

THE MOBREY JUICE LEVEL CONTROL.

By H. G. MCKENNA.

It has long been recognised that the efficiency of an evaporator is largely governed by the juice level, and that if the personal control of the attendant could be replaced by a mechanically self-operating device greater evaporator capacity and economy in steam would follow.

Towards the end of last season an apparatus produced by Ronald Trist & Company, of London, was installed in the pre-evaporator at Doornkop. This apparatus, called the Mobrey Juice Level Control, had already proved useful in several beet factories in England, but this was its first appearance on cane sugar, in Natal at any rate.

Unfortunately, the trial was hampered by the erratic cane supply, but sufficient experience was obtained to see that its installation will prove a great help in the control of the evaporator.

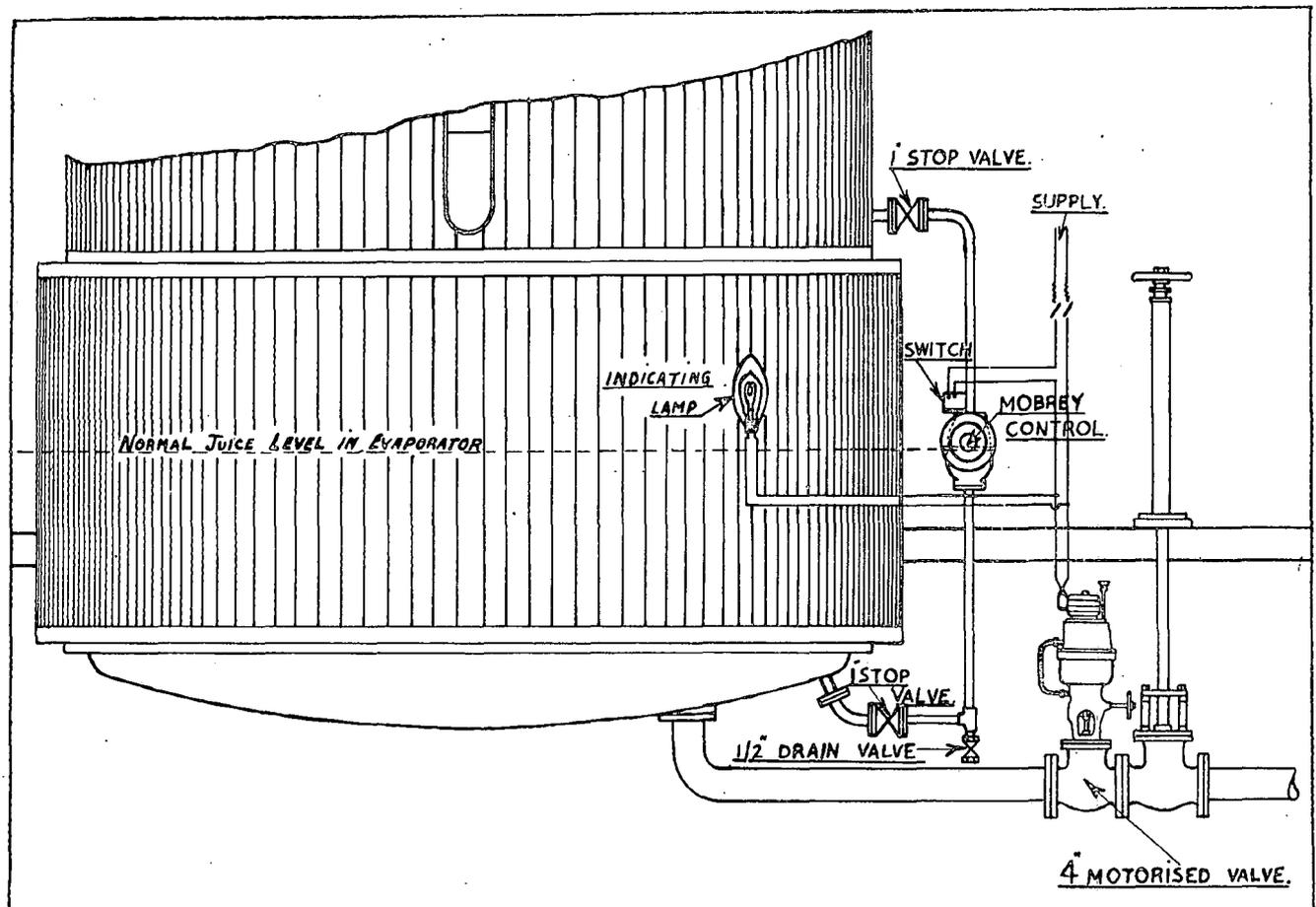
The evaporator at Doornkop consists of a 3,000 sq. ft. pre-evaporator coupled to a 4,500 sq. ft. triple

effect, the vapour from the pre-evaporator being utilized in juice heating and in the first pot of the triple.

Under certain conditions it was found almost impossible to maintain a satisfactory juice level in the pre-evaporator, and many ideas were tried out to overcome this difficulty. Best of all was an overflow pipe back to the evaporator juice supply tank—an idea that could be taken up by many factories with considerable advantage.

