

2 francs the kilogramme it would cost 120 francs. Now a single factory with one printing machine ought to have at least 200 to 250 rollers, or a capital in copper only of 30,000 francs (£1,200), and in the case of large factories we find some that have as many as a thousand rollers.

For some time efforts have been made to find a less costly metal or alloy, which will render the same service, and with which can be employed, without important modifications, the methods of engraving that are at present in use. From 1883, M. Spiral, engineer at the National Foundry of Bourges, and M. X. Dépière have analysed a whole series of rollers. The results of these analyses led M. Dépière to attempt to experiment on different compositions which cost far less than copper. After many failures, he at last obtained satisfactory results, confining himself to the employment of non-arsenical zinc with the addition of a little tin.

Amongst the numerous difficulties which it has been necessary to overcome, one of the greatest has been that connected with the running off of the metal. It is well known that zinc is easily modified by the presence of very small quantities of foreign bodies. So M. Dépière found that it was absolutely necessary to avoid arsenic. A homogenous mixture can only be obtained by rapidly running off the metal with a strong runner. This must be followed by very quick cooling, which ought to take place as far as possible under the action of considerable pressure.

When the metal has once been obtained, it is necessary to harmonise the usual methods of engraving with the usual qualities of the metal, and this is done in the following manner:—After the roller has been cast and turned to the required diameter, it is engraved in the ordinary way. When the first operation has been finished the metal is covered with a galvanic layer of copper, nickel or cobalt, or of nickel and cobalt, this combination yielding the best results. Experience has shown that a layer of about 0.06 millimètres of thickness is necessary, in order to resist the impression without injuring the engraving.

It has been objected that the imperfect adhesion of the galvanic deposit was an obstacle to the general use of this method of engraving. This objection was well founded a few years ago, but at the present day when a galvanic deposit can be applied at pleasure, it ceases to have weight, and in another direction the opposite method is employed. Formerly the copper was deposited on another metal, and then the engraving took place. Now the white metal is engraved, and only when the engraving is finished is the metallic layer deposited. It is the active impression which may influence the copper layer; now all practical people know that in many engraving operations which take place to-day, the rollers are galvanised several times, in order to obtain different degrees of intensity, and yet the deposit adheres perfectly. Another objection which may be made is that to the cost of, are added the difficulties connected with the installations for the galvanic deposit. This point, however, does not call for serious consideration. A third objection is that this new white metal is less tenacious than red copper. This would hold if the metal were very thin, say one centimètre in thickness, but if the metal is from 2 to 2½ centimètres of thickness the resistance is perfect.

The advantages presented by this system may be summed up as follows:—

1st.—Considerable diminution in the weight. This diminution is owing to the difference of the density, that of copper being 8.88, and that of white metal, 7. For instance, take a roller deposited in the technological museum of the Industrial Society of Mulhouse. This roller had under the new conditions a length of 90 centimetres, an internal diameter of 96 millimetres, a thickness of metal of 25 millimetres, and a weight of 61 kilogrammes 600 grammes. The same roller in red copper would weigh 78 kilogrammes, or 19 per cent. more.

2nd.—Cost of production. Another advantage, perhaps, the most important one, is the price. It is well-known that the price of copper, so far as the finished roller is concerned, is pretty nearly twice as much as that of zinc. Moreover, one-seventh is to be deducted in consequence of the difference in density, so that under the most unfavourable conditions a loss of almost 45 per cent. at least occurs by using copper compared to this white metal.

Copper requires for its fusion far more expense than zinc, copper melting at 1,092 degrees, and zinc at 440 degrees. The depreciation on the old metal is about 40 per cent. in the case of copper, and 50 per cent. in the case of zinc. Nevertheless, the difference in the capital sunk is in favour of the white metal.

The roller of white metal may be used for all sorts of printing, but is particularly appropriate so far as textiles are concerned, for handkerchiefs and cravats.

Machinery and Appliances.

THE REVOLVING FLAT CARDING ENGINE.

The flats upon the Revolving Flat Carding Engine should be so placed in relation to the main cylinder that the wire clothing with which they are covered will be supported in such near proximity to the wire clothing upon the main cylinder, that the cotton fibres passing between the cylinder and the flat shall be combed, carded, or cleaned, and laid as nearly even and parallel in their relation to one another as may be, the operation divesting the cotton as nearly as practicable of short fibre, fluff, dirt, shell, and other matter inimical to the production of good yarn.

