

1907.
NEW ZEALAND.

FIRES ON WOOL-SHIPS

(FURTHER PAPERS IN REFERENCE TO).

Presented to both Houses of the General Assembly by Command of His Excellency.

REPORT.

Magistrate's Court, Wellington, 3rd September, 1907.

SIR—

Re Wool Fires.

Referring to the correspondence submitted by you to me for a report by the Commissioners, I have the honour, on their behalf, to submit as follows:—

In respect of the bales of wool shipped to London, the Commissioners would explain, in reply to H. C. Cameron's remarks: The wool had been experimented with here, and the object of shipping to London was that those interested in the safe carriage of such cargo should, in addition to the data collected during the course of the experiment, see the condition in which the wool came out of it, and not for the purpose of any continuance of the experiment on the voyage, as it was considered to have expended its inherent capacity for spontaneous combustion.

Mr. R. J. Friswell considers that he was able to gain from examination of these bales points which he had previously held as open to some doubt. As to remarks in his report, "The bales may have been opened and repacked after the experiment," &c., the bales were not so treated. In the first instance two bales of each description were bought, opened, damped, and repacked, and were then dumped together in the usual manner for shipment, were then placed in model hold, and on conclusion of the test were separated only, and one bale opened for inspection; the other was redumped and so shipped. He doubts "if one bale placed in centre of cube of considerable number of bales," &c. The Commissioners would point out that in the case of a fire on board the "Rimutaka" the bales found on fire were immediately below the deck and only a few feet from the hatch, and in the case of the fire at the Islington Wool-store the wool was not even pressed. Further evidence goes to prove that in the stowage of wool, from the round and crinkled surfaces of the bales, air and to some extent ventilation exist nearly all round the dumps.

J. G. Haldane suggests warming before shipment. The Commissioners consider this absolutely impracticable during the pressure of receiving and loading into vessels. To warm a bale through would take days.

Dr. Voelcker "finds little difference," &c. In the process of the experiment the heating of wool would result in the expelling of the moisture, which was found to be the case on the interior walls of the model hold. As to No. 1 of his report, the wool was before damping in a "natural" condition and safe for shipment. As before stated, no further change was expected during the voyage.

In conclusion, the Commissioners all through their investigations had in their minds the danger from laxity in the regulations in respect of the carrying matches loose in the pockets of men stowing wool in ships' holds, and were of opinion that some fires on ships carrying wool and [or] flax, especially in the case of coastal or intercolonial vessels, might well be attributable to this cause, and this opinion has been supported by the discovery of matches in good condition amongst the cargo of the "Wakanui" and the "Whakatane" on their discharge in London. (Refer to evidence at Christchurch in this connection.) The mere prevention of smoking in ships' holds does not meet the case. Men should be prohibited from carrying matches when in the hold of a vessel.

The Commissioners see nothing in the correspondence and reports submitted to lead them to any alteration or modification of their findings and recommendations, but they desire to emphasize their opinion that regulations in respect of matches in holds should be framed and strictly enforced.

I have, &c.,

A. MCARTHUR,

Chairman, Wool Fires Commission.

The Hon. the Minister of Marine, Wellington.

CORRESPONDENCE.

The HIGH COMMISSIONER to the Hon. the PREMIER.

Westminster Chambers, 13 Victoria Street, London, S.W., 12th April, 1907.

(Memorandum.)

Fire on Wool-ships.

I BEG to forward herewith a report by Mr. H. C. Cameron, Produce Commissioner, concerning the shipment of 8 bales of wool made for experimental purposes by the Commission appointed to inquire into the cause of fires on wool-ships, and referred to in your letters to me of the 7th February (M. 1907/451) and of 13th February (M. 07/481).

Very great interest was taken in the test by the Board of Trade, Lloyd's, the Salvage Association, the Institute of London Underwriters, and others, and representatives of these bodies attended at the docks, when the bales were opened, and made close examination of the condition of the wool. It is to be regretted, however, that as far as outward observation went nothing very definite appears to have resulted from the test. I have, therefore, given instructions for examination of the wool to be made by Professor Haldane and Mr. Friswell, F.I.C., with the view of discovering if any change can thereby be detected that may throw light on the outbreak of fires. The reports of these experts I shall forward to you immediately they are received by us.

By this mail I am forwarding a number of copies of the record of temperatures, &c., of the wool received from Captain Forsdick. It will be observed that the highest temperature recorded in the wool during the voyage was only 75°, and that this occurred in the tropics on the 11th and 13th March, when the temperature of the hold reached 81° and 82°. The opinion was expressed by those who examined the bales when opened that the tubes placed in the bales had acted as ventilators, and had helped the escape of heat.

By the s.s. "Rimutaka," sailing on the 18th instant, I am forwarding samples of the wool taken from the bales for examination by those interested at your end.

