

MECHANICAL LOADING OF CANE IN NATAL AND ZULULAND

By B. H. ABRAHAMSON.

Owing mainly to the topography of our cane fields and to the predominance of small growers in the industry, most of the loaders which have been developed elsewhere are not suitable for our local conditions. We have therefore of necessity to develop loading machines to suit our various conditions.

The main requirements for a suitable loader are, briefly:—

- (a) It must be suitable for use with the several different types of transport.
- (b) It must be able to work on hillsides.
- (c) The loader must be reasonably priced to suit the small grower who has based his costs on cheap native labour.

TYPES OF LOADER.

It is hardly feasible for one type of loader to suit all of our varied conditions. There are three types that are of particular interest to us. They are:—

1. The Drag-line Loader

This loader is not very suitable for picking up loose cane (although there are rakes which could be used with it). Preferably it should be used to haul in cane which has been placed in slings by the cutters.

The advantages of this loader are:—(a) that manual labour is done away with; (b) it can operate with any type of transport; (c) it can operate on steep hillsides; (d) the purchase price is comparatively low.

The disadvantages are:—(a) cane cutters have extra work in placing the cane neatly in slings; (b) the cable has to be drawn out to fetch each bundle; (c) the slings have to be removed from the bundles of cane.

2. The Stack Loader.

The Van der Watt self-loading trailer and the Hyster crane fitted to caterpillar tractor can be classed in this group. These loaders can be used on flats and slopes. With this system the cutters place the cane into stacks which are supported by stakes or frames and are tied in slings. These stacks are lifted by the loader.

The advantages of the stack loaders are:—(a) that manual loading is done away with; (b) the individual task system is made possible for the cutters.

The disadvantage is that the cane has to be stacked by the cutters.

3. The Grab Loader.

The grab loader is the most popular type in other countries. It has a comparatively large delivery. It is best suited to travel with the receiving vehicle, and it is more suited to areas where heavy tonnages are grown and where hills are not too steep.

Its advantages are:—(a) it does away with manual loading; (b) it picks up the cane loose as placed by the cutters; (c) it is a fast working machine and therefore is a large capacity loader.

Its disadvantages are:—(a) it is not suitable for operating on steep hills; (b) it is difficult to use it efficiently in conjunction with a tramline system.

Cane Loaders being developed and used by Growers.

1. The Thomas loader. This is a small drag-line loader. The original Thomas loader was demonstrated to the Mechanisation Sub-Committee of the South African Sugar Association, who saw possibilities and subsequently placed an order for an improved model for experimental purposes.



Hyster loader: Loading 1-ton stacks on to train of waggons, showing stacks of cane in line.

This loader was mounted on a 3-ton motor truck and was of $\frac{1}{2}$ -ton capacity. The designer's idea was to use it as a treble-purpose machine:—(a) for field loading; (b) as a means of transport; (c) for siding loading.

During field trials it was found that the machine was slow and could only deliver normally 5 tons per hour. By modifying the mechanism the performance of the machine could be considerably speeded up to deliver perhaps 10 to 15 tons per hour. The modi-

fications now being made to the machine include the following improvements :—

- (i) The loader will be a separate unit which can be mounted on (a) its own wheels, (b) a 3-ton motor truck, (c) mounted statically, or (d) any other mounting the grower may require.
- (ii) Replacing of gears and dog clutches by friction clutches.
- (iii) The use of a second winch to haul one bundle while the other bundle is being loaded.
- (iv) More versatile controls throughout.



Hyster loader: On top of high platform lifting bundles from wagons and placing them on to S.A.R. trucks.

As an example of the number of units saved on a 28-ton daily delivery, with manual labour the number of units required would be seven cutters and seven loaders, or more where there are long and steep carries. Total, 14 units or more.

On the same delivery the Thomas loader would require eight cutters, besides the driver and two units to operate the loader. Total, 11 units.

The saving of labour does not appear to be much when the Thomas is used as a field loader only.

