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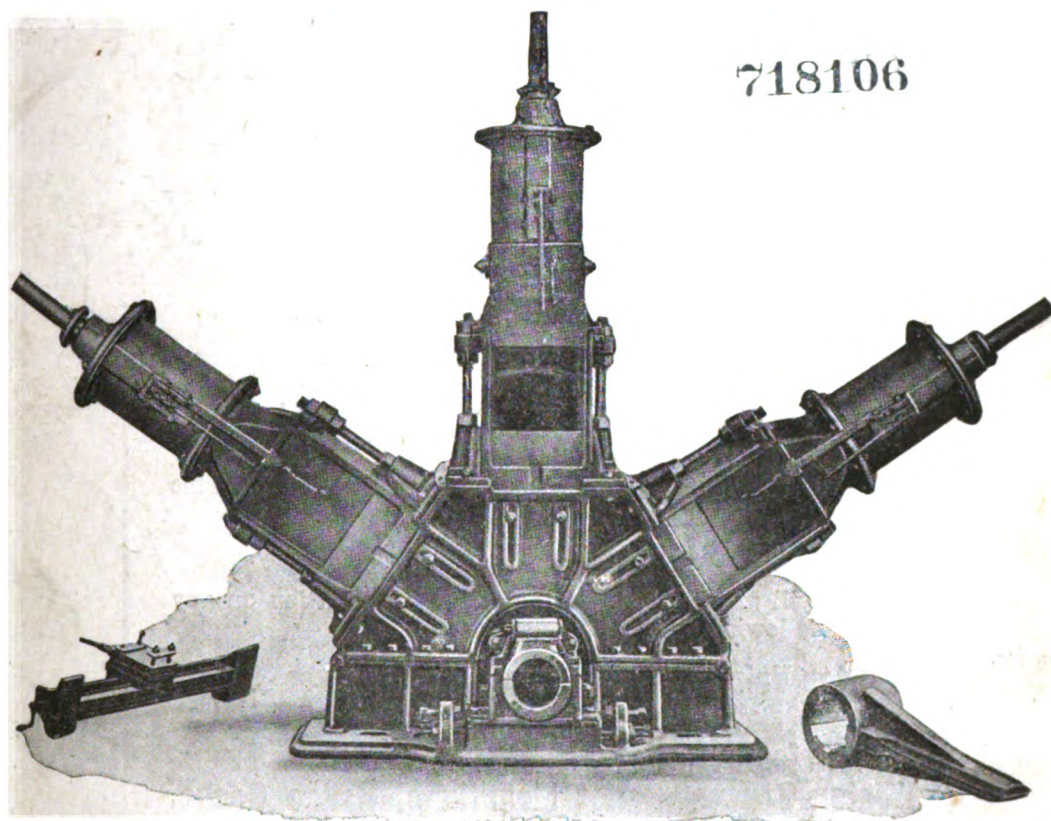
PULP AND PAPER MAGAZINE

OF CANADA

Vol. XV.

MONTREAL, THURSDAY, JANUARY 4th

No. 1



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MILL EFFICIENCY

By ROBERT B. WOLF

Manager of Production, Burgess Sulphite Company, Berlin, N. H.

This article is the address of Mr. Wolf at the meeting of the Technical Section of the Canadian Pulp and Paper Association, held in Montreal, November 24th and 25th, 1916. The interesting discussion that followed the reading of the paper is also included. Complimentary comments on the practical common sense of Mr. Wolf's philosophy have come from all who heard the address.

CHAIRMAN: Dr. J. S. Bates:

THE CHAIRMAN: Will the meeting please come to order.

Gentlemen, we are assembled here this afternoon to hear Mr. Wolf's talk on "Mill Efficiency".



R. B. WOLF.

Some of you have had the pleasure of hearing Mr. Wolf before, and you know that he is an authority along this line, and has something particularly interesting to tell us. I think he needs no further introduction on my part.

You are aware that Mr. Wolf is connected with the Burgess Sulphite Fibre Company, of Berlin, New Hampshire.

I have much pleasure in asking Mr. Wolf to address you. (Applause).

MR. ROBERT B. WOLF: Gentlemen, it gives me a good deal of pleasure to be here with you, and I hope

the next time I attend one of your meetings, if your Meetings Committee or Board of Directors pass favorably on my application, that I will be a member instead of just a visitor. (Applause).

