No. 1282

THE MECHANICAL ENGINEER AND THE TEXTILE INDUSTRY

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The textile industry enjoys the distinction, to a greater extent, perhaps, than any other, of having been brought to a high state of perfection without the aid of the mechanical engineer. The machinery was developed by the mechanic before the mechanical engineer became a very important factor in the industrial world, and the plants were, and are still, built by mill architects, who as their name implies are architects rather than engineers. The most important field of this industry that the engineer has entered is the power department, and in this field he has done much good work. The complicated and delicate machines for working cotton fiber, however, which are wonders of mechanical skill, have been brought to their high state of perfection by men who were mechanics rather than mechanical engineers. The operation of these machines, until recently, has been directed by men whose training was exclusively that of the factory, and who could solve well a concrete problem.

2 In this industry there is, as a rule, a wider gap between the financial interests that control, and the "help" that operate, than there is in almost any other industry.

3 The textile schools are today doing much to fill this gap by supplying to the mills educated men who, while understanding the detail operation of the machines, are capable of comprehending the larger problems of management, and can thus form a link between the financial men that control and the mechanics that operate.

4 The lack of such men in the past is undoubtedly responsible for the fact that some of the processes which influence the subject of management more than they do the product, and which are easily susceptible of being standardized and done automatically, are

Presented at the Spring Meeting, Atlantic City 1910, of The American Society of Mechanical Engineers.

still being done expensively and inefficiently by hand, and in a manner that causes much subsequent labor and expense that should be avoided. The solution of this problem belongs more particularly to the function of management, for the workman often does not see the influence of one process on a subsequent one in another department.

5 I refer, for example, to the process of handling cloth in a bleachery. In order to make clear the point in mind, it is necessary to explain that in the process of bleaching, cotton cloth is generally sewed together piece by piece and handled in the form of a rope, which is drawn from one operation to the next by means of rolls. This rope of cloth is subjected to the action of various liquids, being first boiled in an alkali and then washed. After being washed it is usually impregnated with acid (technically "soured"), and allowed to stand in a pile for some minutes to allow the acid to act. The methods of forming this pile and of withdrawing the cloth from the pile, are the operations to which I have special reference.

6 As the piling operation is repeated after each of several impregnating operations, the successive pilings divide the process into a series of separate and distinct stages with a loss of time between every two. The usual method of piling is as follows:

7 The cloth is drawn from the souring machine by an overhead roll, which drops it to the floor beneath. A boy stands on the pile of cloth and so guides it with a stick that it is piled in substantially uniform horizontal layers. When the pile has reached a size determined by the judgment of the bleacher (or the boy), the rope of cloth is broken at a seam and a second pile is formed. When in the judgment of the bleacher the first pile has stood long enough, the cloth is withdrawn and pulled through a washing machine into a bath of chlorine water (technically "chemic"), after which it is again piled in the same manner by a boy with a stick. The judgment of the bleacher as to the time cloth should lie in a pile after impregnation seems to be controlled by his temperament, or by tradition, rather than by knowledge, for we find that hardly any two bleachers have the same opinion as to how long the cloth should be subjected to the action of the acid; and the practice varies from a few minutes to twenty-four hours. As a matter of fact the acid does all its work in ten minutes or less, and no beneficial effect can be discovered by a longer treatment.

8 Inasmuch as it is necessary to pull the cloth from the top of a pile, the leading portion as it leaves the sour pile has been acted

upon by the acid a shorter time than that at the bottom of the pile.

9 The top of the second pile is attached to the bottom strand of the first pile, and the top of the third pile is attached to the bottom of the second.

10 As each strand of cloth usually goes through several pilings in the course of being bleached, the action of the bleaching liquors on any portion of the cloth would be alternately long and short, according as that portion of the cloth was at the bottom or the top of a pile. If the rope of cloth was always broken in the same place, the worst that could happen would be an unevenness in the bleach due to the difference in treatment. It frequently happens, however (and this is more often the case than not), that the rope of cloth is not broken in the same place; and when this occurs the various lots of cloth of which the rope is composed, which usually belong to different customers become almost hopelessly mixed. The expense of straightening out such a mix-up has usually been considered one of the legitimate expenses of bleaching. Add to this the fact that the piling boy often piles the cloth so carelessly that it tangles as it is pulled off the pile, and not only damages itself, but usually shuts down a portion of the plant for awhile.

