entity is involved in the excitation of the first positive bands in the afterglow. This was done by destroying the visible afterglow by heating, and then showing that the 'dark modification' of active nitrogen could still excite the *D* lines of sodium. The NO bands, requiring about 6 volts for their excitation, are also quenched by heating. This seems to show that the metastable molecules are quenched by heating and the metastable atoms are undisturbed. Willey showed that when a mild electric discharge was passed through active nitrogen and the visible glow destroyed, the remaining gas was still active and was capable of exciting chemical reactions in which the energy was about 45,000 cal. This, it is seen, is in agreement with the present experiments.

The absence of absorption in active nitrogen between 3000 A. and 6500 A. has been reported by several observers. On the hypotheses presented here, the absorption, if present, should be either in the far ultra-violet or in the far red. The far ultra-violet corresponds to atomic absorption and the far red to the absorption of first positive bands, from the low *A* vibrational states in which most of the metastable molecules are likely to be.

A detailed account of this work will be presented later.

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Square Roots and the Decimal System.

IN NATURE of Mar. 3 is an obituary notice of the late Alexander Siemens. The last two sentences of this obituary suggest that possibly there is a misprint or a misunderstanding.

These sentences referred to are as follows:

"There was one thing said at this meeting which the writer never saw contradicted, and that was that without the decimal system it would not be possible to extract square roots. It is quite easy, however, to turn the square root of any number or fraction into a continued fraction and then find its value to any required degree of accuracy as a vulgar fraction."

I am sure Mr. Siemens never advocated the adoption of the decimal system in arithmetic or anything else but weights and measures. Any other application of the decimal system would be quite equal to the American Congressman that tried to get a bill through Congress enacting that π should be proclaimed by law to be 3·000.

C. E. W. DODWELL.

46 Coburg Road,
Halifax, N.S.,
May 4.

I HAVE read Mr. Dodwell's remarks with interest. It will be noticed that I did not say that it was my friend Mr. Siemens that made the statement, but merely that it was said at the meeting. My recollection is that he asked a rhetorical question somewhat as follows: "How were the square roots of numbers such as 6 to be found if we had no decimal system?" I am certain that I was only prevented from speaking on this question by my desire not to help the opponents of the decimal system. I did not attribute it to Siemens in my obituary notice, because I looked up the account of the meeting in the *Journal of the Institution of Electrical Engineers* and found that it had been deleted, probably by the person who said it.

A well-known method of extracting square roots without using decimals is that first given in English in the "Arithmetic" of James Thomson, the father of Lord Kelvin, which was published in 1819. It is interesting to remember that by 1880, when Lord Kelvin and his brother James edited it, it had run through seventy-one editions. Using this method, we get

$$\sqrt{6} = 2 + \sqrt{6} - 2 \qquad = 2 + \frac{2}{\sqrt{6}+2}$$

$$= 2 + \frac{1}{2 + 1/(\sqrt{6}+2)} = 2 + \frac{1}{2 + \frac{1}{4 + \ldots}}.$$

The 2 and the 4 repeating. Thus we get as convergents to $\sqrt{6}$,

$$2,\ \frac{5}{2},\ \frac{22}{9},\ \frac{49}{20},\ \frac{218}{89},\ \frac{485}{198},\ \ldots$$

The last convergent equals 2·449495 approximately, and the true value is 2·449490 approximately. The successive convergents are alternatively less and greater than the true value. In this connexion something may be said in favour of vulgar fractions. The method is still set in school examination papers.

A. R.

New Regularities in the Band Spectrum of Helium.

THE letter (NATURE, May 19) of Messrs. Takamine, Dieke, and Suga, reporting certain results in connexion with the analysis of the band spectrum of helium, was of peculiar interest to me, in view of the fact that I was proposing shortly to incorporate many of them in Part V. of a series of papers dealing with this subject. Mr. A. Harvey, working in collaboration with me, has measured and interpreted a number of new bands, chiefly in the less refrangible region, and, so far as can be gathered from the letter in question, has arrived at substantially similar conclusions. There appears to be at least one important difference of interpretation, but discussion of this had better await detailed publication. Meanwhile it may avoid confusion to remark that in all probability the band $3X \longrightarrow 2P$ ('ortho-He') of Takamine, Dieke, and Suga, is that near λ5885 already described in Part IV. (*Proc. Roy. Soc.*, A, **118**, p. 157), whilst one designated $4Z \longrightarrow 2P$ by Dr. Jevons and myself in a paper at present awaiting publication is actually the next series member to their $3Z \longrightarrow 2P$. It is remarkable, and fortunate, that the same symbols X and Z have been respectively chosen in both cases for the new levels. The latter was employed in our case because of the large and unusual Zeeman effect exhibited by the lines of this band.

The effective electronic quantum numbers of these new levels will be of interest to theoretical workers and are as follows, those of several known atomic and molecular levels being included for comparison:

	S.	*P.*	*D.*	*X.*	*Z.*
ortho He	1·689	1·937	2·997	—	—
par He	1·850	2·009	2·998	—	—
ortho He_2	1·788	1·928	3·013	2·958	2·935
par He_2	1·853	1·964	3·015	2·972	2·952

It will be noted that the $p\mathrm{He}_2$ values are throughout higher than the corresponding $o\mathrm{He}_2$ values, and it is significant that the atomic parhelium and orthohelium quantum numbers differ consistently from one another