DRY FARMING IN SEMI-ARID DISTRICTS.

BY W. FRANK M'CLURE.

A great deal of attention is being attracted at this time to a system of agriculture known as "dry farming," which is being successfully used in the semi-arid districts of Colorado and other Western States in place of extensive schemes of irrigation. By "semi-arid" is meant a territory in which the annual rainfall is less than twenty and more than eight inches. By dry farming, many thousands of acres which, on account of their location, could never be reached by irrigation ditches are reclaimed. Some of this acreage has long been styled "grazing lands," and considered useful for nothing else.

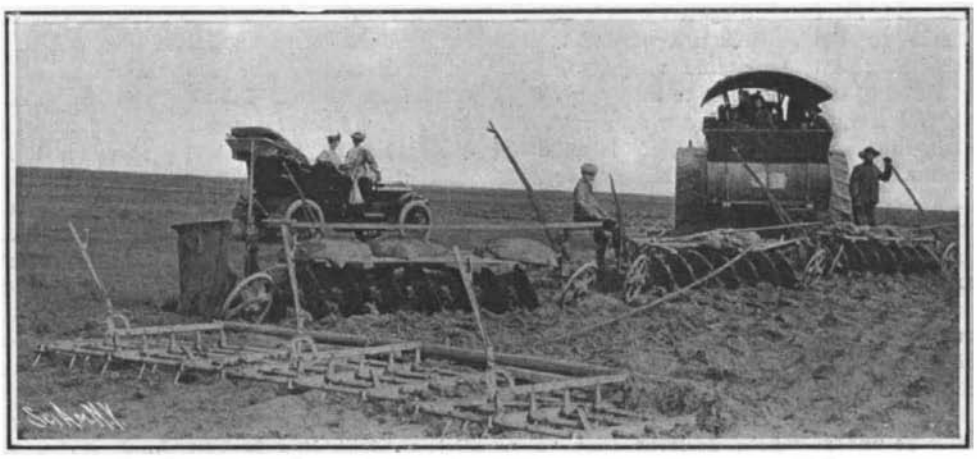
"Dry farming," briefly stated, consists in so preparing the soil in semi-arid regions that it will catch what little annual rainfall there is, and store it within reach of the roots of the plants to be grown. This, as might be supposed, requires a firm, solid foundation beneath the soil. The soil above is kept firm and loose and acts as a mulch, keeping the moisture from escaping into the atmosphere, much as a brick or plank keeps the ground directly under it moist even in a beating sun. With such preparation of the soil, grazing lands will often yield as high as 40 to 50 bushels of wheat to the acre, or more than the yield of the Eastern States, where the natural rainfall is adequate.

The last two years have witnessed the greatest progress in the new plan of reclamation. Not only is "dry farming" being extensively employed in Colorado, Kansas, and Nebraska, where it was first introduced, but in eastern Washington, Oregon, Wyoming, Idaho, and Utah, where heretofore great tracts of prairie land could, in many instances, be bought as low as fifty cents an acre.

The first experiments in this line date back more than a decade. The founder of the method is Prof. H. W. Campbell of Nebraska, under whose personal direction to-day are some large model farms in the West, illustrating the marvelous accomplishments of "dry farming." Five years ago the Department of Agriculture began to lend its assistance in the matter, carrying on investigations as to the localities in which "dry farming" will bring the best results. The department is also searching in many parts of the world for kinds of alfalfa and wheat and other plants which will yield the largest returns with a rainfall of less than twenty inches.

As to land, it may be stated that high plateaus or rolling hills afford a better supply of rain to be stored by "dry farming" methods than do the valleys, and they are therefore usually chosen first.

The accompanying photographs were made at Longmont, Colorado, where many thousands of acres are under cultivation. This State is taking particular interest in development along these lines. Within the past year Gov. McDonald called together a congress of "dry farmers." Many ranches are being broken up to give place to the new system of farming, for it does not pay to raise cattle at the present prices at which this land is selling. In fact, much of the upland country is being turned into a veritable garden.

