

# Report of Labour-Saving Devices Committee

This Committee was appointed at the end of December, 1927, Messrs. Watson, Patrick, Mauss and Fowlie being invited to serve on it.

A meeting was called for 18th January, 1928, which was attended by Messrs. Watson and Fowlie. Mr. Patrick was unable to attend, and Mr. Mauss found himself unable to act on the Committee.

It was decided to get into touch with the Secretaries of Planters' Associations, to ask them to give information of any devices employed by their members likely to be useful to Cane Planters generally.

It was also decided to write to Mr. Aird, Engineer, Cedara, to ask him for any recent information *re* tractors.

The question of asking the industry to set apart a small fund for testing out new machines or devices was discussed, and it was decided to recommend that this be done.

Mr. Patrick and Mr. Fowlie met informally on 25th January. The former was in agreement with the steps taken at the meeting on the 18th.

The following letter was sent to the Secretary of each mill group of Planters on 30th January, 1928:—

"Dear Sir,—I am writing on behalf of the Labour-Saving Devices Committee of the South African Sugar Technologists' Association.

"We are anxious to get information about any recent devices, implements, etc., for cheapening the production or handling of cane.

"Should any of your members have ideas or data of such devices which they are willing to communicate for the information of the whole industry, please send me as full particulars as possible for incorporation in the report which we hope to present to the Annual Conference of the South African Sugar Technologists' Association."

This letter has brought no replies so far, except that one Secretary has written to say he is circulating it amongst his members.

Mr. Aird replied to our inquiry *re* tractors, that he has been unable to give this subject the attention it deserves recently. He encloses a report on trials which were carried out at Elsenburg, C.P., in 1918.

The following devices which are not in general use have come to our notice and are suggested for consideration:—

The use of a slide in place of a wheel on single-furrow ploughs and ridgers where the land is sticky. Frequently wheels are unable to run, and under such circumstances slides are more useful and less expensive. This is particularly applicable to hillside ploughs.

The use of two parallel disc coulters on a large single-furrow mouldboard plough for ploughing out cane to divide the furrow slice into two and lessen the size of the lumps which form when hard ground is turned over.

To inspan two cultivators behind one team of two or four oxen by having traces from the yoke of the after oxen and inspan a cultivator behind each ox. The yoke must be the right length to allow each ox to walk in the middle of its row.

The possibility of employing a hayrake working across the lines of cane when it is desired to remove the trash, or of using a Bernson Cultivator or any other mechanical device for the same purpose.

The efficient lubrication of all farm machinery ought to receive much more attention than it does, and it is suggested that the application of the grease-pump system such as is used in motor cars would be a great improvement on the usual methods in vogue.

With regard to labour-saving devices in the sugar factory, the difficulty of arranging meetings of the Committee in the limited time available has precluded the possibility of making any detailed report, nor was there sufficient time to circularise the various companies with a request for their views.

The Committee, therefore, can only suggest where, in their opinion, means might be provided which would tend to reduce labour costs.

Dumping of cane by grab direct from trucks into cane carrier, without the use of a feeding table and rakes, is practised at one or two factories. This would appear to be a saving in labour over the older methods, but the bulky feed thus produced must be levelled and distributed to some extent by knives before the cane reaches the crusher.

By this method, 12 boys should be sufficient to attend to all work at the carrier of a mill crushing 60 tons per hour, including the shunting of trucks and off-loading of cane which the grab cannot get hold of.

All straining of the juice at mills should be done mechanically.

Peck Strainers have proved a success, while it is understood that Hummer Screens have also successfully been tried out, and both methods are labour-saving as well as being more efficient than the old methods.

Most factories are now equipped with bagasse conveyors, but it might be possible to reduce the labour on boilers, by installing mechanically-operated feed hoppers and mechanical ash-removers.

Various types of mechanically-operated continuous mud filters are now on the market, and although it has still to be proved that these are successful on sulpho-defecation muds, further experimenting is fully justified in view of the great saving of labour over the old plate and frame type.

It would appear that little further saving in labour can be effected throughout clarification, boiling or curing departments, most of our factories being equipped with the very latest types of machinery.

At the centrifugals a certain amount of labour might be saved by the use of mechanical dischargers.

The latest methods are generally in use for bagging, weighing and sewing, but in the case of factories making only raw sugar for the refinery, it ought to be possible for arrangements to be made to carry this sugar in bulk in special railway trucks, with hopper bottoms somewhat after the type used for carrying grain.

The sugar could be loaded into these trucks direct from centrifugals, while the truck could at the same time be standing on a weighbridge, and a predetermined quantity could then be loaded.

