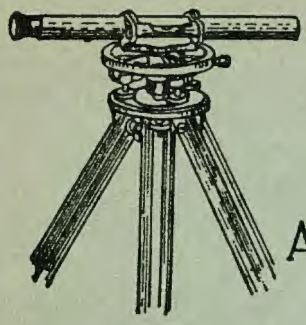

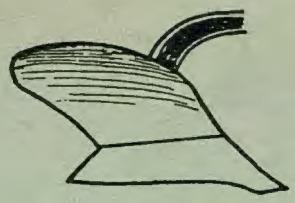

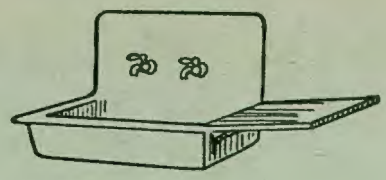

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Sources of Farm Power

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Careful study of the development of civilization clearly shows that civilization has advanced when agriculture and other industries have kept in balance; and the success of one depends upon the success of the other.

Tracing back through the ages, we find that man advanced his civilization by hunting and fishing for his food and by building a suitable hut in which to live. He later learned how to make and use to his advantage such tools as the axe, the shovel, and the hoe.

When he developed sufficient skill and intelligence, he made a wheelbarrow, one of our first "machines." With this machine his efficiency increased, and he was able to move more earth than two men could working with shovels only.

After the labor saving value of the machine called a wheelbarrow had been proven, the wheelbarrow industry was established. The making and selling of wheelbarrows gave a new and more profitable form of employment to the man whom it replaced. This helped to make the necessary balance between those engaged in agriculture and those engaged in other industries, and prosperity was enjoyed by both groups.

Thus far only human power was used. It came from the energy man received from the food he ate, the water he drank, and the air he breathed. This combination of "chemical elements" produces energy in the body of the man in the form of "heat" which is utilized when the body works. Heat energy is the direct or fundamental source of power produced by man or animals. Heat obtained by the chemical combination of fuel with air is also the source of power for operating steam, gasoline, and Diesel engines.

Man has also been able to obtain some power from the wind with a sail on his boat or with the windmill. With the latter he could grind his grain, pump water, or do other work. Owing to the unsteady velocity of the wind and the limited amount of power available from the wind, it is being replaced by more reliable sources of power except in isolated locations where other forms of power are not available.

The cost of the wind, of course, is nothing. The cost of wind power, therefore, is the cost of the necessary wheel with the tower and foundation to support it, also the cost of their maintenance. If it is to be used for generating electricity, the cost of a storage battery must be included to provide electric current when the wind is not blowing.

Another source of power, which like the wind has been used for many centuries, is water power. This is obtained through the use of another of Nature's invisible forces called "gravity." Its cost is also nothing except the making of the water-wheel and its maintenance. Frequently there is an additional cost for the construction of a dam and flowage rights. In the early days it was necessary to utilize this form of power at its source as its transmission to any great distance was not economical. With the development of the electric generator about fifty years ago, it became possible to transform this power into electrical energy and transmit it considerable distances with only a small loss provided transmission lines of ample size were built.

At present approximately 30 per cent of the electricity used in the United States is generated from water power, the supply of which is limited to the amount of falling water available.

Capitalizing upon the experience and attempts of previous inventors, together with the development of machine tools and improvements in the manufacture of iron, James Watt was able to make the first practical steam engine in 1779, only 159 years ago. England was in a depressed condition at that time. The weaving of cloth was done by hand. Farmers, weavers, and other wage earners could barely earn a living. With the development of the steam engine, however, a new industry was born. New employment was given to iron miners, boiler makers, machinists, operating engineers, and coal miners. This in turn removed some workers from farms and set up higher wages which enabled workers to buy more food products at higher prices.

Power to operate steam engines is derived from the burning of fuel, principally coal. The chemical union of carbon in the fuel with oxygen in the air produces heat. This heat applied to the water in the steam boiler produces a physical action in which the molecules of water vapor, composed of hydrogen and oxygen, have a repellent action against other molecules of water vapor, and thus steam pressure is developed. This drives the engine thus transforming the pressure of the steam into mechanical motion for operating machines.

In locations where the cost of coal is low, steam power can be produced at a much lower cost than animal power unless the cost of feed and wages are unusually low.

About sixty years ago, Otto made the first practical gasoline engine. This called for a greater degree of intelligence and mechanical skill than the making of the steam engine. In this engine power is also produced as a result of chemical activity. Carbon and hydrogen from the gasoline, and oxygen from the air, are compressed in the cylinder of the engine, an electric spark ignites the mixture, and the heat energy produced drives the engine.

The cost of this form of power is largely dependent upon the cost of gasoline. Alcohol can be used, but up to the present time its cost is more than that of gasoline.

The Diesel engine derives its power in the same manner as the gasoline engine except that a heavier fuel may be used. This is compressed in the cylinder until it ignites from the heat generated instead of the electric spark. These engines are more expensive to make than gasoline engines, and thus far have not been practical in small sizes for farm use. They are very economical in the use of fuel and are practical for many types of heavy work.

It is clear that the cost of farm power depends upon the cost of the materials from which energy is produced, whether they be in the form of coal, wood, petroleum, hay, oats, corn, or in prepared human food. The cost of power depends also on the cost of labor necessary to process or prepare these materials for use, and to make the engines or machines for converting them into mechanical motion.

It is reasonable to assume that with increased agricultural production due to large areas of fertile land, improved varieties of seed, scientific fertilization, and highly developed methods of cultivation, the cost of producing farm crops will be so reduced as to make possible the conversion of cheap vegetable products into the proper chemical groups to provide our necessary fuel for heat and power.

When this is done, our agriculture and other industries will become more nearly balanced. Man will, to a larger extent, learn to find his employment in the skilled trades, building machines, modern homes, churches, schools and public buildings, highways and parks. His hours of heavy labor will be greatly reduced. He will learn how to really enjoy his job of living like a civilized human being, and he will have reached a very high type of civilization.

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