11 If we also realize the fact that chlorine, or "chemic," not only forms a most unpleasant atmosphere to work in, but is actually injurious to the lungs, it would seem that some automatic piling machine which would hold the required amount of cloth and permit the leading end of the pile to be withdrawn would long ago have been devised. Inasmuch, however, as this is not a problem requiring great mechanical skill, but one requiring a somewhat different kind of knowledge, it apparently had never been attacked until the writer came in contact with it.

12 Fig. 1 shows the machine which has been developed to accomplish the result, and Fig. 2 shows the cloth as it is delivered to and withdrawn from the machine. The machine consists of an inclined chute, with upturned ends, and having a bottom composed of a series of independent rollers, freely revolving. The cloth is dropped into the tall stack, and falling on the rollers is carried by its own weight to the bottom of the incline. The incline is filled, and as the fabric rises in the receiving stack, the forward end of the pile is forced upward in the other end of the machine, from which it is pulled off at the rate at which it enters the receiving stack.

13 By making the chute of the proper length a pile of cloth of any size may be held, and the cloth may be subjected to the action of the

impregnating liquor for any desired time, all portions of the fabric receiving exactly the same treatment. Such action produces uni

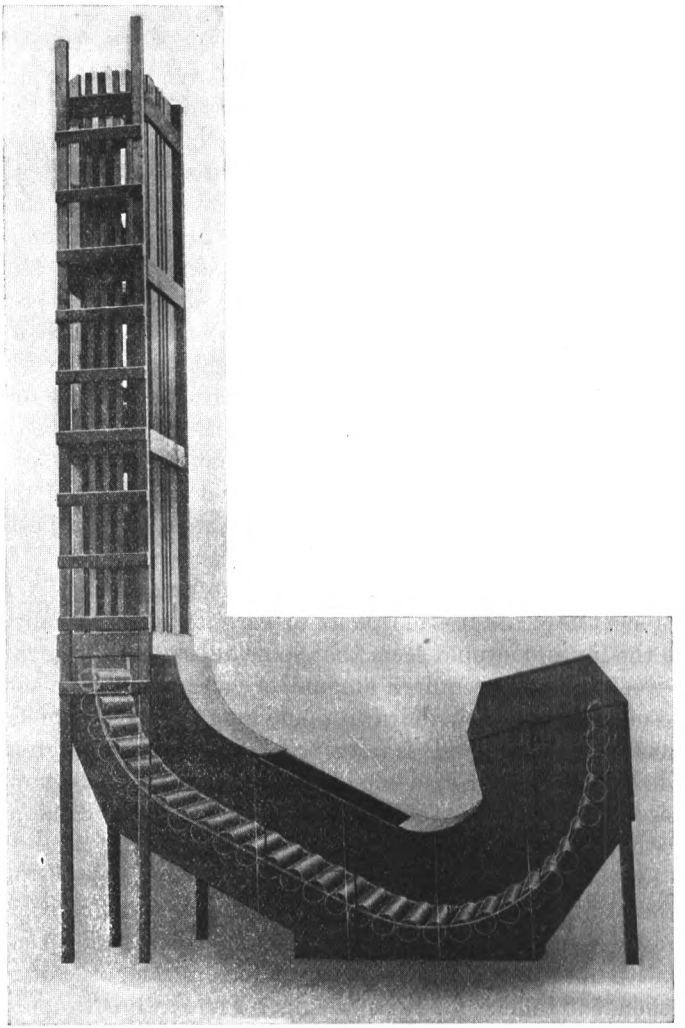

FIG. 1 AUTOMATIC PILING MACHINE

formity of bleach impossible under the old conditions, and as there is no need for breaking seams, the goods go through the bleach house in the order they went in, which produces a saving of expense and

worry realized only by the man who has operated under both methods. The straightening out of "mix-ups" and the "closing out" of "short lots" are the bane of a finisher's existence, and anything that reduces these troubles does much, not only to smooth the operation of the works, but to assure the customer that he is