The wool does not appear to have suffered very greatly through the test, and I have given instructions for it to be sold by Messrs. Charles Balme, wool-brokers. The proceeds realised will be placed as desired to the credit of the Public Account.

W. P. REEVES.

Memorandum for the High Commissioner.

Fire on Wool-ships.

THE test shipment of 8 bales of wool—referred to in the letters from the Premier (M. 1907/451) dated 7th February, and (M. 07/481) dated 13th February—which was made to you by the Commission appointed by the Government to inquire into the cause of fires on board ship, arrived safely in the s.s. "Orari." The vessel docked here on the 26th March, but owing to Easter holidays it was found impossible to get representatives of the various bodies interested in the question of fire on wool-ships together, with a view to examining the wool on the bales being opened, for some time after the arrival of the boat.

Having placed myself in communication with the managers of the shipping company I met Captain Forsdick, from whom I received a tabulated statement that had been handed to him by the Fires Commission at Wellington, and which gave full details concerning the wool and its treatment up to the time it was placed in the captain's charge on board ship. To this statement a record of the temperatures of the bales every second day throughout the voyage has been added by the captain. From this record it will be seen that the heat in the wool has not been great, and that the temperature of the bales rose or fell in sympathy with the temperature of the hold.

Immediately on seeing the managers of the shipping company and receiving the record from Captain Forsdick I arranged a meeting of those concerned. I found very great interest taken in the test, and on Friday eighteen gentlemen, representatives of the Board of Trade, Lloyd's, the Salvage Association, Institute of London Underwriters, shipping companies, and others attended at the docks to see the bales opened and to examine the wool.

The managers of the shipping company were exceedingly kind, and, although so large a gathering was not expected, they provided luncheon for all, so saving loss of time to the busy London gentlemen.

On opening the bales the wool, with the exception of bales 1 and 2, which contained greasy wool, and felt damp, as greasy wool usually does, was found to be perfectly dry and caked very hard. All the bales were also quite cold. The staple in some of them was tender, but this was not nearly so prevalent as I could have expected from the treatment to which the wool had been subjected. In a few instances there was slight discolouration, but this also was less than anticipated.

So far as could be seen from the wool, there was nothing to be learned from the test as to the cause of fires. I have, however, taken samples of the wool, and these, in accordance with your instructions, are being submitted to analysts for examination and report. Mr. R. J. Friswell, Consulting Analytical Chemist, who reported to Messrs. Shaw, Savill, and Albion Company concerning the wool taken from the vessels at the time of the fires some months ago, was present, and has been asked to make a full report concerning the shipment. Professor Haldane also has been requested to undertake an examination of the samples and to make report. These reports will be forwarded to the Premier as soon as they are received from these experts.

It would appear from the record received from Captain Forsdick dealing with the wool prior to shipment that the wool had heated considerably within a short time of being wetted and pressed, and that within a fortnight after being dumped, it began to gradually cool. While I note from the advices supplied to you that the tubes that were inserted in the bales were intended merely to permit of the temperatures being recorded by thermometers placed in them, the opinion has been generally expressed by those who examined the bales that these tubes really acted as ventilators, and that, although they were plugged, they afforded means by which the internal heat of the wool was drawn off.

The following notes made by me give details regarding the various bales opened:—

No. 10. Slips; wool quite cold; perfectly dry; caked very hard; slightly discoloured; staple sound; highest temperature during voyage, 73°.

No. 6. Slips; wool quite cold; perfectly dry; caked very hard; not discoloured; staple sound; highest temperature during voyage, 72°.

No. 12. Slips; wool quite cold; perfectly dry; caked very hard; not discoloured; staple sound; highest temperature during voyage, 74°.

No. 8. Skin-pieces; quite cold; perfectly dry; caked very hard; discoloured; staple very tender; musty smell; mildew dust throughout; highest temperature during voyage, 75°.

No. 3. Scoured pieces; wool quite cold; perfectly dry; caked very hard; discoloured; staple very tender; musty smell; mildew dust throughout; highest temperature during voyage, 72°.

No. 1. Greasy pieces; wool quite cold; wet, but part of this considered to be attributable to grease; not discoloured; staple tender; highest temperature during voyage, 75°.

No. 16. Skins; quite cold; pelts slightly tender; staple of wool sound; not discoloured; highest temperature during voyage, 74°.

No. 2. Greasy fleece; wool quite cold; slightly wet, but this considered to be partly attributable to grease; slightly discoloured; staple tender; highest temperature during voyage, 72°.

Several copies of the record received from Captain Forsdick are being forwarded to the Premier by this mail.

I have arranged with Messrs. Charles Balme, wool-brokers, to offer the bales for sale at an early date, believing that in this way the depreciation in the value of the wool may be ascertained from the price realised for it.

