Machinery.

IMPROVED HEILMANN COMBER.

MESSRS. JOHN HETHERINGTON AND SONS, VULCAN WORKS, POLLARD STREET, MANCHESTER.

The cotton combing machine, it is well known, is essential to the production of the highest class of work, and the best quality of yarn. The reason for this is that it possesses in a much more perfect degree the capabilities of the carding machine: namely, extracting impurities, short and immature fibres, and laying the perfect ones in parallel order. But in addition to this it does what the carding engine cannot do: it extracts all fibres that fall below the length of a given standard, and thus produces a uniformity otherwise unattainable. In the subsequent process of spinning this is important if it be desired to obtain as fine counts, as the cotton will make, for if it should contain short fibres, the yarn must necessarily, be considerably weaker than if they were all of or exceeded the standard length requisite to produce the best results. This can be ensured by the use of the combing machine. Its proper field of usefulness is in the spinning of the finest, medium fine and the highest qualities of the low counts of yarn, and the districts in which it is best known are Manchester and Bolton, and some of the smaller towns around these in this country. It is also extensively used in the United States. On the Continent it is in several places used for combing even Surat cottons.

The cotton combing machine is the invention of Josué Heilmann, of Mulhausen, one of the best known centres of the cotton trade upon the Continent. Heilmann was a man of considerable mechanical ingenuity. He first patented his invention in 1846, but it took several years to mature. It remained unknown until the Exhibition of 1851 when it was introduced to the English cotton trade, by which its merits were discovered. Its high value to the "fine spinning trade" was recognised, and a syndicate was formed to purchase the English patent for the cotton trade. This was accomplished for the sum of £30,000. The new proprietors placed its construction in the hands of the eminent firm of Messrs. John Hetherington and Sons, Manchester. Its use was confined to the members of the syndicate until their immediate wants had been supplied. Subsequently arrangements were made for supplying outsiders under the imposition of a royalty of £300 per machine, which, with cost of construction, brought up the outlay required for a machine to the sum of £500. This, however, did not prevent its extensive adoption by the trade, as it rendered feasible the use of cottons that would otherwise be quite unsuited for fine yarns. It increased their production and extended their consumption, and gave thereby a great impetus to the development of the fine spinning branch of the cotton trade.

Messrs. John Hetherington and Sons retained the exclusive right to make these admirable machines as long as the patent endured, and practically maintained the monopoly for a much longer period, by the use of subsequently patented improvements. During the time the proprietary rights of the syndicate lasted, they paid to it in royalties nearly £80,000, and since they commenced to make the machine, they have supplied the trade with over 4,000, the repute and the connection formed on the basis of the original invention, aided by their many improvements, having maintained for them the command of the market. We have thought it desirable to give this sketch of the history of this important machine, in order to clear away several misconceptions that exist in the public mind on the matter arising from the imperfect information generally available, and also as a prelude to the description of some recent patented improvements by which an increase of production to the extent of 20 per cent. has been made.

For many years comber laps have been made 7½ inches wide, the lap on its passage through the machine having a tendency to spread. The dimensions of the needle strips, the sliver tins, and the distance between the guides on the cushion plate, all helped to increase this tendency, or perhaps we should say did nothing to restrain it. The consequence was that bad selvages were produced on the combed sheet of cotton, otherwise the uncondensed sliver, loose fibres of which were liable on entering the condensing tube to be thrown over upon and across the other portion lying in parallel order, and so to spoil the work which the machine had been endeavouring to accomplish. The makers, whilst endeavouring to increase the production of the machine, also determined if possible to remedy these defects. This they have accomplished by the invention of a new guide which is attached to the cushion plate, by which the tendency to spread is controlled.

