SOME RECENT IMPROVEMENTS IN AGRICULTURAL MACHINERY USED IN THE SUGAR INDUSTRIES OF LOUISIANA AND QUEENSLAND

By H. H. DODDS.

Hitherto the introduction of labour-saving machinery into the South African sugar industry, especially in its agricultural phase, has not been of such urgent importance as in many other sugar-producing countries.

The reason for this is that up to the present there has been no extreme shortage of native unskilled labour, or any very acute increase in cost of such labour.

However, with the many new industrial developments of various kinds now becoming established in South Africa, there is every prospect that the demand for labour will soon greatly exceed the supply, with the natural consequence of considerably increased cost of labour, which is already quite appreciable.

Already there is a tendency evident for native labourers from the extra-Union territories to the north to seek industrial and domestic employment within the Union, where there is plenty to be found.

It is therefore quite time that we as an industry should consider the possibilities of economising in labour by means of suitable agricultural machinery.

Fortunately for us, in several other sugar-producing countries the need for labour-saving equipment has been very acute for some years, partly because of conditions arising out of the war and partly for other reasons; and in several countries such as Louisiana, Queensland, Hawaii and others, the problems entailed have been energetically attacked and at least partially solved.

We have therefore the opportunity to look around the world to find what has been done, and in what way the measures taken in other countries may be adapted or adaptable to our conditions.

It would appear that almost every field operation in the sugar industry is capable of increased mechanization to some degree, from the preparation of the soil to the harvesting and loading and transport of the cane.

I believe, however, that the major operations of planting of cane, and of harvesting and loading the cane, are those that offer the greatest scope for economy of labour.

But it is not a matter of applying directly to our requirements machinery developed for the sugar industry of other countries as soon as we can get it; unfortunately the problem is not so simple. In few countries are the conditions in the sugar industry so much alike that equipment and plant can be applied as it stands from one country to the other.

Conditions in South Africa in particular differ widely from those in every sugar-growing country with which I am acquainted.

In few countries is cane grown on such heavy gradients as it is in many places here, and in few countries are such severe and unseasonable droughts or floods liable to occur at any time of the year.

In few countries, also, are there so many widely different soil types requiring different cultural treatments, intermingled in a relatively small area of land.

Much depends, also, on the variety or varieties of cane under cultivation. In this country Co.281 and Co.301 at present predominate, forming together over 90 per cent. of the crop. Co.281 is not now extensively grown in other countries, except to some extent in Cuba, and Co.301 does not appear to be grown anywhere but in this country, except for a very small area in India. Another consideration to be borne in mind is that motor fuel is much more expensive and field labour less expensive in this country than in Louisiana.

CANE HARVESTERS AND CANE LOADERS IN LOIUSIANA.

Mr. J. C. Etheredge, superintendent of the Valentine Sugar Factory, Lockport, Louisiana, and now president of the American Society of Sugarcane Technologists (formerly known as the Louisiana Sugar Cane Technologists' Association), has on request kindly given the names and addresses in the U.S.A. of several firms of suppliers of agricultural machinery for the sugar industry, and some interesting correspondence has already been received from some of these firms in answer to a memorandum sent them outlining conditions in the sugar industry in this country.

Three of these companies manufacture cane harvesters, one of which is quoted at an approximate price of £2,500, not including cost of the power unit; but it does not appear that the design of harvester for Louisiana conditions would suit conditions in this country. Cane is grown in ridges in Louisiana to promote drainage from the cane roots, instead of on the level or in slight hollows as with us. Further, all cane lands in Louisiana are on flat alluvial soils, field gradients being unknown.

It was formerly considered essential that cane harvesters should have some device for automatically cutting each stick at the right point just below the growing top, and at least two very ingenious devices have been designed for this purpose, but both tend to make the resulting machine cumbersome.

The newer machines in Louisiana and Queensland, however, have topping devices that are adjustable but not selective.

They can harvest about 1 to $1\frac{3}{4}$ acres of cane per hour, but are not designed to deal with lodged cane. It is necessary also that the cane, as well as being upright, is trashed, either by burning or otherwise, since none of the machines have a stripping device. Experiments have been made in taking the trash on the cane to the factory and stripping it there for use as fuel.[5]

An interesting paper on the use of mechanical harvesters in Louisiana was contributed by L. C. Bourgeois,[2] who points out that American patents for cane harvesting devices were taken out as early as 1889, but that it is only in recent years that favourable opportunities for their construction and economic use have occurred. He states that in 1943 it was estimated that 356 mechanical harvesters would be in use in Louisiana in 1943, cutting 2,800,000 tons of cane. This would be about one-half of the total crop.

