Mr. Ray (Inspector of Factories), asked why they did not pay more attention to the feed as in his opinion most of the trouble originated there. It was of little use going to enormous expense in putting in apparatus to rectify faults which probably would be found in the feed of the bagasse. At most factories he had visited they left the feed of the bagasse to a native, and sometimes not even to a native. Sometimes the furnaces had been found burnt out almost except for the centre. Very little time appeared to have been given to this question and he thought it would well repay investigation.

Mr. de Froberville agreed that what had been said was quite normal in mills. The quantity of bagasse obtained from the Uba cane was enormous and they had no occasion to spare it. If in a well-equipped mill they crushed so many tons of cane they would have plenty of bagasse in the mill. Instead of having a native to feed the bagasse some mills would probably have a special method of driving the bagasse into the furnace by having automatic tipping devices so that the least possible amount of air would be admitted into the furnace. In several of the mills, however, the openings were left open with the result that there was probably 5 or 6% of air going in, which was most injurious to combustion.

In some cases when the bagasse began to slacken they covered up part of the openings. He agreed completely with what Mr. Ray had said. There was not enough attention paid to the feeding of the boilers. If this could be attended to in a thorough manner there would be a real advantage and they would reap the benefit of the bagasse to the full.

Mr. J. Murray stated that in the past the methods of feeding had not been very satisfactory and they often had rather large pieces of bagasse going through, and the machinery could not deal with it properly, but nowadays with shredders and double crushers they obtained a much better class of product from the mills and he thought a machine could be made so as to get over the trouble experienced in feeding.

The Chairman expressed the hope that this matter would be taken up and investigated. The discussion had taught them how necessary it was that investigations and experiments should be carried out on these subjects.

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The following paper on "EXPERIMENTS TO DETERMINE THE EXTENT OF DRYING OUT OF SUGAR STORED AT DIFFERENT ALTITUDES IN THE UNION" was then read by the General Secretary Mr. Duncan M. Eadie.

EXPERIMENTS TO DETERMINE THE EXTENT OF DRYING OUT OF SUGAR STORED AT DIFFERENT ALTITUDES IN THE UNION.

By DUNCAN M. EADIE, General Secretary,

The Weights and Measures Act came into force in April, 1923, when a question arose with the authorities about the definition of the "lawful weight" of a "pocket" of sugar in the regulations to be proclaimed under the Act. The Association decided to adopt 100 lb. and 50 lb. pockets, but a difficulty arose about the practicability of the proposal to adopt 100 lbs. as the "lawful weight" because it was suspected that while the full weight might be packed in the pocket at the factory there was a risk that there would be loss of weight due to drying out if sold after being stored for some time in a dry climate such as that of Johannesburg. It was therefore agreed with the authorities that the regulation fixing the "lawful weight" if a pocket of sugar should be allowed to stand in abeyance till May, 1924, before which time the Industry was to make arrangements for testing if, and to what extent in actual practice, sellers up country were exposed to risks of prosecution on account of drying out in transit or storage up country. The problem set was to determine the variation in weight of sugar due to drying out as between Durban and certain up-country towns. An experiment was organised which gave the required data and consequent upon it the Weights and Measures Department decided to treat sugar for the purposes of the Act as an article not subject to variation in weight owing to climatic influences.

The experiment and its results have not been described in detail before, so the opportunity of the Sugar Week is taken to place the data on record.

Organization: Four sets of five bags each of typical sugars were collected at Durban, adjusted to weigh exactly 70 lbs. net and tested for moisture. One set was retained in Durban and one set each despatched without delay to Johannesburg, Bloemfontein and Capetown. Arrangements had been made for storage under normal conditions, weighing on arrival and thereafter monthly weighings. At the conclusion of the test all the sets were tested for moisture except those at Bloemfontein, where a chemist was not available at the time he was required for the work. The data were reported periodically to Durban by the Assize Officer in the town concerned, and careful records kept. At the same time daily records of atmospheric humidity were obtained to serve as a secondary check on moisture fluctuations in the test sugars.

Personnel: Messrs. David Fowler & Co., Ltd., placed storage in Durban at the disposal of the Association and their Agents in the different mentioned towns, provided for storage and co-operated heartily in the experiment. All weighings were done by officers of the Assize Department. Humidity readings at Johannesburg and Capetown were made by hygrographs lent by the Union Meteorological service and forwarded to Durban. At Bloemfontein dry and wet bulb readings were provided by an official of Grey's University College; while at Durban dry and wet bulb readings were obtained regularly from the Point Meteorological Station, as the hygrograph sent here for use was accidentally put out of action before being set up. The use of dry and wet bulb thermometer readings necessitated tedious calculations to arrive at relative humidity; these were done at the Secretary's office. Mr. L. Blacklock, chief chemist, Sir J. L. Hulett & Sons refinery, carried out the original moisture tests in Durban of all the sugars, and the moisture test of the Durban test set at the conclusion of the weighings. Dr. Marloth did the moisture tests in Capetown and Mr. James Gray in Johannesburg.