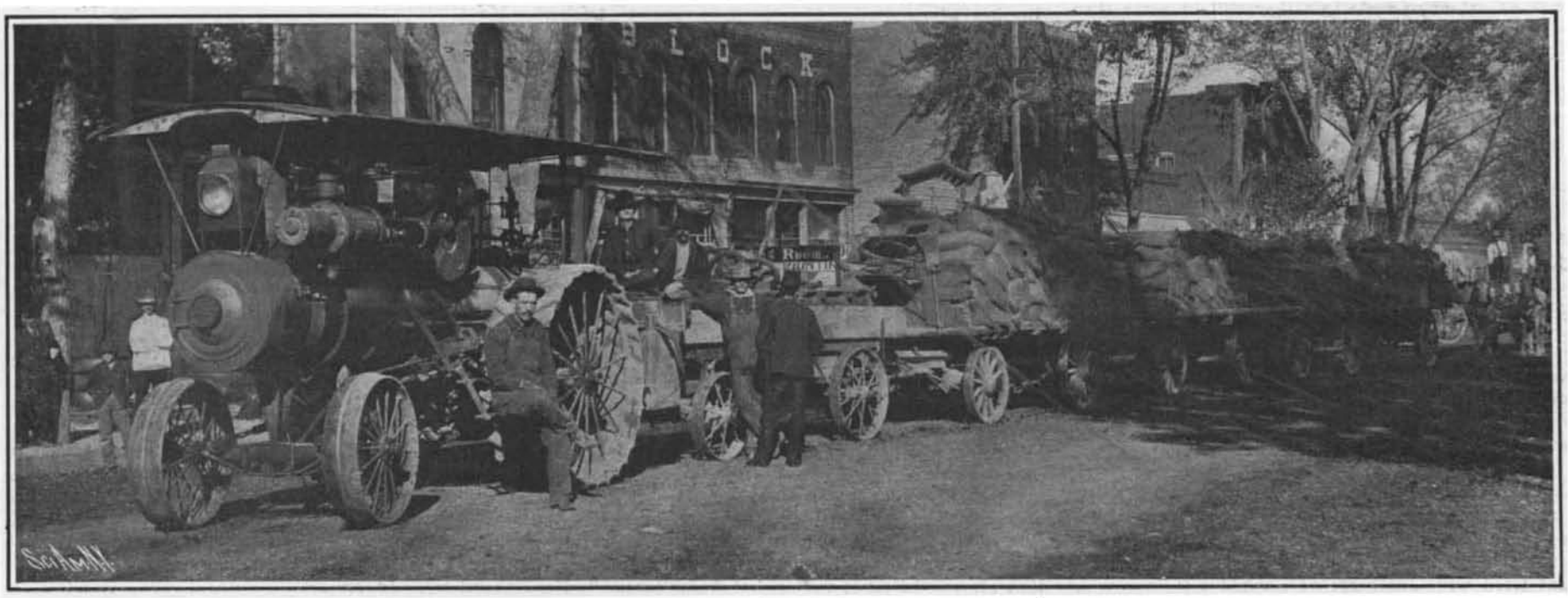


A Smoothing Harrow Follows the Plow. Much Harrowing is Essential to Success in Dry Farming.

The first operation in the preparation of the soil is plowing. This must be deep. A disk or a mold-board plow may be used, depending on the character of the ground. One object of the deep plowing is to provide an adequate reservoir for the storage of the rainfall. Gang plows with twelve to sixteen plowshares in each are a common sight. These plows are drawn by traction engines, as shown in the photograph. Steam plowing helps out wonderfully in this work. In some of the Western States it would be out of the question to secure sufficient men and teams to accomplish the plowing of the hundreds of thousands of acres annually being reclaimed by "dry farming." Steam plowing costs less than half as much as plowing with teams. It is not unusual for one plowing outfit to turn 3,000 acres of sod into cultivated land in one season. Two men are needed to operate the engine, besides a teamster and team for hauling fuel.