It was sometimes said in Louisiana that the mechanical harvester benefited only the large grower who could afford the necessary outlay and would have suitable workshop facilities for maintenance and repair. That may be the case to some extent regarding the direct use of the harvester, but indirectly the whole industry is benefited by the release of workers who would otherwise be cutting cane. However, the use of harvesters under a contract system seems now to have been fairly widely adopted in Louisiana.

The cost of operating the harvester in a series of 24 examples under different conditions and with different harvesters ranged from 1/4 to 2/6 per ton with an average of 1/9, including hand-stripping or burning the cane, cutting, and piling in heaps; also auxiliary hand labour, and maintenance, repair and depreciation costs.

In an earlier paper on the same subject by F. A. Vought[4] in 1941, it is claimed that the cost of harvesting cane with one of the recent types of harvester is 10d. per ton, compared with the cost of cutting by hand at 2/6 per ton. The cost in this case did not include depreciation, however, which was reckoned in the instance first quoted at an average cost of 4d. per ton of cane harvested.

Those of us who attended the International Sugar Technologists' Conference in Louisiana in 1938 will recollect seeing at Greenwood Plantation a motor-driven mechanical cutting and windrowing machine which cut the cane at a fast walking pace. The machine, however, did not at that time top the cane; it was an experimental machine and the forerunner of the present Thomson-Munson harvester, which works on the principle of the reciprocating sickle, distinct from the single disc or saw that effects the cutting in the other models. The former type can still be adjusted to the task of windrowing the cane when required, a very necessary procedure in Louisiana.

Some of the American firms offer cane loaders, which look as though they could possibly be adapted to our conditions.

The cane loader is a portable crane and grab which transfers cane bundles from the ground behind the cane cutters, over to the other side of the truck or tractor on which it is mounted, into a delivery truck alongside. In this way a field of harvested cane can be transported remarkably quickly, with very little labour.

The latest designs of cane harvester can lay the cane in bundles across the cane rows, thus further economising in hand labour.

One pattern of cane loader is offered for £750, without the tractor on which it is mounted. This loader is claimed to handle 250 tons of cane a day; the grab has a lifting capacity of 1,000 lbs. Complete hydraulic controls make one-man operation possible, there being only two levers.

The tractor supplies the power for operation as well as for locomotion.

A difficulty in the use of the cane loader in this country would appear to be that it is designed to pick up bundles of cane laid across the cane-row ridges; such ridges do not occur in this country, so that a good deal of trash and soil would be picked up with the cane by the grab. Hence some change in design to meet this problem would appear to be necessary.

OTHER AGRICULTURAL EQUIPMENT.

In a private communication received from Mr. G. Arceneaux, Senior Agronomist of the U.S. Department of Agriculture Experiment Station at Houma, Louisiana, other new agricultural machinery used in Louisiana besides cane harvesters and cane loaders, is discussed.

A simple but important machine that has long been used in Louisiana, for packing the soil in the furrow after the planting of cane, is the cane roller.

This was formerly a simple roller about 3 feet wide to operate between the rows, but now more elaborate designs are used, including some up to 15 or 16 feet in width, to take three rows at a time.

A new type of stubble shaver is also mentioned. This implement cuts the stumps of the cane after harvesting flush with the ground, to lessen injury to the ratoons from frost or other causes. Whether

this would be worth while doing in this country where frost is practically non-existent is doubtful, but probably the cane roller would be well worth using in certain circumstances by promoting improved germination.

In cultivation of cane and distribution of fertilizer and transport of cane, mechanised equipment is now largely used in Louisiana instead of mule-drawn machines.

For destruction of weeds in sugarcane, flame-throwers are extensively used in Louisiana[3], but recently chemical control of weeds by chemicals of the hormone type has been successfully used.

Apparently the mechanical planting of sugarcane, widely adopted in Queensland, does not seem to be generally used in Louisiana.

Similar enquiries to those addressed to authorities and firms in Louisiana have been sent to Queensland, but there has not yet been time to receive full answers, except as they occur in the Behne report, referred to later.