H. C. CAMERON,

Produce Commissioner.

11th April, 1907.

The PRODUCE COMMISSIONER to Professor HALDANE.

Westminster Chambers, 13 Victoria Street, London, S.W.,

9th April, 1907.

DEAR SIR,—

With further reference to the fires on wool-ships, concerning which the High Commissioner had communication with you some months ago, I am directed to inform you that a test shipment of wool has been made by the Commission appointed by the New Zealand Government in the colony to investigate the cause of the outbreaks. Eight bales of wool of various descriptions were selected and damped, with varying percentages of moisture, and then dumped. After being held in the colony under conditions as nearly similar as possible to those in a ship's hold, and the temperatures noted, the bales were shipped in the s.s. "Orari" to the High Commissioner.

In each bale a tube was inserted in which thermometers were placed, and the captain of the vessel took the temperatures, and recorded them in a log which he kept.

The report of the tests, in tabulated form, I now enclose for you.

On Friday last, in the presence of representatives of the Board of Trade, Lloyd's, the Underwriters' Association, and others the bales were opened. So far as could be seen from the wool there was nothing gained from the test. Samples have, however, been taken of the wool from the several bales, and I shall be pleased, if you think it desirable, to supply you with portions of each, in order that they may be analysed and reported upon by you. Something might be discovered that, in the ordinary course, was not observable that would help to elucidate the cause of the fires. In any case, you might be able to suggest some further test that might be undertaken. The Government are desirous that the Commission should receive suggestions from those interested at this end, and any tests proposed will be duly carried out.

I shall be glad to hear from you in regard to this matter at your earliest convenience.

I am, &c.,

H. C. CAMERON, Produce Commissioner.

Professor J. S. Haldane, F.R.S., 4 St. Margaret's Road, Oxford.

The PRODUCE COMMISSIONER to Messrs. TURNBULL AND Co.

DEAR SIR,—

9th April, 1907.

I have heard from Mr. McKenzie, of the Bank of New Zealand, that you are interested in the question of fire on wool-ships, and that you some months ago had a portion of the wool, out of the vessels from New Zealand that took fire, analysed and reported on by Dr. Voelcker.

I regret that I was not aware of this sooner, as had I known I should have brought under your notice a test made by the Commission appointed by the New Zealand Government in the colony to investigate the cause of the outbreaks. Eight bales of wool of various descriptions were selected by the Commission, which were damped with varying percentages of moisture, and then dumped. After being held in the colony under conditions as nearly similar as possible to those in a ship's hold, and the temperatures noted, the bales were shipped in the s.s. "Orari" to the High Commissioner. In each bale a tube was inserted in which thermometers were placed, and the captain of the vessel took the temperatures, and recorded them in a log which he kept.

The report of the tests, in tabulated form, I now enclose for you.

On Friday last, in the presence of representatives of the Board of Trade, Lloyd's, the Underwriters' Association, and others, I opened the bales, and I only regret that, not knowing of your interest in the matter, I had not given you notice so that you could have been present. So far as could be seen from the wool, there was nothing to be gained from the test. I have, however, taken samples of the wool from the several bales, and I shall be glad, if you think it desirable, to supply you with portions of each lot, in order that they may be submitted by you to Dr. Voelcker, who might analyse and report on them. He might discover something not observable in the ordinary course that would help to elucidate the cause of the fire. In any case, he might be able to suggest some further tests that might be undertaken to help to clear the matter. The Government are desirous that the Commission should receive suggestions, and any tests that may be proposed by those interested at this end will be duly carried out.

I shall be glad to hear from you in regard to this matter at your earliest convenience.

Yours, &c.,

H. C. CAMERON, Produce Commissioner.

Messrs. R. T. Turnbull and Co., 4 Lloyd's Avenue, E.C.

The HIGH COMMISSIONER to the Hon. the PREMIER.

SIR,—

19th April, 1907.

Fire on Wool-ships.

Referring to my memorandum of 12 instant (No. 1350), concerning the shipment of 8 bales of wool made for experimental purposes by the Commission appointed to inquire into the cause of fires on wool-ships, I now beg to forward herewith reports made to me concerning the shipment by Mr. R. J. Friswell, F.I.C., and Professor Haldane, which may be of interest to the Commission.

Samples of the several wools, taken from each of the bales except that containing sheep-skins, were forwarded by me to you in the mail-box sent by the s.s. "Rimutaka," which sailed for the colony yesterday.

I have, &c.,

W. P. REEVES.

SIR,—

Laboratory, 43-45, Great Tower Street, London, E.C., 16th April, 1907.

At your request I attended at the Victoria Dock, London, E., on the 5th April instant, to examine a number of bales of wool shipped to London by order of the Wool Fires Royal Commission, New Zealand.