I want to say, on behalf of the American Association, that we want to co-operate to the fullest extent with the Canadian Association. I believe that if we are going to get the best results in the industry as a whole, it is not because on one side of the line or the other that the best results are obtained, but because we are willing to co-operate with each other.

I hope as many of you as possible will come to the meeting of the American Technical Association, in New York, in February, and I am going to urge our men to come up and visit you when you have your very interesting meetings. (Applause).

The question of mill efficiency is something of very great interest to our organization. Ten years ago, as you may know, we had the reputation of making the poorest quality of pulp made anywhere on the continent, and I guess we deserved the reputation. Mr. Burgess decided that in order to change the quality of the pulp it was necessary to apply science in place of rule of thumb, and in looking about for someone who combined a technical training with a practical knowledge of the business he selected me. He told me afterwards that I was the only man he could find who had these qualifications, so that you see my selection was more or less of an accident.

After graduating from College in 1896, I spent a number of years in the mills until I had operated every kind of machine in the various branches of pulp and paper making. While this practical knowledge is a great asset, I believe the most valuable thing I learned was the workman's point of view, by direct intimate contact with him; so that our method of organization efficiency takes this human factor into account to the fullest extent.

Our production ten years ago was only 225 tons a day and the quality was such that our customers were very careful to conceal the fact that they used Burgess pulp. We brought this up, without adding a single digester or a single wet machine, to 400 tons of pulp, which is the recognized standard of quality in the country and now our customers, when they want to emphasize the excellence of their paper add the fact that they are using Burgess pulp. By the addition of one more digester recently we are now manufacturing four hundred and fifty tons a day.

I mention this, not boastfully, but merely to let you know what has been actually accomplished. It has not been done by any one individual; and I maintain that the only way a result of this kind can be brought about is by getting the fullest co-operation from all workmen in the organization and by giving the greatest possible amount of freedom for the exercise of the creative imagination of our employees, so as to obtain the most rapid changes in the physical equipment of the plant.

It is necessary to build up an organization unity, but in order to do this it is necessary to record the

various elements that enter into the manufacturing operations, in such a way that the results can be analyzed. These analyses can then be used as a basis for changing plant conditions, so that the laws that are discovered can be specialized through the creation of conditions for their analyses can then be used as a basis for changing plant conditions, so that the laws that are discovered can be specialized through the creation of conditions for their expansion. This, as you can see, is a very definite, vital, human problem, and requires a constant development of the intellect of the men in the organization. In other words, it is an educational process and the function of the management becomes primarily educational in nature. **It is more a question of leadership than of compelling obedience.** In other words, we have succeeded in getting every man in the organization (I say this in its broadest sense) trying to produce the largest quantity of the best quality of pulp, at the lowest cost. It is not because the department heads, superintendent, or myself are making superhuman efforts to produce the results; but because we have succeeded in getting everyone to co-operate with us. There is a desire to get this result on the part of the workmen throughout the entire plant.

To be more specific, we will take the digester building as an example. You are undoubtedly familiar with the old methods of cooking, where a man judged the cooking operations by the "feel" of the digester and the relief valve, and based his judgment as to when the digester should be blown upon the color of the liquor, and the smell. You can easily imagine that with nine different men cooking our digesters we got nine different kinds of pulp. It was necessary for us to hit upon some standard method of cooking and then get everybody to follow this method. We began by putting on the bottom of the cooking records a graphical chart, upon which the cook plotted the gauge pressure, the steam pressure (which corresponds to the temperature in the digester) and the gas pressure, which was obtained by subtracting the steam pressure from the gauge pressure. By watching these curves, our cook could tell whether the relief was as it should be, by noting the drop in his gas pressure. If it dropped too rapidly he would shut off the relief valve; if not rapidly enough he would open it up wider. By gradually determining the ideal standard cooking chart, the men began to take a keen interest in their work, as they were in reality following an ideal which they recognized to be the true ideal in order to get the best quality of pulp.