Hawaii has also made great advances in agricultural equipment in recent years, but conditions in the sugar industry of Hawaii are even more different from ours than those of Louisiana and Queensland. Under Hawaiian conditions a heavy grab harvester is used, which does not appear particularly suitable for us. However, further enquiries will be made.

E. R. BEHNE'S REPORT.

A most interesting and informative illustrated report on the sugar industries of Louisiana and Hawaii, as a result of a recent visit to those countries, has been issued by E. R. Behne, assistant director of the Queensland Bureau of Sugar Experiment Stations.

He comments on the remarkable development of mechanical harvesting in Louisiana, and describes in considerable detail the three principal designs of harvester in use, the Thomson, Thornton, and Wurtele, respectively.

The Thomson machine costs about £1,900. With this machine the cane from three successive rows, cut separately, can be deposited in the same interspace by means of a folding extension member which drops the cane where required, thus saving much labour in loading. It has the disadvantage, however, that two or three rows have to be cut by hand before the machine can get to work in a field.

The Thornton harvester is a lighter and smaller machine and can begin to harvest a field from the first row, and cuts as rapidly as the Thomson machine —that is, about one acre per hour. It costs only £1,000, but drops the cane along the row, so that a labour gang is necessary to take it across to where it can be loaded.

The Wurtele harvesting outfit consists essentially of three entirely separate machines—a cane-topping implement, a harvesting machine, and a tractor-drawn self-loading truck fed by an elevator. According to Behne, the complete equipment, including wagons for transport, costs about £5,000 and requires fourteen men, but cuts and hauls up to 140 tons of cane a day. It is necessary to cut the first four rows in a field by hand before the machine can operate.

A defect in all the mechanical harvesting was that long stumps were apt to be left in the ground. The machines can cut as low as desired, but the risk of breakage is thereby increased.

Behne notes that 400 harvesters, cutting one-half of the total crop, and over 2,000 loaders, dealing with 80 per cent. of the crop, are now in use in Louisiana, and new harvesters and loaders are being made as rapidly as possible.

Two-wheel carts drawn by mules or tractors and conveying loads of 2 to 3 tons of cane are used for short hauls to the mill, but for longer journeys semi-trailer motor trucks of a capacity of 12 or 14 tons are used. Derricks are suitably located for transfer of loads to the large trucks, which have now almost entirely superseded steam tramway systems.

Mechanical loaders are also described in detail in the Behne report. The Castagnos loader has long been established, and in its most modern form consists of a motor-driven crane mounted on wheels and drawn by a tractor or mules, the two front wheels being attached to a turntable. A 9-h.p. paraffin engine operates two winding drums, one to close the grab and lift the bundle of cane, and the other to open the grab and carry it after the cane has been dropped into the transport wagon.

The loader costs £300, and with seven men will load 250 tons in eight hours. About 2,000 Castagnos loaders are in service.

The Howard loader is a similar type of machine to the Castagnos. A recently-developed loader is the Barras loader, of which the motor, besides operating the crane and grab, propels the truck. This machine also has a device for pushing the cane along the ground to form a bundle for the grab, thus saving labour, only two men being required, while the machine moves 350 tons of cane per day. The present cost is £1,600, but it is hoped to reduce the price considerably when larger quantities are made.

The Thomson loader is also described, though the design is not yet final. Like the Barras, it gathers its own bundles, but instead of the separate pushing device the grab itself scrapes up the cane, being mounted on a boom in front of a tractor in such a way that, when lowered to the ground, the flat lower jaw of the grab lies horizontally. Thus when pushed by the tractor a load of cane is scooped up and the grab closed by lowering the curved upper jaw, and

then raised, the boom swinging to the right, where the grab is emptied into the waiting cane wagon.

This model also requires only two men to operate. The task is not stated, but the cost, complete with Allis-Chalmer tractor, it is estimated will be about £600.

One make of loader now in use in Louisiana, not mentioned by Mr. Behne, probably came on the market subsequent to his visit in November, 1945.

This is the M1 Link-Belt Speeder cane loader, and according to a letter and pamphlet received by the writer from the manufacturers, the Jackson Machinery Co., of New Orleans, it has an average capacity of 350 to 400 tons of cane per day. It is mounted on a tractor, from which it obtains its power. The grab has a lifting capacity of 1,000 lbs. and is supported and directed by wire cords passing over the end of a boom, and a bracket connected to a counter-weight over the left rear wheel.

