 618-619, and 633-634).

Information is given regarding washing agents containing waterglass and the function of the latter as a water softener.

—B.C.I.R.A.

(G)—BLEACHING

Paper Pulp: Bleaching. H. Wenzl. *Chem. Abs.*, 1926, 20, 3809 (from *Wochbl. Papierfabr.*, 1926, 57, 955-960).

High density bleaching devices are discussed, with especial reference to the Wolf and Thorne systems. A patented process is briefly described which consists in increasing the production of the older type bleachers by chemical means and thereby economising on power, steam, and time. It may be made a continuous system. Comparative bleaching tests, with and without the addition of "Greloxin" to the usual bleach bath at 38°, showed that the time can be reduced from ten to two hours. At 23° the time was about four hours when "Greloxin" was added. The quality of the pulp bleached by the accelerated process was superior; the copper number was 50% lower than that of pulp bleached by the usual procedure.

—B.C.I.R.A.

Bleaching, Dyeing, and Finishing Cotton Warps. W. B. Nanson. *Text. American*, 1927, 47, No. 1, pp. 32-34.

Dyes suitable for use in tinting cotton warps during sizing are suggested. For cream colours on cotton goods, Chrysamine Yellow, Chloramine Yellow, Benzo Chrome Brown G, Chrysophenine Yellow, and Mikado Orange may be used. For cheap classes of goods useful shades may be obtained by topping indigo dyed warps with Magenta, Bismarck Brown, and Methylene Blue. Various shades of blue, violet, and magenta are obtained by the use of Oxydiamine Violet R, Diamine Violet N, direct blues and various shades of magenta. Direct heliotropes may also be used. For brown shades (imitation linen) the following dyes are applicable, Cotton Brown N, Cotton Brown A, Catechu Brown 3G, Diamine Brown 3G, Plutobrown, Benzo-brown G, Benzo Chrome Brown G, Diamine Nitrazol Brown RD and BD, and Direct Brown GG. —L.I.R.A.

Indanthrene Stained Back Greys: Bleaching. M. M. Tschilikin. *Melliand Textilber.*, 1927, 8, 280-281.

The coloration which frequently occurs in scouring back greys ("mitläufer") which have been used under cloth printed with Indanthrene colours is eliminated if, after the scour, the lye is run off and the goods are boiled for 1 hour at 100° C. in caustic soda solution containing Leucotrope W, and subsequently washed. —B.C.I.R.A.

Mohr Bleaches compared with Normal Bleaches. L. Kollmann, *Melliand Textilber.*, 1927, 8, 270-273.

Describes parallel experiments made with cotton cloth for the purpose of comparing the results obtained by the Mohr bleaching process with those obtained in a normal bleach. A table showing the changes in weight and strength is given. A number of analytical data are also included (ash, wax content, &c.). The cloth bleached by the Mohr process was judged to be a better white than that bleached by the normal process; there was no noteworthy difference in strength between the bleached materials. The former lost 7.7% in weight as against 9.2% (once boiled) or 10.6% (twice boiled). A steaming test showed that the Mohr bleached material was only very slightly yellowed, showing the absence of impurities likely to cause yellowing in storage. —L.I.R.A.

Peroxide Bleach Liquor: Application. H. Russina. *Leipziger Monats. Text.-Ind.*, 1927, 42, 109-111.

The author discusses the advantages of the oxygen bleach for goods bleached without a preliminary scour, and shows that the addition of stabilisers to the sodium peroxide bath do not effect decisively the bleaching of raw cotton. The impurities of the cotton itself influence the stability of the bath and render possible the steady exhaustion of the bleach liquor. Scoured cotton does not stabilise the bath because the essential natural impurities are lacking, and a steady oxygen consumption cannot in this case be expected. The whiteness attained on cotton is not a complete white and the different varieties of cotton behave differently in this respect. The whiteness can be considerably improved by combination with a chlorine bleach, which for a stable white must take place before the oxygen boil. The oxygen bleach is not to be recommended for ordinary print goods, because the preliminary scour confers greater adsorptive capacity and the result is a deeper print. For raised style articles, however, the oxygen bleach is desirable, because the raising process is easily effected even after boiling. —B.C.I.R.A.

Safety of Kiers. E. Ingham. *Dyer and Cal. Printer*, 1927, 57, 230-231.

A discussion of details of design and maintenance of kiers. —A.J.H.

Monel Metal (in Textile Treatment). *Dyer and Cal. Printer*, 1927, 57, 186-188.

A description of laundering, bleaching, and dyeing process which may be advantageously carried out in machines lined or made with Monel metal. Monel metal is an alloy consisting of 2 parts of nickel and 1 part of copper; it takes a high polish, and is practically non-stainable by dye and other liquors used in textile treatment. Concentrated solutions of bleaching substances (e.g. Sodium Hypochlorite) should not be

used in contact with Monel metal, although solutions of usual bleaching concentrations are not harmful. Monel metal is attacked by sulphur dye liquors, but is satisfactory with liquors containing direct, acid, vat, and basic dyes. —A.J.H.

(I)—DYEING

Cutches and their Application. O. Piequet. *Chem. Abs.*, 1927, 21, 177 (from *Tiba*, 1926, pp. 1057-1063; 1167-1177).

Discussion and description of their application in dyeing, with a suggestion that other similar products ("Cu-nao," "Cay-da," "Cay-duoc," "Casurina," mangrove) be also used for dyeing. A number of formulas are given. —L.I.R.A.

Sulphur Blacks and the Conditions of their Substitution for Aniline Black. R. Vidal. *J. Soc. Dyers and Col.*, 1927, 43, 25 (*T.I.B.A.*, 1926, 4, 1165).

The sulphur blacks are reviewed historically and the general methods for their preparation outlined briefly. The mode of preparation usually adopted, viz., boiling nitro or nitroso-compounds with sodium sulphide and sulphur in an aqueous medium, and applied chiefly to dinitrophenol, results in contamination of the product with sulphur, which renders the shade grey and leads to attack of the fibre by formation of sulphuric acid. This serious defect prevents sulphur blacks occupying the important position in dyeing which they should do. The discovery of an agent capable of eliminating the sulphur deposited in the fibre and imparting the full beauty to the sulphur black dyeing was the essential condition for the substitution of these blacks for aniline black. The author has discovered such an agent as a result of his work on oils, and so supplemented his original discovery of Vidal Black. Consequently, blue-blacks, to reddish-violet-blacks, can now be obtained of intensity and purity never attained by aniline black. Sulphur blacks, therefore, can now replace aniline black with the threefold advantage of preserving the fibre, preventing poisoning among the workmen, and simplifying the apparatus required.

—L.I.R.A.

Dyeing Cotton with Vat Dyes in Mechanical Dyeing Apparatus. H. Dechaine. *T.I.B.A.*, 1926, 4, 1051-1057.

By immersing the dry cotton directly in the dye vat instead of first wetting it, more results are obtained with lower consumption of dye and of hyposulphite, and at the same time the output of the apparatus and the cost per unit are reduced. The application of the process and its advantages are described in detail.

—L.I.R.A.

Use of Sulphurised Phenols in Dyeing Half-wool and Silk Materials. *M/cr Guard. Comm.*, 1927, 14, 326.

Katanol W, a water-soluble sulphurised phenol similar to Katanol O (used as a substitute for tannic acid in dyeing cotton

materials with basic dyes) retards the dyeing of wool and natural silk with direct dyes, and is thus suitable for prevention of staining of the animal fibre during the dyeing of half-wool and silk materials in one or two colours using acid (for the animal fibre) and direct (for the cotton) dyes. The union material is dyed with an acid dye in a neutral dyebath containing Glauber's salt, and when the animal fibre attains the desired shade, dyeing is continued at a temperature not exceeding 60° C. with the addition of a direct dye and Katanol W for the "filling in" of the cotton. In the case of natural silk it is preferable to mordant the silk (in the union material) with W before dyeing. —A.J.H.

Hank Dyeing Machine. *Text. Exporter*, 1927, 1, No. 1, p. 39-40.

A detailed description of the construction and working of a hank dyeing machine consisting of a number of horizontal rotating hank-carrying arms (the direction of rotation is automatically reversed periodically) which may be raised from or lowered into a dye vat. —A.J.H.

Cellulose Acetate Silk [Progress in Dyeing and Finishing of—]. A. J. Hall. *Text. Exporter*, 1927, 1, No. 1, p. 24-25.

Some recent methods for preserving the lustre of cellulose acetate silk when dyed in the presence of wool at boiling temperatures are described. Methods for dyeing this type of silk in fast black shades are compared, reference being made to improved oxidation blacks obtainable with 2:4-diaminodiphenylamine and *p*-aminodiphenylamine. —A.J.H.

Developed Dyes; Fastness Properties of—. *M/cr Guard. Comm.*, 1927, 14, 251.

Considerable attention is now being given to the dyeing of cotton, and also wool and natural silk, with Naphthol AS dyes (some 9 naphthols and 20 bases of this series are now available), mainly because of their excellent fastness to light and washing. Fast Bordeaux Salt GP has now been replaced by Fast Garnet G and GB bases, which have greater fastness and are more convenient in use; Fast Red Salt AL is a new product which with Naphthol AS-SW yields a Turkey red shade of the highest possible fastness to light even in pale shades. Fast Blue Salt B recently introduced, couples more easily than the base previously available and the resulting shade is faster to washing. Sulphurised phenol mordants (substitutes for tannic acid) such as Kalanol O do not yield insoluble precipitates with basic dyes when the latter are in their form of their free bases, so that printing pastes containing both mordant and basic dyes may be prepared.

—A.J.H.

Dyeing Fabrics Prior to Rubber Proofing. *Text. Argus*, 1927, 3, 27th April, p. 7.

A statement of the chief conditions to be observed in dyeing cotton, wool, and silk

fabrics such that they may be rubber proofed satisfactorily. Proofing is unsatisfactory if the material contains more than 2% of greasy substances or 0.01% of copper. —A.J.H.

Synthetic Dyestuffs. *Text. Argus*, 1927, 3, 27th April, p. 6.

A resumé of recent progress in the dyeing of wool with various dyestuffs, including logwood, alizarin, and vat dyes.—A.J.H.

Sulphur Dyes and their Application. A. J. Hall. *Dyer and Cal. Printer*, 1927, 57, 146-147.

The usually admitted claim of Croissant and Bretonniere to have prepared the first sulphur dye—Cachou de Laval—in 1873 has now been shown not valid by R. Vidal, since this product of the fusion of sawdust and caustic soda and sulphur contains no sulphur, though it dyes cotton in the presence of sodium sulphide. Vidal's discovery of the first sulphur dye in 1892 was quite accidental; he obtained blue and violet indophenol substances having the properties of sulphur dyes while endeavouring to produce dihydroxy derivatives of diphenylamine by the action of phosphane on catechol and hydroquinone, and traced the formation of these to the presence of sulphur as an impurity in the phosphane. Sulphur black dyes have a molecular structure very similar to that of Aniline Black. Sulphur black dyes produced by digestion of dinitrophenol with aqueous solutions of sodium sulphide are more liable to lead to after-tendering of dyed cotton, than those produced by fusing amines with sulphur, or digesting amines with thiosulphates. —A.J.H.

Stripping and Dyeing of Rags. H. O. Richardson. *Dyer and Cal. Printer*, 1927, 57, 118-119.

Before conversion into mungo and shoddy, woollen rags are sorted according to colour (also carbonised if cotton is present), then stripped and redyed; blue, black, and white rags are usually utilised without treatment. The most important stripping agents are sulphuric acid and a bichromate, sodium hydrosulphite, Formosul, or Reductite (zinc). Usually, 3-6% of the bichromate and 6-12% of sulphuric acid, 3-4% of sodium hydrosulphite or Formosul, or 4-6% of Reductite or zinc, and 6-12% sodium bisulphite are employed, the stripping process being carried out at boiling temperature. Dyeing is effected by means of acid or chrome dyes, it being unnecessary to mordant the rags before when stripping has been carried out with a bichromate and sulphuric acid. —A.J.H.

Dyes: Fading. A. Beyer. *Chim. et Ind.*, 1926, 16, 991-992 (from *Papier*, 1926, 29, 307-319).

The author gives four reactions to explain the fading of dyes by light in the presence of air and water, the theory being that the

sensitivity of the dye compound is determined by its residual valencies. In the first reaction nascent oxygen results; in the second are formed the negative OOH^- ion and the positive OH^+ ion, which attach themselves to the residual valencies to form the hydro-peroxide of the dye $\text{X}-\text{OH}$ and a second hydro-peroxide $\text{X}-\text{OOH}$, and a second hydro-peroxide $\text{X}-\text{H}$ and a second hydro-peroxide $\text{X}-\text{OOH}$. These compounds undergo auto-oxidation to peroxides or polymerisation, &c. Six methods of stabilising the dyestuffs by preventing the above reactions are suggested. —B.C.I.R.A.

Dyeing Black Shades on Cotton Materials.

A. J. Hall. *Chem. Age (Dyestuffs Suppl.)*, 1927, 16, 35-37.

A discussion of the methods used and the dyes available; the relative fastness of the latter being indicated. The recent introduction of the sulphur dye, Indocarbon CL, having good fastness to chlorine, renders possible the use of black sulphur-dyed cotton effect threads in fabrics which have to undergo normal bleaching. Tests for distinguishing between dyeings on cotton obtained with direct, developed direct, sulphur, vat, Naphthol AS-SW, and Aniline Black dyes, are described. Any washing or soaping treatment of fabrics dyed with sulphur black dyes which decreases the residual alkalinity of the fabric assists after-tendering; the increased resistance of after-chromed fabrics dyed with sulphur black is attributed to the presence of chromium oxide. —A.J.H.

