The motion of a Navier-Stokes fluid in an infinite straight pipe of constant cross-section, σ, is one of the primary and most studied problems in fluid dynamics. Among all practicable motions, the so-called Poiseuille flow plays a fundamental role. This flow is described by a velocity field with only one nonzero component, $u(x,t)$, directed along the axis of the pipe and depending only on the coordinates, x, of points of σ and, possibly, on time t. The corresponding pressure field does not depend on x and is characterized by a (nonzero) axial gradient, $q(t)$, that depends on time only. We show that the flow rate, $F(t)$, and $q(t)$ are related, at each time t, by a linear Volterra integral equation of the second type, where the kernel depends only upon t and σ. One significant consequence of this result is that it allows us to prove that the inverse parabolic problem of finding a Poiseuille flow corresponding to a given $F(t)$ is equivalent to the resolution of the classical initial-boundary value problem for the heat equation. This is joint work with G. P. Galdi and K. Pileckas.