

three poor ('magere') coals, that is, geologically old Westphalian coals, with a coke content of 82 per cent.—at the same time the yellow hydrocarbon, crackene, was isolated—and it may well be supposed that the coal employed by Messrs. Morgan and Pratt displays a similar character. That  $\beta$ -methylanthracene is indeed concerned, I have already proved in a similar manner to Morgan and Pratt by the oxidation product of the hydrocarbon. More recently I have arrived at this proof by another way (*Berichte der Deutschen Chemischen Gesellschaft*, 59, 2812; 1926),<sup>1</sup> which, however, leads to the same result, namely, the preparation of a double compound of the hydrocarbon with  $\beta$ -dinitroanthraquinone (Fritzsche's Reagent).

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By the courtesy of the Editor of NATURE we have seen the foregoing letter from Prof. Börnstein, in which he states that our letter to NATURE of Dec. 4, 1926, confirms an earlier observation of his as to the presence of  $\beta$ -methylanthracene in low temperature tars from certain Westphalian coals (*Berichte der Deutschen Chemischen Gesellschaft*, 39, 1238; 1906). In a later communication (*ibid.*, 59, 2812; 1926) Börnstein, Schliewinsky, and Szesny-Heyl had expressed a contrary opinion, but Prof. Börnstein's footnote now indicates that this discrepancy was due to a typographical error. With this correction his two observations are now in agreement with ours.

We would take this opportunity of stating that investigations on the aromatic hydrocarbons of low temperature tar are still in progress in this laboratory. Other anthracene derivatives have been isolated in considerable quantities, together with complex hydrocarbons including the so-called 'crackene.' Further details of these researches will be published in the near future.

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#### Activation of Hydrogen by Electric Discharge.

IN Dr. Elliott's absence, en route to Australia, I venture to indicate certain difficulties inherent in the hypothesis proposed by Mr. G. Glockler in NATURE of Jan. 21 for the mechanism of the formation of hydrogen sulphide in experiments on active hydrogen produced in an ozoniser discharge. At a constant alternating potential applied to the ozoniser electrodes, and at a constant gas pressure, it is clear that, as the velocity of gas flow is increased, the number of electrons per litre of hydrogen available for adsorption on the sulphur is increased since the interval in which recombination can take place is diminished. Dr. Elliott's experiments show that under such conditions the amount of hydrogen sulphide formed per litre of hydrogen decreases as the velocity of gas flow is increased.

It is to be anticipated that the passage of the gas through glass wool would greatly diminish any residual ionisation, due to surface adsorption and recombination. The rate of formation of hydrogen sulphide remains, however, unchanged when the glass wool is removed. ("Action of the Corona Discharge on Gases", G. A. Elliott, Thesis, University of London, 1927.) If a stray field capable of sustaining ionisation had existed in the neighbourhood of the

<sup>1</sup> In this communication to the *Berichte* the symbols  $\alpha$  and  $\beta$  should be interchanged.

sulphur, any reaction due to electrons adsorbed on the sulphur would also increase with increasing gas flow, since a greater mass of ionised gas would then come in contact with the sulphur in unit time.

At the lowest pressures investigated the luminous discharge did extend to the sulphur; the intensity of this stray glow could be greatly increased by attaching an earthed wire to the tubing below the sulphur. No change in the amount of hydrogen sulphide formed was obtained by this procedure: it appears that the hydrogen capable of reacting with sulphur is produced in the principal discharge in the ozoniser only. The suggestion that the formation of hydrogen sulphide results from encounters between simple positive hydrogen ions ( $H_2^+$ ,  $H^+$ ) and negatively charged sulphur cannot, therefore, be accepted.

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#### Movements of the Lower Jaw of Cattle during Mastication.

STIMULATED by the interesting communication of Dr. Jordan and Mr. Kronig (NATURE, Dec. 3, 1927) concerning the direction of rotation of the jaws of cows in North Sjælland during mastication, we have ourselves carried out similar investigations. We have made the interesting observation that the direction of rotation is the same whether the cow be taking in food through the mouth or ruminating. If according to the convention of the above-mentioned authors we choose as the positive direction that of the food, it follows that one and the same cow must be classed sometimes as right-handed and at others as left-handed. If we may assume that the processes of taking in food by the mouth and of rumination alternate, then it follows that the cases of right-handed and left-handed mastication must of necessity be equal in number. The fact that the former investigators did not find a ratio of exactly one to one is then presumably due to their not having made equal numbers of observations on the two different phenomena.

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#### The Spark Spectrum of Neon.

By the use of a vacuum spectrograph, in which the spectrum was excited by electron impacts at controlled voltages between a Wehnelt cathode and a wire grid anode, we have discovered a new series of lines of considerably shorter wave-length than any hitherto reported for neon. There are 15 of these lines between wave-lengths 462.38 and 353.01. They show the wave number difference 782 expected of the neon spark spectrum, and have in fact led to an almost complete analysis of the spark spectrum, in which 203 lines have been classified in 59 multiplets. From this analysis the ionisation potential of the neon ion is found to be  $40.9 \pm 0.05$  volts.

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Feb. 9.