On arrival at the refinery, these trucks could be run over the boot of an elevator, into which they could be discharged through the bottom. If necessary, the trucks could then be passed on top of a tank where they could be washed out and the resulting sweet water used for melting or other purposes.

If some scheme on the above lines can be devised, then not only will it result in a vast saving of labour, but the saving of costs of bags and twine would be enormous.

The fact that transportation in bulk has never been attempted so far is simply because no other cane sugar producing country (with perhaps the exception of Louisiana) is in a position to do so, owing to the difficulties presented by sea transport. In our case, however, these difficulties are not present and the distance which raw sugar has to be carried is negligible.

The Committee are well aware that much detail would have to be studied, both at the factory and refinery ends. They simply put the idea forward as one worthy of consideration and discussion.

Chairman: As the speaker has just pointed out, this Committee is the one that was formed very recently, and it was hardly to be expected that they should have made a report at all by this time. The report is very useful and suggestive and augurs very well for the future of this most promising committee. The suggestion of transporting sugar to the refinery in bulk by railway trucks is a very interesting one as a novel idea for the sugar industry. The report states that this is perhaps the only sugar producing country, with the exception of Louisiana, that would be in a position to do it. I think even in Louisiana it would hardly be regarded as practicable, as most of the factories there produce sugar for direct consumption, the refineries in New Orleans being supplied mainly with imported sugar from the tropics. We have in Natal probably a unique opportunity of carrying out this most useful economy.

Mr. Murray: In connection with milling plant, there is a tremendous amount of labour in picking up bagasse which has fallen from carriers; could not the carriers be constructed to do away with this? Another thing is the scraping of juice heaters. If that is overcome there would be a tremendous saving of labour. Also in connection with clarification, the muds could be handled by continuous rotary vacuum filters.

Mr. Watson: About the scraper carrier, there is no doubt at all that the scraper type is a much more cleanly type, but there are a few objections to that type of carrier. I have at present at Amatikulu one scraper and two apron type carriers, and I would not like to say definitely whether my opinion would be in favour of the

one or the other. But the objection to the scraper type carrier is that the tendency to-day with makers of sugar crushing machinery is to close in the mills, which does not lend itself very well to the introduction of a scraper type carrier. I have seen these carriers erected to give a horizontal feed into the following mill. That I don't favour, for the reason that the scrapers of the carrier are inclined to carry with them a lot of loose bagasse and keep on returning it from end to end of the carrier. I would prefer to have an inclined feed plate to the following mill. That necessitates either a very steep rise or putting the mills wide apart. As far as cleanliness is concerned, there can be no doubt that the scraper carrier is the thing. But I don't think, from my experience at any rate, that the feed delivered from a scraper carrier can be compared with the feed from an apron carrier; and if we go into questions of capacity and extraction, then the apron type carrier is the best, despite the fact that it may be more dirty and drops stuff all over the place.

Mr. Moberley: I don't know the exact details, but Mr. Jacobs explained the rough principles by which he was going to work with two series of juice heaters. He heats the raw juice as it comes from the mill, and then again after treating. He first runs the raw juice through one heater, treats it, and then through the other, and then he reverses the procedure.

Chairman: It would be advisable for the Committee to obtain further particulars of this.

Mr. Murray: I notice the Committee report on machines for shifting trash. I believe the machines they have in use in Britain for turning hay would be the very thing for shifting the trash.

Mr. Watson: It would seem that a judicious spacing of the spikes of the rake would be all that is required.

Chairman: The possibility of saving labour in juice strainers is mentioned. I saw in Cuba a type of juice strainer which I think was at that time to be found only in Java elsewhere; that is the grasshopper type, very similar to the ordinary grasshopper conveyor of sugar from the centrifugals. It worked remarkably well in straining the juice and required very little labour or attention. The only difficulty was that the supporting vibrating springs were liable to breakage, which were very troublesome when they occurred. I noticed in a recent number of one of the technical journals that a new and improved design of a juice strainer of that principle has been evolved and is in operation in Cuba, and it may be worth while to get information regarding it.

Mr. Simpson: I understand that particular kind of grasshopper strainer is used at Luabo on the Zambesi very successfully.

Mr. Watson: I think our experience at Amatikulu is that to make the thing a success we have to be very careful with regard to the cleanliness of the machine, and it takes some time to make sure that the machine is perfectly clean. I understand that at Mount Edgcombe the Hummer screens have been tried. Mr. Simpson might possibly give us some idea of what the Hummer screens can do.

