We have spoken somewhat of the functions of water in regard to plant life. Let us now glance briefly at the quantity required. We have said that the plant finds its food in *dilute* solutions. This is very true, as is plainly proved by the fact that to produce one pound of dry matter in a crop of barley, 392 lbs. of soil water containing the food in solution must be pumped up through the plant and evaporated from the leaves. Clover requires 452, and oats heads the list requiring 505 lbs. of water to produce one pound of dry matter. From these facts there can be no doubt but that the water supply in any given locality is of first importance in determining the productiveness of the district. The variation in the rainfall—with its distribution in regard to time—is, where Irrigation is not practiced, the chief factor in determining whether a season is going to be "good" or "bad" in all grazing or grain-growing districts, and to a considerable extent in fruit districts also.

It has been determined by careful experiment that plants require varying quantities of water in the soil at different stages of their growth to ensure the best returns. Let us follow the growth of a spring cereal crop, briefly indicating the percentage of soil moisture at the more important periods of development. The best results in germination and early growth will be obtained by seeding when the soil contains 25 to 30 per cent. of saturation. As the young plant becomes firmly rooted and throws out a number of tender leaves the moisture should be increased to 40 or 50 per cent. of saturation. If sufficient water is not available at this time the growth of the young plant will be greatly impaired and its vitality weakened. After this critical period is passed the water content of the soil can be reduced to 25 per cent. with great advantage, as otherwise the formation of leaf will proceed too rapidly, and a large crop of straw with a decreased grain yield will be the result. A little before flowering the percentage of water should be again increased to 45 or 50 per cent of saturation. It is at this time that the presence of weeds, such as wild mustard, is particularly injurious. Mustard plants at the rate of 5 to 10 per square yard (no uncommon crop in some localities) would require at this season from *8 to 16 tons of water per acre per day*, a most serious drain on the land at a time when the rightful crop requires its maximum amount of moisture. Immediately after the fall of the bloom the moisture must be reduced by at least one-half. About 15 per cent. of saturation has been found to give the best results in finally insuring the grain.

The Progress of Invention During the Last Fifty Years

THE last fifty years may be characterized as a half century of thought. The great men of this time have not been men of fancy, but men of action and of thought, inventors and engineers who are triumphing over the forces of nature, and unlocking and unbarring its fortresses, or its observers who are expounding its laws. The former have covered both seas and lands with the works of their hands and brains, and the latter have solved problems insoluble to their predecessors. These discoveries have made a profound impression on the thought of the nation, creating an intellectual revolution as striking and momentous as the Reformation itself.

Fifty years ago it was almost true that man could not travel faster than the Pharoahs; now we find railway systems in all the countries of the civilized world—more than 450,000 miles of railroad, billions of capital, and billions of passengers, giving employment to thousands—all the outcome of inventions in locomotives, rolling stock, signals, couplings, etc., and the many other lesser details, which give quickness and smoothness of travel, safety in transit and luxurious accommodation to passengers. The railways of England, although only one-sixth as long as those of the United States, have a capital exceeding five billion dollars, and conveyed in 1895 over 911 million passengers. This is just one instance in a small country of the importance of steam transit.

Striking, as has been the progress of locomotion on land, the advance on sea has been even more remarkable. The steam fleet of the world, early in the '40's, was but a little over one hundred tons, now the aggregate tonnage is seventeen million gross tons, exclusive of the warships of all nations. When we compare the advance in construction, it is even greater. Engines, screws, construction, have all reached their highest development, as exemplified in many of the huge grey-hounds. For instance, the "Campania," the great Cunarder, has 192 furnaces for her boilers, worked at a pressure of 165 pounds, and each set of engines has five cylinders for expansion of steam. There are two three-bladed propellers, each blade weighing eight tons, and the vessel is able to maintain a durable speed of 21 knots per hour. The St. Louis and St. Paul of the American line, the first great ocean steamers built in America, are of as great ingenuity and interest as the English boats. There are indications that such improvements may be made in the future, (such as the use use of Leshe's oscillator, and use of acetelyene gas) that a day or two will be "knocked" off the passage across the "Herring pond."

Turning now to the progress of invention in electricity, wesee continents, nations and kindreds linked together by cables, telegraphs and telephones, giving uninterrupted communication all over the world. Here the inventor has found a rich field, and the names of Brett, Morse, Edison, Bell, and others, will be ever remembered. In 1858 the first message between Europe and America was transmitted by cable, but it was not until 1866 that communication was constant. The first telegraph in America was set up between Washington and Baltimore in 1844, and now improvements in telegraphy have so far advanced that by means of an ordinary typewriter with an attachment the message is automatically printed at a speed of two hundred words per minute. Amstuty, of Ohio, has devised a machine for transmitting copies of photographs and drawings to a distance by means of the electric wire, and reproducing the same at the receiving station in the form of an engraving ready for printing. In 1877 Bell perfected the telephone and now it is of universal adoption, and on April 1, 1891, the first submarine telephone cables, between London and Paris, were opened to the public.

Electricity is rapidly coming to the front as a locomotive power, and is supplanting steam in many industries where much machinery is used. In our larger cities electric trolley cars furnish rapid transit for busy people, carrying billions annually. Conduit electric railways are also beginning to find favor. The Love conduit system has proved successful in Washington, and Siemens & Halkes system in Buda Pesth