By preference the point of nearest contact is that which is known as the heel of the flat wire. This necessitates that the working, or sliding portion of the flat shall be made bevel or taper in its relation to that portion which forms the foundation of the wire; this level requiring specially devised tools in order to its proper construction.

In considering the flat in its relation to the cylinder we have three specially variable elements to deal with:—

1st. In order to efficient carding the points of the wire upon the flat and the points of the wire upon the cylinder require to be maintained in a sharp condition, so that no particles of loose fibre or dirt may escape. In order to their maintenance in this condition, periodic grinding is required and resorted to, hence the wires upon the flat and the wires upon the cylinder are subjected to wear, and this causes the effective contiguity of the carding wires to be an ever varying quantity.

2nd. It is well known that in the revolving flat carding engine the flats are caused to traverse or "revolve" round the cylinder or that section of the cylinder which is covered by them, and that in their movement from back to front of the engine, they are supported by their ends resting upon what is technically known as the "flexible bend," which in most cases forms a course upon which the flats are caused to slide. This sliding or revolving movement cannot take place without a corresponding wear of the parts working in contact, and it is absolutely certain that from various causes each flat cannot wear equally with its neighbour.

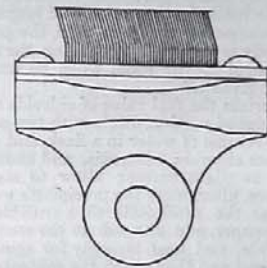
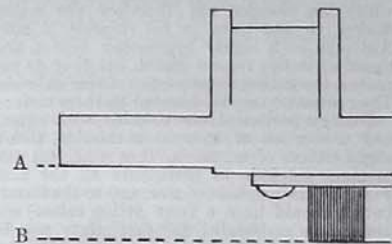
3rd. A third element of variation is found in the fact that the flats are usually ground whilst supported from special facings, not being identical with those which support the flat during the operation of carding; these facings also are subjected to wear which will not be identical with the wear of the carding surfaces nor the wear of one flat equal to the wear of another.

Besides these elements of uncertainty which arise from the working of the engine, in the course of construction irregularities are certain to creep in, notwithstanding the perfection to which tools have been brought; the revolving flat card being a machine in which there are many parts that require to be made with the utmost accuracy in order to secure the best results.

Any arrangement which will tend to reduce the number of working surfaces, requiring accurate adjustment, and constantly liable to change,

will be hailed by both spinners and machinists as a welcome improvement in this already admirable machine, to which so much skilled attention is now being given.

Inventors and machinists are giving a great deal of thought to the question of reducing the liability to error in the working parts of the Revolving Flat Card arising from the causes just mentioned, and with varying success. The relative merits of the many devices now before the cotton spinning public it is not the purpose of this article to discuss, but simply to state certain leading principles which appear to be important in order to secure the efficiency which is sought. As before stated, a considerable item of variation arises from the fact that the flats are not usually ground from the same sliding surface as is at work during carding, and this is now pretty generally admitted to be an item of considerable consequence. The problem at first sight appears to be a very simple one, *i.e.*, grind the flats from their working surface and so dispense with the "special facing" at the back of the flat as an element in the question of adjustment, and at the same time provide means by which any irregularity in the wear of the sliding part of the flat may not affect the working length of the wire between the supporting surface and the point of contact, the supporting surface being represented by the line A, and the wire in contact by the line B.



This, of course, is a solution of the question as regards the grinding of the flats, and if the points of the wires, the foundation of the wire, and the sliding or supporting surface of the flat, lay in lines parallel the one to the other, the problem would be a simple one and easily managed, but as this is not the case and as, for the reasons above stated, the flats are commonly made with the sliding surface bevel, in relation to the points of the wire a more complex problem is involved, and how to guide or support the flats whilst grinding from the working surface so that the wire shall move in a line at right angle with the centre of the grinding roller, whilst the supporting surface maintains a diagonal position. There are many ways in which this is proposed to be done, but in the opinion of practical men, simplicity should be combined with efficiency in the accomplishment of this much-to-be-desired end; and the engine at present unique for simplicity

should not be encumbered with more mechanism than is absolutely needful. It seems needful also that each flat should remain free to choose its own position in relation to the grinding roller, uncontrolled by any mechanism except that which acts directly upon its working surface. The question is undoubtedly one well deserving the very careful consideration of all users of the Revolving Flat Card. A simple and efficient arrangement by which the flats could be ground from their working surface, would not only obviate the evil arising from irregular wear of those surfaces, but would also prevent the mischief arising from wear, or the special facings provided for grinding at the back of the flats.

