fox fur and searching for food as did our ancestors who only had their muscles to rely on. We would be running out of available, economic sources of energy, except perhaps for power from water, wind, and wood.

To me this slide (slide 3) is symbolic! I believe that a whole lecture could be made on the principle underlying that one curve. When Edison built his first electric station it took 19 pounds of coal to make a kilowatt hour of electricity. Think how rapidly this would use up world resources of coal. This exhibit could be described as an engineering curve, and I hope you can see in it a characteristic that is inherent in the development of all your weapon systems, whether it be airplanes, missiles, tanks, or naval vessels. The same characteristic underlies there all. We will try to demonstrate it by exhibits from the U. S. S. Nautilus.

On figure 3 notice that the number of pounds of coal per kilowatt hour have come down on a sort of logarithmic mathematical curve. This chart says that in about 1963 it takes .86 pounds of coal per kilowatt hour. In Dr. Philip Sporns' testimony recently presented to the Joint Committee on Atomic Energy he states the next station of the American Power and Light Company will be designed to do it for about .65 pounds of coal. Now, if one thinks of this as small progress, and thereby related the two-thirds of a pound of coal to roughly the seven-eighths of a pound of coal, per kilowatt hour for 1963, he would see the number of billions of tons of additional coal in the world that would be made usable for energy generation by just that degree of engineering development.

But the point is, that engineering progress is evolutionary, because engineers do not ordinarily deal, like some scientists, with breakthroughs. They deal with measured steps of proven development. This development involves steam pressures in plants never before used commercially in boilers supplying in some cases steam at pressures up to 5,000 pounds per square inch. Imagine what conditions the boiler tube has to meet when it operates at red heat; at a temperature which would immediately destroy the integrity of the materials available only a few years ago.

Thus it involves engineering developments and taking advantage of the research constantly going on in scientific and technological laboratories.