However, more labour is saved when working under the following conditions :—

- (a) With a larger daily delivery.
- (b) When the loader is used as a dual- or treble-purpose machine. In this case the loader crew may replace the entire loading gang at the siding, besides the transport crew, which would amount in all to 10 units.
- (c) In certain cases the crew of the Thomas may be used to operate transport or siding crane.

The purchase price of the Thomas loader will be in the neighbourhood of £500.

2. P. & H. Drag-line crane loader. This loader is simply a large mobile crane. Two milling companies are at present using them for loading cane in the field. The principle adopted with these machines is to lay long slings between the lines of cane. The cut cane is placed by the cutters on these slings. The slings are drawn in by the crane and the bundles of cane lifted on to the receiving vehicle.

These are powerful loaders and are capable of delivering large tonnages. They are, however, uneconomical for the small grower.

3. The Hyster crane, mounted on D.4 Caterpillar tractor. As stated before, this unit can be classed as a stack-loader. Mr. D. Clark, of Empangeni, is the first to use a machine of this type. On his farm the loader is doing the treble task of (a) field loading, (b) hauling, and (c) reloading on to S.A.R. trucks at the siding.

Mr. Clark's farm is particularly suited for this loader, in that he has a very short haul, and a private siding which enabled him to erect a specially-built high loading platform. Since the unit is used for hauling it is necessary to have a short boom of about 15 feet. This is long enough for field loading but is too short for side loading; hence the high loading platform.

The crane is mounted at the rear of the tractor and has a fixed boom.

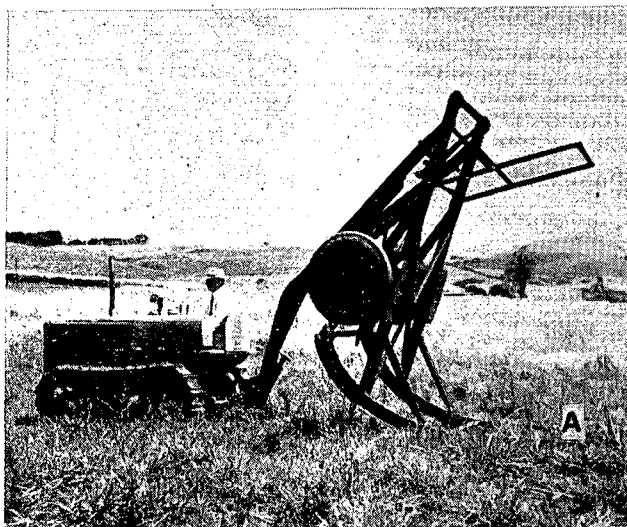
Mr. Clark uses 10 cutters, each loading three 1-ton stacks. The cutters cut into the face of the cane field and place their stacks in three straight lines. The loader pulls a train of three trailers, which are not uncoupled at all but are drawn alongside the first line of stacks. The loader then unhitches and lifts the stacks up one by one, placing them on the trailers. Very little manoeuvring is required, since the trailers are drawn alongside the stacks.

When the trailers are loaded they are hauled to the siding and drawn alongside the high-loading platform. The loader then mounts the platform and lifts the bundles one at a time into the S.A.R. truck, where there are two choppers to fit them in. Two

trips by the loader give more cane than is required by one S.A.R. truck.

The number of units used is 10 cutters, 2 truck choppers, and the tractor driver and tractor boy. This totals 14 units in all, giving a saving of 9 units to cut and load one S.A.R. truck. The time taken for this is six to seven hours.

Since no extra labour is required for transport, the saving is considerable.



Van der Watt trailer in position for picking up stack of cane. Points at (A) slide under stack when tractor is reversed.

4. The Van der Watt self-loading trailer. Can be classed as a stack-loader. This trailer was invented by Mr. I. A. van der Watt of Eshowe, Zululand. His prototype model was bought by the Mechanisation Sub-Committee of the S.A. Sugar Association, who, together with Messrs. J. K. Eaton of Durban, developed the trailer to its present state.