Mr. Simpson: I am afraid I cannot give a great deal of information about the Hummer screen. We tried it for a few weeks, and so far as the straining capabilities of it goes there is no doubt there are great possibilities in front of it; for such a small area to do such a large

quantity of work is extraordinary. Whether the mechanical difficulties can be overcome, I can't as yet say. The size of mesh is another important thing. These Hummers have been used in America and advertised in some of the papers, but they are chiefly being used with 30 to 40 mesh, whereas we are using it with 120 and 150 mesh, which you will realise is very different.

Chairman : I see the Committee recommends that the Industry be asked to set aside a small fund for testing out new machines or devices. A similar recommendation has come from several committees during the course of these meetings, but the difficulty is to find out who can be persuaded to pay for them. That is the trouble with all this kind of work, as we well know at the Experiment Station.

Mr. Watson : I think the idea of the Committee is that those who will benefit by it should be asked to stand the racket. The planters themselves in many cases will certainly benefit ; in the second half of the report, which refers chiefly to manufacture, the millers will benefit by any outcome of the suggestions. Therefore there can be no question as to who is expected to bear the brunt of the cost of experimental work.

Mr. Bechard : Could any member give us any idea with regard to reciprocating fingers for discharging cane from the carrier ?

Mr. Moberley : I have seen these in use in Louisiana and they work very effectively ; but so far as I can see they would not be much use in this country, because we have not the type of truck suitable. They could be used best in a truck in which the cane lies longitudinally. In all our small trucks the cane is loaded across the truck, so that these rakes would merely catch it and bundle it. In Louisiana they have a very much longer type of truck in which the cane, which is usually short, is loaded lengthways, so that these reciprocating fingers pull the cane out and deposit it on the carrier in the right direction without mixing it up.

Mr. Bijoux : They had something similar at Umfolosi, and unless knives precede the crusher to regulate the feed, I do not think it more advantageous than any other type.

Chairman : There is another possible labour-saving device—the portable cane loader as used in Louisiana and Hawaii, a device which saves a vast amount of labour in handling the cane after harvesting in the fields. It picks up the cane along one side of the machine and deposits it in a wagon or truck on the other side. I think all the cane that is grown commercially in Louisiana and Hawaii is loaded in the fields in that way.

Mr. Pearce : Those machines would not do very much in this country. Over there they get 90 to 100 and 120 tons to the acre and it is a different proposition. The labourers in Hawaii won't carry cane more than 200 feet ; that is the contract.

Chairman : They are in universal use in Louisiana, where the average tonnage is usually about 15. However, there are objections to their use in the present form in this country, but it seems to me that the difficulties are of an unessential nature and could be overcome. In Louisiana they operate by means of a grab, which picks up the bundles of cane from the field. In our flat lands it would naturally pick up a lot of dirt and trash at the

same time, whereas in Louisiana, the cane has been cultivated into ridges and after harvesting they are thrown down approximately in bundles across the ridges and there is a space underneath for the grab to get hold of it without picking up a lot of dirt. While the grab system would not be applicable here under our conditions, I believe in Hawaii instead of using the grab they have an arrangement of slings in which the cane is laid beforehand and picked up by this travelling crane.

Mr. Watson : With regard to the observations of the committee in regard to the transport of sugar in bulk, I would like to point out that no opinion was available from the Refinery end of the job. I notice we have the Chief Engineer of the Refinery here, and it might be worth while to ask him what his opinion is as to how it would work out at his end; from the mill end, I don't see that there would be any difficulty.

Mr. Wilson : I think that within the near future it might be possible to handle the sugar in bulk, with the advent of the Redlar conveyor and silos. The idea of the conveyor is that it is situated underneath the silo and draws away from the silo; instead of the conveyor drawing a small portion, it moves the whole bulk. If you have a box, say 6 ins. square, the whole mass is moved in bulk, and the idea is to adopt this to silos in connection with raw sugar. If you leave raw sugar too long in bulk, it becomes very hard and very difficult to remove, but the idea is, to have the stuff put in at the top and by a continuous system of drawing away from the bottom and putting in at the top the whole mass would be slowly moving and never get time to settle. That system would be well worth trying out, and you could put your raw sugar into trucks, send them to the refinery, discharge them into an elevator and always keep it on the move. We have one of these conveyors at the refinery now, and during the next season will be trying it out.

Mr. Watson : With regard to the question of supplying sugar in bulk to the refinery, in view of the present capacity of the refinery and the amount which is likely to be sent to the refinery, it could be arranged that sufficient only would be sent in bulk to keep the refinery going each day and the balance sent in bags as heretofore and stored in the storeroom. Allowance would have to be made, of course, for a certain amount of bulk storage in the event of a breakdown on the railways.