In fig. 1 of our illustrations we give a sectional view of the comber with this improvement embodied. To those of our readers who are not familiar with this machine a brief description may not be without interest. The lap having been prepared is placed upon the rollers A and is unwound by their revolution, the material being directed over the sliver conductor B, which is an inclined guide plate leading to the delivery rollers C D. These have an intermittent movement, turning about $\frac{1}{12}$th to $\frac{1}{16}$th of a revolution each time they move. They deliver the cotton to a pair of nippers composed of the cushion plate E and the nipper knife F. Here it is subjected to the action of the combing-cylinder G, which has a series of combs on a section of its periphery and is corrugated on another. Between these two sections are plain spaces, which as the cylinder continuously revolves cause it to have an intermittent action upon the material. The top comb K is fitted above this cylinder, and its function is to comb the ends of the lock of cotton taken from the feed rollers, and to prevent any fibres being drawn forward that have not been combed. The detaching roller I takes the successive locks of cotton after they are combed, and forms them into a continuous sliver, which is passed to the delivery rollers L and M, whence it passes over the sliver guide N to a trumpet tube and between the condensing rollers shown on the right of the figure, after which it is conducted to the sliver can. The combs G on the cylinder having combed out the short fibre have this stripped from them by the cylindrical brush O, which is in turn stripped by the clearer P, a doffing comb Q doing a similar service for the latter afterwards. The material having now gone through the machine need not be traced any further.

The improvement makes it now possible to use a 9 in. lap without enlarging the size of the machine, thus increasing the production nearly 20 per cent., and improving the quality of the work by preventing bad selvages. The new improvement only requires the same width of guide plate and feed rollers as before. Its importance, however, is so considerable that it is desirable to describe and illustrate it in detail.

The following illustrations show the improvement in its various aspects both in position and detached. In fig. 2 is given a front view of part of the nippers showing them closed; fig. 3 exhibits a corresponding section. It will be observed that only one end is shown, that being all that is necessary for the present purpose. Figs. 4 and 5 are front view and cross section of the same parts when open. Figs. 6 and 7 are views of the guide pieces detached from their position, 6 being a back view, and 7 an inside view. In figs. 2 to 5 the guide piece is shown attached to the end of the cushion plate, *a*, the front being shown in fig. 2 and an end

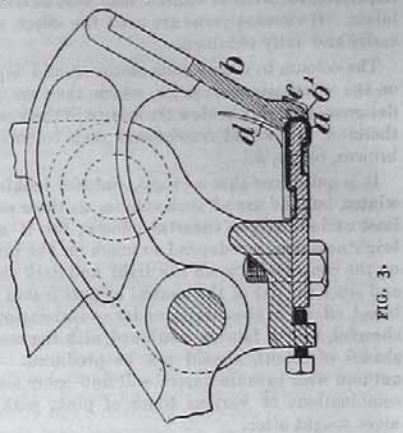

FIG. 3.

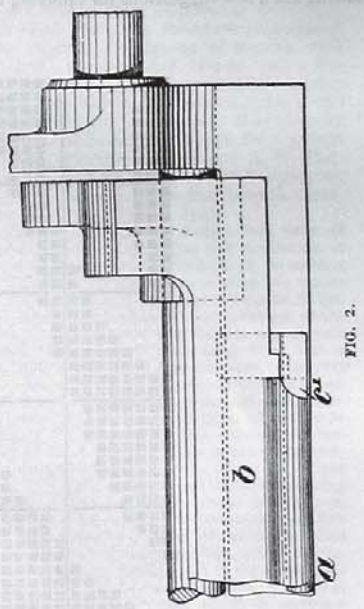

FIG. 2.

or outside view in fig. 5. In each fig. *b* indicates the nipper plate. The guide piece consists of two projections, *c* and *d*, which spring from a common or connecting piece *e*, as shown in figs. 6 and 7. The cushion plate *a* is of course fitted 6 and 7. The cushion plate *a* is of course fitted with a guide at each edge. The projecting lip of the nipper plate *b* is cut away at the part from *f* to *g* in fig. 2, in order to clear the front guide, which extends backwards and comes in contact with the cushion plate *a*, as will be seen in figs. 4 and 8, the latter fig. giving a view of the guides as seen when looking down upon one end of the cushion plate. This construction of the front guide prevents the fibres from escaping sideways between the guide and the cushion