This two-wheel self-loading and self-tipping trailer is very simply constructed. It consists of a long draw-bar supported in front by a raising jack, and at the rear it is hinged to the foremost part of the chassis.

The chassis is carried on the single axle and has two long, curved, upright prongs at the rear and an upright frame in front. It has a swinging draw-bar at the rear for coupling up a second trailer.

The trailer is not power operated, but has a rolling action which is actuated by the pull or push of the tractor as the case may be. It has a roll of approximately 100 degrees and has a catch to lock it in position at either limit of the roll. One catch holds it in the travelling position, while the other holds it in the position for loading or unloading. Since these two catches do not engage at the same time the same cord is used to release both of them; therefore the only controls for the trailer are a brake-lever and the single cord to the driver of the tractor.

At present its development is only complete in so far as cane-loading is concerned.

When loading cane each cutter is required to place his day's cutting of cane in a stack, which is supported by stakes or frames. The base of these stacks should not exceed 6 feet in length, while the width, if travelling on a public road, is limited to 8 feet. The height might be from 6 to 8 feet or more if necessary, according to the specific gravity of the cane. This is the size of stack which will weigh 3 tons and is what is required for a load of the trailer. It is also what can be expected of one cutter for a day's task without bonus.

For loading, the trailer is reversed up to the stack, which has been tied in chains or slings, until the wheels of the trailer are 12 feet away from the front of the stack. The brake is then applied and the cord pulled to release the travelling catch. The tractor is now reversed further and the trailer rolls back to its limit. The prongs are now resting on the ground and slide back, under pressure of the tractor, under the load of cane. The cord is now pulled to release the catch, and as the tractor moves forward the trailer rolls forward, thus lifting the stack. Since the roll is in excess of 90 degrees the load is thrown well forward on the trailer. The brake is released and the trailer moves on.

The brake is always applied when tipping or loading the trailer, since the resistance of the wheels assists in starting the rolling action when tipping and in finishing the rolling action when loading.



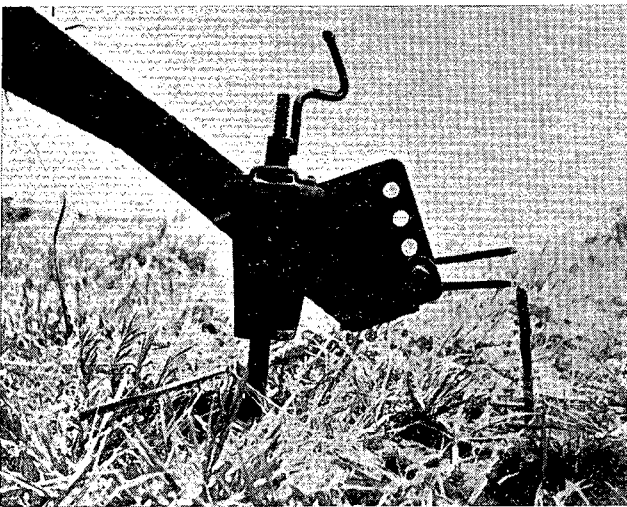
Van der Watt trailer with 3-ton load of cane operated by a 33 h.p. wheel type tractor.

To off-load the trailer the brake is applied. The driver then pulls the cord to release the travelling catch, then reverses the tractor until the other catch engages at the limit of the roll. He now moves the tractor forward, drawing the trailer from under the load of cane, which is left on the ground. Then he pulls the cord to release the catch and the trailer rolls back into its travelling position.

The trailer makes possible a saving in labour of 33 $\frac{1}{3}$ per cent., or e.g. 5 units, on a 30-ton delivery, in that the normal non-bonus task for one unit is to cut and load two tons of cane or to cut only four tons of cane. By cutting and stacking the cane on the spot, with practically no carrying or lifting, one unit can do a non-bonus task of 3 tons. Thus, each unit of labour delivers an extra ton.