I found these lying under cover on wharf, and they were immediately opened, closely examined, and samples taken for further examination.

One bale I found consisted of the actual skins, packed with the wool on, after folding double. As this could have no bearing on the question, I do not propose to deal further with it, beyond stating that the skins were hard, cracked when sharply bent, and had evidently been somewhat heated, as was proved by the brittleness of the skin. The remainder of the bales were numbered as follows: 1, 3, 6, 8, 10, 12, 22.

A series of experiments had been carried out in New Zealand under instructions of the Royal Commission by Mr. S. V. Burrige, and I have a copy of his report now before me dealing with bales numbered 1, 2, 3, 4, 5, 6, 7, 8, 9, 11, 13, 14, 16.

It will be noted that those numbered 1, 3, 6, and 8 appear in both lists. I am not aware whether they are the same bales repacked after examination in New Zealand, and assume that they are not, as evidently the value of the evidence from these 4 bales would be very small if they had been so treated.

I have also before me a list of the bales shipped, together with particulars thereof and of the treatment—viz., moisture added, and of the temperatures obtained by thermometers suspended in closed-ended iron tubes 18 in. long driven into the bale so as to reach to the centre. The thermometers were suspended by a small ring and cord to the under-side of corks with which the outer ends of the tubes were closed. The tubes projected about $\frac{3}{4}$ in. outside the bale. The thermometers were read by removing the cork and drawing up the thermometer.

The bales lay on top of the cargo just beneath one of the hatches, and the captain from time to time had the hatch opened and read the thermometer of each bale.

Appearance on Cutting open the Bales.—When opened the bales did not show any very abnormal appearance, except in Nos. 1, 3, 8, and 22. Of these, 1 and 22 were brown and had a strong smell, somewhat like that of some samples from fired bales taken for me from s.s. "Gothic," but very much less pronounced in character. No. 3 was greenish-grey in general appearance, and had a very strong odour of fungus, mould, or mildew. No. 8 was somewhat similar, but had a smell very like that of mouldy hay, and very strongly pronounced.

Microscopic Examination.—On removing the samples to my laboratory and submitting them to a microscopic examination, the following notes were made:—

No. 1: Many of fibres brown; scorched smell still obvious. Fibres fairly strong, but they show effect of heat as the scales are obscured to some extent.

No. 3: Very foul and dirty; dung present; mouldy smell; greenish-grey look; spores of fungi attached to the fibres. Fibres normal; no heat effect observed.

No. 6: Clean. Fibres normal. No heat effect.

No. 8: Very foul, dung and grit, sands, seeds, and other dirt present. Fibres normal, even where they looked as though scorched.

No. 10: Exactly as 6. Fibres normal. No heat effect.

No. 12: Exactly the same as Nos. 6 and 10; clean. Fibres normal. No heat effect.

No. 22: Brown, scorched smell. Fibres tender, and the browner ones have lost much of the scale and have swollen.

In no case, not even in 22, did the injury approach that of fibres removed from bales or parts of bales from s.s. "Gothic." This is not to be wondered at, as the highest temperature recorded as reached in the model hold at Wellington, New Zealand, in any of the bales is 140° Fahr., as shown by the thermometer; but I am prepared to show that this is not a fair statement of the fact, for, as I have pointed out in at least two cases (Nos. 1 and 22) conspicuous effects of heat are observed. It is well known that wool is not materially tendered or spoiled by a temperature of 212° Fahr.—viz., that of boiling water—and my own experiments show that the tendering and microscopic changes in the fibre require a temperature of about 390° Fahr.

It is obvious therefore that the recorded maximum temperature of 140° in bale 10 or its counterpart while in the model hold does not represent the true temperature reached in those parts of a bale where the fibre was rendered tender. In those parts I am of opinion that it reached a temperature exceeding 300° Fahr.

I cannot, therefore, consider the method used in these experiments a good one, and would suggest, if consulted, a different method of carrying on the experiments and ascertaining the temperatures.

The Observations during the Voyage.—The observations made by Captain Forsdick during the voyage have been carefully made, and so far as they go no doubt exhibit the average temperature of the bales. I have made curves of the ship's hold temperatures and plotted an integration curve of the temperatures of bales 1, 8, and 10 on the same, and I find that the latter closely follows the former and differs but little from it, lagging behind in changes either up or down as might be expected. It is therefore evident that all chemical change had ceased before the bales were shipped, or else that the thorough exposure to air on every side but the bottom so cooled the bales as to prevent the changes from continuing.

Criticism of the Experiments.—I do not think that any further result can be achieved in the manner attempted, if the result desired is to cause the actual attainment of a fire temperature. In my opinion this could only be reached in a bale very carefully secured from all loss of heat by radiation and ventilation. I doubt whether even making the bale the centre one of a cubical block of 9 bales so that it would be surrounded by at least 1 bale on every side would answer.

