in the manufacture of the Turkey-red oil, but only to a small extent, whilst on the other hand, olive and cotton-seed oil are much more affected. The average density of the various acids taken by the Westphal balance at 98° C. are:—

Nature of Oil.	Specific Gravity at 98° C.
Castor oil acids	892.0
Olive oil acids	851.0
Cotton oil acids	872.0

The point of congelation of the fatty acids is often very useful. The fatty acids of Turkey-red oil from castor oil do not deposit any, or the merest traces, of solids at 15.5° C. Olive oil and, still more, cotton-seed oil acids deposit much solid matter at the above temperature. The melting point of the acids from olive oil and cotton-seed oil as determined by the capillary tube pressure method are—

	° C.
Melting point of cotton-seed oil acids	44
Melting point of olive oil acids	40

The combining weights of the fatty acids are too near one another to be of any service whatever. Thus we have—

Nature of Oil.	Mgms. of KHO per 1 grm. of Fatty Acid.
Castor oil	180—184
Olive oil	173—176
Cotton oil	171—175

The iodine value is also very variable, and besides being dependent on the age, &c. of the oil used, is liable to considerable fluctuations, by the method of preparing the Turkey-red oil, especially on the amount of vitriol used. On this account it is not to be strongly recommended.

The method on which the most reliance is to be placed is undoubtedly the acetyl value. I may remind members who may not be acquainted with this process that it consists of the introduction of acetyl groups into the substance and subsequent elimination by saponification, and estimation of the alkali required for this removal. It is, notwithstanding the remarks of Lewkowitsh, a most valuable process, and is certainly a very valuable addition to our methods of examining oils and fats. The process is worked as follows: The dry fatty matter is heated to boiling for one and a half hours under a reflux (dry) condenser with four-fifths of its weight of dry acetic anhydride, and the acetylated acid washed with hot water till the wash-water is neutral to delicate litmus paper, when the fatty matter can be dried as quickly as possible. A weighed quantity of about 2.5 grms. is then titrated in alcoholic solution quite cold with semi-normal alcoholic potash, and the amount noted. A further quantity of alcoholic potash about 1½ times more than the first quantity is added, and the flask kept 30 minutes on the water-bath with a long tube attached. After this time the residual alkali is estimated by semi-normal hydric chloride. Phenolphthalein is used as indicator in both cases. The alkali used in the first instance is calculated to milligrammes per 1 grm. of fat, and is termed the acid value. The total alkali is calculated in the same way and is termed the saponification value, the difference between the two is the acetyl value.

The three chief oils for Turkey-red oil manufacture show when thus tested:—

Nature of Oil.	Acid Value.	Saponification Value.	Acetyl Value.
Castor oil	130.7	201.7	155
Olive oil	170.0	200.0	30
Cotton-seed oil	189.5	210.5	21

Owing to the interactions between the glycerides and the vitriol in the manufacture of the Turkey-red oils the differences are not so apparent. The following table shows the results to be expected:—

Nature of Turkey-red Oil.	Acid Value.	Saponification Value.	Acetyl Value.
Castor oil, maximum	144.0	237.4	143.4
Castor oil, minimum	119.2	287.9	138.7
Olive oil	158.7	205.0	106.3
Cotton-seed oil	179.0	232.0	53.0

The determination of the iodine value before and after acetylation, affords a check on the latter determination. Useful information is also afforded by a determination of the solidifying and melting point before and after acetylation. If mineral or rosin oil were present they would of course be separated and estimated in the usual manner.

SOME FURTHER NOTES ON NITROGEN IN COAL-GAS.

BY GEORGE E. DAVIS.

FOLLOWING the reading of a paper at the last meeting of this Section, by Mr. C. H. New, on the determination of nitrogen in coal-gas, a discussion occurred in which some doubts were expressed as to whether such a large amount of nitrogen as 14 per cent. could possibly exist in a gas supply, seeing that Professor Vivian Lewes had examined a sample of London coal-gas which contained less than 1 per cent. of nitrogen. It was also pointed out by Mr. Stenhouse that if 15 per cent. of nitrogen were present due to the pumping in of air, there should be at least 2 per cent. of free oxygen, the presence of which the reader of the paper had not recorded. I saw that the argument used by Mr. Stenhouse would at once prove the accuracy or otherwise of Mr. New's results, and on Saturday, May 7th, the day after the reading of the paper, I decided to make an examination of the gas for oxygen, nitrogen, and illuminating power, concurrently. At 10 a.m., and when it might be supposed that the night gas lay dormant in the pipes, I found the gas contained 1.1 per cent. of oxygen, and its illuminating power 15.6 candles. At 12.30, after the gas had been burning the whole interval in the laboratory, tests were again made, with the following results:—

	Per Cent.
Oxygen	2.1
Nitrogen	13.9
Illuminating power	13.6 candles.

I think this shows clearly enough that there is a difference between the night gas and the day gas, and that the difference in illuminating power is chiefly due to oxygen and nitrogen. Why this is so I do not pretend to explain. I have made some further tests with reference to the percentage of nitrogen. The day tests on the 18th instant were 8.28 per cent. of nitrogen with 1.08 per cent. of oxygen. On the 23rd the day gas contained 8.67 per cent. of nitrogen. The night tests contained less nitrogen. On the 16th, taken at 8 p.m., the percentage of nitrogen was 7.3; on the 17th it was 7.4, with 1.5 per cent. of oxygen; on the 19th, at 7.30 p.m., it contained 5.6 per cent. of nitrogen; on the 20th, at 10.30 p.m., it contained 7.4 per cent. of nitrogen; and on the 22nd, at 8 p.m., it contained 7.75 per cent. Between the 16th and 23rd the illuminating power varied from 13.2 candles in the daytime to 15.6 candles at night.