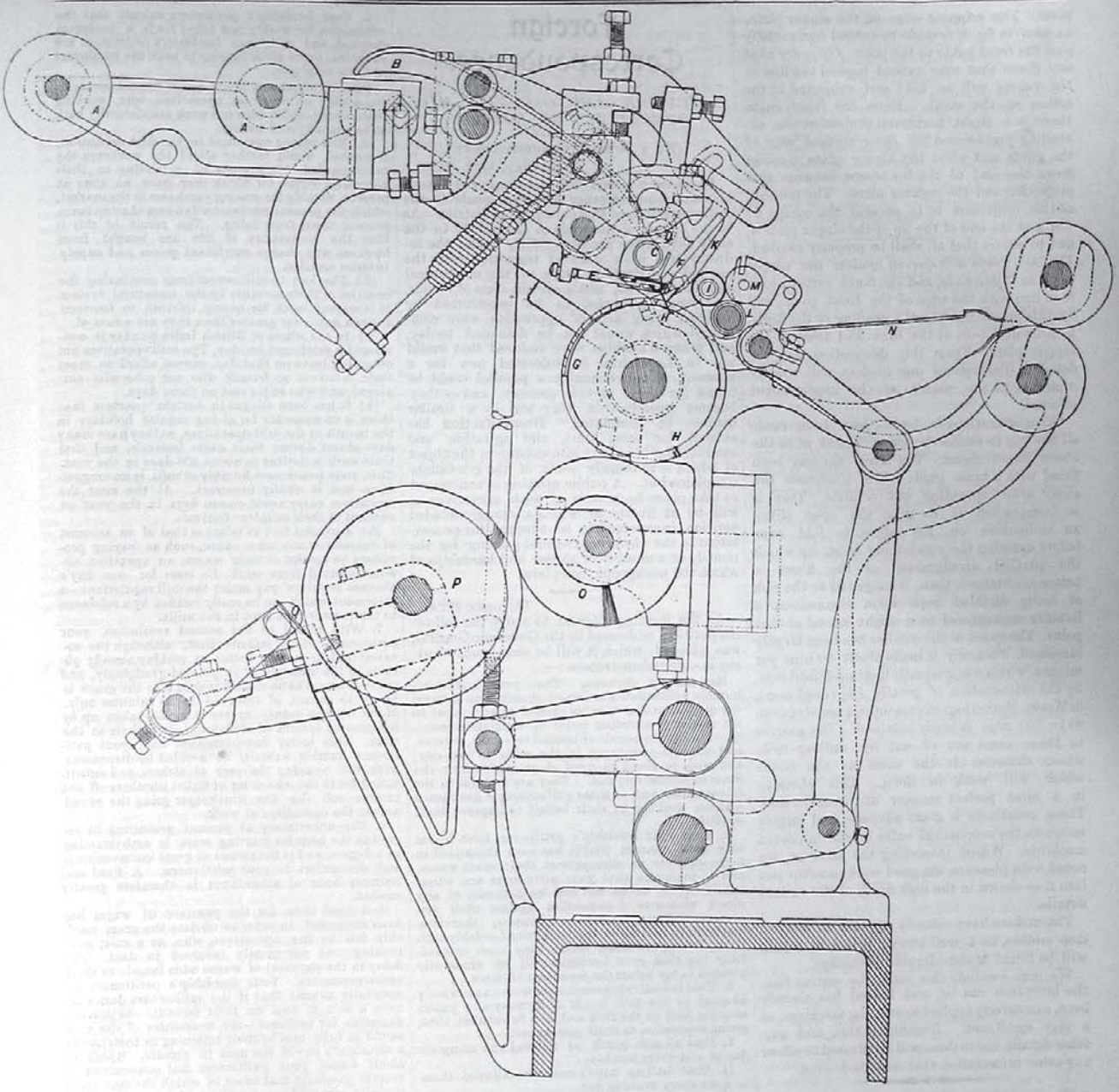

FIG 1.