SETTING.

It is well known, as previously stated, that as the carding wires are worn down by grinding, the relative positions, of the flat and cylinder carding surfaces being thus changed requires to be re-adjusted by what is called "setting." This can only be done by

it will always maintain an absolutely true circle concentric with the cylinder and of varying diameter throughout the life of the wire, and should be capable of infinitesimal adjustment, say to the $\frac{1}{1000}$ part of an inch with facility. Periodic skimming up should be avoided if possible.

With a rigid bend provision is needed by which any wear of the cylinder bearings may be easily readjusted, although under ordinary conditions this readjustment should not be required for years.

IMPROVED CARDING ENGINE.

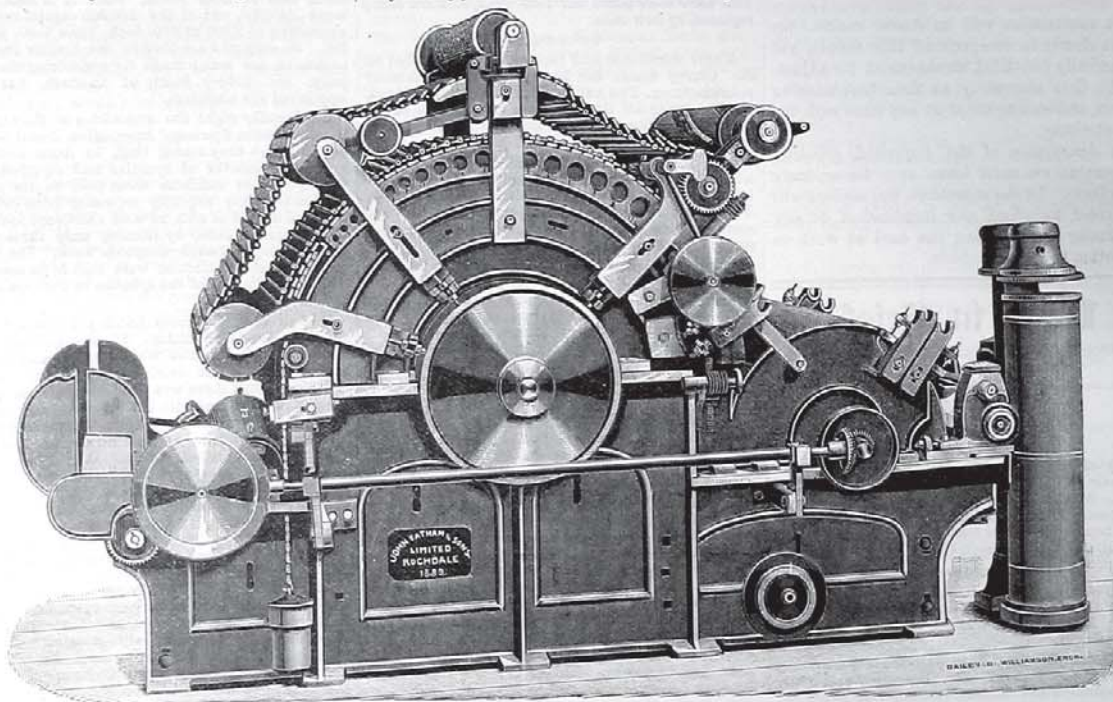
MESSRS. JOHN TATHAM AND SONS, LIMITED,
ROCHDALE.

(KNOWLES AND TATHAM'S PATENT.)

Perhaps no machine has excited a stronger rivalry or a more extraordinary contest amongst machinists than the revolving flat carding engine. It would, however, be somewhat presumptuous in any one to declare that victory has as yet very strongly declared itself in favour of any of

from wear; and 6th to secure the most perfect grinding of the flats by grinding them from their working surfaces. The respective makers have their several plans for dealing with these various points, but our present task is to draw the attention of our readers to those adopted by Messrs. John Tatham and Sons, and which are incorporated in their improved revolving flat card, which owing to these changes has become a strong aspirant for a first place in the estimation of the trade.