Of course the men at first, not being familiar with scientific methods, were opposed to the plan. It is usually the fact that a higher good appears first as an evil, until it is thoroughly understood; but to illustrate the change of heart that takes place when the men are given intelligent assistance, I will tell you a story: I was talking one day, after we had operated under this plan for about two years, with the cook who made the greatest opposition to our plan in the beginning. He had been the surest of all that it wouldn't work, and had rebelled the strongest against being tied down to cooking (as he expressed it) with a lead pencil. After working under our plan for two years, he was much interested in it and became very enthusiastic, and still is. This man was afterwards promoted to the position of digester house foreman and one evening I had occasion to call him into the office to look over the charts that record the general progress of the work in the

whole digester building. These charts we had not been running long enough at that time so that we felt safe in giving them to the men; but a question of changing our cooking methods was something that we were obliged to decide at once, in order to increase the strength of our fibre, and the reason for making the change was so clearly indicated on these charts that I thought it best to begin giving them to the foreman. He was very much surprised, and expressed his surprise a number of times, that the charts showed so clearly the effect of the method of cooking and he seemed so pleased with what he saw that I reached into my desk and took out a bunch of cooking records that I made when I first came to the plant. These were made by simply copying down the temperatures and pressures during the cooking process of all cooks that were being handled while I remained in the room for 36 consecutive hours. I copied these down personally and simply plotted the gauge, steam and gas pressure curves from them. When he saw these curves, he said "It does not seem possible that we ever cooked like that", I assured him that we had and showed him where he had actually handled some of the cooks himself, as his name was attached to the records. After looking at them for a few minutes, he said in a rather amused way: "It makes a fellow think of looking at a picture of himself when he was drunk after he had sobered up, don't it?"

This illustrates, perhaps better than anything else I can say to you, the change that takes place in the mind of the men after having commenced working under the helpful scientific methods.

Through studying the effect of the maximum temperature upon the quality of the fibre, especially the strength, and studying also the effect of the acid strength upon the maximum temperature, we gradually began to accumulate a lot of information which enabled us to co-ordinate and bring together certain parts of the plant which had been running more or less independently. There were hundreds of variables, we found, entering into the different operations and we soon began to accumulate an enormous amount of data which, because of its volume, tended to confuse our minds as to what the real facts were. In other words, by carrying the analytical process to its extreme point, we found a definite necessity for starting a synthetic process which tended to unify and bring together the various factors, so that they would enable us to see the basic underlying principles involved in our manufacturing operations. To make a long story short, we began to record our operations graphically, adding one thing after another until we now have a graphical chart room which contains over two thousand charts, all having to do with the manufacture of bleached sulphite pulp. We have many other charts for our various by-products, in addition to these, but these are handled more or less as separate organizations.

The net result of all this was a gain of over seventeen per cent. in the yield from a cord of wood. In order to do this, however, we were obliged to change the whole character of our acid making process, our process of making chips, and also our process of handling the pulp after it is cooked. This in addition to the careful regulating and recording of the cooking and bleaching operations.

Of course, it goes without saying that we were obliged to put into control of our manufacturing processes technically trained men, and this was done by gradually working these men into the plan through our

chemical and engineering departments. By putting men of this calibre in as department heads, after they were thoroughly familiar with the practical part of the business, and putting the responsibility for the operation of the department up to them, we were able to maintain, in spite of the rapid growth of the organization, the human relationship and contact with our men, which is so essential to the welfare of the workman.

As our organization methods progressed, we were able to give these men greater freedom to change the physical conditions in the plant. In the wood room, for instance, we made such changes in our chipping and screening apparatus that our sawdust has been reduced to one tenth of what it was originally, and the chips are now all of absolutely uniform length. It was a gradual evolution and required steady persistent effort on the part of an intelligent department head, who was being given every assistance to develop the machinery necessary to produce the results.

It is necessary to emphasize here the fact that the method of recording the operations in the department was such that he got the greatest possible co-operation from the men who were actually doing the work. This is not possible for a department head, no matter how intelligent he is, unless he gets this co-operation from his men, and this co-operation cannot be obtained unless full, free information is given to the workman so that he takes an interest in his work.

We make it a policy to record the operations of the individual workmen in such a way that they have some means for recording their progress and thereby able to realize just what their efforts are producing. This brings out what we call the creative faculty of the man to the fullest extent; he is able to really enjoy his work by being given opportunity for self expression. In all of our operations we work to produce this result, realizing that we are primarily developing human beings and that **plant efficiency is not an end in itself, but that the real aim is the development of men.** I could tell you some very interesting things that have happened to men in our employ who have changed their habits of living, decidedly for the better, simply because they were being given opportunity to find joy in their work, and have changed from men doing **negative, destructive** work to men doing **positive, constructive** work. It is a fact that is beginning to be recognized today by men who are thinking deeply along these lines, that a man is internally purified by doing work which is fundamentally creative in nature. The desire for self expression is one of the most fundamental instincts in human nature and unless it is satisfied, it is bound to manifest itself in all sorts of abnormal ways which today are working such havoc in society.