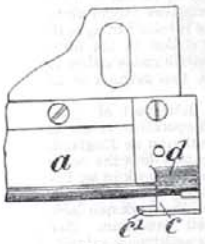

FIG. 8.

FIG. 6.

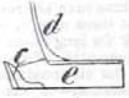

FIG. 7.

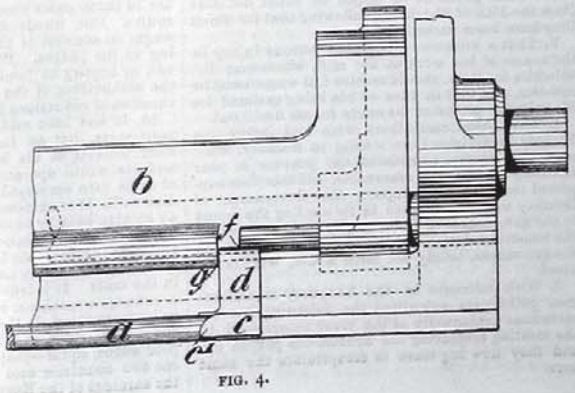

FIG. 4.

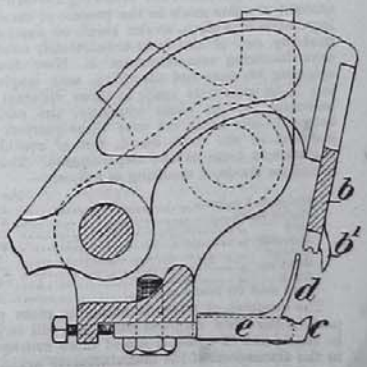

FIG. 5.

plate. The gripping edge of the nipper plate, as seen in fig. 3, is made to extend horizontally past the front guide to the point *f* in order that any fibres that may extend beyond the line of the guides will be held and subjected to the action of the comb. From the front guide there is a slight horizontal projection *e*1, extending just beyond the inner vertical edge of the guide and when the nipper plate *a* comes down the end of the lip passes between this projection and the cushion plate. The purpose of this projection is to prevent the escape of fibres at the end of the lip of the nipper plate *a*, and to ensure that all shall be properly combed. The back guide *d* is curved to clear the nipper plate as it descends, and the inner vertical edge is in line with the edge of the front guide, and by this means the lateral spreading of the fibres is controlled both at the back and front of the nipper plate. From this description and the detailed illustrations our readers will readily comprehend the nature of the improvement effected.

Other alterations in details have been made all tending to secure the effect aimed at in the above improvement. The sliver tin has been fitted with a brass guide which condenses the sliver after spreading out a little. This is so constructed as to give the open sliver an inclination on the edges to fold over before entering the condensing tube, by which the parallel arrangement of the fibres is better maintained than if subjected to the risk of being doubled back upon themselves, a liability encountered to a slight extent at that point. The speed of the comber has been largely increased. Formerly it made about 60 nips per minute, which was gradually increased until now, by the introduction of greatly improved cams, in Messrs. Hetherington's machine, a speed of from 80 to 100 nips is easily attained. The grooves in these cams are all cut by milling tools whose diameter is the same as the bowls which will work in them. This obviates in a most perfect manner all irregularities. These constitute a great advance, and largely increases the economical value of the improved machines. Whilst inspecting the machine, we noted with pleasure, the good workmanship put into it as shown in the high finish of the various details.

The makers have recently applied an electric stop motion, on a well-known principle, which will be found of considerable advantage.

We may conclude this notice by stating that the invention can be, and indeed has already been, extensively applied to existing machines, at a very small cost. Regarding this, and any other details, the makers will be pleased to afford any other information that may be desired.

