

## LABOUR-SAVING DEVICES.

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The advent of the Wage Determination Act as applied to the Sugar Industry recently, with its award for higher wages for the factory labourer, the question of labour-saving devices has no doubt been passing through the minds of many factory executive staffs, especially the engineering staff, since the Act became law.

Although in the past most engineers and factory executives have endeavoured to reduce the number of labourers in the factory, present day conditions call for a radical revised plan for future development and operation.

Unfortunately, in the past the general layout of factories and extensions have not always been arranged with the view of labour saving, principally due, no doubt, to existing arrangements which have been added to over a great number of years, and to a lesser degree to cheap labour which has been available. The question of rearrangement of plant in many instances will now prove difficult without extensive capital expenditure. However, there are quite a number of inexpensive arrangements which can be adopted and certain modifications to plant which will prove advantageous and operate satisfactorily. Further, the use of gravity has not been utilised and developed to the fullest extent possible as a labour-saving means. In many factories to-day the amount of pumping employed is considerable, necessitating labour for the operation of the pumps and so on.

In making any alterations, rearrangement of plant or additions to reduce labour, it will always be necessary to take into account the interest on capital expenditure plus depreciation. In other words, it would not be economical to install expensive plant to do away with, say, a couple of labourers and find that the interest on capital and depreciation is in excess of the annual cost of the two labourers, and further find that it is necessary to employ an extra artisan to maintain the plant.

It is a question also of co-operation on the part of the staff to bring about these changes, as it is difficult sometimes to break down the old methods which have existed for some years and, like everything new in this direction, is viewed with certain misgivings, especially by the labourer, who is naturally afraid of being displaced by a machine.

This is ideally illustrated by Oliver Lyle in his excellent book<sup>1</sup>, where he wrote as follows: "Some years ago one of T. & L.'s directors was walking down the Edgeware Road and stopped at a new bridge that was being built, to watch three riveters working a pneumatic hammer. An unemployed man came up to him and said, 'If it wasn't for that bloody thing there would be ten men working there instead of three.' J. J. R. replied, 'If it wasn't for that bloody thing there would be no bridge being built and those three men might be looking for jobs.'"

We are now beginning to experience and encounter some of the same problems that have occurred in other sugar producing countries such as Australia and the Hawaiian Islands, where it was necessary for the factory staffs to investigate and create ways and means of introducing labour-saving devices if the industry was to survive in those countries and approach an economical standard.

Of course, there are limits to this problem, especially when viewed on the conditions prevailing in Australia with its white labour policy and, in spite of a great number of labour-saving devices, the industry was subsidised directly and indirectly to the extent that the cost of sugar to the consumer was 5d. per pound in 1934, and still is, so far as the writer is aware.

With these few introductory remarks, it is the writer's intention to pass on to some detailed suggestions and arrangements which may prove of interest at this stage.