Theories of Dyeing Wool. A. P. Sachs. *Bull. Nat. Ass. Wool. Manufs.*, 1927, April, p. 243.

In this article it is shown that dye solutions are colloidal in nature, and that wool is an amorphous colloid and an amphoteric protein. The reaction between wool and dyestuff is probably similar in general nature to, but greatly different in detail from, the reactions between other textile fibres and dyestuffs. The process of dyeing wool is strictly a colloid-chemical phenomenon, involving adsorption of the dyestuff by the fibre, due to differences in electrical potential, formation of a chemical compound (a salt of wool and dyestuff), which causes the dyeing to be fast and prevents the reversal of the adsorption process. The colloid-chemical theory of dyeing wool reconciles the facts previously observed, which formed the basis of rival and mutually contradictory theories of dyeing. —B.R.A.W. & W.I.

Cellulose Acetate Silk: Dyeing. R. Metzger. *Leipziger Monats. Text.-Ind.*, 1927, 42, 130-132.

The author describes the process for dyeing cellulose acetate artificial silk with the four classes of "Cellite" fast dyestuffs manufactured under I.G. patents; and deals with the dyeing of acetate silk union fabrics of all descriptions. —B.C.I.R.A.

Cellulose Acetate Silk: Dyeing. J. Pokorný. *Leipziger Monats. Text.-Ind.*, 1927, 42, 113-116.

A- slightly extended account.

—B.C.I.R.A.

Cotton-Artificial Silk Mixtures: Dyeing. J. Ernst. *Leipziger Monats. Text.-Ind.*, 1927, 42, 112.

Directions are given for obtaining uniform shades on cotton fabrics with artificial silk effects, having regard to the fact that artificial silk generally takes a deeper shade than cotton in the same dyebath. If cellulose acetate silk is present in the fabric, the goods should be put into a wetting bath at 50° containing 25 kg. of sodium chloride, 65 g. caustic soda, and 50 g. sodium phosphate, for an hour, and well washed. The acetate silk can then be dyed with direct benzidine dyestuffs and also with basic dyes to give uniform dyeing with the cotton. For the other ordinary artificial silks the fabric should be well wetted in a bath containing 5 g. Turkey red oil per litre for half an hour at 65°. Dyeing is done with 200 g. Monopol soap in 100 litres of dye liquor, without Glauber salt, at 30°, at which temperature the artificial silk dyes lighter than the cotton. When the cotton is dark enough in shade the goods are dyed again with a neutral-dyeing wool dyestuff, which dyes the artificial silk the same shade or slightly lighter than the cotton.

—B.C.I.R.A.

Indanthrene Blue RS: Application. G. Durst and H. Roth. *Melliand Textilber.*, 1927, 8, 158-160.

The methods previously described have been used to follow the changes with time in dyestuff, hydrosulphite and caustic soda concentration in dyeing from an Indanthrene Blue RS vat. Wet scoured cotton (100 g.), cut into small pieces, was introduced into 2 litres of a vat of given composition. The curve for fall in concentration of the dye is steeper than that for Indanthrene Blue GCD (K. 1926, 89). The concentration falls very rapidly in the first 15 minutes, more slowly in the next 15 minutes, and still more slowly in the next 30 minutes. The hydrosulphite concentration falls rapidly in the first five minutes (due to the air content of the cotton), then slowly and uniformly, due to oxidation at the surface of the vat. The curve for fall in caustic soda concentration was similar to that obtained in the Indanthrene Blue GCD experiments, although in this instance pure caustic soda only was determined, so that there is only a minimum conversion to sodium carbonate by atmospheric carbon dioxide.

—B.C.I.R.A.

Vat Dyes: Steaming. K. Reinking and P. A. Driessen. *Melliand Textilber.*, 1927, 8, 269-270.

In laboratory experiments with an air-free continuous steamer operating with saturated steam of little above atmospheric pressure, it was found that the fixation of

vat dyes depends greatly on the steam supply. Whereas the Indigoid colours under low steam supply conditions merely give a paler colour, the Indanthrene dyes, as a whole, require a minimum steam supply to give full, fast colours, and fluctuating results may be due to the pressure accidentally falling below the required minimum. A few anthracene derivatives, namely, Indanthrene Brown R, Gold Yellow GK, Red Brown R, Rose B, and the three violets, RF, BF, and BBF behave like the Indigoid colours.

—B.C.I.R.A.

Aniline Black: Application. M. M. Tschilikin. *Melliand Textilber.*, 1927, 8, 265-269.

An account is given of experiments on the application of aniline black. In Prud'homme's process, loss of aniline amounts to 21-25% of the aniline applied and occurs chiefly in the drying apparatus, whilst the fabric is tendered chiefly in the steaming process. It is concluded that the aniline-hydrochloric acid ratio should be modified or, still better, the prepared salt be used; the quantity of aniline should be reduced from 80 to 60 grams per 1,000 c.c. of dye bath and a colloidal substance such as gum tragacanth should be added. In the drying apparatus, the temperature should not exceed 50° C., in stoppages the apparatus should be cooled by cold air, and goods coming from the apparatus should be cooled in the last compartment by a counter-stream of cold air. In steaming, the temperature should be 95° C. or even somewhat lower, the steam should be sufficiently damp and the goods should, after steaming, be cooled in a separate room and be cold before loading on to transport wagons.

—B.C.I.R.A.

Artificial Silk: Dyeing. P. Rabe. *Melliand Textilber.*, 1927, 8, 260-261.

Sirius dyes (I.G. Farbenindustrie A.-G.) are suitable for dyeing cotton, silk, half-wool, half-silk, and especially nitro, cuprammonium, and viscose artificial silks. They are very fast to light and are particularly useful where the general fastness of the Indanthrene colours is not required. The practical application of Sirius dyes to artificial silk in the hank, in the piece, and in mixed fabrics is briefly discussed and a list is given of those colours which leave acetate silk white in dyeing mixed fabrics of which it is a component.

—B.C.I.R.A.

Artificial Silk: "Blinding" in Dyeing.

H. Lint. *Melliand Textilber.*, 1927, 8, 258.

The blinding of artificial silk dyed with Naphthol AS colours is due to—(1) the use of a too-concentrated naphthol bath, so that the fibre is surcharged with naphthol and in the subsequent development an excess of colour lake is formed which is deposited on the fibre, covering its lustre, and (2) the use of certain naphthol combinations which affect the lustre, even when less

concentrated solutions are used, if finished at temperatures above 60° C. The phenomenon is not due to any change in the artificial silk but to the aggregation of the colouring matter by the hot finishing treatment. The lustre is fully recovered if the blinded fibre is stripped with hydro-sulphite. Less concentrated naphthol baths are required for artificial silk than for cotton. The I.G. Farbenindustrie A.-G. publish a table indicating which naphthol combinations must be rinsed and soaped at temperatures not above 60° C. and which are stable at higher temperatures. —B.C.I.R.A.

Artificial Silk: Dyeing. E. Uhlig. *Melliand Textilber.*, 1927, 8, 257-258.

The advantages of machine dyeing as compared with hand dyeing are emphasised, the Gerber hank-dyeing machine is described and a new Gerber machine which treats the dyed hanks after centrifuging, giving an evenly laid, perfectly winding yarn. —B.C.I.R.A.

Hydrosan: Application. M. Apfelbaum. *Melliand Textilber.*, 1927, 8, 274-275.

The use of Hydrosan is recommended in soaping Alizarin Red prints when the available water is hard. Purer whites, clearer colour tones, and a soft feel are obtained, and it may be possible to omit clearing, so that secondary effects due to the formation of decomposition products of lime soaps are avoided. If clearing is desired, a 0.5 to 1% solution of Aktivin, possibly with simultaneous blueing, is sufficient. —B.C.I.R.A.

Dyeing Cotton Warps. See Section 4G.

Use of Monel Metal for Dyeing Machines. See Section 4G.

(J)—PRINTING

Printing Cellulose Acetate Silk Union Fabrics. See Section 4I.

(K)—FINISHING

Artificial Silk Fabrics: Finishing. L. Hwass. *Kunstseide*, 1927, 9, 275.

Directions are given for using Avivier acid ("Aviviersäure") for the production of different types of silky feel on artificial silk fabrics. —B.C.I.R.A.

Boiling Cellulose Acetate. *Chemicals* (N.Y.), 1927, 27, No. 17, p. 23.

It is stated that a process will shortly be described for making cellulose acetate immune to boiling. Of all the rayon fibres, the acetate is affected least by wetting. The swelling of the fibre when boiled is taken advantage of to prevent slipping and laddering. In order to produce a non-fraying edge on collars, the fabric is treated with sulphuric acid of parchmentising strength. The loss of lustre when boiled may be checked by incorporating certain inorganic salts. De-lustred acetate cellulose can be used for

pattern effects. All salts of the alkali metals may be used to control the lustre in boiling. —F.G.P.

Finishing Cotton Fabrics; Use of the Calender in—. *Text. Exporter*, 1927, 1, No. 1, p. 33-37.

A description of the uses and construction of various types of friction, chasing, and schreiner calenders. The soft bowls are usually made of compressed Egyptian cotton, suitably carded, or of woollen paper, or less frequently of linen; the metal bowls are of chilled iron or closely grained cast-iron, the former being polished. Frames for supporting the bowls may be of the open or closed type, but in either case arrangement for the easy removal of any bowl is necessary. In schreiner calenders a device is provided whereby the engraved bowl may be skewed, since this allows greater lustre to be conferred on the fabrics being schreinered. —A.J.H.

Chlorination of Wool. L. Lussiez. *Chem. Abs.*, 1927, 21, 1015 (from *T.I.B.A.*, 1926, 4, 1299-1307).

A practical technical discussion covering the properties of wool subjected to proper and to excessive chlorination with Cl gas, both dry and in aqueous medium, and with HClO, the mechanism of chlorination and variations in the conditions of treatment according to the properties desired.

B.R.A.W. & W.I.

Cotton, and Artificial Silk: Scrooping. *Leipziger Monats. Text.-Ind.*, 1927, 42, 122-123.

Methods of conferring on cotton and artificial silk the scrooping feel of silk are described. Cotton is agitated in a warm soap bath (40°-50°), containing 4-5 g. of good curd soap per litre, the cotton being in the proportion of one part to 20 parts of liquid. After half an hour the cotton is centrifuged. The subsequent acid treatment consists in placing the cotton for a short time in a bath containing 4-5 g. 100% lactic acid per litre, and centrifuging and drying quickly at 40°-50°. The methods give a permanent feel to the cotton. The process is the same for artificial silk, except that the soap bath contains 10 g. of curd soap and the acid bath 10-15 g. lactic acid per litre. The process gives a soft feel to the fibre. —B.C.I.R.A.

Artificial Silk: Finishing. *Leipziger Monats. Text.-Ind.*, 1927, 42, 128.

The Sjostrom conditioning machine is recommended for use in finishing processes for artificial silk, to restore lustre, feel, &c., after the application of heat.

—B.C.I.R.A.

Calendering Machines. K. Schulze. *Melliand Textilber.*, 1927, 8, 140 and 230-232. A general account of different types of calender and the effects produced.

—B.C.I.R.A.

Finishing Cotton Warps. See Section 4G.

Progress in Finishing Cellulose Acetate Artificial Silk. See Section 4I.**(L)—WATERPROOFING****Waterproofing of Woollen Cloth.** *Text.**Argus*, 1927, 3, No. 135, p. 2.

Waterproofing woollen fabric is most satisfactorily produced by weaving waterproofing yarn rather than treatment of the fabric. A satisfactory process consists of impregnating weft woollen yarn with a waterproofing solution containing rubber, and weaving this into fabric without previous drying, whereby the excess of solution is forced into the warp yarn and the whole fabric thereby proofed without rendering it impervious to air. Re-waterproofing of garments is effected by impregnating the woollen material with a 5-10% solution of mutton tallow in petroleum containing a small proportion of carbon bisulphide (a solvent for tallow).
—A.J.H.

PATENTS**Dyeing and Printing Acetyl-Cellulose.**Bernouilli and Link. U.S.P. 1,613,228 (from *Chemicals* (N.Y.), 1927, 27, No. 5, p. 27).

Dyeing generally has an injurious effect upon the fibre. With this process dyes having a weak affinity for acetyl cellulose may be used and the disadvantages avoided by addition to the dyebath or printing paste of aryl-sulphonic acid compounds of any kind; the dyestuffs are thus brought into a form in which they are taken up by the fibre at a relatively low temperature, which is quite harmless. Protective colloids, such as glue, glucose, boil-off liquor, &c., may be added to prevent precipitation of the dyes; 2% of Methylene Green and 2% of either sodium diphenylamine-sulphonate or carbazolsulphonic acid are separately dissolved in water at 50° C., the fibre being immersed and kept at that temperature for $\frac{3}{4}$ hour. The ratio of fibre to water should be 1:60. For printing: one part of 2:7-naphthol-sulphonic acid dissolved by warming in 13 parts water and mixed with 36 parts gum-thickening 1:1. Into this paste is stirred one part setoglucine dissolved in five parts 80% acetic acid and 10 of water, to which is added 34 parts of 1:1 gum. This paste is printed, steamed, and washed as usual.
—F.G.P.

Waterproofing of Marine Cloths. C. Hafele.

F.P. 607,493.