Mr. Bechard : I would like to draw attention to the report dealing with delivery of cane to the mill. The question of slings should be inquired into, as it would assist considerably in the sampling of cane also.

Mr. Bijoux : In Mauritius, slings are mostly in use ; These have the advantages of allowing the quick unloading of the trucks, and neat stacking of the bundles in the yard, without inconvenience to the field or to the planters in case of stoppage or break-down.

## WASTE PRODUCTS

Chairman : A compilation was made at the experiment station of the references to the disposal of waste products of the sugar industry that have appeared in the literature during the last few years. It is a useful list of references for anybody desiring to study the subject and we propose to have it published with the reports of this Conference.

Mr. Watson : We have had a very full discussion on the factory effluent. But another point that, of course, affects the engineer more than the chemist, is the disposal of the sludge from the waste matter. That will contain a very high percentage of moisture. It must go through a filter of some kind. Dr. Hedley has some information as to what filter press capacity would be required by a factory like Felixton, dealing with about 1,400 tons of cane per day. From these figures, we could work it down to a percentage per ton of cane. While the great thing is to get an effluent sufficiently pure to go into the rivers, we must not overlook the fact that we have the sludge to be dealt with, and the method of dealing with the sludge, requires some consideration at any rate.

Chairman : The sludge is a valuable fertiliser if it can be put into such a form that the planter can conveniently handle it.

Mr. Pearce : I think the main trouble with sludge is the smell. How are you going to get rid of that?

Mr. Watson : I think if we can dry it out to a minimum moisture content, there will be no smell or trouble like that. It would be in a condition that could go direct to the fields. At present the planters object to taking filter press cake during the crop for the reason that it is difficult to handle. The labour is employed in handling cane and they cannot spare the labour to handle filter press cake. If we can have it reduced to a consistency which can be easily handled, then we will get over that difficulty and there will be no nuisance.

Dr. Hedley : I have no definite figures as to the sludge you get. It depends on what practice is adopted by the mills. We heard some time ago, that the Oliver filter was doing very efficient work at Tinley Manor and it would result in very clear waters, indeed so clear, that the purification of waste waters would be practically negligible but would have to be done nevertheless, in view of what Dr. Park Ross has said. We are going to put down two filter presses to deal with our filter press mud, and I think, three at Amatikulu. I think the two filter presses are going to do our work at Felixton. We will have to wait until next season to say for certain. With regard to the smell, I am afraid it will have to go through the filter press and come out at the other side; but there should be no smell. With regard to the sludge, I feel it is a wicked thing to throw this away. I think it ought to be dried, which would make it very much easier to handle and we ought to encourage the planters to buy it. Mount Edgecombe, I believe, buy all Tinley Manor sludge and they realise the value of it. With all the mills, there must be thousands of tons of it. I calculate the annual value of the chemicals in the Felixton Mill to be about £5,000, and these, together with the nitrogen, humus, etc., are going away into the river.

Mr. Murray : In handling filter press cake you get a sludge which contains a large proportion of water. You have plenty of waste heat going up the chimney and that should be utilised for heating the sludge and drying it, and you can then bag it and sell it to planters as a good fertiliser, and save railage.

Chairman : I have been told at some of the factories that they can't get the planters to accept the filter press cake even as a gift. But on making inquiries among the planters you will find that they claim to be well aware of its value to them as a fertiliser, but they are quite

unable to handle it in the form in which the factories offer it to them. I have seen a factory in Louisiana where the filter press cake was made up into a thick sludge and run by pipes direct on to the fields and distributed into the cane furrows, and there was surprisingly little smell or nuisance from it.

Mr. Watson : That idea is certainly the best, but it could not be applied to any of the central mills in Zululand. Our district is thirty to thirty-six miles from the mill, and no local conditions will allow of the sludge being pumped out by pipes. The only way is to make the stuff into such a condition as to allow of it being bagged and sent to the planters for broadcast distribution in the fields.

Mr. Rault : Last year it was certainly in a state fit to be handled at Tinley Manor, as it was loaded in railway trucks and sent to Mount Edgecombe. It was more like dry earth in texture, but there was still a lot of smell about it.

Mr. Watson : The trouble is that in the meantime it is creating a nuisance and the Public Health Department will not have it, so the product must be treated immediately.

Mr. Bechard : Some time ago at Esperanza we started composting surplus bagasse, press cakes, and various rubbish; that was taken to the fields and broadcasted. Perhaps Mr. Bromley will tell us what happened since.

Mr. Bromley : They are still continuing that now, delivering it on to the fields.