A sub-surface packer follows the plow, drawn by the same traction engine as the plow. This packer is similar in shape to a disk plow, except that it has ten wheels. These wedge-shaped wheels or disks are 18 inches in diameter, and are arranged vertically on a shaft six inches apart. The object of the sub-surface packer is to firm the soil. A smooth roller if used for this purpose would have the effect of packing the surface soil rather than that of the sub-surface. The wheels of the packer, however, are so arranged that they firm the soil in the lower portions of the furrow,

Breaking the Ground for Dry Farming. The Work is Done on a Large Scale, and Machine Power is Necessary. One Plowing Outfit Can Prepare 6,000 Acres of Sod in One Season.



Hauling Grain to Market from the Dry-Farming Districts Around Longmont, Colorado.

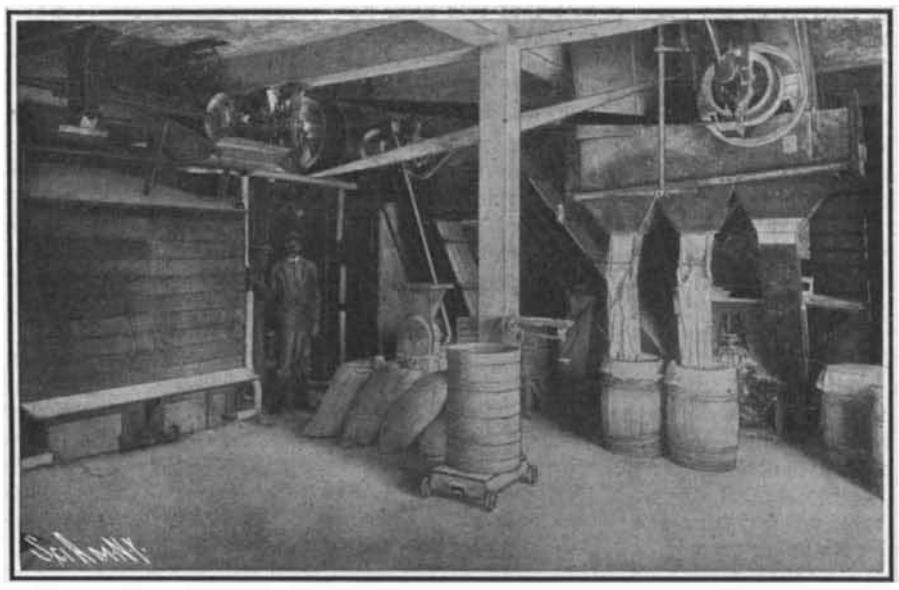
restoring capillarity where plowing has arrested it. A smoothing harrow next follows, leaving a pulverized layer on top, which prevents the moisture from below from reaching the surface and evaporating.

The constant care and working of the soil on which the crops are to be raised is said to be equally important with the rainfall itself. The pulverized ground must not be allowed to pack or break in any event. To avoid this, the harrow is run over it after each rain. The working of the soil begins several months before seeding, and must also be continued after seeding.