Indiarubber is dissolved at 100° C. in benzine so that the mass is sticky. This mass is spread cold upon the cloth; 10% of zinc oxide and 5% of fine baryta powder are added and spread by means of rollers and scrapers. Another cloth is put above the first. Both cloths are pressed together and hot pressed with a dry roller. Sometimes the cloth is vulcanised.
—Bur. Text.

Cotton Cloth: Ornamenting. E. Gminder, Reutlingen, Germany. E.P. 267,566.

A fabric is printed with a mercerising liquid and while under tension is printed with a neutralising liquid. It is then allowed to contract.
—B.C.I.R.A.

Cellulose Acetate Silk: Dyeing and Printing.

J. Y. Johnson, London (I.G. Farbenindustrie A.-G.). E.P. 267,695.

Cellulose esters are dyed and printed by means of water-soluble sulphamic acids derived from coloured amino compounds which are not dyestuffs capable of dyeing cotton. They may also be printed with the aid of sulphamic acids derived from dyestuffs containing at least one amino group, with or without other substituents. In examples, acetate silk is dyed in reddish-violet or reddish-blue shades with the sodium salts of the sulphamic acids from 1:4-diaminoanthraquinone and 1:5-diamino-4:8-dihydroxyanthraquinone. In some cases the shades obtained may be modified by treating with diazo compounds on the fibre, or they may be diazotised and coupled with azo dye components.
—B.C.I.R.A.

Nap Raising Machine. R. H. Monk, Brookline, Mass. E.P. 267,753.

A machine for raising the nap on laundered blankets, &c., and stated to be of general application to brushing machines, is provided with a positively-driven card or bristle covered floating roll suspended so that, when it is bearing against the work, it is but slightly displaced from the vertical plane passing through the pivot axis. Means are provided for adjusting the rolls in relation to the work and for maintaining the adjustment by devices controlled by the thickness of the material.
—B.C.I.R.A.

Copper Printing Rollers: Manufacture.

E. S. Ballard, Eureka, California. E.P. 267,911.

To avoid the necessity of grinding or dissolving away the outer surface of an engraved printing plate or roller in order to remove the design, the actual printing surface is formed as a thin film of metal electrolytically deposited on a base plate or roller in such a way that it can be stripped off when desired. The roller or base, preferably of copper or brass, is provided over the greater portion of its area with a layer of material, preferably an alloy of bismuth, cadmium, lead and tin, having a melting point of about 202° F., on which a film of copper or other suitable metal can be electrolytically deposited but from which the film can be readily stripped. Beyond the layer, the film integrally unites with the base to form a seal which is removed by grinding, &c., when it is desired to strip the film. Instead of using an alloy for the layer, a film of grease, oil, or graphite may be employed, or an oxidising agent may be applied to the base.
—B.C.I.R.A.

Sulphonated Hydrocarbon Wetting Agents:

Application. I.G. Farbenindustrie A.-G., Frankfort-on-Main. E.P.267,924.

Sulphonic acid derivatives from mineral oils or the like containing non-aromatic hydrocarbons, or their salts, are claimed as soap-like agents, *inter alia*, in sizing baths for yarns. —B.C.I.R.A.

Hank-spraying Apparatus. J. L. Rushton, Bolton. E.P.268,035.

In apparatus for the liquid treatment in a series of vats of articles such as skeins of artificial silk, in which rotatable work-supporting rollers are carried by a portable frame, spraying tubes are provided on the frame, lying within the loop of each hank. A pump supplies liquid to these tubes through a detachable connection and distributors and also supplies tubes mounted in the vat to lie between the rollers. The latter have fixed or detachable flanges to separate the hanks and are geared to a worm wheel on the frame, there being a corresponding motor-driven worm forming part of the vat equipment. —B.C.I.R.A.

Scouring Apparatus. W. Pickford, Leicester. E.P.268,149.

To prevent articles from falling between endless tapes as they pass from the squeeze rollers to the return guide roller, there is provided a continuous surface endless band beneath the tapes between these points. The band may be provided with a separate guide and tensioning roller or it may pass round the squeeze roller. —B.C.I.R.A.

Immunised Cotton Mixed Fabrics: Dyeing.

Soc. Anon. des Etablissements Petitdidier Ancienne Maison Jolly-Belin, St. Denis, France. E.P.268,327.

Fabrics composed of immunised cotton and of cotton or other fibres, such as viscose silk, are first dyed with dyestuffs suitable for dyeing immunised cotton, such as amino-, oxy-, diamino-, tetramino-, methylamino-, or dimethylamino-anthraquinones, certain acid dyestuffs, such as Citronine or Roccelline, or basic dyestuffs mordanted with tannin or acetanol. They are then rinsed to remove part of the colouring matter from the fibres other than those of immunised cotton, and finally treated, if desired, with an agent such as sodium hydrosulphite, which bleaches all parts of the fabric except the immunised cotton. The fabric may then be dyed with dyestuffs which act on the cotton or viscose silk without appreciably altering the colour of the immunised cotton portion. The dyeing of a fabric composed of immunised cotton, cotton and viscose silk, is described in an example. —B.C.I.R.A.

Viscose Black Lye: Purification. L. Cerini, Milan, Italy. E.P.268,385.

The diaphragms employed in E.P. 265,126 are constructed of fabrics of cotton or other vegetable fibres mercerised, without tension, by a concentrated solution of caustic soda. —B.C.I.R.A.

Spinning Emulsion: Composition. I.G. Farbenindustrie A.-G., Frankfort-on-Main. E.P.268,387.

Olein (80 parts) is stirred into a solution of dimethyl-cellulose ($2\frac{1}{2}$) and sodium isopropyl-naphthalenesulphonate ($2\frac{1}{2}$) in water (300). Other sulphonates of the same type may be used. —B.C.I.R.A.

Fabrics: Ornamenting. Heberlein & Co. A.-G., St. Gallen, Switzerland. E.P. 268,389.

Pattern effects are obtained on yarns or on fabrics, including artificial silk, by applying pressure by means of embossing rollers or plates heated to at least 100° C., and then treating the material with a swelling agent, such as sulphuric, phosphoric, hydrochloric or nitric acid, alkali lyes of the concentration used for mercerisation, or a solution of a salt, such as zinc chloride or calcium sulphocyanide, the agent attacking the raised parts more than the parts affected by the pressure. The relief is partly or wholly removed by washing, and the material is then subjected to the usual finishing processes, such as bleaching, dyeing, or printing. —B.C.I.R.A.

Vacuum Drying Chamber. O. Minton, Greenwich, Conn. E.P.268,391.

The material inlet and outlet openings of vacuum drying chambers, &c., are sealed by rollers between which the material is passed into and out of the chamber, and an air-tight joint is maintained between the peripheries of the rollers and the casing by recessed resilient strips which are pressed against the rollers by inflated tubes and liquid seals. The entry of air into the chamber between the ends of the rollers and the casing is prevented by resilient rings which are pressed against the renewable metal ends of the rollers by inflated annular tubes. —B.C.I.R.A.

Wool-finished Cellulose Goods. W. Harrison, Nelson, Lancs. E.P.268,505.

Cellulosic fibres, such as cotton, linen, ramie or jute, whether in the form of fibres, yarns or fabrics, acquire many of the properties of wool by treating first with caustic alkali or alkali sulphide and carbon disulphide, to form an unstable insoluble xanthate, and then converting the latter into a stable compound by treatment with a mild oxidising agent which will not split off the carbon disulphide combined with the cellulose. Suitable oxidising agents are nitrous acid or oxides of nitrogen, ferricyanides, iodine, and oxygen or air, preferably in the presence of a catalyst such as oxides of iron, cobalt, nickel or manganese; with air, it is necessary that the material should be moist, the air cold, and the treatment prolonged, or that a catalyst should be present. The carbon disulphide may be applied in the form of vapour, or in solution in an inert solvent such as benzene, and it may be applied before or after treatment with caustic

alkali, &c., or simultaneously therewith in the form of an emulsion or colloidal solution, and the material may or may not be subjected to tension during either of these treatments or during the subsequent washing operation. The unstable xanthate, preferably after washing, with or without the application of tension, or after acidifying with a weak acid such as acetic acid, is subjected to treatment with the mild oxidising agent. The oxidised stable product, if coloured, may be decolorised by treatment with sulphurous acid. The dried product may be shrunk by treatment with ammonia, sodium sulphide, or sodium sulphite, preferably in the presence of alkali. The products of the treatment show strong affinity for basic colours and for certain acid colours of the sulphonated basic type, and the dyeing properties may be further modified by treatment with organic compounds, particularly those of a basic character, and especially aniline, benzylamine, phenylhydrazine, or soluble derivatives of anhydroformaldehyde-aniline. —B.C.I.R.A.

Tubular Fabric Stretching Frame. M. M. Kasanof, New York. E.P.268,659.

Tubular goods, such as knitted tubular fabrics or flat fabrics sewn along the edges temporarily to form tubes, are stretched or shrunk on a hollow head supported on a steam pipe and provided with annular series of perforations, a bead, and an external annular steam pipe provided with perforations directed towards the fabric on the head. In use, the head is unscrewed from the standard over which the fabric to be treated is passed. The head is then replaced and the fabric is drawn over the tapered end of the head, and over the length of the head to rollers. Steam is passed through the standard and grooves are formed in the head to prevent the perforations from being closed by the fabric. —B.C.I.R.A.

Cotton Fabric: Ornamenting. Heberlein and Co. A.-G., St. Gallen, Switzerland. E.P.268,781.

The process described in Specification 268,389 is modified by first subjecting the fabric to the action of the swelling agent and then embossing the fabric while the agent is still active or after it has been washed out, but before the fabric is dry. In an example, bleached cotton is treated with caustic soda lye and is then passed to a goffering machine, and is washed and dyed. In another example, mercerised fabric is treated with sulphuric acid, and is washed and passed between heated goffering-rollers which, incidentally, dry the fabric. The fabric may include artificial silk fibres. —B.C.I.R.A.

Artificial Silk Fabrics: Ornamenting. Heberlein & Co. A.-G., St. Gallen, Switzerland. E.P.268,831.

The swelling agent described in Specification 264,529 is applied locally by printing,

spraying, or painting, or by applying a reserve and subsequently immersing the material in the swelling agent. Colouring matter may be added to the reserve.

—B.C.I.R.A.

Cellulose Acetate Silk: Dyeing. British Dyestuffs Corporation Ltd., A. Shepherdson and A. Davidson, Blackley, Manchester. E.P.268,933.

Acetate silk or mixtures containing it are dyed by means of coeramidines (anthraquinone-acridines), which may be obtained by heating α -arylaminoanthraquinones with sulphuric acid. The dyestuffs may be employed in the form of aqueous suspensions or solutions. A dispersing agent, e.g. Turkey red oil, or the naphthalene derivative described in Specification 224,077 may be added to the dyebath or previously mixed with the dyestuffs. In an example, acetate silk is dyed a full greenish-yellow with the coeramidine from 1-phenylaminoanthraquinone.

—B.C.I.R.A.

Drying Apparatus. T. E. Wood and H. Heymann, Bradford. E.P.269,064.

The materials, such as textiles, &c., to be dried, are conveyed on endless bands or otherwise through a chamber having zones maintained either at the same or different temperatures by independent currents of heated air which are admitted to the zones through concentric ducts. The chamber has three drying compartments and a cooling compartment. Cold air is drawn by a fan through a valve-controlled opening, upwardly through the cooling compartment and into a perforated collecting chamber which extends the length of the chamber, thence through a valved duct to the fan which forces it, together with fresh air admitted through a valved inlet of the fan, through a heater which may be of the kind described in Specification 230,612. From the heater the air passes into concentric ducts and thence through ducts to the drying compartments. The air then passes through the perforated floors of the compartments to the collecting chamber from which it exhausts through ducts into a longitudinal flue having an outlet to the atmosphere. By controlling certain openings and dampers the air may be continuously circulated. —B.C.I.R.A.

Artificial Silk Fabrics: Ornamenting. R. Clavel, Basle, Switzerland. E.P.269,128.

Metallic, coloured, or other effects are produced on fabrics composed of or containing cellulose esters or ethers by applying to the fabric a paste containing a thickener, a powder (for example, a powdered metal, a coloured or white mineral powder or an insoluble dyestuff), and a solvent or swelling agent for the cellulose ester or ether. The powder is fixed on drying the fabric, and after drying, the fabric may be dyed. To obtain special effects the fabric may be stretched so as to break some of the threads,

whereupon a dyed or white background appears. The fabric may be finally calendered. In examples, the paste consists of a water solution of gum arabic, acetone, and powdered gold substitute, and the material, a cellulose acetate fabric is, after coating, quickly dried; it may finally be dyed, preferably at 80-100° C. with a cellulose acetate or cotton dyestuff. An alternative paste consists of sericose, acetone, ethyl alcohol, benzene and powdered gold or silver substitute. Other suitable powdered materials are powdered bronze, aluminium, ultramarine, and iron oxide, and as alternative solvents or swelling agents, Turkey red oil, triacetin, tricresyl phosphate and mono-oil are mentioned. Mixed fabrics such as contain cotton, wool, natural silk or a regenerated cellulose artificial silk, may be treated.

—B.C.I.R.A.

Yarn Spot-dyeing Apparatus. Eclipse Textile Devices, Inc., Elmira, New York. E.P.269,146.