Compared with Professor Vivian Lewes' figures of the London gas, we appear to have a very different mixture in Salford, and the low illuminating power as recorded upon our photometer is clearly explained. How this nitrogen and oxygen gets into the gas is a matter I

have not considered, and these facts seems to be borne out by some further figures from Professor Lewes. He finds that 100 volumes of gas require about 230 volumes of either air or nitrogen to reduce its luminosity to nil, a quantity which certainly does not agree with the earlier notions of gas engineers. In the Salford gas there exists at the utmost 14 volumes, and, as a general thing, 7 to 8 volumes, which is about the proportion necessary to reduce the illuminating power from 18 to 14 candles, if reckoned as a diluent, combined with a certain amount of light-destroying power. Hunter, in his lecture at Salford (published by J. and E. Cornish, Manchester) in 1878 states (p. 32) that 10 per cent. of air added to 25-candle gas reduced its illuminating power to 8.25 candles. Under extraordinary conditions this might be so, but I think I have shown that it is possible to have 14 per cent. of nitrogen and 2 per cent. of oxygen in 14-candle gas.

DISCUSSION.

Mr. STENHOUSE (Rochdale) said that after hearing Mr. Davis's and Mr. New's papers read at the last meeting, he had obtained two samples of gas from Blackfriars Street, and very carefully determined the amount of oxygen, finding 0.6 per cent. in each sample. If there were oxygen in the gas there must be air present, and there could not be a large quantity of nitrogen in the gas without there being a corresponding quantity of oxygen. Such a large percentage of nitrogen was very remarkable, especially from Salford gas, where it was very carefully made and where there would be no means of air rushing in without its being known. If they did pass air in they would only use just sufficient to revivify the purifiers, whether oxide of iron or lime were used; and with that end in view it would be folly to add more than four or five per cent. altogether, because half a per cent. of air could not possibly be taken up by partly fouled oxide. It might be said that they made a very good gas at Salford, and then reduced its illuminating power by passing air into it, but that would be a very expensive process, and if Mr. Davis's figures were correct, of which there could be scarcely any doubt, it would appear that a large quantity of air was being passed into the gas. Mr. Davis appeared to have found a large quantity of nitrogen in the morning. It was difficult to understand why there should be more in the morning than at night, for if they had to pass air in it would be in regular quantities, and it would be impossible to say into which holder it had passed.

Mr. DUNCAN asked if the nitrogen might have got there by diffusion?

Mr. CARPENTER said that he remembered it once being suggested that every gas manufacturer who proposed to put air in his gas should carefully measure it, but it was quite possible that air might get into the gas through cracked retorts.

Mr. STENHOUSE: That would be an isolated case; whereas Mr. Davis had quoted many instances.

Mr. CRIPPIN: I said that undoubtedly there were certain periods when gas contained large quantities of air, but how the air got there he could not say, unless it was through cracked retorts. He had just heard evidence given before a Parliamentary Committee with regard to the Eccles and Swinton districts which verified the fact.

Mr. DAVIS, in reply, said that he could not see why it would be foolish to put air into gas, so long as the consumers were prepared to accept a mixture of gas and air. It was an undoubted fact that gas had a low illuminating power at certain times of the day; and it was also undoubted that the tests proved the presence of air, but whether it got there by diffusion through the pipes or joints as suggested, by Mr. Duncan, he was not prepared to say.

Nottingham Section.

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Hon. Local Secretary:

R. L. Whiteley, University College, Nottingham.

The names in italics are those of members of Committee who retire at the end of the current Session.

The following have been elected to fill the vacancies, and will take office in July next:—*Vice-Chairman*: F. Clowes. *Committee*: F. J. R. Canilla, F. D. Mordle, and G. J. Ward.

SESSION 1892.

Notices of Papers and Communications for the Meetings to be sent to the Local Secretary.

Meeting held Wednesday, 25th May 1892.

MR. L. ARCHBUTT IN THE CHAIR.

ON THE MANUFACTURE OF PORTLAND CEMENT FROM ALKALI WASTE AFTER TREATMENT BY THE CHANCE SULPHUR RECOVERY PROCESS.

BY CHARLES SPACKMAN.

THE accumulations of waste from the manufacture of soda by the Leblanc process have long been a source of unceasing trouble and expense to the manufacturers, and the proposal to make use of this waste as the lime constituent of Portland cement is not new. In a book on Portland cement by H. Reid, published in 1877, reference is made to experiments carried out at St. Helens some years previously with a view to its utilisation for this purpose, which were not successful, as the sulphate of lime interfered with the production of a perfectly hydraulic cement.

A paper describing his process for the manufacture of cement from alkali waste was read before the Liverpool Section of this Society by J. S. Rigby (this Journal, 7, 301), in which the author states that his attempts to produce cement with the unpurified waste were unsuccessful.

"It produced a cement of a very uncertain quality; when made into briquettes and placed in water they frequently crumbled away, or if they held together at all a very slight strain caused them to break. The cement had also an unpleasant slippery feel with it when taken from the water; it also evolved sulphuretted hydrogen when treated with an acid." Cement of good quality was, however, obtained by purifying the waste. This was said to be accomplished by passing carbon dioxide obtained from the calcination of a previous kiln of cement through the semi-liquid waste, either before or after it had been mixed with the required quantity of clay.

A second paper, by the same author (this Journal, 9, 254), considers the action of calcium sulphate on cement, and describes a continuous process of calcination.

In Mr. Chance's paper describing his sulphur recovery process, three analyses of the waste after treatment by this process are given (this Journal, 7, 162), and reference is made to the possibility of utilising it for the manufacture of cement. In this paper I propose to briefly consider this subject, and to give the result of an actual experiment.