The grab is designed to collect the cane from the ground as well as to lift it, so that there is no need for hand labour for this purpose. It is claimed that complete hydraulic control of the machine with only two levers makes it possible for one man to operate the machine. The loader attachment can be removed easily, making the tractor available for other uses. The price is £750 without tractor.

MISCELLANEOUS IMPLEMENTS IN USE IN HAWAII AND LOUISIANA.

Behne's report deals also in some details with conditions in Hawaii and special equipment in use there, of which, however, little seems to be adaptable to conditions in other countries where conditions are very different.

The Ford disc weeder of Hawaii described by him, however, seems to have more general possibilities. It consists essentially of two discs or wheels drawn behind a tractor. These wheels are inclined outward at an angle to the ground, with the lower side resting on the ground, leaving a gap between the two wheels to accommodate the cane row. The outer rims of the wheels are provided with tines, and as the tractor moves forward the wheels rotate by friction with the ground and the tines eradicate the weeds on each side of the cane row. Using this device, it is claimed that one man can cultivate from 4 to 6 acres a day.

Among other field implements described in the report is the latest design of the well-known Louisiana "middle-buster" or double mouldboard plough for taking out old stools of cane.

There is a heavy rectangular frame with a coulter in front to split the cane stool. This is immediately followed by the double-mouldboard plough which eradicates the plant, and this in turn is followed by two sets of scalloped discs in line, which harrow the debris of the stool into small pieces. It is necessary to bear in mind that the plough in this implement is raised above the level of the harrow to meet Louisiana conditions, and would need to be lowered for our purposes.

A new manure spreader was also examined and described. This is a two-wheeled cart, with a conveyor operated by the axle of the cart when in motion. This conveyor brings the manure with which the cart is loaded to the rear of the cart, where a spinner is mounted capable of throwing the manure to a distance of 18 feet on either side. The use of this machine for applying other bulky material such as filter cake is evident.

Some of the machines now in use in Louisiana for destruction of weeds by flame-throwing are described, also the use in Hawaii of a crude oil emulsion to kill weeds, distributed by a high-pressure spray pump mounted on a tractor.

Mr. Behne was accompanied by Messrs. R. J. S. Muir, general secretary of the Queensland Cane Growers' Council, and S. E. Toft, a Queensland cane grower, on a three months' tour of Louisiana, Cuba and Hawaii from November, 1945, to February, 1946.

The report is very instructive, and this up-to-date, first-hand information has no doubt been of much value to the Queensland sugar industry.

There is also a section of the report dealing with the new cane varieties now in use in Louisiana, and one on manufacturing practice and equipment and one on technical research in the manufacture of sugar. These sections are quoted in full in News Letter No. 14, of which no copy is as yet available to the writer.

QUEENSLAND CANE HARVESTERS AND LOADERS.

Appendices to Mr. Behne's report give for comparison descriptions of the two cane harvesting machines and loaders now in use in Queensland. These are :—

The Toft cane harvester.
The Fairymead two-row cane harvester.
The Toft cane loader.
The Fairymead loader, large and small patterns.

The Toft cane harvester is a three-wheeled machine, self-propelled and with cutting and topping devices. It is about 14 feet long, with a 4-foot extension for the topping mechanism. It is only 9 feet wide and can therefore operate in a field after only the outside row of cane has been cut by hand. The cane is cut by two overlapping rotating discs of 24 inches and 30 inches diameter respectively. They are geared so that the rim of the smaller disc travels seven times as fast as the forward movement of the machine. The cut cane is hauled by endless chains up an inclined plane at the top of which is a belt fitted with

iron paddles. These paddles strike the tops of the cane to bring them into alignment. The cutting disc then comes into operation again and the paddles sweep the tops out on to the ground, while the sticks fall into a box having two compartments, capable of being rotated longitudinally. It is so designed that when one bundle is being tipped the movement is arrested half way to allow of the bundle being cleared by the mechanism before the second compartment is turned fully into position.

The Fairymead two-row cane harvester is built on to a wheel-type Farmall M.D. tractor. There are two separate gathering, cutting, topping and conveying units, mounted parallel, one on each side of the tractor, that deliver cut and topped canes into a common hopper at the rear.