In another direction, however, the experiment has been extremely useful. In my report to the owners of the s.s. "Gothic" I considered the probable action of fungoid growths as likely to generate heat. I was, however, met by the fact that the samples from the ship proved nearly

sterile, so that though I carried on the experiments for weeks, and infected the experimental cultivation with actively growing moulds derived from a butter cargo, I could only get the organisms to develop very slowly. I was therefore compelled to hold this method of firing as doubtful.

But bales 3 and 8 have proved beyond doubt the validity of this hypothesis. I have no doubt whatever that these would have fired if the heat had not rapidly escaped, and that the fungus would, as in the case of haystacks, have been the cause.

Another most interesting point is the fact that the oxidation of the grease by air and moisture (to which I attributed the fires on the s.s. "Gothic") is proved by these experiments. I have extracted the grease from Nos. 6 and 12, and have found it oxidized and rubber or varnish like in character. This is the more satisfactory, as the fired samples from the "Gothic" were too much injured for examination. The sample from which I extracted the grease was uninjured. The grease was consequently soft, and at ordinary temperatures took some months to pass into the condition of varnish.

Another important point determined by Mr. Burrige is connected with both of the two methods by which firing may occur. In the case of heating due to the growth of fungus, the plants during their life resolve the vegetable or animal matter on which they live into carbonic acid and water. There is consequently a considerable loss of weight due to these actions.

In the case of heating due to oil or grease oxidation there is, however, a very marked increase in weight, due to the oxidized oil retaining the oxygen it has absorbed.

Both these cases are illustrated, bales 1, 2, 3, 10 increasing, and 6, 8, 12 decreasing, and it may be inferred that in the former the fungus was the predominant factor and in the latter the oil oxidation.

Having thus thoroughly considered and discussed these experiments, I am of opinion—

1. That the effect of moisture in setting up heating in wool is amply demonstrated, and that better conditions only were required to cause actual firing, or, at any rate, carbonisation.

2. That the possibility of fungoid growths acting in this way, which was very obscure in the case of the "Gothic," is fully proved.

3. That the oxidation of the grease is proved by the discovery of oxidized grease actually now existing in bales 6 and 12.

4. That both causes may act concurrently, but that one or the other predominates, as is proved by some bales losing and some gaining weight.

5. That the observed thermometer readings do not represent actual temperatures reached in the bales; such temperatures were considerably higher.

6. That it is proved that wetted wool in any form is likely to fire, and that the placing of any such cargo in the hold of a ship or in a warehouse insufficiently ventilated should be absolutely prohibited.

7. That as a standard of moisture a maximum of 10 per cent. on the weight of the wool as total loss on drying at 212° Fahr. should on no account be exceeded, and that it is desirable to reduce this as much as is feasible. Possibly in the drier climate of New Zealand a maximum moisture of 8 per cent. could easily be secured.

I am, &c.,

R. J. FRISWELL.

The High Commissioner of New Zealand.

DEAR SIR,—

Sennen Cove, Land's End, 12th April, 1907.

I am away from home for a few days just now, and only received your letter last night.

The results of the tests quoted in your letter are, I think, very instructive. They seem to me to point to this: that the rise in temperature of the bales was due to some substance (probably an oil) capable of combining with oxygen at comparatively low temperature and so producing heat: that the amount of this substance is very small, since the process practically came to an end after about a fortnight, and that more or less of this substance was present in all the bales tested.

Had the bales been stored in greater bulk at Wellington they would probably have fired, just as certain qualities of coal do when stored in sufficient bulk, the flow of air through and over large masses of the material being insufficient to carry off the heat produced by the slow oxidation process.

I should think that the wool could be rendered safe for shipment if it were subjected to a preliminary warming for a few days in a warehouse, with air-spaces between the bales at a temperature of about 120°. The oxidizable material would in this way be safely destroyed, as appears to have been the case with the bales experimented on.

As regards further tests, I hardly think that anything is to be gained at present by analysis of the bales experimented on. Much more valuable results would be obtained by taking wool which had never been heated, and determining the rate of absorption of oxygen at various temperatures, varying percentages of moisture, and varying periods after heating had been started. In this way it would be possible to get at the root of the whole matter with a minimum of trouble and expense, and to suggest tests on a large scale as to the best means of securing safety from fire.

I am at present so much occupied with work for our Government, as well as with my ordinary work at Oxford, that I have no spare time to devote to this question, but should you contemplate having experiments made on the lines I have suggested, I think I could arrange to have them done in London at 66 Victoria Street (the laboratory of the Metropolitan Gas Referees) by our chemist, Mr. W. J. A. Butterfield, F.I.C., who is thoroughly familiar with the necessary methods, and whom I constantly see, and would gladly advise as to details.