The first improvement incorporated in Messrs. Tatham's card, to which we call attention, is the improved flexible bend, the invention of Mr. Thomas Knowles, of Bolton. In this arrangement Mr. Knowles constructs the fixed bend of a peculiar form, making it, not as usual concentric to the cylinder, but upon such a line as would if continued, form a helix. Upon this is mounted the flexible bend, the inner surface of which corresponds to that of the fixed bend constituting as it would if continued an internal helix. Its outer surface on the con-



IMPROVED CARDING ENGINE, KNOWLES AND TATHAM'S PATENT.—MESSRS. JOHN TATHAM AND SONS, LIMITED, ROCHDALE.

reducing the radius of the bend or flat course upon which the flats are supported whilst carding.

The requirements of a flat course are that it shall form a rigid base for the flats whilst at work, incapable of deflection from the downward pressure of the flats, irrespective of the tightness or slackness of the chain which couples them together, that there should be no lateral strain upon the bend rendering it liable to vibratory movement from oscillation, &c. The bend should not be encumbered with moveable parts requiring to be replaced by others. There should be no parts liable to wear or displacement from oscillation or vibration. The bend should be simple, with the smallest possible amount of mechanism and the fewest sliding or fitting parts.

The setting should be done at one point only, if possible, and no more should depend upon the skill of the operator than can be avoided. The flat course should be made upon such principle that

the leading competitors whose machines have at all become conspicuous candidates for the laurel wreath of the victor.

As is well known from many of our previous notices, the particular points that have demanded and received the greatest attention from inventors and machine makers have been—1st, the provision of a theoretically perfect flat course; that is, a course which throughout its length should maintain the chain of flats when working in a position perfectly concentric to the periphery of the cylinder; 2nd, to combine with this a capability of the finest adjustment to permit of the rectification of the relationship of the working parts when deranged by wear and tear; 3rd, the prevention of wear in the bearings of the cylinder, or the provision of facile means of securing perfect readjustment should such wear occur; 4th, to secure perfect rigidity in the flats when in their working position; 5th, to secure the working surfaces of the flat ends, and the bends upon which they move

trary forms a true cylinder concentric in its periphery with the axis of the carding cylinder. This bend if laterally extended would make a wedge, and if its lower surface were placed upon a correspondingly inclined plane its upper surface would be a horizontal plane. To shew its action let us suppose the two parts to be arranged in this manner and the flexible bend to be advanced up the surface of the fixed inclined plane, the effect would be that its upper horizontal surface would be raised to an extent corresponding to the distance it had been moved forward. Withdrawn a corresponding lowering of the height of the horizontal surface would result.

As these movements of the two parts can be made over any extent, it will be obvious that a maximum, minimum, or any intermediate arrangement can be made as desired, and that the minimum can be reduced to the smallest conceivable movement. The adjustment is made by means of drag screws of a fine pitch, which

give the finest possible setting. The contact surfaces of the two bends being planes, afford a solid basis for any weight superimposed, thus avoiding all lateral pressure, the tendency of which, were it present, would be to lower the body resting upon it.

The wedge constituting the flexible bend is rendered flexible by a number of circular perforations being made through it horizontally, which increase in size towards the thick end; from the bottom of these cuts are made to and through the inner surface which rests upon the fixed bend. By these means, a great degree of flexibility is obtained in the direction required, and the bend readily falls into a firm and secure position. At each end of the bend, brackets are attached to the fixed bend which carry the drag or adjusting screws attached to the flexible bend, by which the latter from this one point can be set with the nicest accuracy and the greatest facility, carrying the flats either further away or nearer to the face of the cylinder.

This explanation will no doubt enable our readers clearly to comprehend this simple, yet mechanically beautiful, arrangement for adjusting the flats accurately to their best working position, and setting them at any time with the greatest nicety.

Our description of the improved grinding arrangement we must leave over for an early future issue. In the meantime, the makers will be pleased to afford any information or any opportunity of inspecting the card at work on application to them as above.

News in Brief,

FROM LOCAL CORRESPONDENTS AND CONTEMPORARIES.

ENGLAND.

Ashton.

Many of the mills in this town have adopted automatic sprinklers. The Whitelands Twist Co., Messrs. Samuel Newton and Co., Booth-street, and Messrs. N. and A. Buckley have decided to adopt them, while other local firms are considering the merits of different sprinklers.

Barnoldswick.

The machinery at Well House Mill is advertised to be sold piece meal at the latter end of the present month. Mr. Matthew Watson, of Burnley, will be the auctioneer.

