

## I

### *Power and Energy*

In our industrial age, power is the thing. Everywhere we read and hear about it and the measures men take to tap the world's available sources of it. More recently, innumerable discussions have swung to energy, as distinct from power.

Man began by harnessing animals to turn their energy to his use. He contrived machines to use the power of gravitation, levers, and elastic bodies. He harnessed wind, steam, and water. He has tapped the depths of volcanic regions. Many the contrivance invented to put at work the tides and waves of the sea. Man would pluck electricity from the very air over our heads; he would even concentrate sunlight and draw from it great power for the running of machines.

All this time there has been little talk of man power and man energy.

We use the former term, to be sure, but generally in the collective sense. We speak of a "nation's man power," or of an "army's man power." And as we attempt to heighten the efficiency of our workers, we still do not think of the

individual worker as primarily a store-house for power. We do not calculate his potentials as we do those of a stream or a dynamo. Nor do we begin to use his energies to the fullest. The most glorious machine the world has ever known, man suffers greatly from too casual treatment.

Fortunately, he possesses a neat mechanism of nerves and muscles that largely compensates of itself. Low or high in power, he generally adjusts himself to his environment and his stores of energy, all in a manner that goes for harmonious living. Yet even here, his power has never been truly reckoned. Man has too long been considered as a "spiritual" being, without taking into account the electrochemical determinants of his personality.

Power and energy must not be confused. Energy is the total working potential present in a given thing or person. Power is the work done under given conditions. Two engines using the same energy may differ enormously in power, for power is efficiency or end-result. So it is with plants and animals, including man. A person may have high energy and low power. Conversely, he may have low energy and high power. With inferior volume of available drive he may get much more done than another man whose energy is much greater. Observe, for example, a brilliant man, curious over the behavior of a chemical in his laboratory. He begins to experiment to discover what it is. He may work with it for

ten years, solve its nature, and prove only that it is a rather useless mess. During the years he has undoubtedly spilled energy about profusely. The power exerted is the "work done" in satisfying his curiosity and nothing more.

In all conditions of matter, the amount of work done varies more or less inversely to the rate at which it is done. The faster a machine works, the more energy is wasted and the smaller is the proportion of useful energy. The efficiency of a dynamo, for example, is greatest when the current is the least possible. An automobile driven at sixty miles an hour requires, relative to the number of miles covered, more gasoline than when driven at thirty miles. Broadly, too, this rule holds true for all human endeavor; and, thus, persons having little available energy tend—so far as they are well adjusted to their environment—to use it at relatively low rates. A person rich in energy may rush about at top speed, with absolute disregard of the consequences to himself and others. Even as he accomplishes more, he wastes still more.

In general, the wider differences in energy stored up, conserved, or poured out yield the greatest of all differences between man and man. They give us the chronic invalid and the piggishly healthy moron, the lunatic and the sane man, the unstable eccentric and the too stable dullwit. Ruling out the diseased and the insane, we may say that the practical consequences

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of sheer energy are greater than those of any other single human quality.

If we could only tap all the energy in one pound of ordinary matter, such as dirt, ice, iron, coal, wood or anything else, we would develop 10,000 horse power for ninety long years. This is locked up in the atoms and still far beyond our reach. But every year brings us nearer to the goal. Children now living may reach it, and then a new world will be born.

Meanwhile who taps the energies of nature most efficiently? The ordinary citizen, not the engineer! The human nervous system is by all odds the finest tapping device known to science. But its excellence does not reside in volume production of power; it cannot draw forth from the atom any Niagara of kilowatts. Rather does it make a very little energy go a long way; and that little it extracts largely from atoms and molecules.