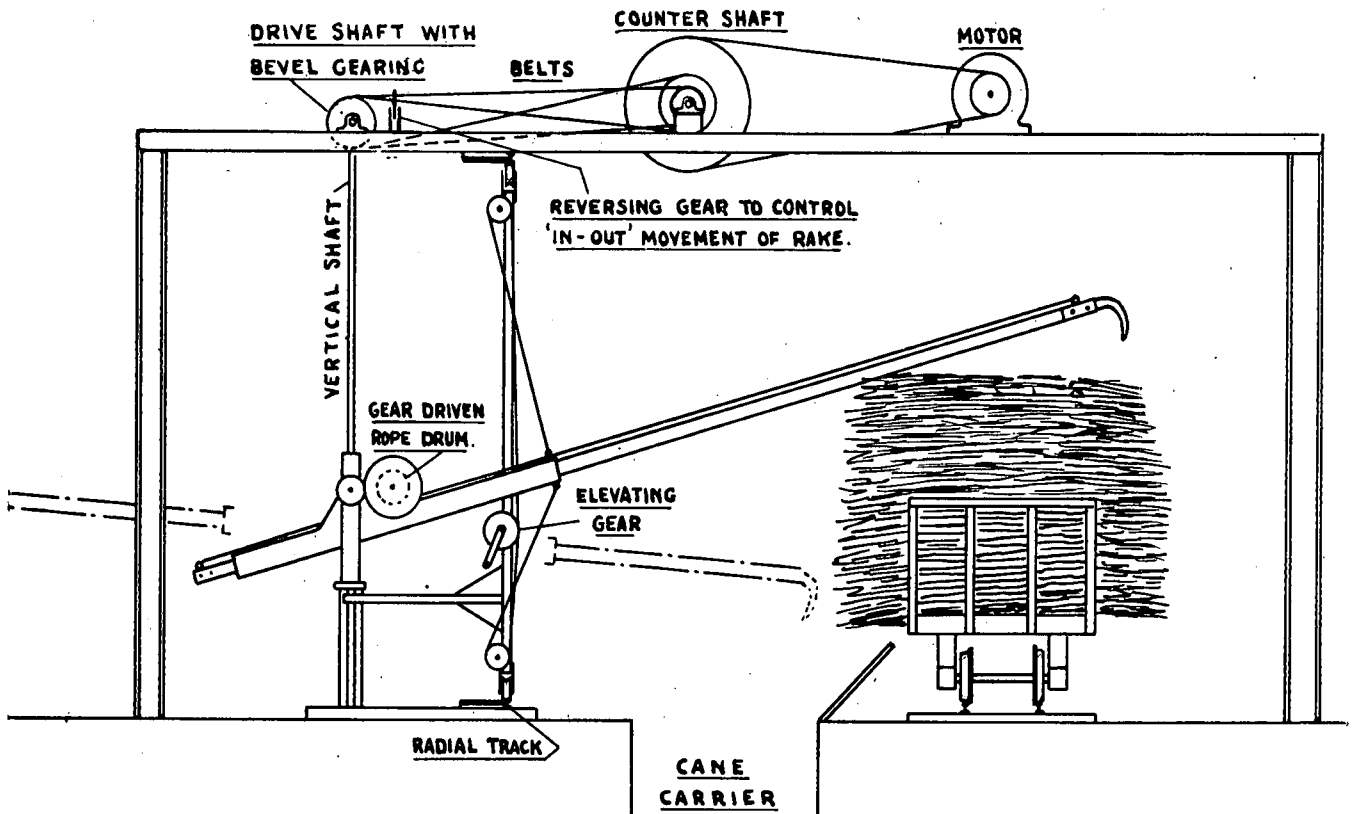


Fig. 1.  
**WICKS CANE UNLOADER.**

### LOADING CANE AT SIDINGS.

The loading of cane into S.A.R. trucks at sidings, in the majority of cases, is performed by manual labour, and in these cases as many as five or six boys per truck are employed. The labour requirements for this duty could be reduced considerably if mechanical means of handling the cane from the siding to the truck were installed. It is known that at various sidings where mechanical means are in use the number of boys to load seven to eight S.A.R. trucks per day (eight hours) is four to five, whereas by the old means of handling the cane as many of 30 to 35 boys were employed for this duty. Where a number of planters use the same siding for despatching their cane, it is possible for them to come to some arrangement amongst themselves for the purchase of a crane to load their respective daily deliveries. These cranes can be operated either by electric motor if electric power is available, or by oil, paraffin or petrol engines at a very economical cost. The whole of the structure of the cranes could be manufactured in this country, with possibly the exception of the electric motor or the engine. In the case where a number of planters are using the same siding, the question may crop up as to the maintenance and running repairs of the crane. It may be possible for them to have some understanding with the nearest factory, so that should it be necessary to carry out repairs a mechanic from the factory concerned could be despatched to do this work. The number of boys used throughout the sugar belt on this duty during the crushing season must be considerable, and it is felt that if mechanical means of loading cane into S.A.R. trucks was adopted, the labour requirements in this direction would be very much reduced.

