

machines, factories, and transportation devices, requisite to fabricate, carry, and erect the houses cheaply, (§ 219).

[368] Two of our oldest inventions, *weaving* by reciprocating a shuttle among warp threads, and *sewing*, seem to need basic changes after thousands of years. Chemistry can enable a revolution, if the possibilities of Mechanics and Topology have been exhausted. It is possible by chemistry to weld or to glue together fibers, especially of the new synthetic types. Indeed felting and papermaking did this long ago, but with fibers at random and weak. Instead of weaving, or knitting, thread by thread in millions of reciprocating movements, we might simply lay the warp threads together side by side on a board, lay the weft threads all side by side across them with a single movement, weld the two together by pressure and chemical action, and there would be a fabric strong yet elastic and porous, nonraveling, needing no hemming, and capable of endless variation, by three or more layers in different directions, etc.

[369] Next, to make clothing or other articles, stamp out multiple pieces, as today, from various fabrics, and *glue* or *weld* them together instead of sewing. The Russians have done this extensively if not well, and we have lately made great use of paste in shoemaking. Thus pots of plastic could be transformed into a suit of clothes mechanically and fast, by simultaneous, typical machine action, not thread by thread as today.

[370] But the possibilities of invention in mechanical weaving are not exhausted, despite the centuries. As we seek always to replace Nature's reciprocation by Man's continuous rotation, it is possible to whisk the shuttle in a continuous rotary, slightly spiral path around a lengthening cylinder of warp threads in sheds, thus weaving, with normal varied warp thread arrangements, a cylinder of cloth, instead of a strip of it. It was done in France in 1949.

7. TRANSPORTATION INVENTIONS

[371] The preeminent aircraft of the future, both for peace and war, should be a *combination of helicopter and airplane*, able to take off vertically by rotary wings from a tiny airport, then transform itself into an airplane in order to fly with the speed and economy of one, then reconvert in flight to a helicopter, so as to be able to alight gently, in fog or clear, on practically any land or water in emergency. Almost always it would land at a small airport; but when the need arises to land immediately without one, that need is drastic. Such hybrid aircraft have been produced for years, with the stimulus of military orders, under such names as Rotodyne, Convertaplane, or Vertol craft; but this writer thinks a much more vigorous inventive program should be activated, in view of the craft's evident value for peace and war, especially for its safety, and its obviation of big, costly, remote, and bomb-vulnerable airports.

[372] For fast watercraft and seaplanes, inventors willing to take a long chance have been inventing the *ladder-boat*, as we may call it, or hydrofoil craft, since around 1908; but only in the last few years has it gone into practical use, carrying passengers across straits like those of Messina and Florida. The boat may have three ladders extending a little deeper into the water than the keel. Each rung of the ladders is