Diagrams Nos. 1 to 6 show the variations in weight of each type of sugar at each test station.

Diagrams Nos. 7 to 10 show relative humidity from day to day at each station with the weight variations from month to month of each type of sugar superimposed on the humidity curves to discover whether or no there is a relation between weight and humidity fluctuations.

The following tables summarise the weighing and moisture data for each type and station and are derived from Table I exhibited, but not reproduced here.

Table 2 summarises the moisture data for each type and station.

TABLE 2:- **Original Moisture and Final Moisture as Percentage of Original Weight of Test Sugars with Difference (Plus or Minus) of Final Moisture from Original Moisture.**

Class	DURBAN.			JOHANNESBURG.			BLOEMFONTEIN.			CAPETOWN.		
	Orig.	Final.	Diff.	Orig.	Final.	Diff.	Orig.	Final.	Diff.	Orig.	Final.	Diff.
E	.0485	.25	+ .201	.0485	.028	—.02	.0485	(c)	(c)	.0485	.011	—.0375
TM	.039	.046(a) .499(b)	+ .007 +4.951	.039	.072	+.033	.039	(c)	(c)	.039	.15	+.111
YC	.793	3.69	+2.897	.793	.158	—.635	.793	(c)	(c)	.793	.37	—.423
T	.307	2.51	+2.203	.307	.092	—.215	.307	(c)	(c)	.307	0.13	—.177
H	.0325	+0.040(d) +4.14 (d)	+0.0075(d) +4.107(d)	.0325	.060	+0.0275	.0325	(c)	(c)	.0325	0.06	+0.0275
SY	1.12	3.69	+2.57	1.12	0.421	—0.699	1.12	(c)	(c)	1.12	0.46	—0.66

(a) This pocket was in contact with SY and absorbed moisture therefrom. (a) gives moisture of upper portion and (b) of lower portion of pocket.
(c) Final moisture test at Bloemfontein could not be arranged when required.
(d) This pocket was in contact with badly sweating SY sugar and was wetted by exuding moisture. The top layer and bottom layer analyses are given separately.

TABLE 3 summarises the variations in weight between the original and final weighings.

TABLE 3:-

Variation in Weight (Plus or Minus) at Conclusion of Test of Respective Stations from Original Weight at Durban.

Class.	Durban.	J.H.burg.	Bloemfont'n.	Capetown.
	Ozs.	Ozs.	Ozs.	Ozs.
E	+ 1½	+2 10/16	—2¼	— ¼
TM	+13(a)	+3 3/16	+ ½	—2¾
YC	+8 12/16	—8½	—5⅜	—9
T	+28¼(b)	—⅜	Nil	Nil
H	+7¼(c)	+ 15/16	+ 5/16	—2¾
SY	—3½(d)	— 6½	—8¾	—11½

(a) This sugar took up weight owing to absorption from floor of sweated sugar from Y.C. or S.Y.

(b) Sweating at final weighing.

(c) This sugar suffered in the same way as class TM described in (a).

(d) This bag "ran out" on the floor thus accounting for the loss in weight as well as for part of the increase in weight of TM and H.

TABLE 4 is derived from Table 3 the variations being expressed as percentages of original weights.

TABLE 4:-

Variation in Final Weights as Percentages of Original Weights.

Class.	Durban.	J.H.Burg.	Bloemfont'n.	Capetown.
	Ozs.	Ozs.	Ozs.	Ozs.
E	+0.1325	+0.2317	—0.1953	—0.1753
TM	+1.149	+0.2817	+0.0351	—0.2427
YC	+0.7727	—0.7509	—0.4747	—0.9544
T	+2.474	—0.0331	Nil	Nil
H	+0.6406	+0.9622	+0.02754	—0.2429
SY	—0.3092	—0.5741	—0.7729	—1.016

BEHAVIOUR OF TEST SUGARS.