I would like to call your attention here to the fact that we do not use any of the so-called efficiency methods of payment, such as task or bonus and piece work. Our men are all paid by the hour, except those who are on a salary basis. In other words, we have enabled our men to forget that the dollar is the most important thing in life and by paying them liberally (much more than in any other mill) they are able to devote their energy entirely to the task and are actually doing their work well for its own sake. This brings back, as you can readily see, somewhat, the old artisan idea, where the workman took pride in the execution of his work because he had means for realizing himself in it; only in our case the man does not create the complete finished article, but does create and form a more or less definite record, and realizes its relation-

ship to the finished product in which he takes a personal interest and pride.

The progress that we made in our organization was so rapid that I felt the necessity of becoming acquainted with the fundamental laws with which we were working. The one outstanding fact was that it was a process of rapid evolution and I therefore began studying Darwin's "Origin of the Species", in order to get some line on the evolutionary movement in nature. After Darwin I took up Bergson's "Creative Evolution"; then Carpenter's "Art of Creation"; following this with the works of Troward, Henry James, and others; and, at the suggestion of my friend, Mr. Ellwood Wilson, who is here with us today I read the "Ethics of Aristotle." I found that the old philosophers like Aristotle, Pythagoras and Plato had some very fundamental truths and that modern science was confirming a great many of their theories of life. I also found it necessary to take up the study of embryology, which is the scientist's attempt to record the vital processes which take place in the development of man; and finally this led to the study of man's nervous system. The result of all this work brought me to a realization that the principle of Individuality was the thing I was after. I found that in our organization we had built up, through our system of control, a plant nervous system and that we had, without realizing it, created in our organization controlling mechanism.

1st.—A plant memory, which is, as you can readily understand, represented by our graphical department room;

2nd.—A central nervous system, which corresponds to the functioning of the spinal cord, which is the seat of the intelligent sub-conscious control, sometimes called reflex action.

This was represented most distinctly by the system of records that were constantly going out to the men in all parts of the plant, giving them information as to what they were accomplishing. In this way, groups and individuals in groups, wherever it was possible to arrange it, were being informed of their work; and because of having this information they were striving to keep the organization functioning as it should, without constant direction from the conscious mind of the organization, as represented by the superintendents and department heads. In man, for instance, such functions as walking and breathing, after once being set in motion by the will, acting through the conscious mind, are kept in motion by the nerves in the spinal cord, without conscious effort on the part of the individual. It is also the seat of the so-called muscular action, which causes the body to act involuntarily for its own protection when necessary.

3rd.—We had also, in our efforts to relieve our men of the drudgery of memorizing routine work, created, in a tickler system, something which corresponds very definitely to what is known as the sympathetic nervous system in man. In our physical bodies this is the seat of those almost entirely automatic functions over which the conscious mind has only very indirect control. This consists principally of the efferent (or outgoing) nerve cells, whose bodies are collected into ganglia, or groups outside of the spinal cord, principally in the head and in the body cavities. For instance, the nerves which stimulate the growth of the hair, the finger nails, and even the growth of the body itself; the vaso-constrictor and vaso-dilator nerves controlling the contraction and expansion of the blood

vessels; the nerves controlling the beating of the heart and thousands of other functions are all a part of the sympathetic nervous system. This is so designed that it constantly reminds and, in a sense, releases the forces required to keep the routine work necessary to our preservation in motion. In our plant system of control we accomplish this through the use of a tickler system, as it is used in the Taylor system of Scientific Management. This consists simply of a cabinet with a drawer for each month in the year, containing substantially built folders for each day of the month. In these drawers are placed the various memoranda, to be taken out and distributed on the proper dates, reminding those to whom they are addressed of certain routine work to be done. Of course, you can easily understand how a system of this kind accomplishes two distinct functions:

1st. By relieving individuals of the necessity for remembering all of the various routine jobs, and

2nd. Preventing the organization itself from departing from methods determined upon as best. Once a routine tickler is started, it cannot be changed without permission from those in charge of the operations of the plant. It is changed, however, freely and easily, whenever increased knowledge of plant conditions indicate that it is best to make the change.