The patent relates to a method of spot-dyeing yarn and to means for removing the surplus liquid. A cone of yarn is dyed within one or more bands by means such as the grooved needle described in Specification 205,812, whereby the dye is carried into the yarn under pressure, and the greater portion of the liquid vehicle, which may be water, is subsequently extracted by rapid rotation about an axis perpendicular to the plane of the band. The liquid in which the dye is dissolved or suspended may be heated and may contain an assistant to penetration such as Turkey red oil. Where the cone of the yarn is to be rotated about its axis, for drying, it may be inserted in a perforated holder mounted on a shaft rotated by a pulley and belt, a casing provided with a drain-pipe confining the liquid thrown off. The apparatus may be duplicated. The centrifugal force restores the shape of the core if it has been softened by the liquid.

—B.C.I.R.A.

Yarn Dyeing Apparatus. Eclipse Textile Devices, Inc., Elmira, New York. E.P. 269,147.

A cone of yarn wound on a perforated hollow core is dyed by circulating the liquid first between both ends of the cone and the interior of the core, and then through a different path, and subsequently drying centrifugally. The yarn is wound on perforated conical paper cores, which soften in the liquid and are drawn by the suction so as to make tight joints with perforated metal holders mounted over a conduit which is situated at the bottom of the open dyeing tank and is connected to the pump. Shields having handles are adjusted by screws to fit closely round the sides of the cores of yarn and compel the dye to pass in through the ends. The covers are then removed and the dye is allowed to circulate through the entire outer surface of the cones to ensure even dyeing, or this step may be

performed first. A valve is opened and the supply valve is closed so that the pump empties the dyeing tank into an open storage tank. The cones of yarn are then dried by insertion in perforated frusto-conical holders which are rapidly rotated on their axes, the softened cores being urged into, and dried in, their original form, by the centrifugal force. The storage tank contains a heater.

—B.C.I.R.A.

The following is a list of patents of which abridgements have recently appeared in the *Illustrated Official Journal (Patents)*—

Washing—

268,979. R. S. Hiltner. Cleaning or scouring raw wool, &c.: materials and processes for washing.

5—LAUNDERING AND DRY CLEANING

Textile Fabrics: Laundering. K. Brauer. *Melliand Textilber.*, 1927, 8, 166-168 and 277-279.

A preliminary account is given of a comparative investigation of the effect of a pure curd soap, a soap powder, and a per-salt washing agent. Sunlight soap, Thompson's soap powder (a mixture of soap and soda), and Persil (a mixture of soap, soda, and sodium perborate, with the addition of a little water glass), were selected, and washing tests were made on pieces of fabric stained with oils, cocoa, coffee, milk, red wine, rust, blood, and iron-free ink. Except for machine oil, the three materials showed almost the same emulsifying power for oils. The stain removing power of Persil was superior to that of either the curd soaps or the soap powder, and the fabric was not affected by the presence of copper as, for example, by the use of a copper boiler. Cocoa-stained pieces of fabric were tested for strength before and after 50 washes: the loss in strength was scarcely greater using Persil than when soap was used, and when the lower stain-removing power of the soap and soap powder, and consequent increased number of washes required to obtain an effect equal to that of Persil is considered, the decrease is quite as great for soap and greater for soap powder. The experiments to date, including laundry and household tests, have failed to discover any damaging action due to Persil. The divergent results of different contributors to this subject are due to their having considered either the appearance after washing or the results of strength tests. Logical conclusions can only be drawn when the two factors are considered together.

—B.C.I.R.A.

Colloidal Clay in Soap Boiling. R. Tefs. *Chem. Abs.*, 1927, 21, 1198 (from *Z. Deut. Öl. ü Fett-Ind.*, 1926, 46, 801). Laboratory experiments show that colloidal clay may be usefully employed in soap-boiling. In experiments carried out for

1½-4 hours, the addition of clay increased the amount of oil saponified in every case, the percentage increase varying between 7% and 41%. There is, therefore, a possibility of clay being usefully incorporated in soaps, apart from any detergent considerations. —B.L.R.A.

Stained Fabrics: Cleaning. U.S. Dept. Agric. *Farmers' Bull.*, No. 1474, 1926, 30 pp.

Home methods for the removal of common stains from fabrics are described.

—B.C.I.R.A.

Emulsifying Agents. B. Mead and J. T. McCoy. *Chem. Abs.*, 1927, 21, 1391 (from *Fourth Colloid Symposium Monograph*, 1926, p. 44).

The mechanism of the action of Tret-o-lite, a product containing sodium oleate 83%, sodium resinate 5.5%, sodium silicate 5%, phenol 4%, paraffin 1.5%, and water 1%, is discussed, and its efficiency ascribed to the Na. Oleate and the phenol. The ageing of Na. Oleate solutions is ascribed to reaction with some atmospheric constituent. Other oil-soluble emulsifying agents are discussed. —B.L.R.A.

Artificial Silk: Laundering. G. H. Johnson. *Silk J.*, 1927, 3, No. 34, p. 67.

An analysis of the various examples of damage in laundering to artificial silk, sent to the Mellon Institute of Industrial Research, shows that the following occur most frequently: (1) Loss of lustre after the first washing, due to the removal of soluble sizing or mechanical finish, (2) dissolution or disappearance of artificial silk fibres when laundered for the first time, (3) shrinkage difficulties, (4) distortion of the design due to the employment of a loose weave, (5) poor laundering qualities due to designing materials without reference to how they will launder, (6) damage due to misuse by customers, and (7) tears due to faulty handling in the laundry. Only this last may be ascribed to the laundry, and this may be reduced to a minimum by careful handling and netting. Part-artificial silk materials should not be starched, because the starch coating reduces the lustre of the artificial silk. Over-bleaching in manufacture may be responsible for trouble in the laundry. —B.C.I.R.A.

Removal of Stains from [Cellulose] Acetate Silk. *Text. Argus*, 1927, 3, 11th May, p. 7.

In removing stains from cellulose acetate silk materials by sponging with a solvent, it is important to remember that aniline, alcohol+ether, amyl acetate, chloroform, cresol, ethylene dichloride, tetrachloroethane, nitrobenzene, pyridine, formic acid, acetic acid, acetone, carbon tetrachloride, trichlorethylene, and methyl alcohol, are also solvents for cellulose acetate. The silk is not affected by benzene, carbon bisulphide, glycerine, naphtha, and turpentine; warm benzene containing a small

proportion of alcohol quickly dissolves cellulose acetate. A solution consisting of 2 pts. of glacial acetic acid, 1 pt. of acetone, and 3 pts. of glycerine, does not adversely affect acetate silk. For removing stains, a solution consisting of 1 pt. of a solvent and 1 pt. of glycerine is recommended.

—A.J.H.

Use of Monel Metal for Laundering Machinery. See Section 4G.

6—ANALYSIS, TESTING, GRADING, AND DEFECTS

Waxes: Analysis. K. Arndt. *Z. angew. Chem.*, 1927, 40, 314-316.

A simple apparatus for obtaining cooling curves for commercial waxes is described. From curves showing the rate of cooling of Chinese wax and carnauba wax and of a mixture of the two, the author shows that the minima on the mixture curve (though slightly displaced) give an indication of the constituents of the mixture. —B.C.I.R.A.

Cellulose: Copper Number. C. G. Schwalbe. *Papier-Fabr.* (Verein Zellstoff Ingenieure Section), 1927, 25, 157-160.

The author reviews the methods which have been suggested by numerous authors for improving and simplifying the test for the (Schwalbe) copper number. —B.C.I.R.A.

Chemic: Titration. H. Kauffmann. *Leipziger Monats. Text.-Ind.*, 1927, 42, 40-41 and 111-112.

The authors record their tests of the suitability of the methods in use for estimating available chlorine in bleach liquors, and conclude that the method of testing in degrees Baumé is inaccurate; that titration with indigo solution gives variable and false results; although the errors may be eliminated to some extent by reversing the titration procedure; and that the Kertesztitration method with nitrite solution is very suitable and gives reliable results if boric acid be added. —B.C.I.R.A.

Copper: Determination of, in Specially Treated Fabrics. L. Levi. *Brit. Chem. Abs.*, B, 1927, p. 136 (from *Ann. Chim. analyt.*, 1927, (ii.), 9, pp. 2-7).

Hemp, linen, and cotton materials subject to the action of fermenting media are protected by treatment with insoluble metallic soaps (chiefly copper), with or without previous treatment with aniline black and fixation with potassium dichromate. Determinations of copper show that when the raw material has been directly treated with a copper soap, all the copper passes into a nitric acid solution of the calcined product, but with the aniline treatment a product of the form CuCr_2O_4 , 2CuO is formed which on calcination gives the soluble copper oxide and insoluble CuCr_2O_4 . In order to determine the total copper 1 dm.² of material is calcined, the ash treated with boiling 50% nitric acid, filtered, any soluble copper washed out of

the insoluble residue, which is then calcined in a platinum crucible and the residue treated with 3 g. of Meker's oxidising mixture. After cooling, the ash is dissolved in dilute nitric acid, the solution added to the first, and the mixture electrolysed. To determine copper insoluble in water 1 dm.² of material is washed for 12 hours in running water and treated as above. —L.I.R.A.

Influence of Dilute Acid on Strength of Woollen Yarn. *Scotch Tweed*, 1927, April, p. 238.

Dilute acid has no harmful effect on the wool fibre, even when such sols. are boiled. An acid treatment, if not too drastic, gives to the fibre additional spring, and it is generally averred that by boiling in dilute acid sol. a woollen yarn instead of being weakened becomes actually stronger. Results of experiments show—

- (1) That boiling in water alone causes a great weakening of the yarn.
- (2) Tap water has greater effect than distilled water.
- (3) That strength of yarn increases with acid concentration, and reaches its maximum with 10% acid.

It was also found that the stretch of the yarn, at the breaking point, increases with the concentration of acid and reaches its maximum value at 20% acid. So although the strength remains constant between 10% and 20% acid, the stretch is actually increasing. B.R.A.W. & W.I.

Sulphurous Acid: Estimation. J. Bicskei. *Z. anorg. Chem.*, 1927, **160**, 64-66.

The acid is oxidised by the addition in excess of a solution of sodium hypochlorite of known iodine value and the excess is determined iodometrically. Sulphurous acid in any concentration may be estimated by this method. —B.C.I.R.A.

Surface Tension: Measurement. N. E. Dorsey. *Sci. Papers, Bur. of Standards*, No. 540, 1926, 563-595.

The author presents a brief survey of the more important methods which have been employed in the measurement of surface tension, calls attention to important facts which must be kept in mind for successful measurements to be made, indicates some frequently-made errors and shows how they may be avoided, and gives the working equations applicable to the methods considered. A bibliography of 110 references is appended and in each instance the purpose for which the reference was selected is indicated. —B.C.I.R.A.

Density Measurement Apparatus. J. Carmann. *Z. angew. Chem.*, 1927, **40**, 316.

An apparatus for determining the density of a liquid available in quantities of only 10-20 c.c. consists of two U-tubes connected by a junction carrying a three-way cock. One U-tube holds water, the other the

liquid to be tested, and the measurement consists in reading the difference in level of the liquids in each tube under increased or decreased pressure applied through the three-way cock. The specific gravity is given by the ratio of the heights of the two columns of liquid and for all ordinary liquids the reading is independent of the room temperature. —B.C.I.R.A.

Flours: Testing. N. A. Trofimuk. *Analyst*, 1927, **52**, 89 (from *Z. Unters. Nahr. Genussm.*, 1926, **52**, 311-318).

Iodine absorption is determined by adding 200 c.c. of water, gradually and with shaking, to 5 grms. of the flour, shaking for 3 mins., allowing to stand for 30 mins. and filtering. Fifty c.c. of the filtrate are titrated with a 0.01 N solution of iodine in potassium iodide in the presence of 2 c.c. of sterile 0.5% starch paste. Before each titration the strength of the iodine solution is determined by means of 0.01 N thiosulphate solution, and the absorption of iodine by the distilled water used is also measured, the colour obtained in this titration serving as a standard. Since the iodine does not react immediately with the aqueous extract of the flour, one hour is allowed for completion of the titration. The amount of iodine absorbed is calculated in c.c. of solution per 100 grams of the dry matter of the flour, determined by drying to constant weight at 100° C. Flours of monocotyledonous plants absorb little and those of dicotyledonous plants much iodine. The following values were obtained—millet 70; rice 70; wheat 109; barley 131; rye 165; oats 178; bean meal 703; pea meal 798. Flours may also be identified by the varying rapidity of sedimentation. In a test tube 2-3 cm. in diameter, 1 gram of flour is mixed with 5 c.c., then with a further 7 c.c. of water, the tube being finally shaken and 10 c.c. of the mixture pipetted into a test tube 9.5 mm. wide. A curve connecting the height of the sediment in mm. with time of settling in minutes is traced. The form of the curve varies widely for different flours and allows of the detection of 10% of rye meal, 15% of oat meal, and 20% of barley meal in wheat flour. By the iodine adsorption, 15% of barley meal in wheat flour may be detected. —B.C.I.R.A.

Cuprammonium and Viscose [Artificial Silk]: New Testing Method. *Text. Argus*, 1927, **3**, 1st June, p. 4.

When cuprammonium and viscose artificial silk fibres are immersed for a few minutes in a 1% solution of carminic acid made slightly alkaline by the addition of ammonia, cuprammonium silk fibres become coloured deep claret while viscose fibres assume a pale pink shade. —A.J.H.

Silk and its Testing. J. O. Thompson. *Silk J.*, 1926, **3**, No. 29, p. 52.

Raw silk is peculiar in that it comes on the market in a manufactured state.

There is a description of the cocoon and the process of winding. The American method of testing is spoken of fully. —F.G.P.

