inches of water to one foot of meadow mud and peaty matter seems, at the first view, a large quantity, but in a test of seven samples the average was 9.08 inches.

Samples of marsh mud give the following results, average three samples of a kind of mud clay and vegetable matter, 9.76 inches. One sample, 8.64 inches. Clay and vegetable matter, 8.47 inches; clay and vegetable matter from the bank of creek, 7.74 inches. Black mud 6.6 inches. Turf formation, 8.18 inches. Mud from under water and 5 inches below the bed of a standing pool, 19.59 inches or 260,000 gallons of water to the acre of soil one foot in depth. The seven samples above quoted indicate that the power of salt marsh mud to retain water is not essentially different from that of common fresh water mud and peat.

Experiments on soil from a dyked-out marsh brought to a fine state of cultivation showed that it had become about like air-dried and well-drained soil in fresh water meadows.

Experiments upon sand have shown for a coarse gravelly sample, quite dry, 0.93 inches. Fine building sand, quite dry, 0.33 inches. Fine gravel 3.13 inches. Beach sand, under mud saturated, 4.95 inches.

Out of loam and every variety of vegetable formation in the form of mud and peat and all combinations of these with sand and clay, water filters out with extreme slowness as compared with sand.

Yet through these soils, if given time enough and ample drainage, vast quantities will pass The really impervious soils are the clays and the compact hard-pan.

Of the loam and peaty soil the capacity to retain water has a normal limit. Up to that normal limit no water will percolate through the soil; it can only be removed by evaporation or by the roots of plants. What that limit is, experiments have not determined

Soils of this kind may contain and hold from 162,000 to 250,000 gallons per acre for each one foot depth of soil. Yet, notwithstanding this vast quantity of water stored in the soil, it is available for the water supply of only a single family, not for a village or a city. It is there on deposite and for other purposes than those of direct use.

Stored water for industrial or domestic use must come, if it comes from the soil, from the loose porous sands and gravels or the open fissures in the rocks. The driven well, or the filter gallery, can therefore only succeed where the conditions are favorable. In general it may be said that very fine sand, though it may hold a large quantity of water or coarse sand, yet makes a very unpromising field to work upon or experiment with.

The coarse sands and the open gravelly strata are the only soils that can be of any avail as supplies for villages, towns or city use.

Areas composed of good fair building sand, good clean beach gravel and sand, and the loose gravels, may contain, when saturated, from 3 to 5 inches of water for each foot in depth, or from 81,400 to 135,700 gallons per acre, or from 17 to 87 million gallons per square mile. When the quantity held by a single foot of soil is multiplied by 10, 20, 30, 40, or 50 feet, some conception can be formed of the enormous amount of water held in store in the earth.

These sands and gravelly formations are found in larger or smaller areas in all parts of the country, and wherever they exist to a large extent, and reach below the water table, they are valuable sources of water supply or aids to other means at hand.

In using a driven well the question must always occur, how fast will water flow through the sand into the well? This question cannot be answered definitely by a formula of universal application. All soils differ so largely in their make up that a rule, or estimate, would not be true as applied to for one another. Water, however, has a rate to flow in loose earth varying from two to five inches in fifty feet, or from twenty five to forty feet in a mile. A careful study of the topography of the shed from which the supply is to be obtained, with tests to ascertain the stratification, should be made and carefully digested before assuming that an amply water supply can be derived from artesian wells.

Roads and Roadmaking.

IX.

Advantages of Good Roads.

Good roads are not only a benefit to the section of the country which they traverse but also in the towns serving as a market to those sections. They benefit agricultural districts in that they improve the facilities for transporting the farm products to the market, or lines of commere, thus saving time in transporting and increasing the amount of burden carried by each load. In this manner they have a great influence on the price of commodities. The price of wheat is increased for a locality having improved transportation facilities. If it costs a farmer $1.00 to haul 100 bushels of wheat one mile over a dirt road, and by macadamizing the cost can be reduced to 20 cents per mile ,the price of wheat is raised accordingly ; one mile saves 80 cents, ten miles saves $8.00 per hundred bushels,or 8 cents per bushel, in the increase in price of each bushel, not considering the larger load that can be carried on a macadamized road. The price of wheat is thus permanently raised by improved facilities for transportation ; the value of farm land is also relatively increased. The value of farms is increased by the improved facilities of transportation of their products in thus finding an earlier market. As the time needed to reach the market is lessened, the farm is brought relatively nearer the town and its market. If improved roads make the journey an hour shorter the farm is, relatively speaking, brought an hour's journey nearer the market.

When farmers once see this road problem in its true light, they will not hesitate a moment to consent to higher taxes, if necessary to bring about the desired improvements. They have come to look upon the present condition of our public roads as a necessary inconvenience, one that it is not possible to remedy and must therefore be endured. They do not realize their loss in time and labor in hauling their farm products to the market. They do not seem to be aware that a horse can draw more than four times as much on macadamized and Telford roads as on ordinary dirt roads, in good condition, and that this is increased to more than ten times as much as when the dirt roads are in bad condition,which they are often, for more than half of each year.

Towns are benefited by improved roads in that they increase the scope of their market and therefore a larger area will bring in its products and take away its supplies.

The general public, whether travelling on foot, in carriage, or on horseback, or bicycle, would also be benefited by the great saving in time. Improved roads may detract slightly from railroad passenger traffic because pleasure parties and others might travel by other means more frequently than now if the roads were macadamized. This, however, would be a direct saving of money to them in most instances.

We must also consider the enlarged and improved educational advantages of good roads. They bring us into closer proximity to schools, to lectures and to churches. They facilitate the more general intercommunication in the rural districts. In the same manner the moral plane of the community is elevated and civilization extended.

Townships should have the power to borrow large sums of money by giving bonds running a series of years—say fifty years—wherewith to improve the principal roads. Should they do this the principal roads in the township could be macadamized at once,while the money raised by taxation at the present rates would be sufficient to keep the roads in repair, and pay at least part of the interest on the bonds. This would entail no extra burden on the taxpayers and they would have the advantages of good roads while the improvements are being paid for. The coming generations, in this manner, will also be obliged to assist in defraying the expense of improving the roads. This would not be unfair to them, because they will enjoy the same benefits, and should therefore assist in paying for them. A sinking fund should be started at once to eventually pay off the bonds. Many conservative