Chairman : I remember some time ago seeing that at Tongaat they were making a compost of press cake, molasses, bagasse, cinders and other refuse.

Mr. Foster : As a fertiliser we could work the press cake up, also a considerable amount of the molasses, and sometimes we utilised that. We could get it in a form in which we could apply it to the land quite easily. But unfortunately the plant we had was made up from the scrap heap and was not altogether successful. We are still carrying out the idea, however, and hope later to construct a plant which will be able to deal with it effectively. We will probably be able to utilise some of the flue gases for the purpose of drying the cake.

Mr. Bijoux : The filter press cakes (which had a very high proportion of cush-cush) were used on the Zambesi for firing locomotives. The flue gases were used to dry these cakes, which were then cut into slabs, and used in conjunction with coal or wood to fire the furnaces.

Chairman : I think last year it was pointed out how advisable it was to circulate all papers beforehand, and that recommendation, I think, is shown this year to be a necessity for the success of the Congress, and to get adequate discussion of the papers. The difficulty is to get the papers in in time. Usually most of them come in a week before the annual meeting. I think this meeting ought to make it a very strong recommendation to the Committee next year to insist on getting all the papers in beforehand, and not to hold the Conference until the papers are in and circulated. (Hear, hear.)

Mr. Rault : I would like to make a suggestion regarding the circulation of these reports. During the past year the Experiment Station has very successfully undertaken this work, and I think that the monthly synopses have been very much appreciated by all the mills. The

figures issued were, however, tabulated with numbers so as to mask the identity of each mill. All the same, it is no secret that everybody had more or less a shrewd idea of the corresponding number of individual mills. Now that the many advantages of a mutual control are becoming evident, I would suggest that the millowners be written to in view of allowing the correct names of each mill to be put in the synopsis, which would thereby gain more life.

Dr. Hedley : That is so ; we practically know all about each other. We are not in competition really, and if it were possible to put the names of the mills it would be of advantage. We have all to send our sugar to one central body, and if you go round to the various mills and ask for information they are always only too pleased to show you round and help you. So why not give it openly and freely in the papers ?

Chairman : Most of the factories when first approached showed some little diffidence in contributing figures at all. Now we get reports from every mill, with two exceptions. But there were two factories which made a condition when they supplied the reports that they would not be published ; one was the factory which gains the best results, and has done so for many years—the one with which the mover of this recommendation is associated (laughter) ; the second is one which is not nearly so successful, but none of the others have made any specific reservations in the matter, and I think the time has now arrived when they could be approached to see if they have any serious objection to the factories being described by name. That is what we propose to do.

Dr. Hedley : I would like to say that, with regard to one of the factories mentioned, we all knew it immediately, and we all looked at it as a standard. We all compared ourselves with the "secret" factory. So much for that secret. (Laughter.)

Mr. Watson : Regarding the production of the reports some time before the annual Conference, there is the fact of the constitution of the committees concerned. Is it an appropriate time now to appoint the committees for the various jobs, or are we to leave it to later on ?

Chairman : Last year the procedure was to leave it to the General Committee at its first meeting to elect the

sub-committees. That was done, and the first meeting of the General Committee, I regret to say, was in September. It was impossible to get a representative meeting of the General Committee until then.

The committees were then nominated, and more time was lost in getting acceptances and filling up refusals. I propose to have a meeting of the General Committee as soon as this Conference closes, and see if we cannot come to some more expeditious arrangement for the present year.

Mr. Watson suggested that quite a lot could be done by correspondence, to which the Chairman replied that a great deal could be and had been done by correspondence, as the conveners of the committees, who had had all the writing to do, were well aware.

Mr. Pearce proposed that all members be divided into various sections, either mechanical, agricultural, or chemical. That each member have a letter placed after his name on the list, also that on the Committee in future there be four members from each group, making twelve members for the Committee. The four members from each group to elect their own chairman. This Committee could draft out the reports necessary for the next Conference, and could draw on the various members of the Technologists' Association to make up the various committees. This idea was made use of in Hawaii, and he considered it would be suitable in this country also.

The Chairman, while agreeing that this had been found a suitable arrangement in more highly developed and organised sugar producing countries, such as Hawaii, was of the opinion that it was not at present advisable to divide our relatively small membership into distinct groups. Many of us have to act in diverse capacities in our work, and in any case many members are interested in several different aspects of sugar production and desire to be able to keep in close touch with all the activities of our Technologists' Association.

Mr. Watson proposed a vote of thanks to the Chairman for the able manner in which he had presided over the proceedings of the Conference, which was passed amidst enthusiastic applause.

The Conference terminated at 4.40 p.m.