Snapped Cotton: Spinning Tests. H. H. Willis. *Exper. Sta. Rec.*, 1926, 55, 896 (from *U.S. Dept. Agric. Bur. Agric. Econ.*, 1926, 18 pp.).

Spinning tests were made in co-operation with Clemson Agricultural College on snapped and picked cotton from the same fields in Oklahoma and Texas. Though not held conclusive, the tests indicate that snapping as a method of harvesting lowers the quality of the cotton by about two grades. With efficient boll extracting equipment, the spinning qualities of a cotton were not noticeably affected. The percentage of visible waste in snap cotton was not found materially greater than in picked cotton of equal grade. Considering these results as typical, snapping cotton at the officially quoted prices and under conditions prevailing in 1925, resulted in a loss to the grower of 7.29 dollars a bale as compared with picking. When greater discounts were assessed against the cotton because of its being snapped and when the cotton was sold in the seed, this loss ranged from about 14 to 27 dollars per bale. —B.C.I.R.A.

Tensile Tester Automatic Indicator. H. Vollprecht. *Leipziger Monats. Text.-Ind.*, 1927, 42, 63-64.

An automatic indicating device for tensile strength testers is described in which the change in direction of the weight lever at the movement of break is made use of. While the lever rises a circuit in the extension mechanism is closed, and this circuit is broken on the slightest backward movement of the lever caused by the break in the material. The device is made by the Schopper firm. —B.C.I.R.A.

Streaky Artificial Silk Fabric: Testing. H. Sommer. *Leipziger Monats. Text.-Ind.*, 1927, 42, 116.

Streaky dyeing effects in dyed artificial silk fabrics (a fault due to differences in the dispersity of the fibre and caused by admixture of different celluloses, irregular mercerisation, sulphidation, &c.) may be detected by heating the sample with Goetze's silver reagent, i.e. an ammoniacal silver nitrate solution, for a few minutes. The faulty places, which have the greater dyeing power, are rendered visible more effectively with the reagent than with substantive dyestuffs. A tricot fabric is illustrated with a pitted effect after dyeing; the pit formation was always found in the places stained deeply by the silver reagent. —B.C.I.R.A.

Paper Stiffness Tester. W. Ewald (Askania-Werke A.-G.). *Zellstoff u. Papier*, 1927, 7, 112-115.

The apparatus consists of a clamp with cylindrical jaws and a stage carrying a vertical rod and movable over a horizontal scale graduated in millimetres.

A strip of paper 8 cms. long and 2 cms. wide is clamped in a horizontal position, the cylindrical jaws providing that the upper surface of the strip is slightly concave at the clamped end. The vertical rod terminates in a steel ball and is so weighted as to rest on the paper without bending it in the zero position. On moving the rod over the scale and away from the jaws a point is reached at which the weight is sufficient to cause a sudden bend in the paper strip. This distance gives a measure of the relative stiffness of different papers. Loading weights are provided to allow of testing papers over a wide range of stiffness. —B.C.I.R.A.

Snapped Cotton: Spinning Tests. *Nat. Assoc. Cotton Mfrs. Bull.* No. 80, Dec. 1926.

An extract from a report of American official preliminary test on the comparative spinning properties of picked and snapped cottons gives tables of (1) staples and waste percentages for Oklahoma and Texas 1925 cottons and (2) breaking loads of yarns spun therefrom. —B.C.I.R.A.

Textile Fibres: Identification. W. Wagner. *Melliand Textilber.*, 1927, 8, 246-249.

The reagent is prepared by dissolving 4 grams of sodium ammonium phosphate and 1 gram of sodium carbonate in 25 c.c. of water, adding 5 grams of Ranvier's picocarmine (Merck) and 75 c.c. of water and warming. The material to be examined is dyed for 5 min. in the reagent in a small porcelain dish and well rinsed in running water. Animal and vegetable fibres are readily differentiated: undyed animal fibres acquire a yellow colour whilst vegetable fibres, including cellulose products, acquire a red colour. Exceptions to this broad classification are raw silk which shows a red-brown colour due to the gum coating, and acetate silk which is coloured an intense greenish yellow. Dyed materials must first be stripped, except with pale shades, where it may be possible to make allowance for the original colour. The method is applicable to mixed threads and fabrics, warp and weft threads being removed from the edges of fabrics to facilitate identification. The reagent may be used to differentiate between artificial silks. Acetate silk gives an intense greenish yellow, cuprammonium silk wine-red, and viscose and nitro-silk a pale rose, nitro-silk somewhat deeper than viscose. A sample of viscose should be dyed simultaneously with artificial silk tests to facilitate identification. Three tables are given covering a complete system of chemical tests for the identification of textile fibres. —B.C.I.R.A.

Systems of Count Determination with Artificial Silk. *Text. Argus*, 1927, 3, 27th, April, p. 4.

A comparison of the original Italian denier system with its more recent modifications

—the Macclesfield and the metric denier systems—for indicating the fineness of artificial silk yarn. With the Macclesfield system, yarn of which 1,000 yards weighs 1 lb., has a denier of 4,352. Cotton yarn of 10's count corresponds to 528 deniers. Any worsted yarn count divided in 7,920 gives the equivalent of that count in deniers.
—A.J.H.

Shade Nomenclature and Registration.

"Textrion." *Text. Argus*, 1927, 3, 11th May, p. 2.

Suggestion for numbering shades instead of naming them. This will enable matching to be done more accurately, as the exact tone can be obtained by its number. It will also enable all people to know shades by the same number, and not as at present, the dyer and manufacturer know it by a number, and the outside world by a fancy name.
B.R.A.W. & W.I.

Measurement of Rayon Properties. N. U.

Berchin. *Chemicals* (N.Y.), 1927, 27, No. 13, p. 21.

Very little theoretical work has yet been done in this field, it has been nearly all practical and experimental. The cost of the raw material is stated to be 5 cents a pound, of the finished material as much as 4 dollars; this is said to show that the processes are relatively primitive and the profits in efficient factories very high. There is a tendency to overlook the fact that rayon manufacture is chemical rather than mechanical, the processes, also, have not been fully described, and the result is that rayon produced is of vastly different qualities and appearance. No definite standard has been fixed. Tests made by the author show that rayons vary from 6.27% to 26% of the strength and elasticity of silk. Rayon will not turn yellow with age. When the name "artificial silk" was used the comparison of the lustre with that of silk was disadvantageous, but by calling it "rayon" the comparison does not arise.
—F.G.P.

Cotton: Grading and Regain. K. Pietsch.

Leipziger Wochenschrift Text.-Ind., 1927, 42, 164-165.

In consequence of complaints by suppliers of American cotton that the specifications of the Bremen cotton exchange for staple properties are too stringent, the author explains the requirements of cotton spinners as regards character, class, and staple length of the cotton they employ. It is alleged that American cottons contain at times more than 11% of conditioning moisture and frequently more than 8½-10% moisture, instead of agreeing with the permitted 8½% regain.
—B.C.I.R.A.

Deterioration of Jute in Storage and in Transit. W. Schepmann.

Melliand Textilber., 1927, 8, 237-239.

Describes the isolation of a bacterium which

is the cause of the "heart-damage" sometimes met with in bales of jute. For prevention of such damage it is essential to ensure that the material is sufficiently dry before baling, if necessary by artificial drying; further, the bales must not be stored under damp conditions. The possibility of disinfecting the material by a gaseous reagent is referred to.
—L.I.R.A.

Doubled Yarn Fabric: Faults. P. List.

Melliand Textilber., 1927, 8, 221-223.

Some faults occurring in cloth woven from 3 and higher fold yarns, and their avoidance, are discussed. The necessary consideration is not always given to the beaming of the warp.
—B.C.I.R.A.

Listing. A. Jackson. *Dyer and Cal.*

Printer, 1927, 57, 138 and 165.

Faults in the scouring process are probably the chief cause of listed pieces; they may be caused through three agencies—

- (1) The use of unsuitable water, in scouring, causing formation of lime, iron, and other mineral soaps.
- (2) The presence of soap or alkalis in the pieces when they come to the dyer.
- (3) The presence of unsaponifiable oil in the pieces when they reach the scourer.

Methods of avoiding faults through these three points are dealt with in detail. Listed pieces may also result from the pieces being given a light milling only, as the lists may receive a heavier milling than the centre of the pieces, which will result in them dyeing a lighter shade than the centre. Crabbing is not directly responsible for listing, but defects present in the cloth show up more on crabbing. Steaming which usually takes place after dyeing can have no part in the formation of listed pieces, but in one or two cases where it immediately follows crabbing, trouble may arise. Precautions which should be taken to avoid trouble through these processes, are given. However, even if all precautions have been taken in scouring and other operations that precede dyeing, it is necessary to take certain steps in dyeing itself, if listed pieces are to be entirely avoided. The precautions necessary in the dyeing process are discussed in detail.
B.R.A.W. & W.I.

Defects in Artificial Silk Manufacture.

Dyer and Cal. Printer, 1927, 57, 122-123 and 145.

A discussion of factors which contribute to the uneven colouring of textile materials containing cellulose and cellulose acetate artificial silks. Uneven colouring in fabrics is chiefly due to the presence of uneven grades of silk; in artificial silk weft fabrics this defect is largely corrected by using box looms for the weaving so that the various grades of yarn are intimately mixed. In dyeing cellulose acetate silk materials

supersaturation of this silk with a dye should be avoided. For instance, when Celanese silk is dyed too heavily in navy blue shades, the colour suddenly reverts to a brown shade. —A.J.H.

Baled Cotton: Weather Damage. R. L. Nixon. *U.S. Dept. Agric. Bull.* 1,436, 1926.

Tests to determine the seriousness of the damage that baled cotton suffers when exposed to weather are described. Six tests in different localities were carried out on seven bales stored in each test as follows: (1) fully protected in a warehouse, (2) uncovered on poles and turned after each rain or once a week, (3) on poles and covered by tarpaulin, (4) flat on the ground, (5) on end on the ground, (6) on edge on the ground, (7) on edge on the ground and turned as (2). After exposure, the cotton was reconditioned, the damaged cotton removed and the remaining cotton weighed. The average loss in weight over all the tests calculated on a 500 lb. bale was as follows—Bales (1) 4 lb.; (2) 19½ lb.; (3) 10 lb.; (4) 273½ lb.; (5) 117 lb.; (6) 109 lb.; (7) 64½ lb.; It is apparent that the damage is small when bales are placed on timbers to keep them from contact with the ground and when the bales are turned after each rain, or preferably are covered with canvas.

—B.C.I.R.A.

Chrome Yellow Suspensions; Diffusion of Light in— G. I. Pokrowski. *Z. Physik.*, 1927, 41, 493-506.

Experimental data on the diffusion and polarisation of light in suspensions are recorded and compared with the theory. The data include measurements on Chrome Yellow.

—B.C.I.R.A.

Alkali Hydroxide Solutions: Surface Tension and Viscosity. O. Faust. *Z. anorg. Chem.*, 1927, 160, 373-376.

Measurements at 20° of surface tension and viscosity of solutions of lithium, sodium, and potassium hydroxides of concentrations up to 4 and 6 times normal are given. The surface tension in all cases increases with concentration; at 3.5 N the surface tensions of the three hydroxides nearly coincide. At 6 N potassium hydroxide has a higher surface tension than sodium hydroxide. The author concludes from these results and from his earlier swelling experiments that the swelling of cellulose cannot be ascribed to the surface tension or viscosity of the swelling agent, but must be looked upon as a specific property of cellulose.

—B.C.I.R.A.

Nitrocellulose Solutions: Viscosity. J. R. Cochrane and G. W. Leeper. *J. Soc. Chem. Ind.*, 1927, 46, T117-119.

Relative viscosity determinations are given for 2.5% solutions of nitro-cellulose in the following mixed solvents—(1) Ethyl acetate and ethyl alcohol, (2) butyl acetate and

ethyl alcohol, (3) ethyl acetate and benzene, (4) ethyl acetate and ethyl alcohol and benzene, &c. The specific effect on the viscosity exerted by the "dilutents" is discussed. Alcohol diminishes the viscosity considerably.

—B.C.I.R.A.

Wetting-out Agents for (Wool-) Carbonising Liquors. P. Kraus. *Melliand Textilber.*, 1926, 7, 757.

The rate of sinking of woollen fabric in a carbonising liquor (sulphuric acid of d. 1.03) at 20°, is greatly increased by the addition of but ½% of Flerhenol PF, Neomerpin, or Leonil, the beneficial effect of these wetting-out agents decreasing in the order named.

B.R.A.W. & W.I.

7—BUILDING AND POWER

(C)—POWER

Mule Spinning Frame: Driving. R. J. Nowotny. *Melliand Textilber.*, 1927, 8, 129-130, and 216-217.

It is shown mathematically that there is considerable loss of power through slippage of the belt during the outward run of the mule carriage, and an individual electric drive due to the Siemens Schuckertwerke is described by which belt slip is reduced to a minimum, production is increased, the quality of the yarn is improved and belt wear is reduced.

—B.C.I.R.A.

Artificial Silk Factory: Electrical Equipment. *Sci. Abstr.*, 1926, 29, B, 514 (from *El. Rev.*, 1926, 99, 175-176).

The entire mill described is electrically driven, three-phase motors being employed in all cases, varying from 2 to 40 h.p. The generating plant consists of two turbo-alternators of 1,000 k.w. and 100 k.w. capacities, supplying electrical energy at 440 volts, three-phase, 50 cycles. Particulars are given of the turbines used and of the other portions of the plant.