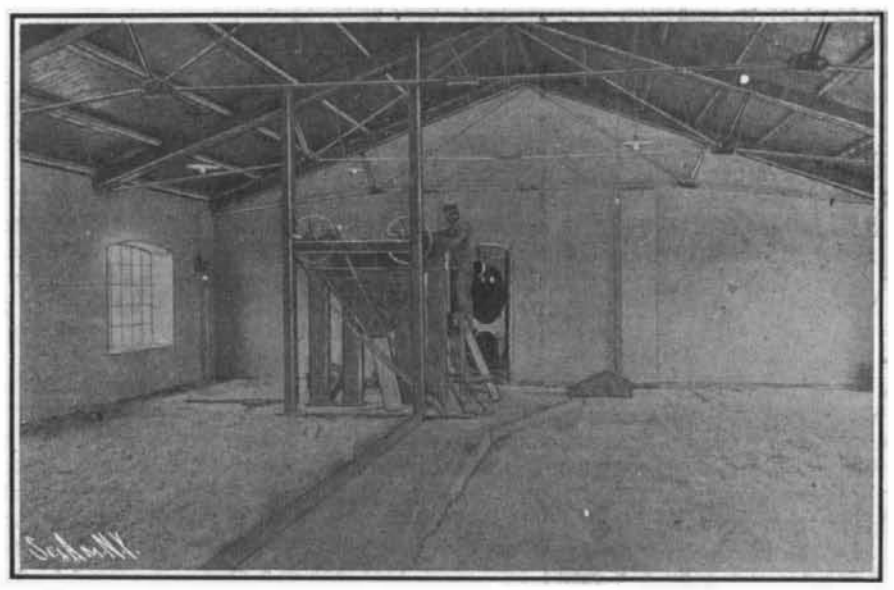
A great many people, cultivating their land under the new system, aim to raise but one crop from the same ground in two years. They divide this land into two equal parts, and use one part for crops one year, and the other the next. This admits of what is known as "summer culture" on the part not in use, and the storing of a season's rains in the soil reservoir. Again, it may be feasible to allow the land to produce crops for two years, and alternate one year of "summer culture." Where crops are planted every year, plowing must quickly follow the operation of harvesting, the aim being to save all possible moisture in the ground and simultaneously prepare the soil for the next rains.

It is confidently expected that the time will come when land on which but a ten-inch rainfall is now recorded will be made to blossom as the rose. This will be accomplished by further advances in scientific discovery. At present, districts having less than fourteen inches rainfall are not regarded as profitable. An educational movement for the scientific study of "dry