### HAULAGE.

Under this heading investigations should be carried out on the principle of centralising transport facilities in an endeavour to minimise haulage costs of cane. There are various systems under this heading which may be employed with satisfactory results, i.e., motor transport, light portable railway track and the use of diesel engines, and in some instances aerial transport.

### OFF-LOADING.

The problem of off-loading cane, either from tram trucks or S.A.R. trucks, is really a matter which concerns each individual factory, according to the topographical position in which they are placed, but there is room for improvement in the way of mechanical handling at quite a number of factories in this country. Improvements could be made in the off-loading and handling of cane from S.A.R. trucks to the cane carrier. For instance, some factories employ a crane for removing the cane from ox wagons, motor transport and S.A.R. trucks respectively, and the cane is dumped on to slightly inclined platforms. The removal of the cane from these platforms to the cane carrier is performed by manual labour, whereas this operation could be carried out by mechanical means, such as the mechanical arm which can be operated by one boy. A detailed drawing of this mechanism is available and should be investigated by those concerned or interested. Other mechanical means could be adopted, such as hydraulic tipping platforms, the ordinary tippers and mechanical off-loading rakes, any or all of which may be suitable to meet the requirements of each factory. See figs. 1 and 2.

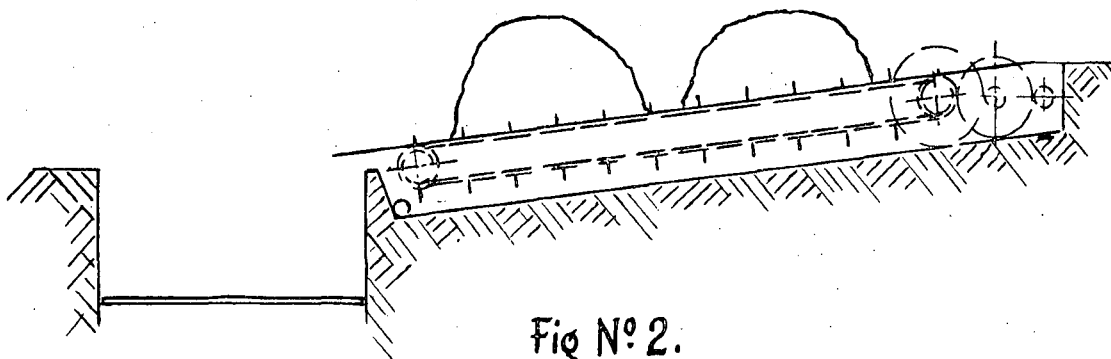


Fig No 2.

### MILLING.

The application of central control for the operation of the milling tandem as a whole could be applied in the case where mills are steam-driven as to those arranged for electrically-driven plant, or at least on similar lines. In many instances in this country, milling tandems have from three to four steam engine-driven mills, and in all instances each engine is operated by an engine driver. By central control all these engines could be operated by one or two drivers, by providing a central platform with extension controls from each steam valve to this platform. In addition to this arrangement an emergency stop could be fitted for each engine. This emergency control consists of butterfly valves inserted in the steam pipe to each engine, which is controlled by a small magnet, and upon the current being disconnected from this magnet the butterfly valve automatically closes and shuts off the steam to the engine. See fig. 3.

Speed variation for each engine can be arranged by a small servo-motor and a gear box for the governor control. This could be operated from the mill platform. Several of these installations have already been installed in one or two factories in this country. Further, automatic control of a mill engine can be arranged according to the thickness of the blanket entering the mill. Although it may not be practicable to arrange this control to all carriers feeding mills, there are instances where it can be applied with satisfactory results. See fig. 4.

Where central control is adopted on a milling plant the use of mirrors can be used with satisfactory results. These can be

arranged in such a position as to reflect the amount of feed entering individual mills, and hence convey to the operator on the central platform the actual amount of feed entering each unit. Mirrors can also be utilised in other departments as well for various purposes.