The individual task the trailer offers is a further incentive for the cutter to give extra weight. It also simplifies the working of the bonus system. A further advantage is that the cane is tied and delivered in a 3-ton bundle which can readily be re-handled by a crane, thus saving any further wastage in cane or labour.

5. Loading frames for the Van der Watt trailer. It is essential to use loading frames or stakes of some type. There are several types of frames that could be constructed for use with the trailer.



Jack fitted to Van der Watt trailer to facilitate linkage to a second trailer.

Where the grower has an arc welder these frames need cost very little. The best type of frame is a sledge-like frame with fixed uprights at one end, and three loading steps attached to the uprights. At the other end are two detachable uprights with supporting stays. These clip on to the beams of the frame and when the cane has been tied they are removed to allow for the approach of the trailer. The cane is loaded on to this frame and, if necessary, it could be dragged over impossible field conditions by the tractor to a suitable place where the trailer could load it. These frames can be easily made from an old motor chassis.

A cheaper idea is to have two upright structures resembling bed ends which are placed face to face 6 feet apart—one with three loading steps to support it, the other with only a hinge stay.

On the inner side of each are two pegs, on to which the chains or slings are hitched in such a way that when the cane is loaded on the chains these structures are pushed on to the ground. When the chains are tied these structures are easily removed.

With this type of frame it is advisable to use poles or beams under the load.

6. Suitability of conditions for Van der Watt trailer.

The new Van der Watt trailer is designed to operate under normal conditions with a 30-h.p. wheel-type tractor. This is the size of tractor normally used for cane haulage. A track-type tractor may be used when conditions are too wet or too steep.

The trailer can be used on reasonable hillsides. The steeper the hill the more powerful the tractor must be to reverse the trailer up the hill to the stack of cane. The bundles from this trailer may be re-loaded in S.A.R. trucks, tram trucks, or almost any other form of transport.

The trailer was primarily designed for those growers who haul by tractor and trailer—in other words, those with a short haul with conditions not too hilly. Certain growers, however, who use tram-line, see in the trailer a means of doing away with their field line. They intend to haul with the trailer and reload on to tram trucks by means of a crane or gantry. Similarly, it may replace motor-truck transport. Where there is a long haul, it is advisable to couple these trailers in twos or threes.

Although the trailer has no springs, it can be hauled at the reasonably fast speed of, say, 15 m.p.h. when empty and 10 m.p.h. when full, provided the roads are fair. It is, therefore, most necessary to use a tractor with fast speeds.

The tonnage that can be shifted with one trailer should surpass that of a motor lorry, since the lorry has to wait while it is being loaded.

As this trailer is an entirely new idea in loading, and coming on the market this year for the first time, it is only with the new season that it will have the opportunity of proving its performance over a period of time.

7. The Castagnos Loader. Is the simplest and cheapest form of grab loader. It is animal-drawn, and its boom, which moves on a fixed radius and has a traverse of 90 degrees, is hand-swung. The winches are powered by a 6-h.p. Fairbanks-Morse paraffin engine. Bundles weighing 450 lbs. are lifted from the rear of the machine and swung to the side, where they are deposited in the receiving vehicle, which travels at the side of the loader. One of these loaders was imported for the Mechanisation Sub-Committee and was found to work very well under the conditions for which it was designed.

While the grab principle has possibilities, the machine in itself is not satisfactory for our conditions, mainly due to the facts that :—

- (i) The grab is cable-operated. This necessitates a long boom, which makes the centre of gravity of the machine too high.
- (ii) The boom being hand-swung, is uncontrollable when the machine is on a slope.

The PRESIDENT thought that the paper covered very largely the main achievement of the Mechanisation Committee. In loading, more advancement

in mechanisation had been made, than in any other operation except perhaps planting. It was interesting to find that a number of loading appliances had been constructed in this country and in particular the "van der Watt" Loader seemed to have great possibilities.

Dr. DODDS said that loaders were by no means new machines. For example, the Castagnos Loader was in common use in Louisiana when he first went there 28 years ago, and he believed that there were now over two thousand "Castagnos" Loaders in use in that country.