You can readily see from this description of our mechanism of control how our plant became a definite organized individual and is actually carrying on its function of converting wood into pulp as a unit. We have a definite plant memory and also means for making subconscious all of our consciously acquired talents, which enable us to produce a large output, of a constantly improving quality of fibre, with greater economy.

No individual can make progress unless he has means for constantly acquiring new talents and making them subconscious. This is what our progress in the world largely consists of and it is useless to expect an industrial organization to make progress unless it is provided with a definite mechanism of control, which we have a right to pattern after the nervous system of the human body.

We, as individuals, can never create anything that we have not first become ourselves; but what we are, that we can certainly create and externalize in physical matter.

It is all, as I said before, a creative process, and whether we are creating the directing mechanism of the organization, as is done by the executive and his associates, or whether we are actually creating, or helping to create, as the workman does, articles of manufacture, the process is the same.

The desire to express life is man's most fundamental, basic instinct, and this, of course, implies the fuller expression of life, which can be nothing else but a creative process; and it is because we reckon with these forces in our organization and constantly provide means for their expression that we obtain such splendid results.

The more knowledge a man has of the laws that he is working with, the more he is able to create conditions for the expansion of these laws. As I have said before, man does not create matter nor force, but he does create conditions for the specializing of the natural process and, as this is the basic instinct in all mankind, the progress that is made in any organization depends upon the amount of opportunity given to

the human units, of which it is composed, to do creative work.

Of course, the great problem of management is how this can be done and at the same time blend all of the various individuals into one great harmonious whole. If we make sure that at the same time the self-conscious faculty is developed, a cosmic or universal consciousness is also developed, thereby enabling each man to realize his place in the organization, there is little danger of interferences which will cause trouble. In other words, that great power which we may call "The Will of Man," operating in the "natural or generic" field, cannot destroy itself if it becomes conscious of the great unity of the whole and its particular place in the universal scheme of things. **It is necessary to teach men their place in the parent organization, as well as teach them how they can become more intensely creative in their own particular sphere of operation.**

I will now show you, by means of lantern slides, the practical application of these principles to our industry. I will show you, first, the illustrations which have to do with our tickler system, or subconscious mind; next, illustrations of that part which corresponds to the intelligently subconscious control, as exemplified by the spinal cord and central nervous system; and, finally, an illustration of our plant memory, as illustrated by the graphical chart room.

(Here followed the lantern slides which were explained in detail).

* * *

With these slides Mr. Wolf illustrated clearly that the philosophy of management outlined was practical. He showed how by the use of the Tickler System a great mass of routine work was handled and how, by having these reminders automatically come to the attention of the men in the plant, a large amount of creative energy was liberated for improving plant conditions. The system is clearly safeguarded so that no change can be made without the conscious mind of the organization directing the change.

His illustrations of the various records which are sent out to the men showed clearly why he was able to get their co-operation. From these records the men can tell just how well their work is being performed, and see the effect of their efforts upon their standing. His statement that this function of the plant organization system prevented things from going wrong was certainly substantiated by these records and it could be easily seen how this method would produce a desire on the part of the men in the organization to do their best at all times.

Further illustrations of the Graphical Department records, or plant memory, showed how everything which in any way affected the progress of the organization was recorded; the records being made in such a way that things affecting each other were placed close together, so that it was a very easy matter to study the forces at work in the organization. This system gives not only a record of the efficiency of the men, but, what is perhaps **more** important, it gives a record of the efficiency of the management, in such a way that it can more intelligently decide upon the best policy to pursue.

Finally, these illustrations made it plain that there was a very distinct and definite **plant individuality** and that the real reason why great progress has been made in the art of manufacturing bleached sulphite

pulp was that the organization, **as a whole**, was the instrument used by the creative process for converting wood into pulp. In other words, the plant, considered as a unit, had a consciousness which enabled it to create the special conditions needed for making steady progress in the quality, quantity and economy of operation and the great vitality of the plant came from the fact that this organization unity was used for studying how it could liberate the creative powers of the individual men in the organization, by making their work so interesting that they took real joy in it.