farming" has already been talked of. Not all attempts at "dry farming" are a success, nor will be, until the mass of the people using it understand the principles on which it must be carried out. The rainfall varies in different years, and this emergency must be met in a scientific way. Conditions differ also in different localities.

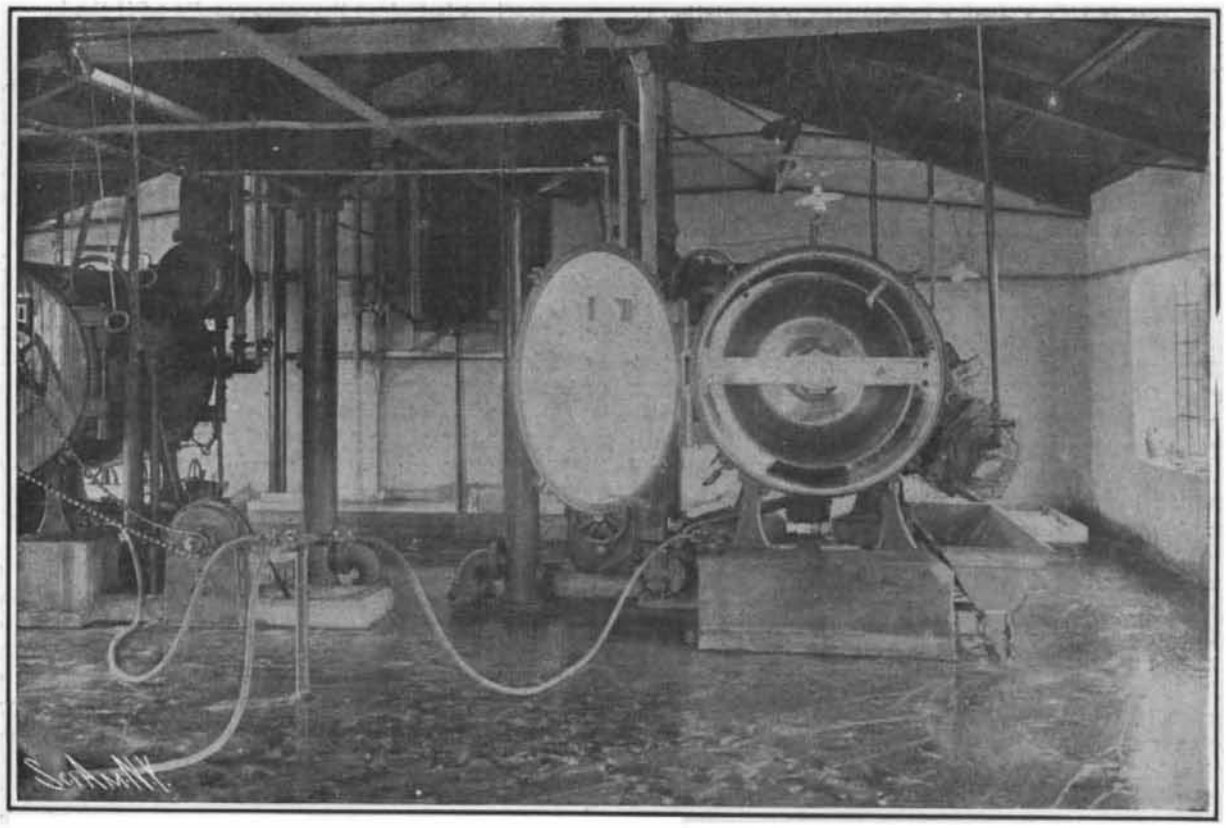
The establishment of more government experiment stations will greatly assist different sections. Several are to be established, it is understood, this year. At Cheyenne, Wyoming, the Board of Trade not long ago established an experiment station, assisted by the government and the railroads. It was here found that, although Cheyenne is at an elevation of 6,000 feet above sea level, wheat, rye, barley, oats, alfalfa, field peas, and sugar beets can be grown profitably. As a result of the experiments the ranchmen in Wyoming are buying thousands of dollars' worth of farming machinery, and are breaking up large acreages and sowing alfalfa and other grasses and grains. Ranches are also being sold for colonization purposes.