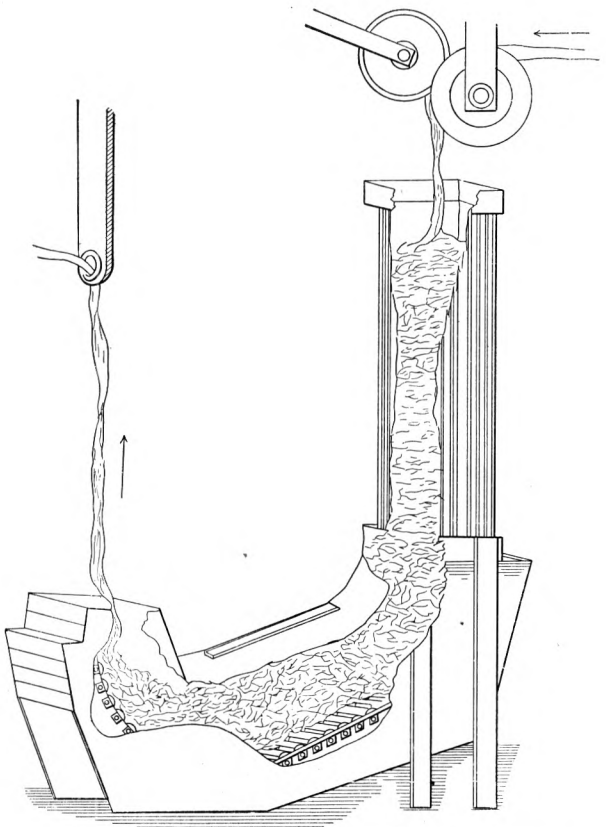

FIG. 2 PROGRESS OF CLOTH THROUGH MACHINE

getting back exactly the goods he sent. Moreover the dirt and damage caused by the piling boys are eliminated.

14 The saving in always having clean goods in uniform condition is greater than the saving in wages of the boys, and the relief to the foreman of having a smaller number of bleach-house boys to manage, makes it possible for him to devote his time to bleaching rather than to boys, with distinctly beneficial results to the bleaching.

15 In addition to the advantages already mentioned, there is a marked saving in time, for the cloth remains subject to the action of each liquid only the time needed to produce the desired result. Each piling machine takes the place of from three to four bins, and as it takes up less space than one bin, the saving in buildings is very con-

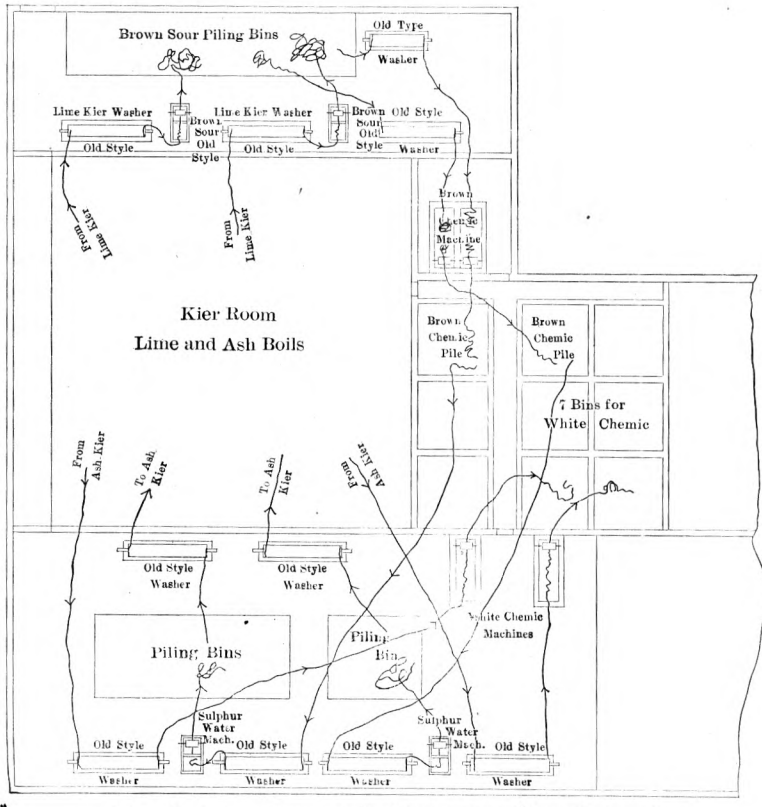

FIG. 3 ARRANGEMENT OF BLEACHERY (OLD SYSTEM)

siderable. In one case, when the washing, "souring" and "chemic machines were rearranged in such a manner as to use a full equipment of piling machines to the best advantage, the saving in bleach-house space amounted to more than 40 per cent. Wherever the machines have once been installed it is obvious that they soon become indispensable.