—B.C.I.R.A.

Carpet Mills; Electric Drive in— *Text. Exporter*, 1927, 1, No. 1, p. 41-44.

A discussion of the reasons for and method of substituting electric for steam driving machinery in a large carpet works.

—A.J.H.

(D)—LUBRICATION

Use and Abuse of Combs, Spindles, and Looms. *Text. Argus*, 1927, 3, 25th May, p. 7.

A discussion mainly directed to lubrication problems.

—A.J.H.

(F)—LIGHTING

Mixed Daylight and Artificial Light: Visual Efficiency. C. E. Ferree and G. Rand. *Sci. Abs.*, 1926, 29, B, 528 (from *Trans. Amer. Illum. Eng. Soc.*, 1926, 21, 588-609. *Disc.*, 609-612).

The author describes experiments to determine the relative merits of (a) daylight,

(b) artificial light, and (c) a mixture of both as regards (1) visual acuity, (2) speed of vision, (3) power to sustain acuity, and (4) avoidance of fatigue. The three systems were compared at equal intensities, and comparisons were made at 0.575, 1.15, 2.3, and 6.7 foot-candles. The results obtained showed that the daylight was best, the artificial light worst, and the mixed light intermediate. The factor causing prejudice against mixed light was found to be the lag in the adaptation of the eye behind the decrease in illumination which takes place rapidly in the middle and late hours of the afternoon. This was demonstrated by the results of experiments in which it was arranged to change suddenly from 60 foot-candles daylight to 2.3 foot-candles artificial. The speed of vision at first fell from 40 to 5.5 and then showed a gradual rise to 11.2 as the eyes became adapted. —B.C.I.R.A.

Lighting Bowls: Surface Brightness.

C. J. W. Grieveson. *Illumination Research Techn. Paper* No. 4, 1926, 9 pp. The results of measurements of the surface brightness of 18 diffusing bowls used for interior lighting are given. —B.C.I.R.A.

(H)—HUMIDIFICATION

Air: Thermal Properties and Humidity.

L. G. Jones. *Chem. & Met. Eng.*, 1927, 34, 179.

The thermal properties of air with varying moisture content are embodied in a chart. Some of the information that can be obtained readily from the chart is (a) change in heat content in B.T.U.'s per lb. of air for changes in temperature and moisture content; (b) changes in dewpoint, for varying wet bulb depressions, heat content and saturation; (c) change in relative humidity for addition or removal of heat, or change in wet or dry bulb temperature; (d) change in wet bulb depression caused by heating or cooling air, with the accompanying total heat change. —B.C.I.R.A.

Humidification. *Leipziger Monats. Text.-Ind.*, 1927, 42, 83-84.

Modern principles of air conditioning in textile works are outlined in answer to a query as to whether humidification is effected better by water atomising or by distributing damp air from pipes.

—B.C.I.R.A.

9—COMMERCE, ECONOMICS, LABOUR &c.

Artificial Silk Production; Outlook for—

S. Courtauld. *Times Tr. & Eng. Suppl.* (Artificial Silk Number), 1927, 20, 1.

Attention is drawn to the fact that artificial viscose silk is now one of the cheapest textile fibres, and that the profits of textile manufacturers utilising artificial silks are invariably higher than those of manufacturers using only the usual fibres such

as wool, cotton, and natural silk. Current prices for comparable qualities of 150 denier viscose silk, degummed Canton silk, degummed Italian silk, mercerised Egyptian cotton 2/70's, and Botany worsted 1/50's yarns are 5, 23, 36, 3½ and 6½ shillings per lb. respectively. —A.J.H.

Agricultural Co-operative Movement in Esthonia. M. K. Kornel. *Internat. Rev. Sci. and Pract. Agric.*, 1927, 18, No. 1, pp. E2-12.

A general account of agricultural co-operation in Esthonia where 58% of the population is agricultural. The central organisation is the E.T.K. or Esthonian Central Union of Consumers Co-operative Societies which includes flax and linseed amongst its exports. By 1924 the E.T.K. included 268 consumers' co-operative societies. Amongst these unions is the Central Co-operative Union, the "Esthonian Flax" which was founded in 1925. Its functions are the bringing together of the flax growers, the development of flax cultivation, improvement in methods of handling and manufacture, and the fulfilment of the part of intermediary between the flax products and the foreign markets. The society collects from members throughout Esthonia flax straw for scutching and also buys flax already scutched. Membership is open to co-operative societies for flax growing and for linen manufacture alike, as well as to any other co-operative society wholly or partially engaged in the same business. On 1st January 1926 there were seven co-operative societies exclusively engaged in flax cultivation.

—L.I.R.A.

Increasing Artificial Silk Production in Japan. *Silk J.*, 1926, 3, No. 29, p. 76.

Plans are preparing for a great increase in output, which is shortly expected to be about 350,000 lb. a month. The two largest producers are the Imperial Artificial Silk Co. making 1,800,000 lb. a year, and the Asahi Silk Weaving Co. making 1,200,000 lb. a year. The former is contemplating raising the capital from yen 5,000,000 to yen 10,000,000. Other big financial houses are preparing to go into the industry.

—F.G.P.

Silk Manufacture in Spain. *Silk J.*, 1926, 3, No. 29, p. 54.

The efforts of the Government to encourage sericulture are having only partial success. The total output last year was only 1,100 tons of silk, of which 900 came from the Segura valley, where mulberry trees grow to perfection, or would, if the natural laziness of the cultivators would allow it. The methods generally are antiquated; they grow *Phalæna bombyx* which yields a 2 gram cocoon instead of *Bombyx atlas*, which has one weighing 9 grams. Properly looked after the industry should have at

least twice its present output. The production of rayon is progressing rather better, being in the hands of a Dutch-French combine, but even they find progress almost impossible. —F.G.P.

Artificial Silk Mixture Fabrics; Export Trade in—. *Text. Argus*, 1927, 3, 25th May, p. 4.

Returns relating to the export of cotton and wool materials containing artificial silk to Australia, China, India, and Africa during the present year are discussed. Of every one hundred yards of cotton goods used at home or exported, ten and four respectively contain artificial silk.

—A.J.H.

New Factory at Leningrad. *Text. Argus*, 1927, 3, 20th April, p. 7.

A factory to be built at a cost of 2,000,000 roubles is to be erected by a newly organised joint stock company called Iskustvennoye Volokno (Artificial Fibre). —F.G.P.

Artificial Silk in Belgium. *Text. Argus*, 1927, 3, 20th April, p. 4.

The British import duties have resulted in a partial loss of that market and the depreciation of the French franc reduced another market. The preference for silk in the home market has also had an adverse effect, while increasing competition in all countries has to be met, all in face of rising cost of production. The past year has not been so prosperous; the increase in orders during the latter part being due to the low rate of exchange. —F.G.P.

Artificial Silk; Indian Demand for—.

Text. Argus, 1927, 3, 30th March, p. 6. Artificial silk is being increasingly used in India by both the cotton mills and the hand-loom weavers. During 1925 and 1926, India imported 13 and 36 million yards respectively cotton and artificial silk fabrics, 6 and 14, and 4½ and 11½ million yards being obtained from Great Britain and Italy respectively. During the same years, Great Britain exported to India 869,000 and 476,000 lb. of artificial silk, whereas Italy's exports to India increased from 1 to 2½ million lb. —A.J.H.

The Trade Cycle. H. A. Silverman. *Belfast Chamber of Comm. J.*, 1927, 4, No. 11, pp. 172-173.

Depression in trade can be divided into two categories, firstly, those depressions which follow some catastrophic event such

as war or a harvest failure, and secondly, those periods of inactivity which occur with a certain degree of regularity, alternating more or less evenly with periods of prosperity. In this article the trend of events during a trade cycle are described and its main characteristics commented on. It is pointed out that strictly speaking, a trade cycle cannot be said to have beginning or end, but as a convenient starting point for his observations the author chooses the time at which trade conditions are just reviving after a general depression. The different steps of the revival culminating in a boom are shown, then the conditions heralding a decline and finally a trade depression is described. The following conclusions are reached as a result of the above—(1) That cyclical fluctuations do not exercise the same force on all trades or on all prices. (2) Constructional trades benefit first when trade is reviving and suffer first when it is declining. (3) Banks and other financial agencies have an important share in helping on, although they do not actually cause the fluctuations in trade. (4) Over-production is due as much to speculation as to purely industrial causes. —L.I.R.A.

10—MISCELLANEOUS

Silverfish Insect: Life History. H. Morita. *Rev. Appl. Entomol.*, 1926, 14, Ser. A, 543 (from *Proc. Hawaiian Entomol. Soc.*, 1925, 6, 271-273).

The author describes the habits of the silverfish (*Lepisma saccharina*) which feeds on the paste and glue of bookbindings and is found in clothing and fabrics containing starch. In experiments, glazed paper that had been treated with glue in manufacture was preferred to starch. —B.C.I.R.A.

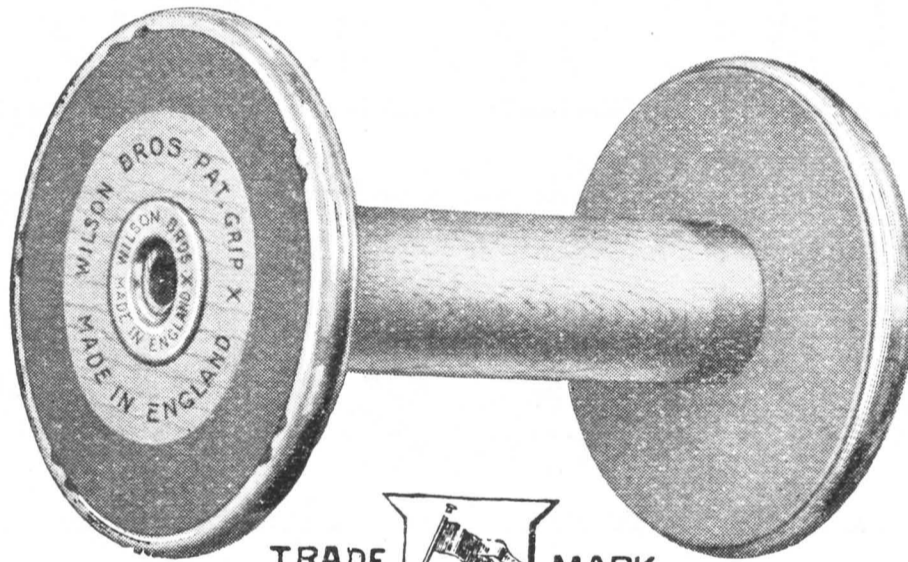
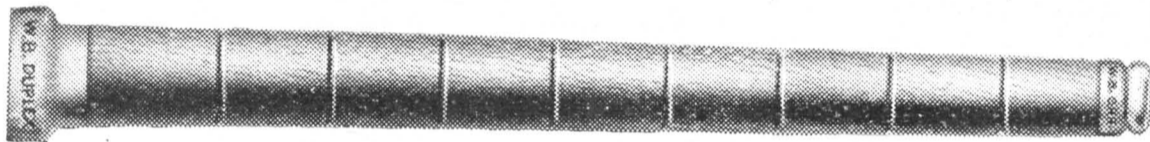
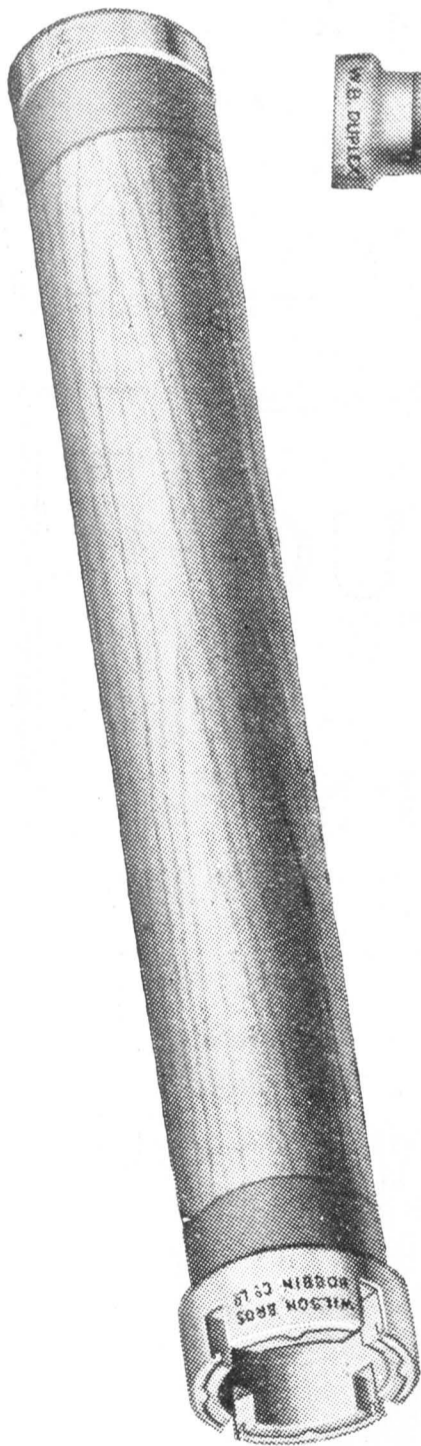
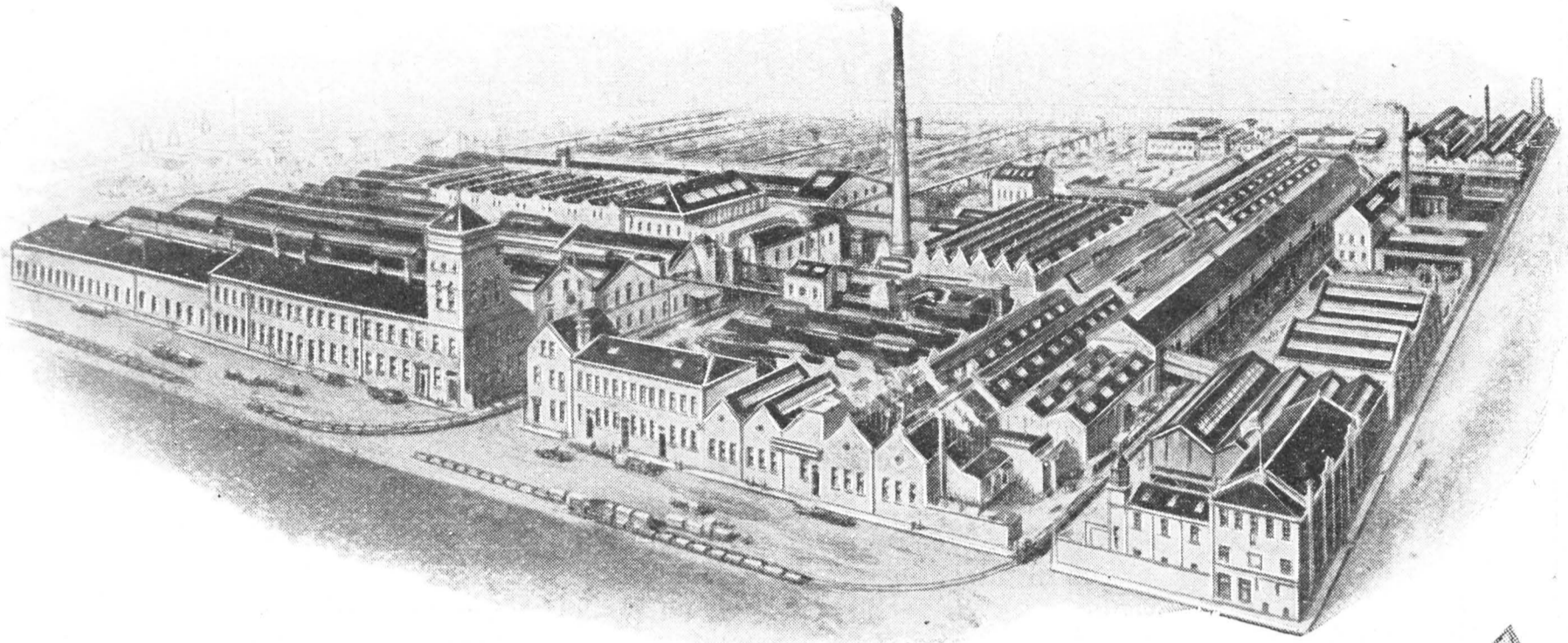
Alkalies in the Textile Industry. *Chemicals* (N.Y.), 1927, 27, No. 17, p. 25.