Mill bed plates are not always arranged to be self-cleansing, and in many instances it is necessary to employ labour with the usual squeegee to remove bagasse which collects on these beds. The most improved type of bedplate is the one arranged on the inverted pyramid principle, but, unfortunately, this cannot always be installed, due to existing arrangements not lending itself towards its adoption.

### AUTOMATIC CONTROL VALVES.

There are numerous duties where the ordinary float valve can be used to advantage, especially where centrifugal pumps are in operation to control liquor levels in tanks and so on.

There is also the mechanically-operated valve, which can be utilised to discharge given quantities of liquor over specified periods, such as from continuous subsiders. This valve could possibly be used in other directions as well. See fig. 5.

### CENTRIFUGING.

Investigations should be carried out on the latest self-operating centrifugals which are being offered at the present time. Full details on the operations of these machines, however, are not available, so far as the author is aware.

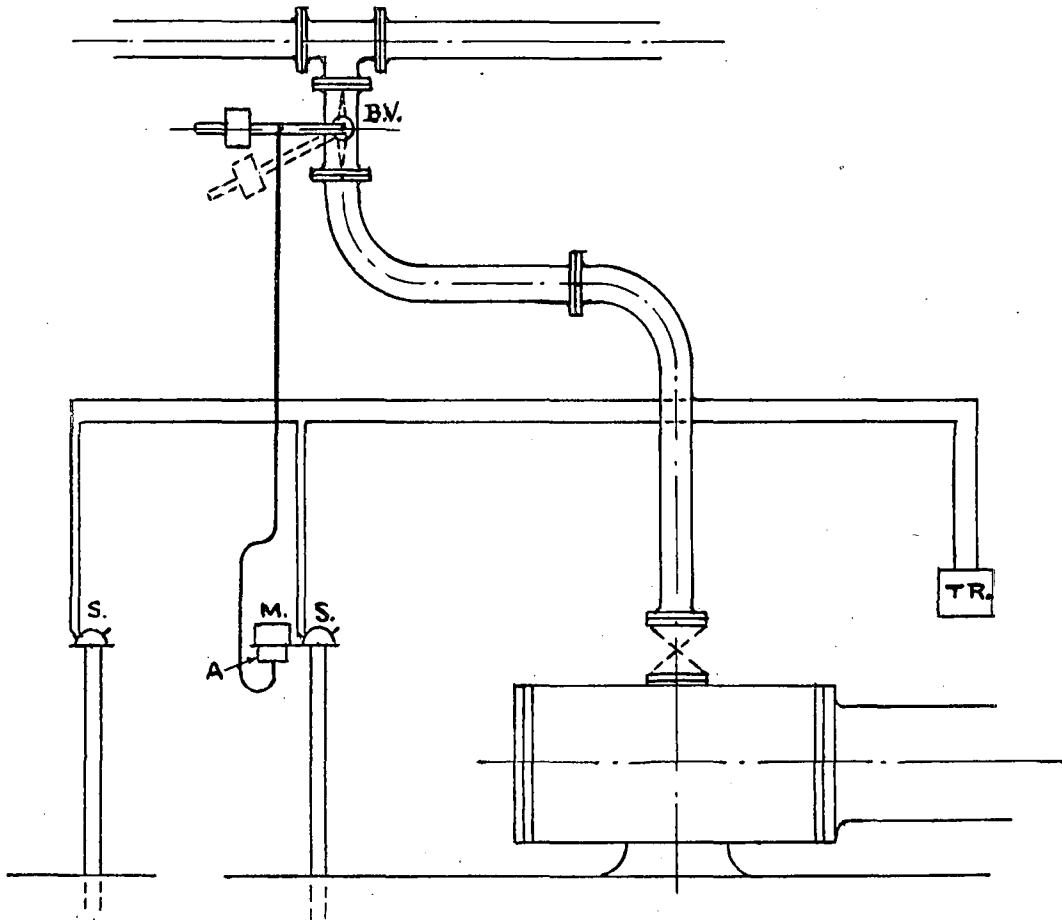


Fig N°3.

