

new fundamental inventions have been born, they exist in dark corners, they have proved their possibility, and their capacity to confer immense benefits, but they are not yet practical, nor viable, able to pay for their own development, unless perhaps in some minor use. They have been born in a sort of trap, a no-man's land, where help is available at several boundaries, but only if and when they can manage to crawl to one of these; and the crawl without assistance usually takes many years. One of the escapes is to attain general practicality, or an evidently near enough approach to it so that commercial assistance, and even hopeful patents on details, will be obtainable. Another boundary for escape is the military—if an inventive idea can show a fairly early potentiality for war use, the Defense Department may take it up. Likewise for atomic inventions, and for agriculture ones (if not a typical machine like the century-old cotton-picker,³⁵⁰ such as are always left to commercial "enterprise"), and perhaps for the postal or other Federal services, or for medicine, astronomy or any other science which rates as pure and noncommercial with our universities and most foundations—for invention in all these domains there is some support available, even if not enough. There are a few foundations, and the governmental Office of Technical Services, which help a few inventors near the practical stage, which we shall discuss in chapters 9 and 10. And, finally, there is the escape route of limited, particular-purpose usefulness, like the telephonic uses for work on vocal sounds, which have helped as well as hindered the telegraphone (§ 317), and furthered voice operation (§ 328), likewise various minor marine uses of jet propulsion (§ 327), and fractional distillations of liquid air, and of sea-water (§ 353). These special uses assist, but do not grapple with and conquer the main problem we are considering, the major invention, for example, the problem of separating and finding uses for almost *all* the fractions of air or sea water, *cheaply* and on a vast scale. We acknowledge that through rare uses the fundamental inventions do find some aid and in time make their escapes to glory, but we are concerned in this chapter with how they tarry for decades and even centuries in the no-man's land of little or no support, and with how this fact is vastly ruinous, and unnecessary if we had some institutions adapted to this great need. Our first group of languishing and highly needed fundamental inventions is in the field of communication inventions.

1. COMMUNICATION INVENTIONS

[336] *Writing machines*, voice-operated, we have just discussed (§ 328,9). *Reading machines*, able to read printed or typewritten material and translate it into appropriate actions, such as sorting mail or cards, charging postage, detecting counterfeits, counting money, doing bookkeeping, translating languages, setting type, or transliterating a book, journal, or typed letter into sounds or tactile stimuli understandable by a taught blind person, could all be of enormous utility, especially to the sighted majority, since Reading and Writing is our greatest industry. All of these reading activities have been mechanized already in more or less clumsy fashion, often requiring a preliminary transcription by hand and eye onto cards or tape, a bottleneck of slow and expensive work. Some inventive progress is