WASTE IN COTTON MILLS.—The Boston *Journal of Commerce* publishes the following concerning the amount of waste made in the process of manufacturing cotton into cloth, as the result of careful tests made by one of the most economically conducted manufacturing establishments in New England, spinning 30s warp and 40s filling, with single carding. The tests were made in three different mills, belonging to the same company, the variations between them being not over three-quarters of one per cent. in the total result, but of considerable variation in some of the departments. The tests lasted for six days, resulting as follows:—

	Per cent.
Hoops and sacks	4·250
Picker waste	3·750
Card "	5·250
Spinning "	3·750
Slasher "	·025
Weaving "	2·750
Cloth "	·950
Yarn used for bands, etc.	·075

The question of waste is becoming more prominent in our New England mills and will very soon be considered of equal, if not of more consequence in the discussions of the manufacturers' association, than high speed.

Foreign Correspondence.

AGITATION AMONGST THE MILL OPERATIVES OF BOMBAY.

(BY A SPECIAL CORRESPONDENT.)

BOMBAY, OCT. 24TH.

In previous letters that have appeared in your columns some reference has been made to the mill operatives of this enterprising district. As in the history of the trade in Lancashire in the early days of the present century, when the industry was in a state of transition from the manual and domestic state to the mechanical and factory one, and a certain class of labour was being discarded to be substituted by another, many acts of oppression were committed which would not be defended to-day, and many hardships were endured that would not in Lancashire be tolerated now for a moment. Unquestionably a parallel could be found for these in this country, and as they become unendurable, they will in a similar manner be eliminated. Dissatisfaction has existed for some time, and agitation and combination is coming into existence, the object of which is to remedy some of the grievances complained of. A public meeting is announced to take place to-morrow of such operatives as will be at liberty at which a strongly-worded petition is expected to be adopted for presentation to the Governor-General praying for the remedy of a number of abuses and hardships of which the workpeople complain.

OCTOBER 28TH.

At the meeting referred to above the following petition, addressed to the Governor-General, was adopted, which it will be seen is not wanting in comprehensiveness:—

Respectfully sheweth,—That your Lordship's humble petitioners have watched with keen interest the discussion that is being carried on at present in the matter of affording relief by legislative enactment to the thousands of operatives—men, women, and children—employed in the mills in this city, and who do stand in need of protection from the State in several respects. They are grateful to the Government and to those philanthropic gentlemen who are working in their behalf to improve their condition.

2. That your Lordship's petitioners have learnt with great concern that it has been attempted in some quarters to misrepresent their exact wants, and to insinuate that your petitioners are either indifferent to, or do not feel the necessity of, any direct measures of protection against their employers. Your humble petitioners, therefore, respectfully venture to approach your Lordship with the following few lines, which they most respectfully beg that your Lordship will be graciously pleased to lay before the Secretary of State.

3. That the following resolutions were unanimously adopted by the mill hands of Bombay at a public meeting held on the 23rd and 26th September, 1884, giving expression to their grievances:—

I. That all mill hands be allowed one complete day of rest every Sunday.

II. That half an hour's recess be allowed them at noon every working day.

III. That work in mills should commence at 6-30 a.m. and cease at sunset.

IV. That payment of wages be made not later than the 15th of the month following that for which they have been earned.

V. That a workman sustaining serious injury in the course of his work at the mill, which may disable him for time, should receive full wages until he recovers, and that in case of his being maimed for life suitable provision be made for his livelihood.

4. That these resolutions were laid before the Factory Commision then sitting in Bombay, who, after the inquiry, considered the prayers of your Lordship's petitioners reasonable, and therefore supported them in their report. The Government of Bombay were also pleased in forwarding the report to the government of India to give their approval to the recommendations of the Commission, in which the grievances, briefly set forth above, were recognised.

5. With reference to the foregoing resolutions your petitioners submitted the following few observations explanatory of the views entertained by the meeting respecting the concessions prayed for, and they now beg leave to recapitulate the same here.