Part of the Plant Where Milk Powder is Ground and Sifted to the Consistency of Wheat Flour Ready for Packing.



Cooling the Dry Milk and Feeding the Conveyor Leading to the Milking Plant. The Powdered Milk on the Floor is Yellow in Color and Brittle in Texture.



The Milk-Drying Room, Showing the Exsiccator Devised by Dr. Ekenberg for Drying the Milk under Vacuum with Exhaust Steam.

One exsiccator is shown open, upon the interior nickeled surface of which the milk powder is deposited. The supply of milk from the feed tanks is maintained through flexible pipes from the standpipe in the center.

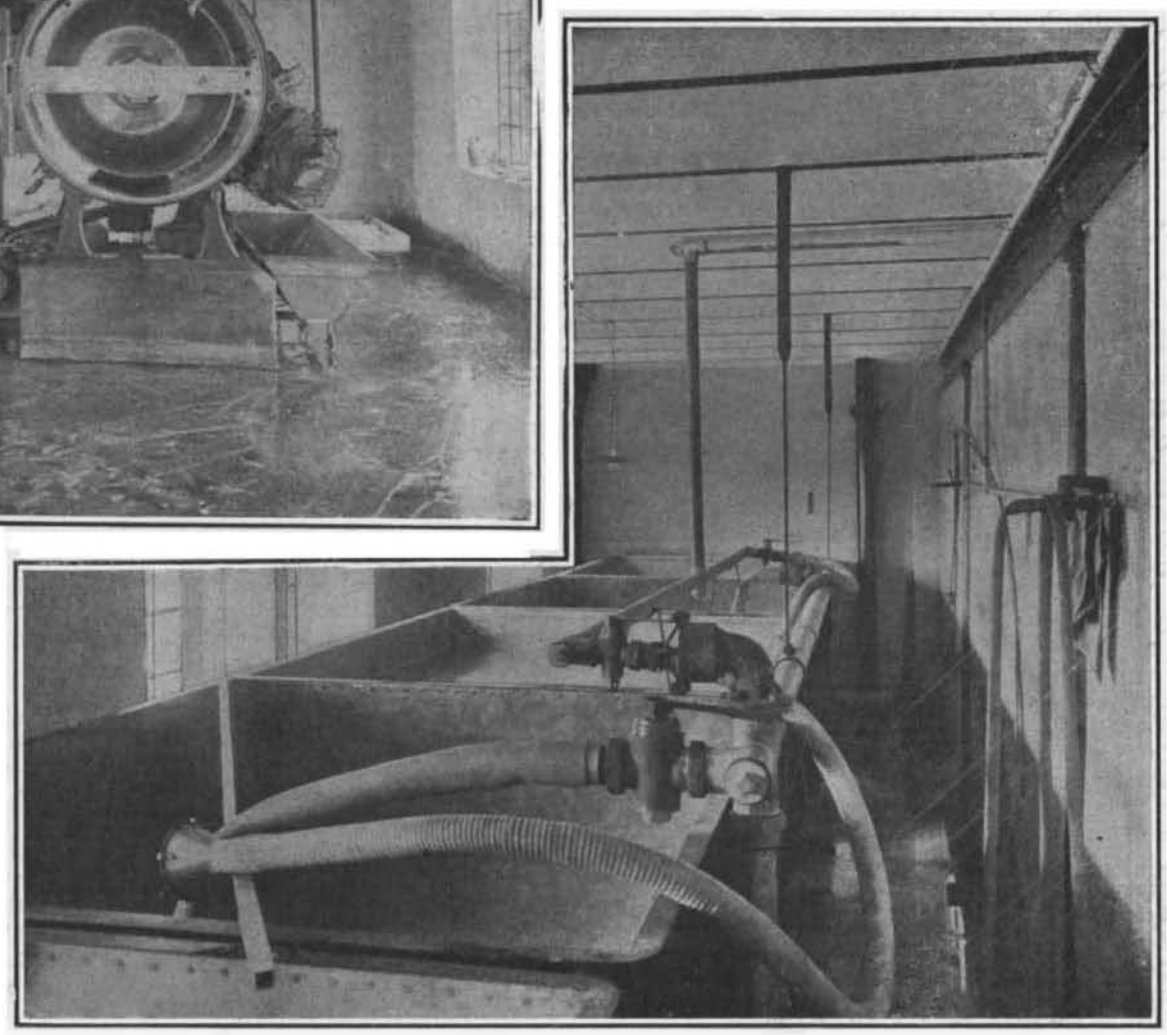
THE EKENBERG PROCESS FOR MANUFACTURING DRIED MILK.

BY THE ENGLISH CORRESPONDENT OF THE SCIENTIFIC AMERICAN.

Some five years ago we briefly referred in the pages of the SCIENTIFIC AMERICAN to a lecture delivered before the Royal Academy of Agriculture in Stockholm by Dr. Martin Ekenberg, the eminent Swedish scientist, relative to the production of dried milk, in which he tersely described a system he had then recently evolved for the production of this substance upon an entirely new basis, and in which the constituents of the liquid even when condensed were perfectly retained. Since that date several improvements in the process have been effected, and at the present time there are several factories in Sweden and other countries where the production of the milk powder is being carried out upon an extensive commercial scale.

While there is no food which can take the place of milk in its various uses, there is at the same time no dietary article which is more difficult of distribution, as it is extremely sensitive, and liable to rapid changes and sour fermentations. The reason is that the liquid is composed of 88 per cent of water, in which the solid food substances are dissolved and suspended; and among these latter substances there is one most subtle class, i. e., the albumenoids. It is clear that the great amount of water present renders the milk remarkably susceptible to the propagation of bacteria, while at the same time its bulk militates against cheap and easy transportation.

Numerous efforts toward preserving the solid sub-



The Tanks into Which the Milk is Pumped from the Delivery Room.

THE EKENBERG PROCESS FOR MANUFACTURING DRIED MILK.