Yours, &c.,

J. S. HALDANE.

H. C. Cameron, Esq.

WOOL EXPERIMENTS.
TEMPERATURES WHILE IN MODEL HOLD AT WELLINGTON.

No.	Description.	Condition of Contents.	Moisture added.	Dec. 10.	Dec. 11.	Dec. 12.	Dec. 13.	Dec. 14.	Dec. 15.	Dec. 17.	Dec. 18.	Dec. 20.	Dec. 24.	Dec. 26.	Dec. 29.	Jan. 2.	Jan. 5.	Jan. 10.	Jan. 16.
10	B. & P. slipe	Slipe wool mixed with painted pieces, with lime showing in pieces	20	Deg. 120	Deg. 123	Deg. 138	Deg. 132	Deg. 135	Deg. 130	Deg. 140	Deg. 140	Deg. 135	Deg. 100	Deg. 100	Deg. 90	Deg. 80	Deg. 79	Deg. 80	Deg. 82
6	Slipe C	Slipe skin-wool removed off skin by depilatory, what is known as "painted"	24	70	75	85	91	99	100	110	110	120	100	100	110	100	100	100	90
12	Slipe C	Slipe Lincoln, painted, extra moisture	24	75	85	85	85	110	112	110	110	110	100	100	100	84	81	80	82
8	Skin pieces	Skin pieces, sweated, increased moisture	22	140	140	140	140	140	130	130	110	108	90	90	85	89	84	85	94
3	Scoured pieces	Scoured pieces and crutchings with vegetation and small particles of broken dags; similar in condition to ordinary country shipping lots; increased moisture	24	120	130	125	130	130	120	100	105	98	80	82	80	80	80	80	82
1	Greasy pieces	Greasy pieces	15	70	80	80	80	100	100	110	110	110	100	90	90	80	80	82	84
16	Skins	Damp sheep-skins with plenty of fat on	Damp	120	120	120	121	120	125	125	125	115	110	98	100	94	90	88	84
2	Fleece	Greasy fleece, low moisture	18	70	90	108	110	120	115	110	110	110	100	90	90	84	80	82	87

TEMPERATURES ON BOARD SHIP.

No.	Weight before Moisture added.	Moisture added	Weight after Test.	Loss or Gain.	Feb. 7.	Feb. 9.	Feb. 11.	Feb. 13.	Feb. 17.	Feb. 20.	Feb. 23.	Feb. 25.	Feb. 27.	Mar. 1.	Mar. 3.	Mar. 7.	Mar. 9.	Mar. 11.	Mar. 13.	Mar. 15.	Mar. 17.	Mar. 19.	Mar. 20.	Mar. 23.	Mar. 25.
10	Lb. 355	Per Cent. 20=71	Lb. 437	11 gain	Deg. 66	Deg. 61	Deg. 57	Deg. 56	Deg. 49	Deg. 48	Deg. 48	Deg. 48	Deg. 52	Deg. 52	Deg. 64	Deg. 71	Deg. 72	Deg. 73	Deg. 73	Deg. 72	Deg. 70	Deg. 68	Deg. 64	Deg. 63	Deg. 60
6	399	24=95.76	433	61.76 loss	64	*	*	*	*	*	*	†	54	60	64	70	72	72	72	71	69	67	64	62	59
12	329	24=78.96	420	12.04 loss	64	62	53	55	50	48	48	49	54	60	66	71	73	73	74	72	70	69	67	65	60
8	370	22=81.40	365	86.40 loss	66	63	58	58	50	48	48	49	52	59	65	73	74	75	75	74	74	70	67	64	60
3	278	24=66.72	357	12.28 gain	65	61	56	53	48	47	48	48	50	60	65	70	71	72	72	70	67	66	63	60	56
1	456	15=68.40	537	12.60 gain	66	64	60	56	51	50	48	49	52	59	64	71	74	74	75	74	73	72	72	66	62
16	..	..	..	..	70	64	61	58	52	50	50	50	52	58	61	70	72	73	74	72	71	70	66	65	62
2	276	18=49.68	361	35.32 gain	68	64	58	55	50	48	49	49	52	58	64	71	72	72	72	72	68	68	64	62	58

Date.				Air on Deck.		Temp. of Hold.		Date.				Air on Deck.		Temp. of Hold.	
February	7	..	..	Deg.	Deg.	Deg.	Deg.	March	7	..	..	Deg.	Deg.	Deg.	Deg.
"	9	..	..	55	65	55	64	"	9	..	..	79	81	79	81
"	11	..	..	55	64	55	64	"	11	..	..	81	90	81	90
"	13	..	..	44	60	44	60	"	13	..	..	78	82	78	82
"	17	..	..	46	52	46	52	"	15	..	..	74	81	74	81
"	20	..	..	43	49	43	49	"	17	..	..	68	81	68	81
"	23	..	..	45	50	45	50	"	19	..	..	63	70	63	70
"	25	..	..	49	54	49	54	"	20	..	..	61	68	61	68
"	27	..	..	53	56	53	56	"	23	..	..	56	63	56	63
March	1	..	..	75	78	75	78	"	25	..	..	52	58	52	58
"	3	..	..	74	81	74	81	"		..	..	43	52	43	52

* Tube bent and thermometer broken.