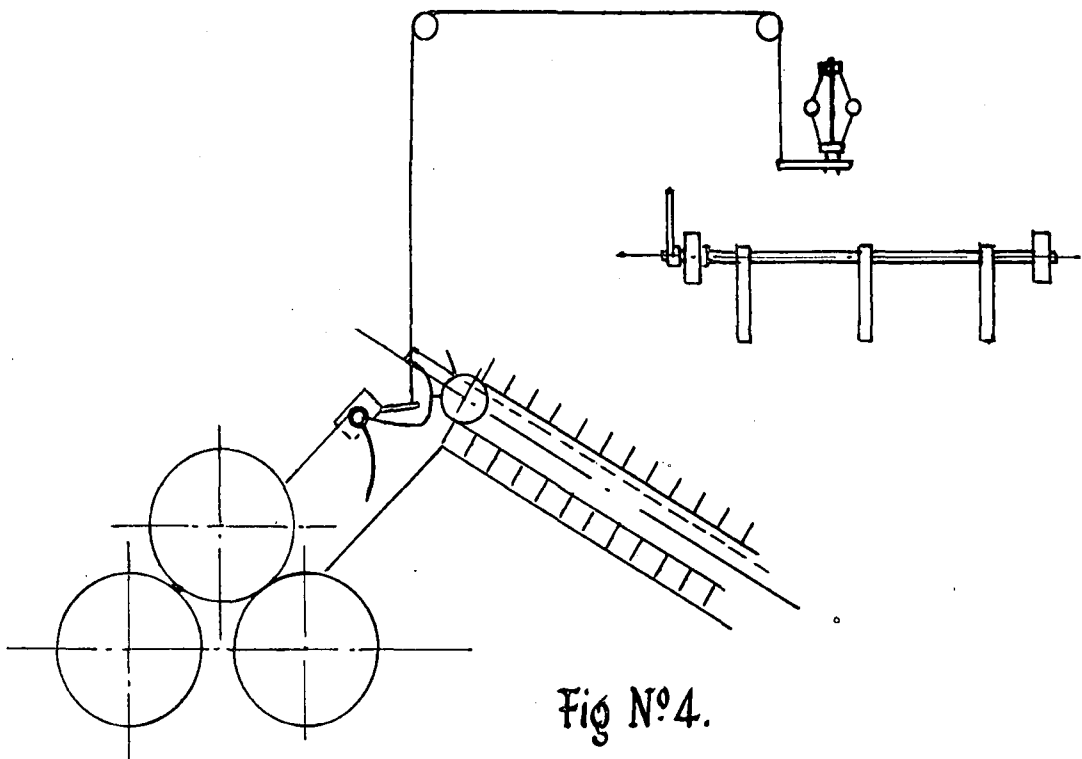


Fig N°4.

### CONCLUSION.

These few suggestions only touch on the fringe of a subject which has tremendous possibilities, and although some of them in a number of instances may not be practicable, they may be applied in others. The contents of this paper may provide sufficient interest to others to investigate the problems which now confront the Sugar Industry as a whole. It is really a matter for each individual concern to endeavour to solve some of the

items under the heading of this paper, so that they may maintain an economical standard through increased efficiency; and this can also be achieved by co-operation in the exchange of views between the staffs of the factories and should be encouraged by all companies concerned.

### Reference.

<sup>1</sup> Lyle, Oliver (1941): Technology for Sugar Refinery Workers. Chapman and Hall, 316.

