Letters to the Editor.

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The Ionisation Potential of Ionised Manganese.

IN his paper on the manganese spectrum (Phil. Trans. Roy. Soc., vol. 223 A, p. 127) Catalán gives some triplets and multiplets of the spectrum Mn II, and suggests identifications of some of them. I have recently made an attempt to estimate terms from some of these lines; two independent methods agree within the estimated limits of error, and it seems that it is possible thereby to estimate the ionisation potential with an error probably less than half a volt.

Catalán (*loc. cit.*) suggests that the enhanced triplet λλ 2576, 2594, 2606, and multiplet consisting of three triplets near λλ 2428, 2438, 2453 are the first principal and first diffuse triplets of Mn II. Back (*Zeit. f. Phys.*, vol. 15, pp. 238-40) has confirmed the first of these identifications by the Zeeman effect, and has shown that the terms belong to a septet system similar to the Cr I septets (for which see Gieseler and Grotian, *Zeit. f. Phys.*, vol. 22, p. 228), and he agrees with Catalán's identification of the diffuse multiplet.

Further, Catalán states that the lines λλ 2576, 2594, 2606 forming the first principal triplet are the most persistent of the enhanced lines of Mn, so they are probably the "ultimate lines" in Russell's sense (*Astrophys. Journ.*, vol. 61, p. 223), and if so, the septet $1s$ term corresponds to the normal state of the atom.

Now Hund (*Zeit. f. Phys.*, in press) has shown reason to believe that the distribution of electrons in the Cr and Mn^+ atoms in their normal states is the same (5 electrons in 3_3 orbits and 1 in a 4_1 orbit, the inner n_k sub-groups being complete; this is the only case in the iron group in which the normal state of a neutral atom has the same distribution of electrons as the normal state of the ionised atom in the previous place in the periodic table), so the $1s$ terms of the Cr I and Mn II septets are really corresponding terms. Also for Cr I the zero of term value corresponds to the ionisation of the atom by removal of the 4_1 orbit, and if we take a corresponding zero for Mn II it seems likely that quantitative relations between the septet terms of the two spectra can validly be applied.

From the principal triplet alone it is possible to estimate term values in two ways. The quantum defect q for the n_k term, wave number ν, of an atom core charge C being defined by $\nu/R = C^2/(n-q)^2$ as usual, the two estimates are as follows:

(1) For Cr I septets, the s terms belong to a sequence of the Rydberg type, so they can be associated with different orbits of a single series electron, and the concept of a quantum defect is significant; and the first p term (Gieseler and Grotian's 4_2) looks like the first member of a Rydberg sequence. The difference of quantum defect between the first s term and the smallest member of the first p term is 0·46; judging from the behaviour of the similar difference in other spectra, it seems probable that its value for Mn II septets will lie between the limits $0{\cdot}35 \pm 0{\cdot}02$. Using the first principal triplet above mentioned, this gives $1s(4_1) = 119{,}000 \pm 4000$.

(2) The triplet separation for the p term of Cr I fits the Landé formula (see *Zeit. f. Phys.*, vol. 25, p. 48) fairly well, so it may be expected that the relation between the separations for corresponding terms of Cr I and Mn II will be given by this formula. The best way of applying it is through Δq, the difference of quantum defect q between the extreme members of a multiple term. The value of Δq for the 4_2 term of Cr I septets is 0·00584; for the corresponding term of Mn II it would be expected to be about 0·0061. The value of $\Delta\nu$ is known from the separation of the first principal triplet, so the value of the term can be calculated. It leads to a value $1s = 116{,}000$, the limits of error being estimated at ±5000.

The agreement of the two independent estimates, one from the position of a line of the triplet and the other from triplet separations, is most satisfactory; it seems likely that the $1s$ term of the Mn II septet system lies within the limits $118{,}000 \pm 3000$. The ionisation potential corresponding to the removal of the 4_1 electron is then $14{\cdot}5 \pm 0{\cdot}4$ volts.

It seems possible that similar methods may be of use in providing approximate values of terms of other spectra of ionised atoms, of which only a few lines are known, if suitable lines can be identified.

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The Future of the British Patent Office.

PATENT Law is a means to an end, and until the nature of the consideration which the patentee is to bring in in return for his monopoly has been clearly ascertained, it is idle to attempt to lay down what should or should not be the appropriate practice at the Patent Office. Now the object of British Patent Law has varied materially during the last three hundred years.

Coke, for example, is the chief authority for the construction of the Statute of Monopolies and this is his commentary: "The reason wherefore such a privilege is good in law, is because the inventor bringeth to and for the Commonwealth a new manufacture by his invention, cost and charges, and therefore it is reason that he should have a privilege for his reward" (Coke, 3 Inst. 181). Under the Stuart dynasty, the jurisdiction of letters patent was reserved to the Privy Council. This body administered the Statute of James in the sense of Coke's dictum. It insisted that the patentee should make good at the earliest opportunity and was always ready to revoke an unused patent in favour of a second applicant with better credentials; the latter became "the true and first inventor" under the Statute. About 1750, however, its jurisdiction was allowed to lapse, and patentees henceforward were compelled to seek their remedy in the Courts of Law. The latter, being without recent precedents to guide them, interpreted the contract in the letters patent in the light of the specification clause, and in 1778 it became established law that the patent specification was the price of the monopoly.

This doctrine held the field until 1883, when the needle of patent law again began to show signs of instability. The Patents Act of that year contained certain inoperative compulsory licensing clauses, which were afterwards strengthened, but in 1919 the needle once more veered round with a swing to the Statute of Monopolies—the Act of 1919 laying down that "patents for new inventions are granted not only to encourage invention but to secure that new inventions shall, as far as possible, be worked on a commercial scale in the United Kingdom without undue delay, and further providing that a patent shall not be invalidated by the prior sale of the inventors' product if a patent has been applied for within six months of such sale."