† Tube replaced.

Westminster Chambers, 13 Victoria Street, London, S.W., 9th May, 1907.

SIR,—

Fires on Wool-ships.

With reference to the inquiry that has been recently made into the cause of fires on wool-ships, I beg to attach hereto copies of letters received from the managers of the New Zealand Shipping Company (Limited) that may be of interest.

From the letters it would appear that great carelessness has been shown during loading of the cargo in the colony, and possibly you may consider it advisable to cause strict inquiry to be made into the matter at the ports of shipment referred to.

The Hon. the Premier, Wellington.

I have, &c.,

W. P. REEVES.

SIR,—

138 Leadenhall Street, London, E.C., 26th April, 1907.

In connection with the inquiry which your Government is holding into the origin of recent fires amongst wool cargoes, we send you copy of a letter from our superintendent of discharge regarding the unloading of the s.s. "Whakatane," from which you will note that wax vestas have been found scattered over a considerable area between tiers of wool in that steamer. Matches have also been found among the wool in our s.s. "Wakanui," and when we receive report from Captain Parsons, of that steamer, we will forward copy to you. In one case the matches apparently got where they did when loading at the Bluff, and the other at Gisborne.

We shall be pleased to give you any further information on the subject you may require, and meantime we are writing to our colony office, suggesting that they should consider what steps can be taken to prevent stevedores going on board with matches of any description.

Yours, &c.,

THE NEW ZEALAND SHIPPING COMPANY (LIMITED).
(C. J. COWAN, Joint Manager.)

The High Commissioner for New Zealand, 13 Victoria Street, S.W.

New Zealand Shipping Company (Limited),

GENTLEMEN,—

"A" Jetty, Victoria Dock, E., 26th April, 1907

During the discharge of the s.s. "Wakanui," half-way down the No. 1 lower hold, between tiers of wool, several New-Zealand-made matches were found scattered over an area of 20 to 30 sq. ft. During the discharge of the s.s. "Whakatane," the previous ship, half-way down her No. 1 lower hold, between bales of flax, we also came across matches, scattered over an area of about 40 sq. ft., and a part of a box.

At first it looked as if they had been put there by design, but on looking into the matter, I find in the case of the "Whakatane" the matches must have got there when loading at the Bluff, whereas with the "Wakanui" the matches were found amongst Gisborne wool.

I am forwarding the matches to you, showing the dangerous type of matches they are, and it is a miracle that none of the flax or wool did not catch fire.

Yours, &c.,

The Joint Managers.

G. H. NOAKES.

SIR,—

138 Leadenhall Street, London, 27th April, 1907.

With reference to our letter of yesterday's date, regarding the discovery of wax vestas amongst the wool on board our s.s. "Wakanui," we now enclose copy of letter from Captain Parsons, of that steamer, which was referred to therein.

Yours, &c.,

C. J. COWAN, Joint Manager.

The High Commissioner for New Zealand, 13 Victoria Street, Westminster, S.W.

New Zealand Shipping Company's Steamship "Wakanui,"

GENTLEMEN,—

Albert Dock, 26th April, 1907.

I beg to inform you that while discharging No. 1 hold a number (about twenty) of wax matches were found under about six bales of wool. The whole of the wool in that hold was shipped at Napier. These matches, in my opinion, could easily have fired the ship had they come into contact with the iron bands of the wool, or even with the friction of the bales caused by the spring of the ship. I may mention that one match fired while turning over the bales, and was put out.

I am, &c.,

V. C. WHITE PARSONS.

The Joint Managers, New Zealand Shipping Company (Limited).

Westminster Chambers, 13 Victoria Street, London, S.W., 30th May, 1907.

SIR,—

Fires on Wool-ships.

Referring to my previous letters of 12th and 19th April, concerning the shipment of eight bales of wool made for experimental purposes by the Commission appointed to inquire into the cause of fires on wool-ships, I now beg to forward herewith a report on the wool made by Dr. Voelcker to Messrs. R. T. Turnbull and Co.

Dr. Voelcker, at the request of Messrs. Turnbull and Co., examined the bales when in the warehouse, where they had been placed for inspection prior to sale by Messrs. Charles Balme and Co., under my instructions, as notified in my letter of the 12th April. He took samples of the wool then.