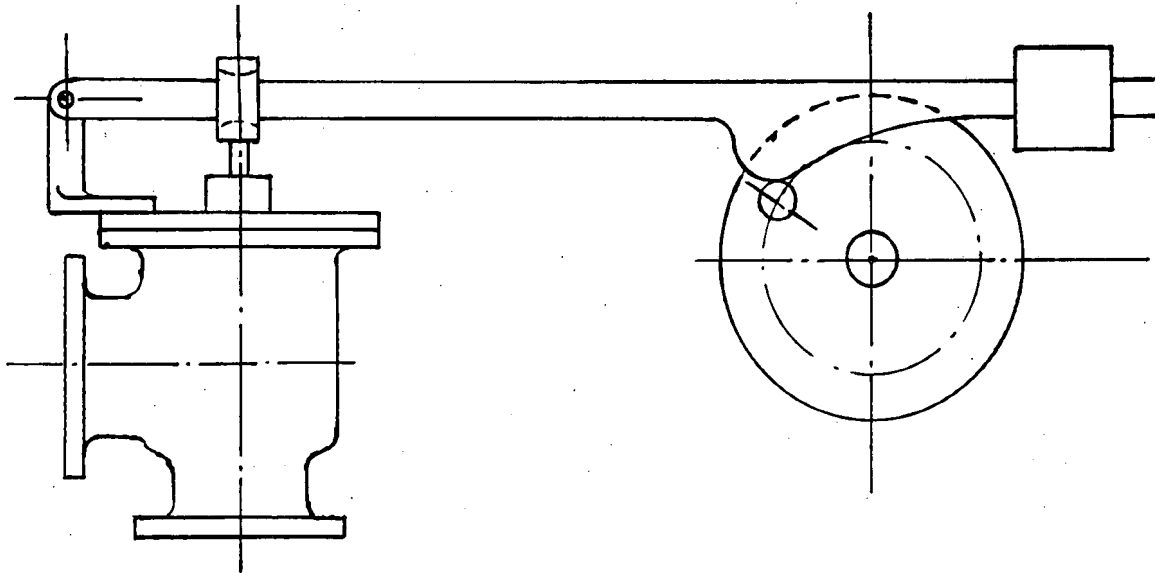


Fig No 5.

The PRESIDENT, in opening the papers on Labour-Saving Devices for discussion, said that one of the most pressing problems facing the South African Sugar Industry was that of labour. There already seemed to exist an acute shortage of labour on many farms and estates. These papers were therefore most opportune.

Mr. MOBERLY, referring to automatic control of mill engines, said that one of the best examples he had seen was a very simple device in Queensland. There, however, the general rule was that each mill had its own engine. He had seen the working of this device well demonstrated by adding an extra lot of bagasse on to the carrier and at each mill in turn the plate on the bagasse carrier lifted, the engine was speeded up and the particular mill was able to take the extra load. In this country, where the general practice was that one engine drove several mills, the extra bagasse entering one mill would give unwarranted control to the other mills. At Natal Estates mill, one of the few in this country with individual engines at every mill, automatic control certainly was very successful.

If a mill bed could be so designed as to be self-cleansing, it would obviously be by far the best. Where that could not be done, however, mechanical scrapers operating from the same linkage which worked the pushers, as was done in Queensland, could be made use of. This would save a great deal of labour.

The speaker thought the Committee had passed rather hurriedly over the problem of weighing. Useful information could have been given, as we had had considerable experience of automatic weighing in this country and it appeared to be very satisfactory. Automatic weighing of cane by electric scales as carried out at New Guelderland and Gledhow in particular worked very well after initial mechanical problems such as suitable oil had been overcome. Automatic weighing of water and juice seemed to be very adequately met by the vertical type of Maxwell-Boulogne scale. Horizontal scales of this type were also in use, but in his opinion the vertical type was to be preferred. Automatic scales for water and juice were rendering good service at Doornkop and some of the Hulett mills.

The new laboratories at the Tongaat Sugar Company provided a good example of careful planning in selecting a convenient

site. He thought more co-operation between the mill and cane testing laboratory staffs should be possible if the latter were recognised as a legitimate and essential service. It might even be possible to dispense with some personnel, although he himself was not of the opinion that in the majority of cases surplus labour was employed.