To improve upon this—and perhaps to work in conjunction with this overflow pipe—the Mobrey control was installed, and, even with our short experience, we believe it to be capable of doing useful work.

Several points have to be improved upon, and it is hoped that a further study of the apparatus will better its performance this coming season.



General arrangement of Mobrey Control applied to a pre-evaporator to operate motorised valve fitted in juice inlet.

The Mobrey control is a float-operated device activated by changes in the level contained in a float chamber and is designed to maintain a constant level of juice in the pre-evaporator.

The device consists of two separate parts:—

- (1) the float mechanism, and
- (2) the motorised valve.

The float mechanism is connected directly to the pre-evaporator through one-inch bore pipes to the juice gauge cocks. It consists of a float enclosed in a float chamber, the float being connected to the actuating arm of an electrical switch by means of a transverse spindle passing through a special gland in the float chamber.

The motorised valve is placed in the juice supply line on the delivery side of the juice pump.

This valve consists of a small motor mounted on top of an oil chamber. In this chamber is a gear type pump which exerts pressure on a piston which closes a spring-loaded valve, thus throttling down the flow of juice.

The float mechanism is placed at the same height as the desired juice level, that is, half way up the tube height in the evaporator. This means that during boiling the top tube plate will just be covered.

The switch already referred to is connected to the motor on the motorised valve.

In operation, the float rises or falls with the juice level in the pre-evaporator. When the level rises the float, acting on the transverse spindle, closes the switch, which starts the motor operating the oil pump in the motorised valve.

The oil pressure thus developed acts on the face of the piston and closes the spring-loaded valve, thus shutting off the supply of juice to the evaporator. So long as the juice level remains higher than the predetermined height set for the float, the switch will remain closed and the motor will continue to act on the oil pump closing the juice supply through the valve. A relief valve, allowing for about 10 lbs. greater oil pressure than is required to keep the juice valve closed, is provided.

When the juice level falls, the float allows the switch to open, releasing the oil pressure against the piston. The juice valve then opens to allow a flow of juice to the evaporator.

This may sound somewhat complicated, but, once the apparatus is actually fitted up, it functions very simply. The juice level is controlled within a few inches of the predetermined height, which, to say the least, is something that the usual evaporator attendant cannot maintain.

Like the majority of mechanical devices, the application to local conditions has to be studied. For instance, the juice pump—centrifugal type—was of greater capacity than was needed to handle our volume of juice, so that the supply was in consequence more intermittent than it would otherwise have been with a smaller pump. The motorised valve was therefore in operation—that is, the juice valve was closed—longer than we believe it should have been. Again, for the proper functioning of the motorised valve, we had to experiment with several oils to maintain the pressure. The oil specified by the makers is a high grade turbine oil such as Shell BA8.

As an addition to the outfit, we thought it advisable to instal an indicating lamp in the circuit, so that when the motorised valve started to operate the lamp was lit. This was necessary in our case as the motorised valve was not visible to the attendant on the evaporator floor.

We believe that the Mobrey control has definite possibilities. Its installation between each vessel in a multiple effect would be a great advantage. With a steam control device, a final syrup density control and the intermediate control as indicated, our evaporators would be entirely automatic, or requiring only a casual inspection.

Doornkop Sugar Estates,
Doornkop.
March, 1941.

The PRESIDENT said that the author had described an apparatus which should be of considerable use to the factories.

Mr. BOOTH, who had collaborated with Mr. McKenna, said that he had no doubt that the Mobrey Juice Level Control was a most excellent thing and he was sure that the staff of Doornkop would welcome enquiries about it, and would willingly demonstrate how it worked.

Mr. MITCHELL thanked Mr. McKenna and Mr. Booth for their interest shown in the Mobrey Control. He thought it was an instrument the sugar industry had been looking for.

Mr. MACBETH thanked Mr. McKenna for his interesting paper on the Mobrey Juice Level Control.

He had been in possession of the facts and details with reference to the alterations of this controller as fitted to the pre-evaporator at Doornkop, together with other particulars handed to him by Mr. Mitchell, and he was satisfied that there was no doubt that this Juice Level Control would be of great benefit to any evaporator plant wherever it was installed.

There were one or two points which he would like to know in connection with this controller.

It was mentioned in the paper that a centrifugal pump was used to supply the juice to the pre-evaporator, but would it not be possible, if necessary, to have an elevated tank for the duty?

He thought the level control between the first and second, second and third and the third and fourth vessels was done by hand control at the present time.

The Mobrey Level Control apparatus, he believed, could also be fitted between the first and second, second and third and third and fourth vessels of

any evaporator and hence make it automatic in juice level control.

He presumed also that in the event of the motorised valve failing to operate, the valve was automatically left in the open position.

Mr. McKENNA agreed with Mr. Macbeth that it would be much more satisfactory to have an elevated tank for the juice. Mr. Macbeth was also quite correct in his further assumptions.

The PRESIDENT said that in a time when automatic controls were used so widely in the mills, this paper filled a gap.

(Applause).