

which we shall discuss in chapter 8, such as the voice-operated writing machine, or the wholesale fractioning of air and sea-water, all have their starting dates already in the past, yet they would not appear in those lists.

[53] A third, and perhaps most important consideration, is that inventions are probably evaluated by comparison with their contemporaries, and as there are always leading inventions in each period, we would tend to see a constant frequency of them in all the ages. Thus, e.g., the power loom⁵⁰ is rightly recognized as one of the great inventions of the early 19th century; but when the like is devised today, in frequent mechanizations of simple operations formerly done by hand, we do not recognize in these any great invention, nor add them to a list of the important inventions of the 1960's—we notice simply a swarm of mechanizations. We shall speak again (§ 103) of this principle after completing our new indices of inventive effort and success, and must now abandon this method of seeking to count important inventions, and find better approaches to the much desired index of invention.

[54] However, a useful purpose can be served by such lists, in the comparison of one nation with another, at a given epoch and down through time, since the inventions will be compared with their contemporaries. Thus, Streit's list (see ftN 47) gives America 37% of the world's inventions and discoveries made in 1880–99, rising to 54% in 1930–39, and to 88% in 1940–50. The statistical basis is rough, but the finding may be of interest. (Cf. § 89.) Another study,⁵¹ based on patents with statistical precaution, shows the U.S. in 1925 contributing something over 15% of the superior patented inventions. Federico⁵² and Sanders⁵³ supply some modern data based on patent applications. Cf. also § 86.5.

HOW ONE MEASURES AN ECONOMIC COMPLEX

[55] When one seeks to measure the importance of any multifarious social phenomenon, like war or entertainment or education, one will probably go at it by reckoning the money spent for it, on the assumption that it is worth about what people pay for it—or else by counting the man-hours devoted to it. Only the latter were better to be not a crude count of man-hours, but weighted according to the value of the man, which varies widely. So let us apply these same two measures, of the cost and the weighted man-hours, so well as we can, to the measurement of invention. We cannot find statistics completely to our point—one never can—but we can at least find fair *indicia*, variables that should be concomitant and commensurate with the inventing we seek to measure.

[56] “Money makes the mare go” is an old proverb, and it is truer than ever when we substitute for *mare* the airplane ticket, laboratory, and all the host of researchers salaried from public and private treasuries, that are necessary for most modern invention. The amount spent on organized inventing, by government, industry, universities, foundations and all other organizations large enough to have a laboratory, for

⁵⁰ By de Gennes in 1678 and by followers, more importantly by Cartwright in 1788 ff., and little usable until well in the 19th century.