Mr. MACBETH, in replying to Mr. Moberly, said that he realised that automatic control could not very well be applied to engines operating three mills with the same degree of efficiency, nevertheless the principle could still be adopted by many factories in this country. He thought that it would still work satisfactorily with an engine driving two mills.

In some factories overseas the mill beds from the crusher to the last mill were on a slope from the side of the mill cheeks to the centre, with a central trough right through. This arrangement obviated the accumulation of bagasse collecting on the bedplates, to be removed by labour.

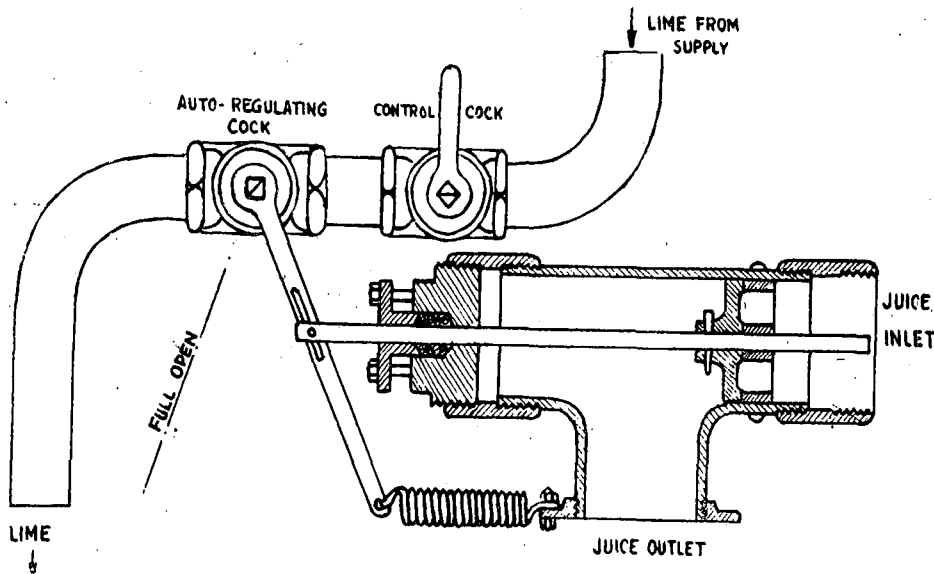
In this country he thought that the slat carrier was preferred to the drag type of carrier, because of the more efficient feeding to the mills.

Mr. PATRICK MURRAY drew attention to the fact that a cane-cutting machine invented here in 1920 was tried out here in 1921 and 1922. The machine was built in Glasgow, and after considerable alteration a good workable machine was evolved which cut, trashed and topped the cane. The power available proved too small for the duty. The machine was not proceeded with, as the cost of cutting was higher than the present hand method, but with rising costs and shortage of labour it might be worth while to go ahead with its development now. The machine would not be suitable for steep hillsides as encountered here.

He agreed with Mr. MacBeth that the pyramid type of mill bed juice trough which was self-cleansing was the best. Some were in use in this country, and one was being made in Durban now, and would be in use this season.

The speaker suggested that the Committee be strengthened and continue the work, which he considered of great value to the Sugar Industry.

Mr. VIGER drew attention to the following automatic liming device.



Automatic Juice Limer.

He said it had been designed by Mr. Jelly and was in operation at Darnall. It was very suitable for a factory with a large production, but not so satisfactory for a small mill. Praeger, in the *International Sugar Journal*, March, 1939, described several interesting automatic limers and discussed their advantages and disadvantages. The Helmer automatic limer, the Merang method, Zitkowski continuous device and the Redjoagoeng device were mentioned, and Praeger suggested a design which incorporated the Zitkowski and Redjoagoeng limers.

Mr. DODDS said that he had been quoted as referring to a certain graveyard of labour-saving devices. That graveyard existed on the property of Natal Estates, as this enterprising company had always been in the forefront in trying out new devices. He would like to know what their opinion was of the gyrotiller compared with ploughing. In England experiments quoted by Keen had shown the plough to give uniformly better results.