6. Your Lordship's petitioners submit that the concession for weekly rest asked for is a moderate demand, and will, your Lordship's petitioners are sanguine, prove advantageous to both the employers and the employés.

(1.) The employers would derive benefit by securing a body of healthier operatives, who, working with energy, would turn out work satisfactorily both as to quantity and quality.

(2.) The prayer contained in the first resolution, if granted, would further afford the workmen the much-needed opportunity of attending to their household duties, for which they have no time at present, notably for making purchases in the market, which the present unreasonable hours of attendance prevent them from doing. The result of this is that the necessaries of life are bought from hawkers who charge exorbitant prices and supply inferior articles.

(3.) The loss to millowners from overtaxing the energies of their servants by the unnatural system of incessant work for nearly thirteen to fourteen hours a day is far greater than they are aware of.

(4.) In the whole of British India Sunday is considered a privileged holiday. The mill operatives not obtaining leave on that day, cannot afford to meet their relatives or friends who are otherwise employed, and who enjoy rest on these days.

(5.) It has been alleged in certain quarters that there is no necessity for giving regular holidays in the month to the mill operatives, as they have many days of rest during their caste festivals, and that their work is limited to about 300 days in the year. This, your petitioners humbly submit, is an exaggeration and is wholly incorrect. At the most the operatives enjoy about eleven days in the year on account of their religious festivals.

(6.) A painful fact to relate is that if on account of sickness or any other cause, such as buying provisions on receipt of their wages, an operative absents himself from work, he loses for one day's absence two days' pay under the mill regulations—a statement which can be easily verified by a reference to the muster-rolls kept in the mills.

7. With regard to the second resolution, your petitioners would submit that, although the so-called half an hour's recess at midday already obtains in the mills, yet it is granted grudgingly, and when it comes to be closely looked into the grace is found to consist of from 15 to 20 minutes only. Much of this scanty recess is again taken up by the present system of delivering up tickets at the time. This latter inconvenience can, your petitioners humbly submit, be avoided by dispensing with the noonday delivery of tickets and substituting for it the checking of ticket numbers off the muster roll by the timekeeper going the round among the operatives at work.

8. The uncertainty at present prevailing in regard to the hour for starting work is embarrassing to a degree, and is the source of great inconvenience and discomfort to your petitioners. A fixed and uniform hour of attendance is therefore greatly needed.

9. A fixed time for the payment of wages has been suggested, in order to obviate the great hardship felt by the operatives, who, as a rule, save nothing and are mostly involved in debt. The delay in the payment of wages adds largely to their embarrassments. Your Lordship's petitioners respectfully submit that if the millowners desire to have a sort of hold on their servants—to prevent desertion, for instance—the necessities of the case would be fully met by their retaining in their hands a fortnight's pay of the men in arrears. Speaking about wages, your petitioners feel constrained to remark passingly that cases in which the employers illegally withhold the hard-earned pay of the poor are so frequent that a reference to the Court of Small Causes will convince Government that wages are in many cases recovered only by recourse to the courts. But hundreds of operatives forego their wages on account of the trouble involved in appealing to the judges. The many strikes in the mills will on inquiry be found to be attributable either to the withholding of the wages in this manner or to threatened reductions in them.

10. It has been said, to the detriment of your petitioners, that an Indian mill operative is not as hard working as his brother workman in England, and that a mill operative in England does the work of three men employed on the same work in an Indian mill. It is extremely discouraging to find such an opinion held by those to whom the workmen look up for the amelioration of their condition. The real cause of this, your Lordship's petitioners submit, is the bad machinery and the bad raw material used in the mills. It is true that three men are required to manage a machine, and that these men, it should be borne in mind, do their work for long hours without intermission, and in an enervating climate, on poor wages, equal—taking all the circumstances of the two countries into consideration—to one-third the earnings of the European workman, and perform