This not only applies to the individual workmen, but also to the Department heads, who are given a distinct record of their work through the departmental cost sheets. By the use of these cost sheets the department heads are being charged with all of the maintenance materials used in their departments, so that they are, as a matter of fact, managers of the departments; being held responsible not only for the quantity and quality of the output, but also for economy of operation. The almost unbelievable saving in maintenance materials since these departmental cost sheets were put into use demonstrated that Mr. Wolf's philosophy of management is not a vague, indefinite theory, but something that is thoroughly practical and actually produces results.

The development of the larger organization consciousness is materially aided by the weekly meetings of the department heads, with the superintendents and manager; but it is evident that the organization principles, without the aid of these meetings, enable each man to become conscious of the effect of his department operation upon all of the other departments.

DISCUSSION OF MR. WOLF'S PAPER.

At the close of the address, the chairman asked for a discussion of Mr. Wolf's paper. This discussion brought out and emphasized several important points, which are summarized below.

To some of the members the greatest interest was in the entirely human aspects of the proposition. It calls out the desire of the individual to create, to co-operate and to give, three tendencies which make for greater happiness and success for both the individual and the group.

It was further shown that the cost of administering such a system is insignificant in comparison to the savings effected. But such a system cannot be planted full grown in a plant whose organization had not already begun to think along these lines. It is a process of evolution and not one of revolution. The first thing is to build up the true scientific spirit on the part of the management. The men will respond instantly, as soon as they are given a chance to know what they are accomplishing.

There is no task and bonus system or piece work. The men are paid enough so that they may forget the selfish instinct and to really do the work for its own sake. It really gets down to a practical application of christianity.

A member spoke somewhat as follows:

"We have seen here the results of giving a man an opportunity to use his brain. Is that not really what scientific management means? Depend upon your men—give them the opportunity—depend on them, and they will work out things themselves. We will get something out of them. Don't treat them as machines.

If you do, you are no managers. If you cannot depend on the man's work you should not be a manager."

In reply to a question as to the relation of safety work and efficiency, Mr. Wolf replied:

"We have a safety department controlled by the men themselves. The mill is divided up into departments and in each department there is a committee of three men, one on each shift. These men make regular inspections and report their findings direct to the Engineering Department. The Engineering Department then sees that their recommendations are immediately carried out, provided they have been approved by the manager or superintendent. I want to point out, that the effect of the work done by this committee has been very far reaching. We have had practically no major accidents in the mill for over two years and almost none due to unguarded machinery or dangerous places. Through their safety committee the men are brought into closer contact with the management."

There is one more thing I would like to say, namely, that the leaders of industry must begin to realize that the main reason for its existence is for the purpose of developing men. In other words our industrial organizations should become the fields for the evolution of mankind. We are too apt to focus our attention upon how much money we can make, forgetting that if we emphasize the development of men the material results are bound to follow; for, in the last analysis, everything in civilization is created only after it is first conceived in the mind of a human being. High grade are always created by high class workmen.

MAY BUY CHIPS IN WISCONSIN.

Owing to the growing scarcity in Wisconsin of wood suitable for making paper pulp, the Forest Products Laboratory has just completed a study into the methods of barking, chipping, screening, and baling of chips. Laboratory tests show that certain western woods are admirably adapted for manufacture into pulp, and negotiations are now under way between paper companies in Wisconsin and western railroads with a view of securing freight rates on trainload shipments of chips to Wisconsin. It is estimated that some of these western woods can be cut into chips, which, when dried and baled, can be delivered to the mills in Wisconsin at a very small advance over the cost of chips made from local timbers. Since there is a market for more than 300,000 cords of wood annually in Wisconsin, an attempt to utilize western species appears worthy of consideration in order to hold the supply of wood for our American paper mills on American soil.

SAFETY FIRST FOR WOMEN WORKERS.

The women who work on and around the machines of the Thames Paper Co., England, wear a very sensible style of clothing that should be a great protection from accidents. Instead of skirts they wear bloomers. They wear elbow length sleeves and caps. A picture of this squad of women paper makers appears in the **Paper Maker**. They take the places of many of the men who have gone to the front.

ANOTHER RAW MATERIAL FOR PAPER.

Specimens of tambookie grass and paper successfully made from it can now be inspected in the South African Court of the Imperial Institute.