No doubt Dr. Voelcker's report will be of interest to the Commission. If it should be decided to have the report published, I trust that care may be taken that a due acknowledgment is paid to Dr. Voelcker for it, as requested by Messrs. R. T. Turnbull and Co. in their letter forwarding the report. A copy of this letter I also enclose.

The Hon. the Premier, Wellington, New Zealand.

I have, &c.,

W. P. REEVES.

DEAR MR. CAMERON,—

4 Lloyd's Avenue, London, E.C., 25th May, 1907.

As promised, I have now the pleasure of enclosing copy of Dr. Voelcker's report on the wool which was experimented upon at Wellington, the bales of which were sold by Messrs. Charles Balme and Co. on the 16th instant.

In sending you this I expect that the same will be published in New Zealand, and you will no doubt see that a due acknowledgment is paid to Dr. J. A. Voelcker for his interesting report so kindly given to me in the interests of the wool industry of New Zealand.

I am, &c.,

R. T. TURNBULL AND CO.

H. C. Cameron, Esq., Produce Commissioner for New Zealand,
13 Victoria Street, S.W.

R. T. Turnbull and Co., 4 Lloyd's Avenue, 25th May, 1907.

REPORT RECEIVED FROM DR. J. A. VOELCKER ON NEW ZEALAND WOOL BY MESSRS. R. T. TURNBULL AND CO.

You will remember the two samples of wool that I took away with me from the docks—the one of the “experimented-on” wool, the other of the natural. Though the former (it was No. 391, greasy fleece, and to which 18 per cent. of water had been added in the experiment) had been damped originally, I was inclined to question whether, when I took the samples, there was much difference in the relative percentages of moisture. I accordingly determined the moisture per cent. in the two lots when I returned to my laboratory, and find these to be—Damped sample, No. 391, 13·90; natural sample, 13·85. Thus, you see, there is nothing to choose between them in respect of moisture as they are now.

On the general question of the “experiments” conducted on the other side, I have pointed out to you the weak points of these, the main of which are—

- (1.) That there were no samples taken, or actual moisture-determinations made, in the wool experimented on:
- (2.) That the preliminary storing in model hold from the 10th December to the 16th January was not under such conditions as would rule in the case of wool not properly dried, and put straight into the hold of a vessel:
- (3.) That by the time the experimented-on wools were put into the vessel's hold the “heating-up” (as shown by the tables supplied) had passed off; in almost all cases the moisture had been driven off (as confirmed by my test now communicated); and there was no reason really why they should suffer damage in the ship's hold subsequently.

J. AUGUSTUS VOELCKER.

Approximate Cost of Paper.—Preparation, not given; printing (1,650 copies), £5 19s.

By Authority: JOHN MACKAY, Government Printer, Wellington.—1907.

Price 6d.]

The first part of the paper is devoted to a discussion of the general principles of the theory of the structure of the atom. It is shown that the structure of the atom is determined by the laws of quantum mechanics, which are based on the principle of the uncertainty of the position and momentum of the particles.

The second part of the paper is devoted to a discussion of the structure of the nucleus. It is shown that the structure of the nucleus is determined by the laws of quantum mechanics, which are based on the principle of the uncertainty of the position and momentum of the particles.

The third part of the paper is devoted to a discussion of the structure of the molecule. It is shown that the structure of the molecule is determined by the laws of quantum mechanics, which are based on the principle of the uncertainty of the position and momentum of the particles.

The fourth part of the paper is devoted to a discussion of the structure of the crystal. It is shown that the structure of the crystal is determined by the laws of quantum mechanics, which are based on the principle of the uncertainty of the position and momentum of the particles.

The fifth part of the paper is devoted to a discussion of the structure of the solid. It is shown that the structure of the solid is determined by the laws of quantum mechanics, which are based on the principle of the uncertainty of the position and momentum of the particles.

The sixth part of the paper is devoted to a discussion of the structure of the liquid. It is shown that the structure of the liquid is determined by the laws of quantum mechanics, which are based on the principle of the uncertainty of the position and momentum of the particles.

The seventh part of the paper is devoted to a discussion of the structure of the gas. It is shown that the structure of the gas is determined by the laws of quantum mechanics, which are based on the principle of the uncertainty of the position and momentum of the particles.

The eighth part of the paper is devoted to a discussion of the structure of the plasma. It is shown that the structure of the plasma is determined by the laws of quantum mechanics, which are based on the principle of the uncertainty of the position and momentum of the particles.

The ninth part of the paper is devoted to a discussion of the structure of the universe. It is shown that the structure of the universe is determined by the laws of quantum mechanics, which are based on the principle of the uncertainty of the position and momentum of the particles.