In the course of a general article it is stated that the tonnage of caustic soda used in America during a year in the manufacture of rayon exceeded that in all other textile industries; figures given show 49,500 tons for rayon and 36,000 tons for other textiles. The greater part of this is used for viscose. The rapid growth of the industry is becoming a very vital factor in the alkali trade.

—F.G.P.

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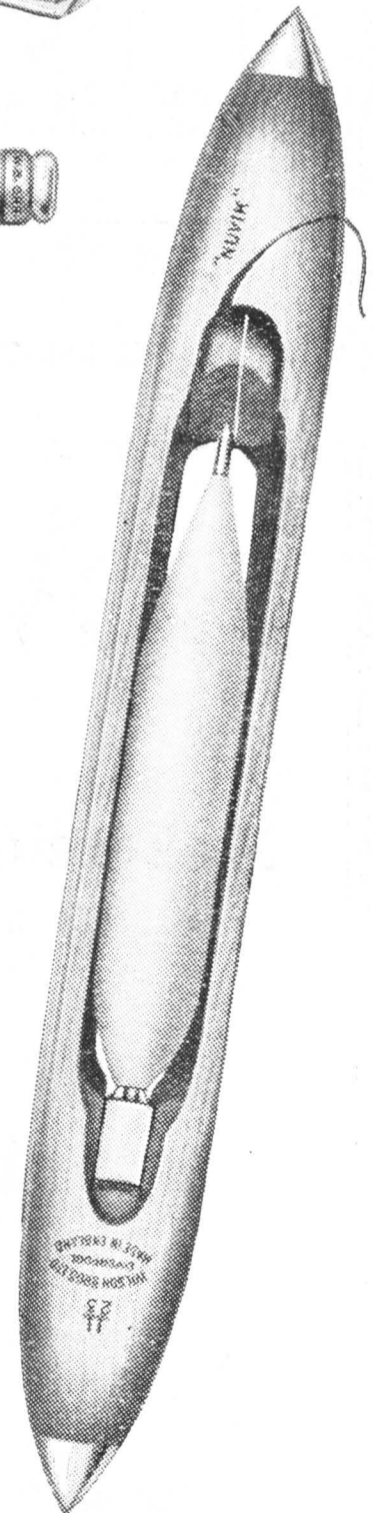
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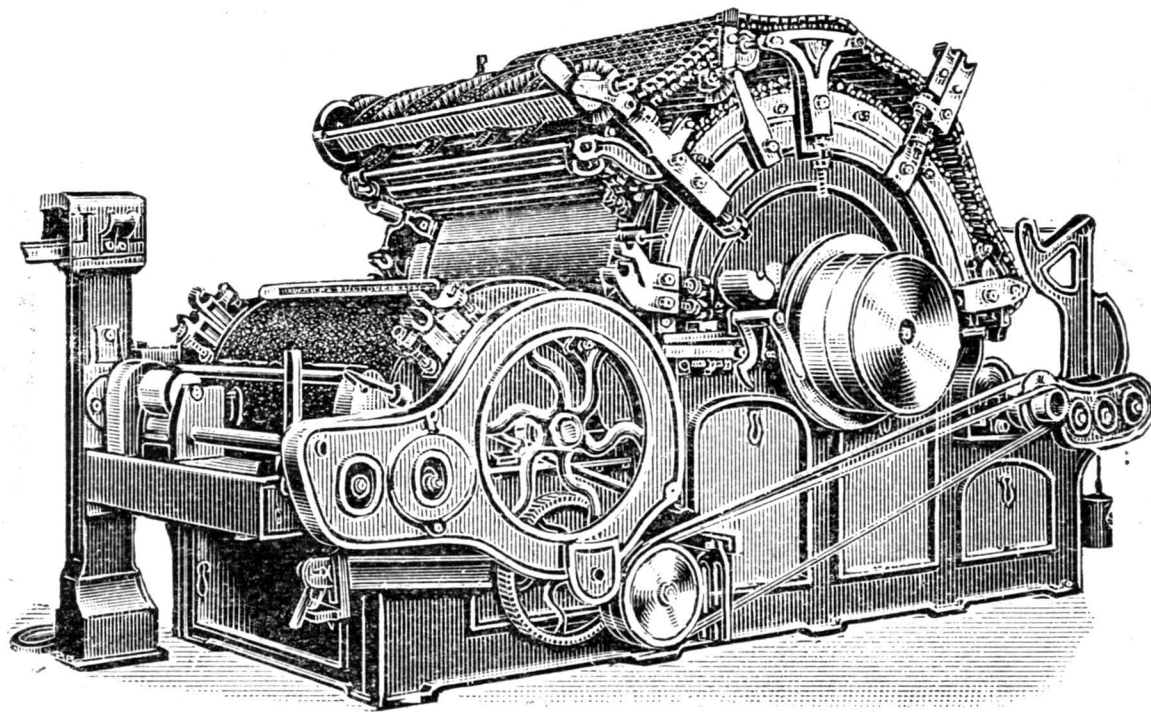
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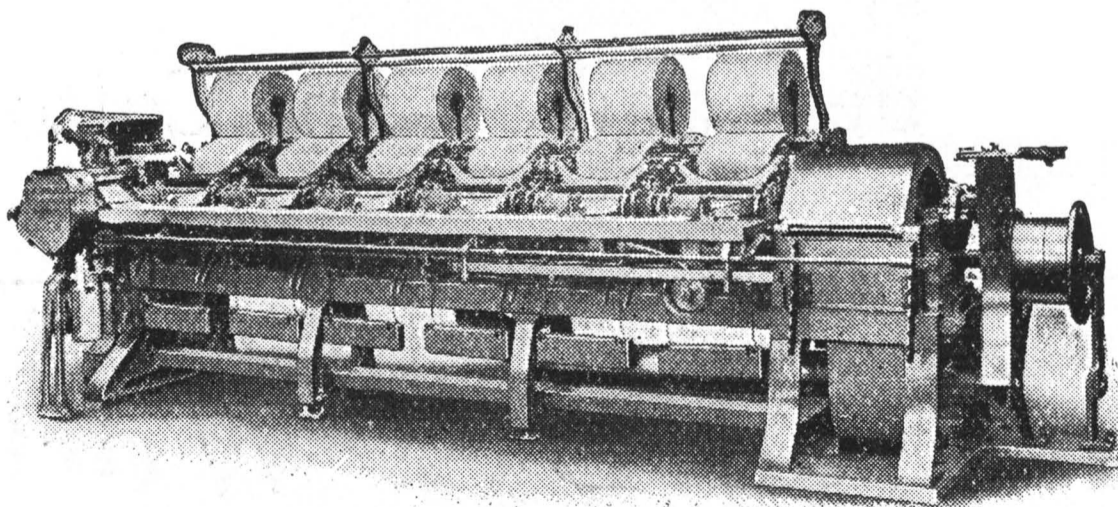
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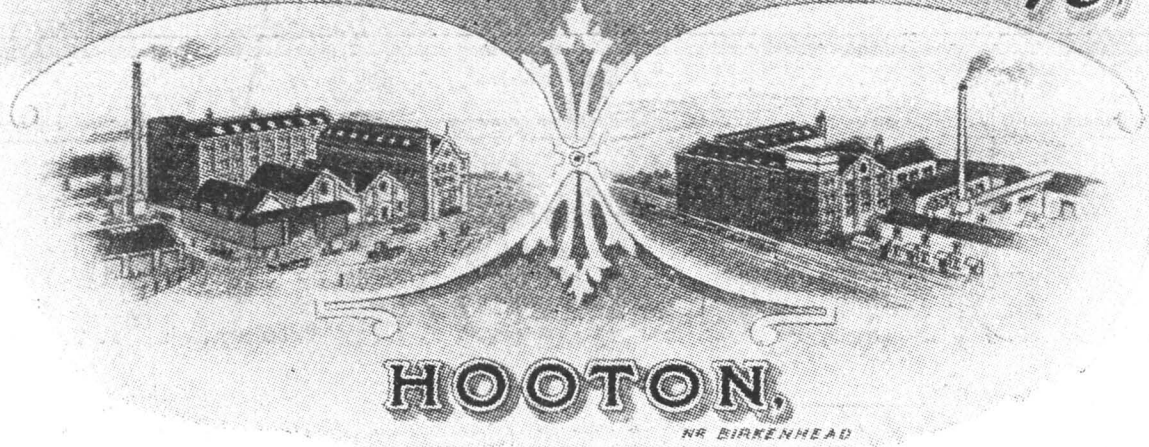
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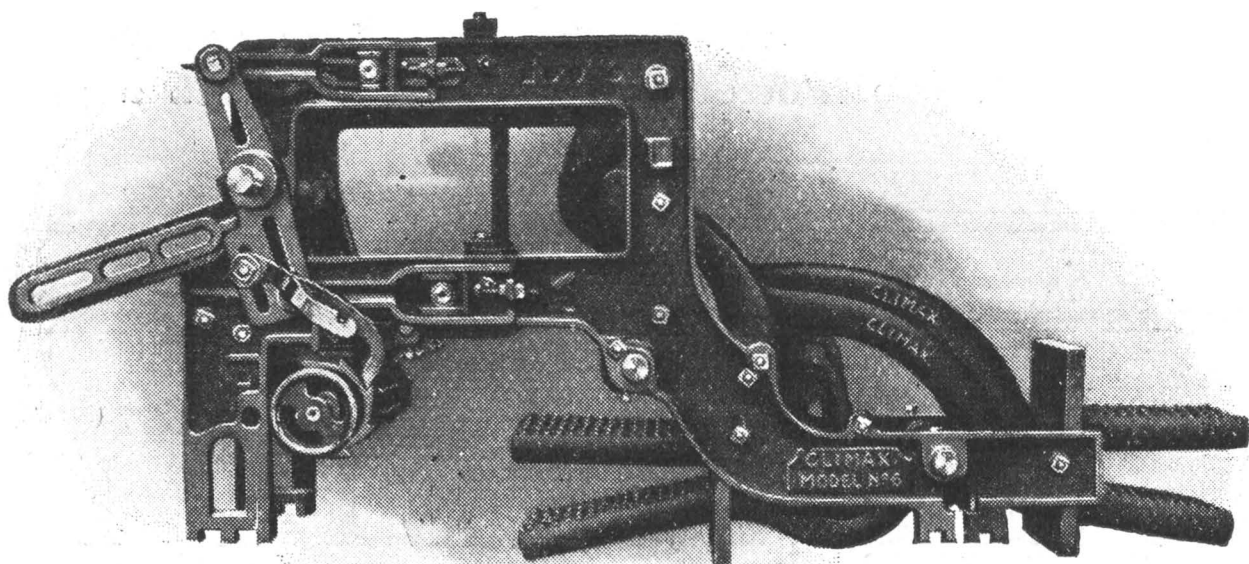
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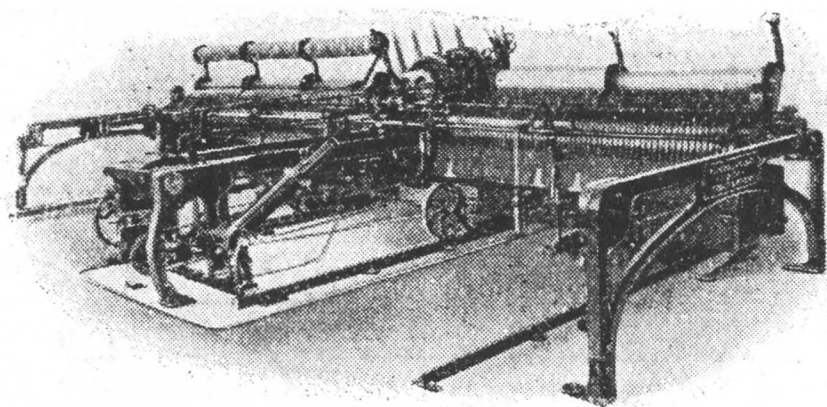
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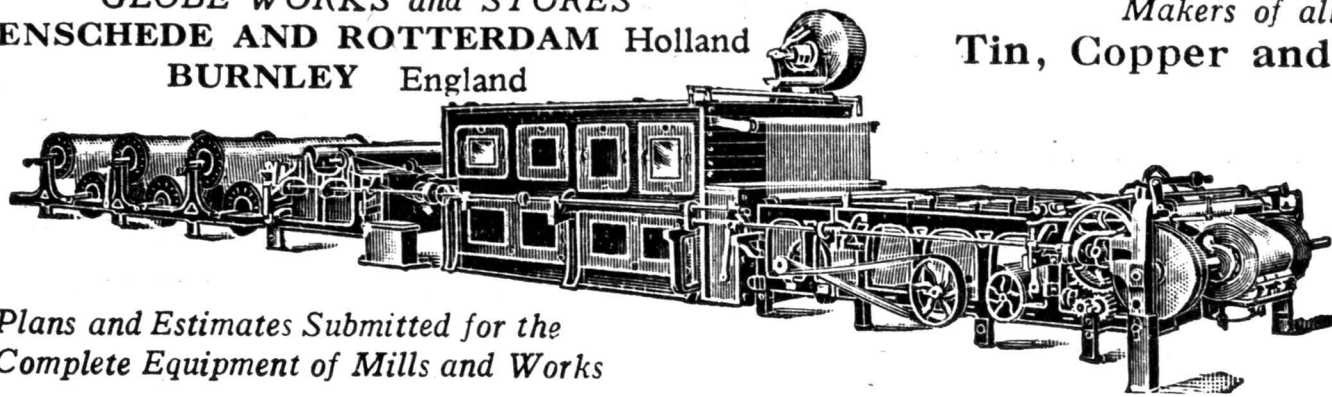
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Mechanical Engineering