Durban: The history of the Durban Test pockets was disturbed by liquid from badly sweating pockets affecting pockets in contact with them. Making allowance for this disturbance H and E behaved in parallel. T and TM also followed approximately parallel courses and both sweated in January. SY and YC formed a third pair on a parallel course. In December both began to sweat. No important losses of weight occurred with H and E. Taking H to January before accidental absorption occurred, gains occurred in November (3½ and 2 ozs. respectively) thereafter weights remained within an ounce of the original weight. T and TM both lost in weight in October; thereafter both gained weight, T more rapidly than TM until the former sweated. The variations of SY and YC had a parallel character hardly so pronounced as in the other two cases. YC lost more rapidly than SY to September, but YC returned to the SY position in October, both following a parallel course from that point till January when the heavy sweating of SY resulting in "running" destroyed comparisons.

The expression "parallel" is borrowed for the above description from the appearance of the curves on the diagrams. This parallelism is a notable feature of the record.

Johannesburg: The characteristics of Johannesburg curves are flatness and parallelism, H, E, T and TM showing little reaction to atmospheric influence during the six months storage. YC and SY, however, while reacting in parallel, lost weight appreciably.

Bloemfontein: At this station the history of the sugars was almost exactly similar to Johannesburg. The E pocket arrived torn, but deducting the loss on that account as shown on weighing at the station on arrival, there is little change in weight. H gained slightly, so did TM while T did not alter. YC lost 5⅜ ozs. and SL 8¾. Final moisture measurement was not obtained at Bloemfontein.

Capetown: Whereas the other stations are in summer rain areas Capetown is in a winter rain area, so that the test occurred during the dry season there. A close inspection of the diagrams and comparison with numerical data will show that with the exception of E and SY the results are anomalous when accepting moisture as the only function in variation of weight. YC might be explained by sifting en route leaving H, T and TM under inquiry. There is evidence that at Capetown weights were not taken with the exactitude shown at other stations, e.g. weights were recorded to the nearest ounce. But this source of error would not explain all the discepancies. An inspection of curves demonstrates (1) that E and H reacted generally in parallel with a flattish curve of weight variation (2) that T, TM, YC and SY formed a second group reacting approximately in parallel with a wavy curve, a noticeable exception for a short time being T, which at the beginning of the test showed a considerable divergence from the parallel. From the curves it can be deduced that E and H were more stable under Capetown conditions than the other types. Except for the cases of SY and YC, however, there was nothing in the degree of instability of any of the sugars to warrant the belief that in the ordinary course of trade there would be danger of unintentional infraction of the Weights and Measures Act Regulations.

Humidity Diagrams: It is not proposed to discuss in detail the relations of the humidity and superimposed weight curves of the humidity diagrams. Such a discussion would be beyond the scope of this note. But an inspection of the curves to show their main comparative characteristics will repay anyone interested in distribution of sugar. It will be noted that the point of departure for weight curves to the 60° relative humidity line. Keeping the eye on this it will be plain that the Capetown data is made up of short range fluctuations, just above the 60° line in September-October. On that line in November-December and below the line in January-February. In the statement made above about the weights it was remarked that the results were anomalous as between different sugars, but study of the chart, while indicating differing degrees of reaction will disclose a marked uniformity in the shape of all the curves. Durban shows Capetown's characteristic of short range fluctuations, but here, with few exceptions the daily humidity points indicated are above the 60° line, October, January and February being particularly noticeable in this respect. In this instance the sugar weight variations re-act regularly to the general rise and fall of humidity. Bloemfontein and Johannesburg humidity curves both show a general average humidity below 60°, with few high points and these of short duration. The behaviour of moist sugars under these conditions is notable.

DISCUSSION ON EXPERIMENT TO DETERMINE THE EXTENT OF DRYING OUT OF SUGAR STORED AT DIFFERENT ALTITUDES IN THE UNION.

Mr. H. O. Andrews asked if any indication could be given of the class of sugar tested.

Mr. Eadie replied that one of the samples was refined and the rest were mill sugars.

In reply to a question by Mr. Townsend as to the variation in weights and the percentage of loss, Mr. Eadie referred to the detailed figures under Table 4 of the paper.

In reply to a further question from Mr. Andrews Mr. Eadie replied that he could not tell under what process the various sugars were made. He had simply received the samples and was only responsible for the obtaining of the records. He could not say where the sugars came from.

The only purpose of the note was the question of variation in weight during storage. The quality of the sugar was not under discussion; it was only the question of the original moisture and how that would affect the sugar in storage at different parts of the country. The statements contained in the paper were the results of experiments made for the purpose of determining that information.

Mr. Andrews stated that he thought that did not go far enough. The article was really incomplete without some idea of the process of manufacture of the various samples of sugar.