In this machine the canes are topped after being gathered into one of the two cutting grooves, the tops being discarded by dropping them against vertical baffles that direct them out of the way of the bundles of cane already on the ground. The cane is cut off from the ground by the forward movement of the tractor, then enters a conveyor that discharges it into the hopper. The hopper has a sliding base that is operated by the driver, who can thus discharge the cane on to the ground in bundles of the desired size. The Fairymead can enter a field directly without any rows having to be first cut by hand.

Since there is an optimum ground speed that is about the same for all cane harvesters, it follows that they all do about 1 or $1\frac{1}{4}$ acres in cane rows 5 feet 6 inches to 6 feet apart, as in Louisiana and Queensland. That is, of course, for the single-row cutters; the Fairymead, which is the only double-row cutter of those mentioned, will therefore cut two acres or more per hour, or twice as much as the others.

The price of the Queensland cane harvester is not definitely stated, though Behne estimates the cost of the Toft harvester to be £1,800 (Australian), say £1,450 in sterling.

However, recent numbers of the *Australian Sugar Journal* have advertised the Fairymead cane harvester at £650, equivalent to about £520 sterling.

Thus the Australian cane harvesters are considerably less expensive than the American patterns, and according to Behne are as good.

The Toft cane loader is based on two conventional truck front axles. Thus it can be drawn and steered from either end, and the steering mechanism of either axle can be locked as required. The loader is not self-propelled but is drawn by horses or a tractor when used on a tramway system, such as are still very common in Queensland, or when loading on to motor trucks is towed by the truck itself.

The power plant, a 10-h.p. petrol or oil engine, is mounted in a large turntable capable of turning through a complete circle, so as to permit of picking up and loading of cane in any direction. By means of crank-operated levelling screws the turntable may be kept horizontal at all times while working on gradients.

The power plant drives a shaft carrying the boom raising clutch, two clutches for turning in either direction, and two for operating the grab. There are also two winding drums for the cables closing and raising the grab, or opening and lowering it.

The boom is 25 feet long and made of steel, but is easy to operate.

The loader weighs 3 tons in all. It requires three men to work it, one operating the controls, another guiding the grab to the cane, and the third directing the bundles on to the truck.

The cost of this loader is £650 in Australian currency, say £520 sterling; it will load 150 tons of cane per day.

The two loaders designed and used by the Fairymead Sugar Company are intended for different conditions.

The large loader is used for loading on to tramline trucks. It is made from an I.H.C. T.20 tractor of the caterpillar track type. The engine of the tractor is mounted on a turntable built on the tractor and utilized to propel the loader as well as to work the turntable, boom and grab.

There is a 27-foot jib for raising and lowering and placing the grab. The forward speed of the machine is 3 or 4 miles per hour, and the hoisting speed of the grab is 140 feet per minute. The grab capacity is about 600 lbs., and when loading into tram trucks the loading capacity is 17 tons of cane per hour on a 20- or 30-ton crop, and about 25 tons when loading into motor trucks.

With the original T.20 engine the fuel consumption is 1 gallon per hour, but a smaller tractor engine such as the P 12 will do the work adequately and require only half as much fuel.

The machine operates up to ten cane rows on each side of the portable tramline, which is then shifted.

One operator on the machine and two on the ground complete the crew. The cost of the machine is not stated.

The small loader is designed for towing behind a motor truck being loaded. It has four rubber tyres but cannot be steered. A turntable mounted on a frame carries a 21-foot jib and 6-h.p. engine to operate the mechanism for the jib and grab; the engine has also an auxiliary drive to the rear axle to assist the towing motor truck when required.

The grab lifts 300 to 400 lbs. weight of cane. The fuel consumption is about 3 pints of paraffin per hour and the machine can load about 15 tons per hour. The cost is not stated.

The Queensland cane loaders have lower capacity than the Louisiana loaders in terms of tons of cane per day, but are more versatile.

The daily capacity of the Louisiana machines are from 250 to 350 tons of cane per day, and those of Queensland 120 to 150 tons.

But in South Africa, under present arrangements for allocating daily quotas of cane for the mill to estates and planters, how many could supply even 120 tons of cane per day? And still larger quotas would be necessary to keep a cane harvester fully employed.

Of course, some system of taking larger quantities of cane over a period from each source in succession would have to be devised, but this would entail difficulties concerning disposal of labour on plantations when not actually cutting cane, and problems resulting from a departure from the present equitable system of allotting a planter a share of cane deliveries for every day of the crop proportional to his total.

