ion reads:

$$-\left\{\frac{1}{4}-\frac{n}{\rho}+\frac{l(l+1)}{\rho^2}\right\} R = 0. \qquad (3)$$

$$\cdot e^{-\frac{1}{2}\rho}\rho^l F(\rho), \qquad (4)$$

$$-\rho)\frac{dF}{d\rho}+(n-1-l)F=0 \qquad (5)$$

netic function *)

$$+1-n, 2l+2, \rho). \qquad (6)$$

e series expansion for F breaks off so
guerre polynomials. The wave function
, being the normal boundary condition

le is to calculate how the $1s$, $2s$ and $2p$
om are changed when it is uniformly
de lies at finite r_0. The energy levels are
ough the influence of the potential wall.
ergy E and radius r_0 of the cage will be
ige beginning with the large values of r_0.
l $2p$ level" will be maintained, although
teger for $r_0 = \infty$. The quantum number
by compression.

chels, De Boer and Bijl. For a
deviation of E from its value at $r_0 = \infty$
nels, De Boer and Bijl [1]) have
ve method. They calculated the shift

$$\frac{\alpha}{\gamma}\rho+\frac{\alpha(\alpha+1)}{\gamma(\gamma+1)}\frac{\rho^2}{2!}+\ldots. \qquad (7)$$

ictions have specially been investigated by Whitt-
mbols k, m and z with the variables l, n, and ρ used
ρ. Buchholz' [4]) parameters $\nu \equiv i\tau$, p and $z \equiv i\zeta$

this notation by N and the second by l, the number N
vave function "Nl" has $N-l-1$ nodes between its
uantum number" N coincides with the variable n
2)) for $r_0 = \infty$ only.

of the ground state $1s$, but their method can easily be extented to the higher levels. Here it will also be calculated for the $2s$ and $2p$ levels.

Putting $F(\rho)=\sum\limits_{\tau=0}^{\infty} b_\tau \rho^\tau$ and inserting this in the differential equation the following recursion formula is obtained:

$$\tau(\tau+2l+1)\, b_\tau = (\tau+l-n) b_{\tau-1}. \qquad (8)$$

If n is an integer the series breaks off and gives a polynomial of the degree $n-l-1$. In that case the wave function has a zero point at $r_0 = \infty$. If however r_0 is not infinite, but still large enough that n is nearly an integer, we can put

$$n = N + \beta \text{ with } N \text{ integer and } |\beta| \ll N \qquad (9)$$

and

$$E = -\frac{1}{2n^2} = -\frac{1}{2(N+\beta)^2} \simeq -\frac{1}{2N^2}+\frac{\beta}{N^3}, \qquad (10)$$

where the first term in the last member represents the energy value for $r_0 = \infty$.

Substituting this in the recursion formula (8) and applying $|\beta| \ll N$, approximations for the coefficients b_τ are found. With the boundary condition that, for finite r_0, reads:

$$F(\rho_0) = 0, \qquad (11)$$

one can easily find the first order correction for the $1s$-level, where $N = 1$ and $l = 0$:

$$\beta_{1s} \simeq \frac{1}{\sum\limits_{\tau=1}^{\infty}\frac{1}{\tau(\tau+1)!}\rho_0^\tau} \simeq \frac{1}{\sum\limits_{\tau=1}^{\infty}\frac{2^\tau}{\tau(\tau+1)!}r_0^\tau}, \qquad (12)$$

the formula of Michels, De Boer and Bijl.

The calculations for the $2s$ and $2p$ levels, where $N = 2$ and $l = 0$ and 1, yield:

$$\beta_{2s} \simeq \frac{\frac{1}{2}\rho_0 - 1}{-\frac{1}{2}\rho_0+\sum\limits_{\tau=2}^{\infty}\frac{1}{\tau(\tau-1)\cdot(\tau+1)!}\rho_0^\tau} \simeq \frac{\frac{1}{2}r_0-1}{-\frac{1}{4}r_0+\sum\limits_{\tau=2}^{\infty}\frac{1}{\tau(\tau-1)(\tau+1)!}r_0^\tau}, \qquad (13)$$

$$\beta_{2p} \simeq \frac{1}{6\sum\limits_{\tau=1}^{\infty}\frac{1}{\tau(\tau+3)!}\rho_0^\tau} \simeq \frac{1}{6\sum\limits_{\tau=1}^{\infty}\frac{1}{\tau(\tau+3)!}r_0^\tau}. \qquad (14)$$

Michels, De Boer and Bijl found the energy values of