NOTICE: When government or other drawings, specifications or other data are used for any purpose other than in connection with a definitely related government procurement operation, the U. S. Government thereby incurs no responsibility, nor any obligation whatsoever; and the fact that the Government may have formulated, furnished, or in any way supplied the said drawings, specifications, or other data is not to be regarded by implication or otherwise as in any manner licensing the holder or any other person or corporation, or conveying any rights or permission to manufacture, use or sell any patented invention that may in any way be related thereto.
When any wave $u_0(M)$ hits the closed surface $S$ of a body of revolution on which $r = f(z)$, $a < z < b$, the total field will be $u(M) = u_0(M) + v(M)$. $v(M)$ is determined by the boundary value problem $\Delta v + 2\lambda v = 0, \quad v|_S = u_0|_S, \quad \frac{\partial v}{\partial n} + i\chi v = O(1/R)$ for $R \to \infty$. Other boundary conditions can be treated in a similar way. The function $v(M)$ is determined by its values on $S$ and by its derivatives in the directions of the normal to the surface by means of Green's formula. The author generalizes a method established by N. N. Govorun (DAN SSSR, 126, no. 1, 49, 1959; 132, no. 1, 91, 1960) to obtain a first-kind Fredholm integral equation for the determination of $v(M)$. This equation has a kernel without any singularities:

$$\int \left\{ f(z) - r^{2} \ln (kA') \frac{\partial v}{\partial n} - v(z) \frac{\partial}{\partial n} \left( f(z) - r^{2} \ln (kA') \right) \right\} \times$$

$$\times f(z) \sqrt{1 + f'(z)^2} dz = 0, \quad (1)$$

where $A = (z - \eta)^2 + r^2$, $a < \eta < b$. The $H$ are Hankel functions, $\mathbf{n}$ is the unit vector directed along the surface normal to the outside, $v_\nu(z)$ are the harmonics of $v(M)$ upon $S$. Thus,

$$v(M)|_S = \sum v_\nu(z) e^{i\nu}, \quad \frac{\partial v}{\partial n}|_S = \sum \frac{\partial v_\nu}{\partial n}(z) e^{i\nu}$$

When this steady case is to depend on time it is formally subjected to a Fourier transformation with the aid of the Kirchhoff-Sobolev formula, resulting in an integro-functional equation. An electromagnetic wave is dealt with also. This procedure is a translation of the results found for the scalar case into a vectorial analog. The field outside $S$ is given in terms of the field strengths $\mathbf{E}$ and $\mathbf{H}$ upon $S$ according to the Stratton-Chu formulas. It is pointed out that the equations always have solutions when the boundary conditions of the differential equations can be fulfilled. The uniqueness of the solutions obtained is demonstrated.