Hence the application of labour-saving devices on a large scale in the harvesting and loading of cane, however desirable and indeed necessary it may become, will entail many problems of organization of cane supply.

Having regard to the facts that the topography in many parts of Queensland more closely resemble conditions in this country than does that of Louisiana, and the general practice of growing cane in ridges in Louisiana, also the circumstance that the climate of Louisiana requires that the crop be harvested in an extremely short period, it appears that Queensland implements are more likely to be adaptable to our conditions in this country than machines evolved primarily for the sugar industry of Louisiana.

Acknowledgments.

The writer wishes to acknowledge with thanks communications from the following implement manufacturers:—

The Thomson Machinery Co., Thibodaux, Louisiana.

The Thornton Grab & Derrick Works, Jeanerette, Louisiana.

The Wurtele Cane Harvester Co., Mix, Louisiana.

The Jackson Machinery Co., New Orleans 15, Louisiana.

The Louisiana Tractor & Machinery Co., Baton Rouge 2, Louisiana.

The International Harvester Co. (S.A.) Ltd., Durban.

I also wish to express my indebtedness for much of the information received to Messrs. J. C. Etheredge and G. Arceneaux of Louisiana, the American Society of Sugarcane Technologists, and Dr. E. V. Abbott, secretary, and particularly to Mr. E. R. Behne of Brisbane, Queensland, for his admirable report which has been freely drawn upon.

Experiment Station,
South African Sugar Association,
Mount Edgecombe.
April, 1947.

Inquiries in South Africa.

The South African Sugar Association recently decided to send a representative to travel about the South African sugar industry to see, as far as possible any agricultural labour-saving devices that might have been devised locally, and to decide whether they could be adapted to general use in the industry.

Mr. Frank Jex was appointed to this work and prepared a very interesting and valuable preliminary report on a general preparatory survey tour, but unfortunately was not able to complete the project and a successor has not yet been appointed.

The Association also advertised some months ago for suitable designs for cane harvesters or loaders that could be constructed and used in this country.[6] However, only one original design was received, and is still under consideration.

SUMMARY AND CONCLUSIONS.

The need for labour-saving agricultural methods and appliances in the sugar industry of this country is pointed out, and developments of new implements in other countries that might be adapted to South Africa are mentioned, having regard to our special conditions and requirements.

Cane harvesters, cane loaders, and other agricultural machines in use in Louisiana are described and discussed.

E. R. Behne's report to the Queensland Department of Agriculture on a visit to Louisiana and other countries to study the mechanical harvesting and loading of cane and other aspects of the sugar industry is abstracted.

Mr. Behne's description of cane harvesters and loaders designed and used in Queensland is also quoted in some detail.

The conclusion is arrived at that, for various reasons, Queensland cane harvesters and loaders are probably more adaptable to South African conditions than those evolved in Louisiana.

A note of preliminary inquiries made into labour-saving devices on sugarcane plantations in this country is included.

References.

[1] Behne, E. R. (1946): The Sugar Industries of Louisiana, Cuba and Hawaii, with Particular Reference to Mechanical Harvesting and Loading. Cane Growers' Quarterly Bulletin **10**, No. 2, 1946.

[2] Bourgeois, L. C., Jr. (1943): Use of Mechanical Harvesters on Sugarcane Plantations in Louisiana. Papers presented at meetings of the American Society of Sugarcane Technologists during the years 1941-45 inclusive, 13.

[3] Farwell, F. E. (1944): Flame Cultivation and Flame Eradication. *Ibid.*, 23.

[4] Vought, F. A. (1941): Mechanical Cane Harvesters and Windrowers and Cane Cleaning Machine. *Ibid.*, 91.

[5] —— (1942): Cane Cleaning at the Factory as Practised in Louisiana. *Ibid.*, 97.

[6] —— (1946): Mechanical Harvesting—Competition for Inventors. S.A. Sugar Jour. **30**, No. 10, 527.

Mr. PALAIRET thought the correct approach in this country was to cut the cane by hand and to gather and load it mechanically. He would like to see the cane topped and trashed at the loading bank by a machine which would deliver the cane on the trucks and the trash directly on to compost heaps.

Mr. CAMPBELL said that he knew of no such machine that could be used in the field; in fact, he did not think any of the cane-cutting machines so far evolved would find application under South African conditions. In Hawaii, however, cane was cleaned at the mill by stripping rollers. That was not a difficult problem, but it had not been adapted to field use.