Cane loaders were considered a necessity in Louisiana, but few had tried them in this country, though not without success. Many attempts were made in different parts of the world to devise cane harvesters, but none of them had ever been quite successful. Topping had always been one of the greatest difficulties: The Luce harvester, which was worked for some time in Louisiana and Cuba, overcame this in a most ingenious way. The canes were subjected to pressure from a lever which gradually travelled up the stem, and as resistance suddenly gave way when the top was reached, a knife cut the cane at that point. The machine was, however, too clumsy and expensive and could only be used on perfectly level land on well-grown cane in very long rows.

Mr. W. A. CAMPBELL assured Mr. Dodds that the gyrotiller had come to stay. He said the cane-cutting machine referred to by Mr. Murray certainly did cut, trash and top the cane, but in those days it could only do the work of about three or four men.

Mr. SIMPSON said that it was many years ago that that particular machine was tested out thoroughly but unsuccessfully. The cutting device was a pair of discs, set angularly to each other; but it was quite unable to handle an average stool of cane. It was an expensive experiment, which was finally discarded owing to its many insuperable mechanical defects.

Mr. MACBETH thought that the graveyard mentioned by Mr. Dodds referred to old implements used in connection with the steam plough in the olden days. He had, however, noticed

various discarded modern instruments in their yard, but he considered if further investigated most of them could be made to work satisfactorily. Subsoiling machines had been greatly improved in recent years and were doing excellent work throughout all the fields of Natal Estates. The agricultural staff spoke very highly of the gyrotiller.

The speaker said that he saw a very ingenious little liming device during a recent trip, and thought that it would suit a small factory where large quantities of lime were not necessary. It consisted of a small tank with sprockets arranged to take an Ewarts chain with small buckets attached. The driving shaft was driven from the pinto of one of the first mill rollers. As the chain revolved the buckets lifted the lime from the tank and delivered it on to a feed or splash-plate which was regulated to supply the desired amount of lime to the juice; the lime ran down a small chute to the juice gutter and mixed with the juice on its way to the crush. He illustrated this device on the board by rough sketches.

Mr. RAULT maintained that while we were all in favour of saving labour and kept this in mind in our work, he felt that by cutting labour in the laboratory there existed the greatest danger of practising false economy. Essential, if less obvious, information might be lost which financially would by far outweigh the meagre immediate saving accomplished.

Mr. BOOTH said that research should not be curtailed, but the idea was that every chemist should revise his methods a little bit. This hint had already been conveyed by him to the Chemical Control Committee. He doubted whether all the analytical work done was as necessary as previously thought.

Mr. DYMOND stated that the Committee did not in any way want to decry the vast amount of work that chemists had to do in order to maintain and improve efficiency and obtain accurate records. He thought, however, that certain work, such as possibly the Clerget method of analysis, might be cut out so as to leave more time for co-operative research. The chemist should be in a position to help in the investigation of any item of special interest such as the Oliver Campbell filter, subsidisers or factory costs.

The PRESIDENT referred to Dr. Keen's conclusions that cultivation could be greatly overdone. The validity of these conclusions had also been borne out by some of the experiments at the Experiment Station, where it was shown that, provided weeds were kept down, cultivation itself did not lead to any increase in yields.

Mr. DODDS said that a record of cultivation experiments carried out at the Experiment Station on Uba cane had been published in our Proceedings some years ago. The experiments showed that eradication of weeds was the important factor. Last year a field of Co.281 and Co.301 in alternate plots was left uncultivated after harvesting, except that the larger weeds were removed. The cane forced its way through a dense blanket of trash, and it was surprising what an excellent stand of cane

resulted. This offered a key to further investigation to see whether we could dispense with some cultivation at least.

Mr. DYMOND said that the index to the literature showed what an enormous amount of references were available at the Experiment Station on the various aspects of labour-saving problems. He thought it would be necessary to condense all these articles under the various headings, as few had the opportunity of consulting the originals at the Experiment Station.