Mr. Dodds stated that a similar series of tests in this most important subject had been carried out by the Research Bacteriologist of the Louisiana Experiment Station (W. L. Owen), a year or two ago, and it had been found that the gain in weight of sugar in storage appeared to be due as much to the physical condition of the sugar as to the chemical composition and there were many instances in which mill whites showed less fluctuations in weight than refined sugar and that in each case it was dependent on the fineness of the crystals. Sugars containing a large amount of dust or very fine crystals whether refined or not, would absorb larger quantities of water and vice versa.

Mr. Townsend considered this was a very important matter. There was no question about it that one of the problems the industry had to face was the question of the preservation of sugar from deterioration whilst in store and it seemed to him that it was a pity the industry had not started an experiment with a view to testing the right class of store to use for the prevention of sweating in sugar. In his experience he had had a great deal to do with that in the early days when they did not send their product in to market until it was really required, and the result was that they had to store it in the factory. He had stored large quantities of sugar and had found very little sweating where they excluded the air. The storeroom was built of brick with the ventilation at the top entirely and the air was excluded as much as possible at the bottom. He had found very little loss in the weight. They used to use the 75lb pockets and were very careful in weighing them on the scales. After storing sugar for three months they had found very little variation in weight. He would like to know whether a pocket of sugar weighing 100lbs. in Durban would still weigh 100 lbs. in Johannesburg. The variation was so slight that he took it it did not affect the position at all.

Some of the stores in Durban appeared to be suitable for the storage of sugar and others were not. He wished to know if steps could not be taken with a view to arriving at a solution of that particular question.

Mr. Eadie replied that he thought everybody who dealt with sugar in a general way was aware of the dangers of sweating and of the probabilities of sweating in particular stores, but so far as he knew there had been no scientific inquiry as to what the causes were, so that no definite answer could be given to the question except that the matter appeared to demand inquiry, but, so far, such inquiry had not

been made. After all the purpose of this experiment was limited and that was to find out for the purposes of the Weights and Measures Act, whether sugar lost in weight at any particular point in the Union so as to make it a danger for persons to trade in it at the risk of being prosecuted for selling short weight. Unquestionably the result showed that there was no danger of that, and acting upon that the so-called lawful weight of a pocket of sugar had been fixed at 100 lbs.

Mr. Townsend remarked that in Johannesburg it showed a plus, which was a curious thing.

Mr. Eadie replied that there was one weakness, and that was that the test should have been carried on for six winter months as well to complete the experiment. That had not been done so far.

Mr. Dodds in referring to the matter of design and construction of suitable stores for the storage of sugar reminded the meeting of the paper which was read at the 1923 Congress by Mr. Blewett. In this paper a lot of useful information had been given as to the best types of stores to use. Whether this excellent work had been continued by anybody more directly interested in sugar storage than Mr. Blewett he was unable to say. But the paper which had been read at that time was of very great importance.

Mr. Townsend thanked Mr. Dodds for drawing attention to the paper read by Mr. Blewett, and stated that it was hardly fair for an industry such as the sugar industry to ask people to come to the Congress and give papers, and then practically leave them on the scrap heap. It did seem extraordinary that they should be simply dropped and nothing more said, although they all knew that the evil which the lecturer was endeavouring to remedy still existed in their midst. He thought it was a great pity that these matters were not given a little more serious consideration.

The Chairman stated that he thought the policy of the Association was to have these papers put into pamphlet form and sent round. They were available for all sections of the industry. That had been done since the commencement of the Congress and he thought it would continue.

Mr. Townsend replied that that was not the point. If valuable information was brought before them and it was not made use of what was the good of getting the information ? They might just as well go on as they did fifty years ago and not have it. Why should it be shelved? He considered a little more interest ought to be taken by the industry so that the suggestions could be inquired into and made use of.

The Chairman remarked that it should be a recommendation to the sections to take the matter up and follow it up. (Hear, hear).

At 1 p.m. the Congress was adjourned for lunch.

On resuming at 2.30 p.m., the following paper was read by Mr. C. O. Williams, Chief Chemist, School of Agriculture, Cedara, on "THE CHANGES THAT TAKE PLACE in the SOIL," being a portion of the Symposium on General Agriculture as affecting cane growers, by members of the Technical Staff of the School of Agriculture, Cedara.

"It is not our idea that we should read papers and for you to listen to them and say nothing further, but that each member of the staff, by means of a short introduction, should deal with each subject and the meeting would be open for discussion afterwards. Now from what I saw this morning there appears to be great difficulty in getting people to talk. I hope it will not be so this afternoon, because I think the value of the sitting depends on what each man has to say upon each particular subject. The subject down for myself is the changes, or some of the changes at any rate, that take place in the soil. This I believe is the fourth time I have spoken and I have dealt each time more or less with the same old subject.