comparison with the action of the potential wall. To show this let n approach zero in the equation (3), giving:

$$\frac{d^2R}{d\rho^2} + \frac{2}{\rho}\frac{dR}{d\rho} - \left\{\frac{1}{4} + \frac{l(l+1)}{\rho^2}\right\} R = 0 \tag{54}$$

or modified by writing $\rho = 2rn^{-1} = 2ir\sqrt{2E}$ (2)

$$\frac{d^2R}{dr^2} + \frac{2}{r}\frac{dR}{dr} + \left\{2E - \frac{l(l+1)}{r^2}\right\} R = 0. \tag{55}$$

This is indeed the equation of the particle in a spherical box. The solutions of (55) are the Bessel-functions

$$J_{l+\frac{1}{2}}(r\sqrt{2E}), \tag{56}$$

that can also readily be found as an asymptotic case of (4) for $E \to \infty$ as a series expansion shows.

For $l = 0$ the Bessel function (56) has nodes at $r_0\sqrt{2E} = q\pi$ where q is an integer. So for the energy curve of the 1s level the cubic hyperbole

$$E = \pi^2/2r_0^2 \tag{57}$$

is found to be an asymptote. For the 2s level it is:

$$E = 2\pi^2/r_0^2, \tag{58}$$

whereas for $l = 1$ the first node of (56) lies at $r_0\sqrt{2E} = 4.4934$ so as to give

$$E = 10.0953/r_0^2 \tag{59}$$

for the asymptote of the 2p level. All three asymptotes are indicated in figure 3 as dotted lines. The $r_0 = 0$ axis is evidently also an asymptote of the energy curves calculated.

f) By plotting $E^{-\frac{1}{2}}$ as a function of r_0, the asymptotes (57), (58) and (59) become straight lines through the origin, being there tangent to the corresponding $(E^{-\frac{1}{2}}, r_0)$ curves. It is easy to find now graphically points of the (E, r_0) curve.

The results are listed in tables II–IV with the indication § 3*f* and represented in figure 3.

g) Although it follows from section *c* of this paragraph that the energy values E for $\lim r_0 \to 0$ are the same as for a spherical box, it is not allowed to conclude that the quantum mechanical average potential energy $\overline{V}$ is zero, as with the box.

In fact, it is only true that $\lim\limits_{r_0 \to 0} \overline{V}/E = 0$. Taking the value of