16 The fact that such an important operation can be taken care of in such a simple manner, is the best evidence that the writer entered

a field that has not been thoroughly investigated by the mechanical engineer. The field is still open, for plants are being built today to handle cloth exactly as it has been handled for fifty years. The builders of these plants have not yet discovered the function of the mechanical engineer, and are still putting their faith exclusively in bleachers.

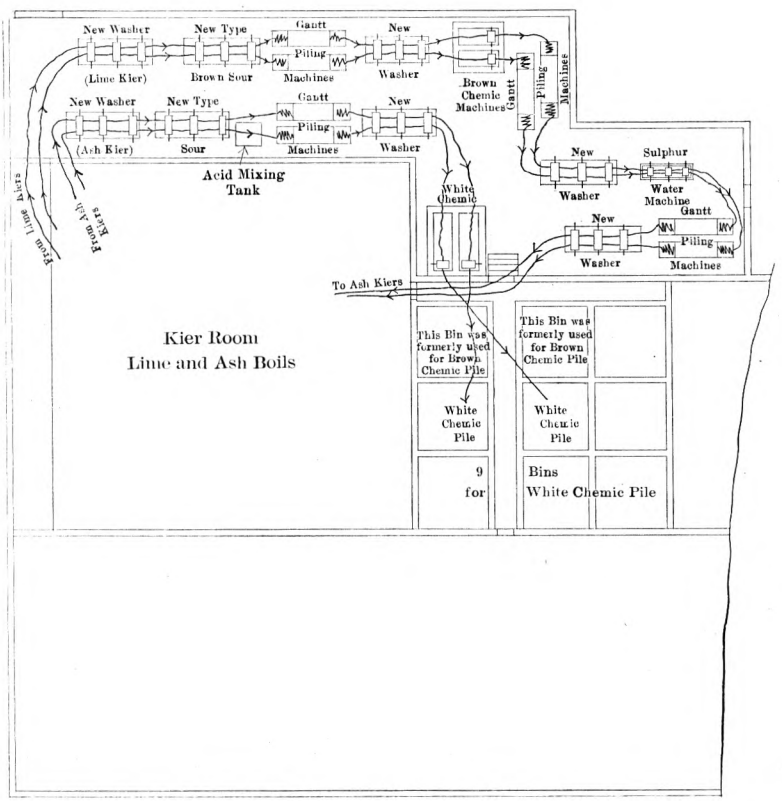

FIG. 4 ARRANGEMENT OF BLEACHERY (NEW SYSTEM)

17 Fig. 3 represents the course of cloth through a bleachery where the writer was told that the process had not been changed for fifty years. Fig. 4 shows the course of the cloth in the same bleachery after it had been equipped with piling machines, and other machines adapted to work economically with them. The new installation takes up less than 60 per cent of the space of the old and is operated by six people against the twenty people formerly needed.

18 The operations and their sequence are the same in the new as in the old layout, except for the installation of an additional "sour", which was thought desirable to remove the alkali of the second boil. The new layout is not a new method of bleaching, but simply a mechanical engineer's method of handling the old. There is hardly a bleachery in the country where the mechanical engineer cannot do similar work, and that without doing violence to the prejudices of the bleacher.

19 The standardization of bleaching methods must come later, and will take time, for we have here the habits of at least half a century to combat.

20 Thefield of the mechanical engineer today seems to be industrial. He is needed in all kinds of industries. Up to this time his attention has been confined largely to the power portion, and almost exclusively to the metal working portion of our industry.

21 By accident, having always been engaged in the metal working industry until a few years ago, I got into the textile industry, and am also familiar with some other industries, and I am satisfied that the field for the mechanical engineer in the non-metal working industries is as large, if not far larger than in the metal working industries, since the latter have been developed to a much higher state of perfection than the former.

22 At a meeting of the National Metal Trades Association in New York at which I was present, statistics were given as to the decreasing cost of production of machines of various kinds. Those in attendance were largely engineers and manufacturers, whose business it is to manufacture cheaply, and who were interested in effecting shop economies. Shortly afterwards I read a paper in Boston before the National Association of Cotton Manufacturers and there I found comparatively few people who were familiar with the details of their shop. They were more skilful as merchants, for the high price of their raw materials, cotton, for instance, was such as to make the buying and selling end of their business much more important in their eyes than the actual process of manufacturing. The best talent was devoted to the buying and selling end and they knew but little about the details of manufacture in many cases.

23 Until the average cotton mill owner comes to the conclusion that something more is needed to make a manufacturer than a classical education, this situation will continue. The value of the mechanical engineer in this field has not yet been realized.