(Prof. DEMPSTER SMITH M.B.E.,
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(Prof. MILES WALKER M.A., D.Sc.)

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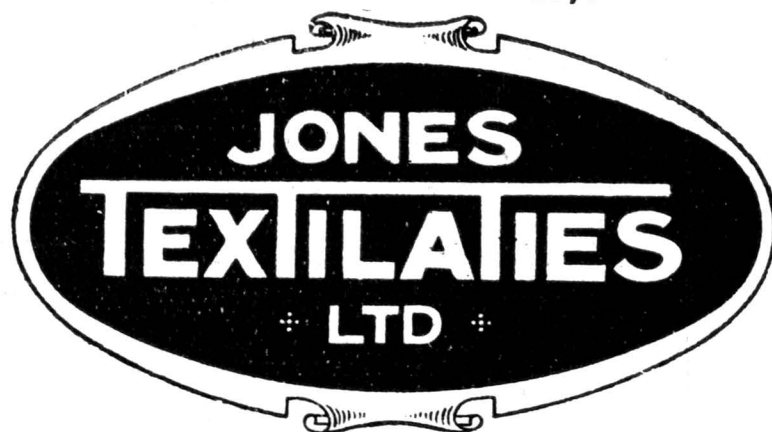
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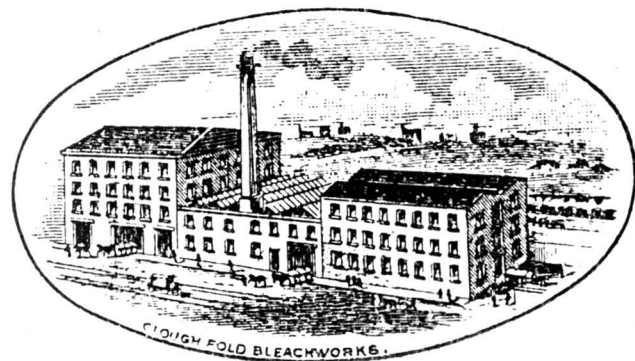
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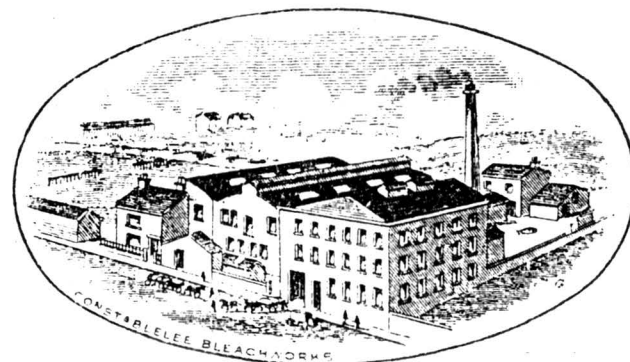
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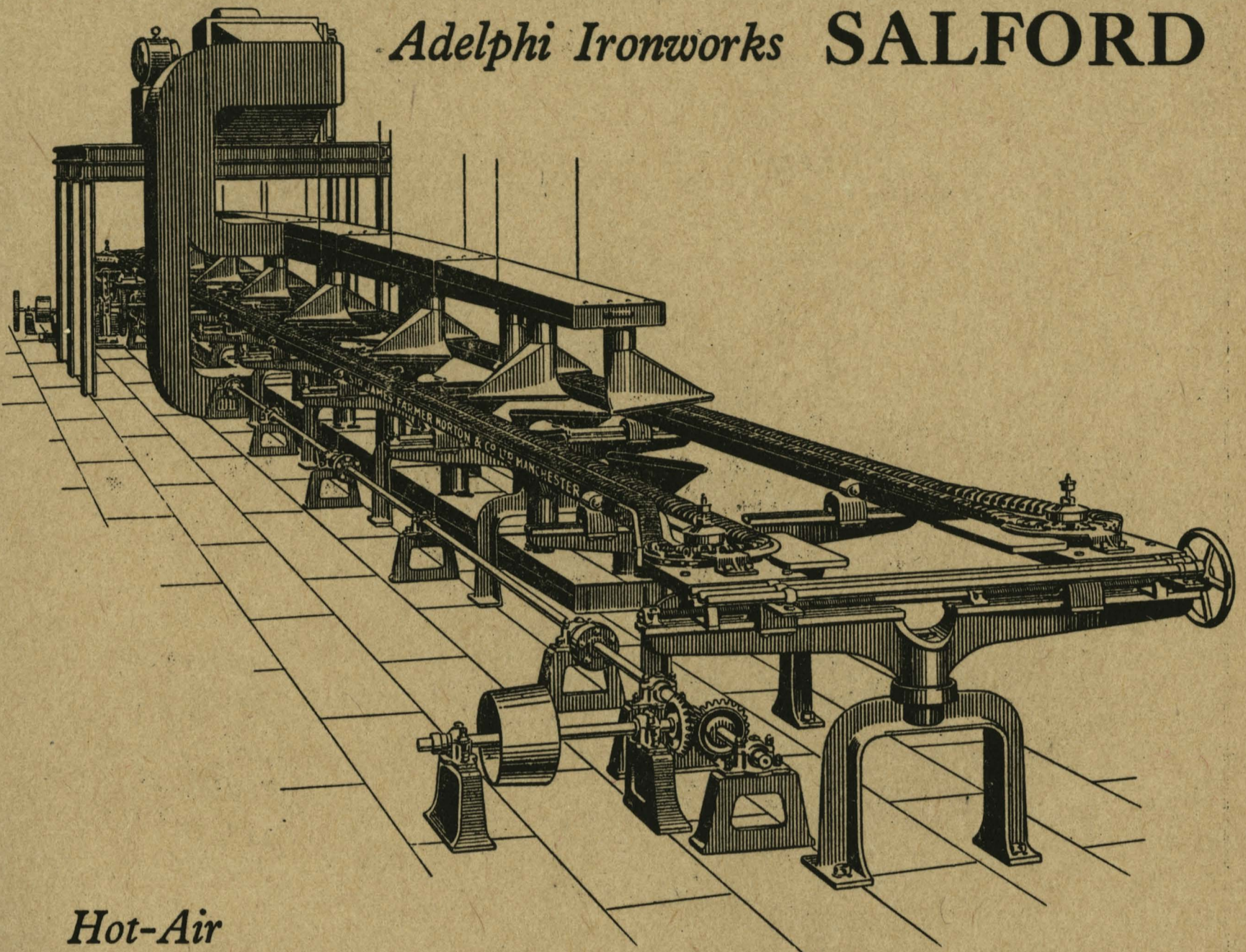
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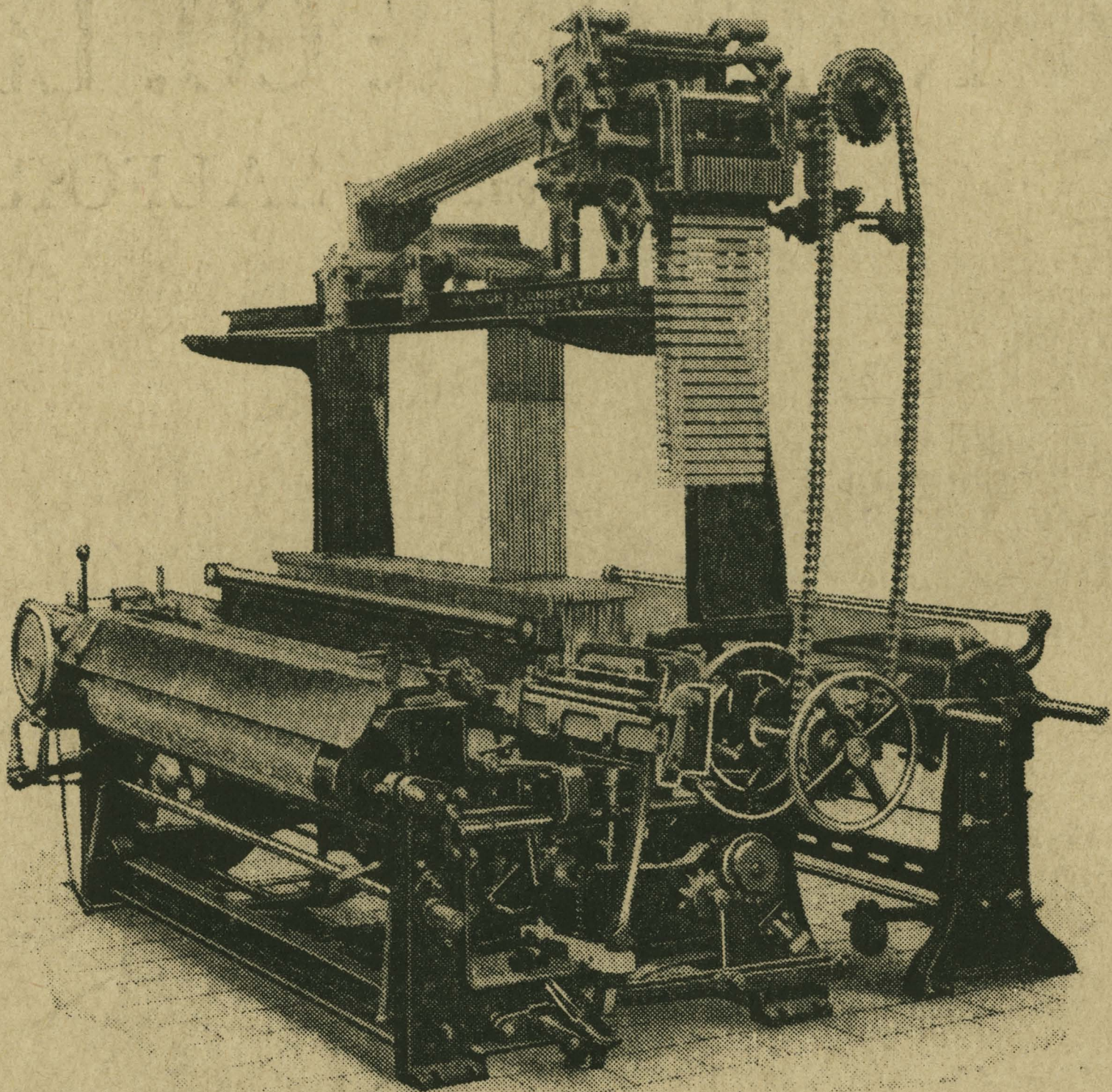
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