

[333] *Why* have these basic inventions been so slow to develop? It has not usually been because they were not wanted. For they were all held important subsequently, and they were usually much wanted, at least later. They were by no means average inventions, but the best. But because they were fundamental rather than improvement inventions, striking out in new lines, requiring multifarious new detail devisings and discoveries, they were hard to carry through, and took long. Taking long, they overran the 14-18 year term of patent grants, so that only improvements added in the latest period of development could have protection during large commercial exploitation, which alone could give a worthy financial reward, or even much psychic reward of widely recognized achievement. Thus almost all the pioneer inventors in question, or their backers, had to work for nothing in cash, and little in fame, unless perhaps in old age or posthumously. Borkin and Waldrop say "Of the 40 men who did pioneer service of a major nature to bring radio activities up to a reasonable standard of technical performance, only 2 ever received any appreciable monetary reward. One died with an estate of less than \$150,000 (Marconi) and the other went bankrupt (Lee De Forest)." ³⁴⁵ One might amend that Fessenden, though he had received nothing from his first 300 patents (and applications) on wireless and other communication inventions, ³⁴⁶ finally won \$2½ millions, at 61 years of age, with 500 patents, and died 5 years later.

[334] Any pioneer inventors having the sagacity needed for their most demanding craft could foresee that their labors would probably go unrewarded, by patent or otherwise, and their outlays probably never be repaid them. Fundamental inventions, like the steamboat, airplane, helicopter, and television are particularly expensive ones. It stands to reason that men with brains enough to succeed in quests as hard as the Holy Grail's, will perceive the odds they face, and usually do something more promising instead. Or if they try nonetheless, continued failure, dissuasion, and bankruptcy will in most cases bring them to a halt, as with almost all the inventors who built 34 steamboats before Fulton's success. ³⁴⁷ And today when, as the statistics show, ³⁴⁸ the decisions whether to undertake or continue a fundamental invention are typically made by noninventor corporate or governmental executives, rather than by enthusiast inventors themselves, these considerations must run stronger than before. ³⁴⁹

C. BASIC INVENTIONS WE ARE THEREFORE MISSING

[335] There are many other babies beside the voice-operated writing machine begging for a chance to grow to greatness, doubtless more than we could ever find and list, for they are so obscure. These

³⁴⁵ Cf. the phenomenal rise of real expenditures for *organized* research, in graph 3, and the rise in percent of patents assigned to a corporation, from § 116.

³⁴⁶ H. H. Villard in his useful study of Competition, Oligopoly and Research, says: "A corollary of this analysis is that the *more* important the invention, the *less* important is its achievement to the individual firm, which I offer as at least partial explanation of why FM was developed by a college professor and the jet engine by a junior officer of the R.A.F. For really basic inventions cannot be denied to competitors and therefore do not disturb competitive relationships nearly as much as falling behind in year-to-year improvements. The radio industry, for example, was quite content to let RCA develop TV on the ground that RCA would inevitably have to license its patents, and license them reasonably, if it was not to be prosecuted under the Sherman Act." Farnsworth's efforts were a unique case of effort for patents. *Jol. of Pol. Ec.* 66:483-97, 1958, p. 492.