Mr. Christopher Geo. Bracewell, the last surviving partner in the firm of Wm. Bracewell and Sons, cotton spinners and manufacturers, Barnoldswick, died somewhat suddenly on Wednesday morning.

Blackburn.

At a crowded meeting of weavers at Blackburn on Thursday an excited discussion took place on the disastrous results of the cotton corner, which has caused the stoppage of thousands of looms in Blackburn and East Lancashire. The rules of the Weavers' Association prohibit any allowances being paid to the weavers at present out of employment through the cotton corner, and a resolution was carried recommending the Executive to call a special meeting of members to alter the rules so as to enable the unemployed to receive assistance.

Bolton.

The Dacca Twist Company (Messrs. Rylands and Sons), commenced running short time last week, in the spinning department.

The iron trade in this town continues very brisk, overtime being extensively resorted to. Messrs. Dobson and Barlow, machinists, have orders in hand for several months to come. The orders are nearly all from the continent and America.

Colne.

The County Sealkeeper, instructed by the Chancellor of the Duchy, has placed on the Commission of the Peace for the County of Lancaster the names of the following gentlemen:—Messrs. Robert Shawe, Colne; J. Eroyd, Nelson; William Peate Robinson, Brierfield; and Harry Tunstall, Junfield, Colne.

Darwen.

The following gentlemen's names have been placed on the Commission of the Peace for Darwen: Messrs. A. T. Eccles, cotton spinner, and John W. Shorrook, Longmarsh.

Farnworth.

The technical classes commenced this week for the winter session and are being well patronised.

Trade here is reviving a little, and manufacturers are booking a few new season's orders, but the high state of cotton is absorbing all profits.

Messrs. Porritt Bros., manufacturers, have been closed two days this week, owing to a breakdown in the engine.

Messrs. Irlam and Co., manufacturers, have finished brick-making operations and have completed their new reservoir.

Mr. William B. Crompton, of this town, has succeeded in gaining the highest position in the honours grade at the recent examinations in weaving, held under the auspices of the City and Guilds of London Institute, being awarded £3 and a silver medal. This is the second time Mr. Crompton has taken a medal, the other being for the 1st position in the ordinary grade.

Heywood.

Two scutching machines at the Albert New Mill have been taken out this week, and are being replaced by new ones.

Leicester.

A new warehouse and factory is being erected on the Clump estate for Mr. H. Langdale, hosiery manufacturer. The building is central, well lighted, and combines all the recent improvements which characterise the whole of the buildings on this estate.

The Hosiery Students' Association have initiated a movement for the celebration in this district of the tercentenary of the invention of the stocking frame. A number of the leading hosiery manufacturers have also formed a committee to assist in carrying the project to a successful issue.

Mr. W. H. H. Chambers, proprietor of *The Hosiery and Knit Goods Journal*, of Philadelphia, has just paid a flying visit to this town, and, by the courtesy of a few firms, has inspected some of the most interesting hosiery factories. He has expressed himself as greatly impressed with the magnitude of the industry in this district, and highly pleased with the reception he received.

Macclesfield.

The Macclesfield Technical School again takes the lead in the City and Guilds of London Institute Examinations. In the subjects "silk weaving" and "silk throwing" the students of this school have this year won no less than six silver medals, two bronze medals, £17 10s. in prize money, and twenty-four certificates, the majority being in the honours grade. Some splendid examples of weaving were executed by students to compete for the prizes in the honours grade. The master of the weaving school is Mr. John T. Taylor, who is also the weaving master at the Preston and Blackburn Technical Schools. The master of the throwing school is Mr. David Walmesley.

Manchester.

Mr. Ardill (Messrs. William Barbour and Sons, Limited, Lisburn) was in town on Wednesday.

Mr. D. E. Anderson is managing the branch just opened here by Messrs. William and John Don, of Forfar.

No news has yet been received of David Duff, the jute agent, who absconded some months ago with nearly £3,000 of other people's money.

Mr. William Hicks, who represents Messrs. Thomas Lewty and Sons, Leeds, and D. and R. Duke, of Brechin, has removed from York-street to 9a, Mosley-street.

Messrs. Campbell, Smith and Co., London, the contractors for the decoration of the Princes Theatre, have covered the pit with cork carpet, which from its warmth and noiselessness, is admirably fitted for use in places of public entertainment.

The announcement that Messrs. J. P. Westhead and Co., Limited, have opened a warehouse in London, has given rise to much comment in home trade circles. The step is a bold one, and the result of the venture will be watched for with interest.

Mr. C. L. Mason, whose premises were injured by the recent Portland-street fire, has removed to 99, Portland-street. Mr. Mason represents Messrs. Henry Widnell and Co., carpet manufacturers, Lasswade, and Messrs. Henderson and Co., Limited, of Durham, manufacturers of Axminster, Wiltons, &c.

Oldham.

A notice has been posted up at the County End Mill, Lees, intimating that the mill would probably close on Thursday night for an indefinite period.

The mills of the Coldhurst and Anchor Spinning Companies did not recommence work on Monday morning after the Wakes holidays. This was on account of repairs to the engines not having been completed, but which were carried out so as to enable work to begin at a latter portion of the week. The Grosvenor was also in a similar position.

Mr. Ezekiel Hawkins, late manager of the Woodstock Spinning Company, has been appointed carder of the Hathershaw Spinning Company, vice Mr. Thomas Dobson; while Mr. George Newton has vacated the position of manager and salesman of the Quick Edge Spinning Company, in which case, we are informed, the management will be undertaken by two of the directors.

We have previously referred to the large number of orders which Messrs. Platt Brothers and Co., Limited, and Messrs. Asa Lees and Co., Limited, cotton and woollen machine makers, have on hand. As an illustration we learn that a spinning company in the town desired an early delivery of cardroom machinery, but in consequence of being unable to obtain this, they had to consult a firm elsewhere, who were able to meet their requirements.

The promoters of the Stamford Spinning Company speak confidently of successfully floating the new venture, notwithstanding that many hesitate before taking up shares in any undertaking on the Yorkshire side of Lees brook. Still, it is stated that some £40,000, out of the £60,000 capital required, consisting of 1,200 of £50 each, have been applied for. So sanguine are they in the matter that preparations are being made for registering the company. Mr. Sidney Stott, of Oldham, has been appointed the architect.

On Tuesday night the committee of the Oldham Master Cotton Spinners' Association issued a circular, in which they stated that, as firms owning a sufficient number of spindles had signified their willingness to continue short time to the end of September, they urgently requested firms (whether they had agreed or not), to work short time to the end of this month, either by running only three days a week or stopping each alternate week. The replies to the previous circular were sent in on condition that seven-eighths of the spindles in Oldham agreed to work short time.

The strike of cardroom hands yet remains in the same unsettled condition. It was rumoured last week that the disputes were settled, and that the operatives were to commence work on Monday morning. But there was not the slightest ground for the rumour, and with the object of counteracting any effect it might have upon the strike hands, a meeting was called, at which an explanation of the position of affairs was made. At present there is no prospect whatever of the strikes coming to an end, no negotiations having been opened up between the Masters' Committee and the Executive of the Card and Blowing Room Operatives' Association, with that object. Indeed, we have authority for stating that, unless some understanding is come to shortly, there is likely to be a further development of the present breach. The mills at which the hands have left work were opened on Monday morning, in the anticipation of securing some workpeople, but they were unsuccessful.

In respect to the working of short time there is considerable dissatisfaction in Oldham. It is stated that many firms have not yet completed the first instalment of half-time, and we have heard of several instances where stubbornness is being exhibited as to the carrying out of the second instalment. Then there is a suspicion, given utterance to in more than one quarter, that the statement of obtaining the Oldham seven-eighths majority is "cooked." That is, where no returns are sent in, they are taken as favourable. Further, information is demanded both from the Oldham Masters' Association and the United Spinners' Association as to the number of spindles representing "yes" or "no," and the calculation forming their basis. It is infinitely better, and will contribute largely to the success of the movement if the spinners were taken into confidence, and the particulars, now withheld by the respective committees, given to them. Some of the discontents have even gone further than this, and say that the names of the firms ought to be published, so that the scrutinising eye of the public will be able to discern how far firms carry out their pledge. There is a feeling of suspicion in this district that some private firms endeavour to utilise limited companies to serve their own ends by getting them to join in such movements, but at the same time doing all they can themselves to evade performance of their promises. But apart from this, both private firms and spinning companies have been remarkably loyal in working short time.

Preston.

On Tuesday afternoon a fire, which resulted in damage amounting to close upon £4,000, occurred at the Fishwick Mill of Messrs. Swainson, Birley,