farmer's point of view we approve of the stand which you take on the various questions that arise from time to time; your editorials are calm, judicious, sane and sensible and therefore very effective. What a contrast from some of those that we read in other publications. We always say a good word for "The Advocate" whenever occasion arises; we frequently hear some of the urban population debating on the high cost of living, and blaming the farmer for it. We advise such to subscribe for and read "The Farmer's Advocate," for they would then become better informed and might be deterred from making, absurd, ridiculous statements.

Ontario Co., Ont. JOSEPH FOX.

THE FARM.

Another Barn Plan.

Editor "The Farmer's Advocate":

In looking through your magazine I came across the article, "Descriptive Articles of Stable Construction Wanted," so I thought I would see what I could do. I live on a 90-acre farm. We built a barn last summer 40 feet by 75 feet, hip roof, plank frame on an 8-inch cement basement, mixed 1 to 8, and 8 feet high, under the whole of it. It has a 14-foot drive, 13 feet high in the middle crosswise and a 10-foot drive 8 feet high lengthwise on the east side and both are level drives. The siding and roofing are of galvanized steel. There is accommodation for six head of horses in stalls besides three box stalls. The stalls are 4 feet high and are of cement, as are the mangers, feed boxes, etc. On top of the cement stalls running up are ¾-inch rods 4 inches apart and these go into the overlap above. There is no boarding in front of the horses or cows, thus affording no obstruction to light. Windows are put in wherever there is room and this makes it much lighter than some barns I have been in. In front of the horses and cows are feed alleys 6 feet wide. They are made this wide so as to give plenty of room when feeding time is on. In each feed alley roller door is a window 2 feet square, which can be shoved back and forth to open or cut off ventilation. Ventilators 8 inches by 8 inches, made sloping down to keep out the rain, are placed behind the cows and horses and in the box stalls and a foot above the floor. Slides made of galvanized tin are put over the ventilators on the inside and can be opened or closed according to the weather. Thus the fresh air comes in below, drives out the foul air through the windows in the feed alley doors up the centre drive and out the five ventilators at the top. There are two grain bins in front of the horses and four in front of the cows. The mangers in the box stalls are put on hinges and can be swung back and out of the way for a mare foaling. Windows are placed half way in the partitions in the grain bins. In front of the cows is a cement water trough two feet high, a foot wide and six inches deep. The floor the cows stand on is five feet wide at one end and four feet six inches at the other end. The long cows stand at the long end and the shorter ones on farther down. There is no trench in the cow stable. From the shoulder of the floor the cows stand on there is a drop of eight inches and the floor is sloped down to it. The shoulder and the floor at the wall are on a level. We find this the most convenient way. The drives, horse stalls, feed alleys, grain bins, etc., have cement floors. The drives are creased so as to give the horses a toe-hold when pulling a load over them. We keep our manure spreader behind the cows and load up the manure and haul it out as it is made. In our barn are two steel tracks the whole length of the barn, and these in the middle of each half of the barn. I consider that these two will pay for the extra one in one season. We use slings and they are certainly a big help. I forgot to mention that we have a complete waterworks system in our barn—water for both cows and horses—and that the barn is on 14-foot posts. JOHN W. SCRATCH.

Essex Co., Ont.

A Good Yield.

W. B. Roberts, an Elgin Co., Ont., correspondent writes reporting the yield of various crops on his farm in 1913 as follows: Twenty-three acres of winter wheat yielded 606 bushels; 20 acres of barley and oats, 987 bushels; 26 acres of oats, 1,269 bushels; 1 acre barley, 22 bushels, and 15 acres of beans, 296 bushels, a total of 3,180 bushels. Seventy acres of hay cut 140 tons, 10 acres of ensilage corn filled a silo 14 feet by 40 feet, 11 acres of husking corn yielded 1,450 bushels of ears, 1½ acres of mangels 950 bushels and 1½ acres of potatoes 300 bushels. Besides this nine acres of corn was harvested by pigs with an estimated yield of 900 bushels. Mr. Roberts uses a gasoline engine for threshing and filling silos.

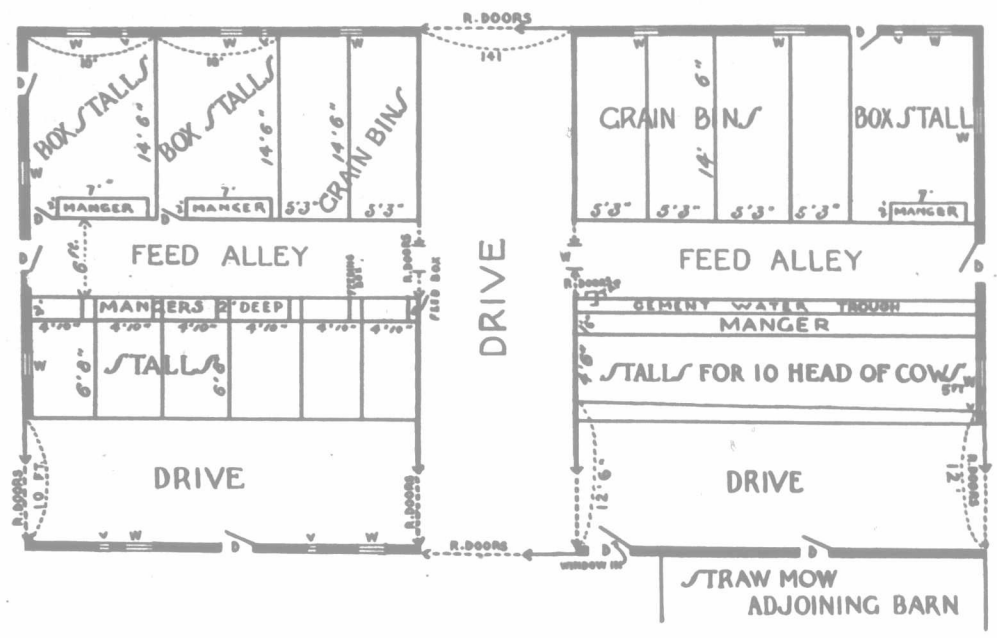
Artificial Fertilizers; Their Nature and Use—VIII.

By B. Leslie Emslie, C.D.A., P.A.S.I., F.C.S.

SOIL BACTERIOLOGY.

Bacteriology is one of the latest sciences to receive attention, and progress in the knowledge of bacterial functions has been very rapid in recent years. The decay of organic matter in the soil is brought about by these small organisms. There are numerous varieties, each performing its own special function. The favorable bacteria require a liberal supply of air and moisture, as well as a suitable temperature for their work. They utilize the free oxygen of the air and are thus known as aerobic bacteria. One of these breaks down organic matter in the soil into its component parts and produces ammonia from the nitrogenous compounds. Another variety of aerobic bacteria then steps in and continues the process, until the ammonia is oxidized to form nitrates, in which form nitrogen is available to plants. This variety is known as nitrifying bacteria. The process of nitrification proceeds most rapidly in light, well-aerated soils, which accounts for the rapid decay of organic matter in such. When a soil is so wet as to prevent the free circulation of air the aerobic bacteria cannot thrive, and another kind, known as anaerobic, from the fact that it does not depend on the free oxygen of the air, but derives this element from the breaking down of oxygen compounds in the soil, becomes active. This kind is known as denitrifying bacteria, since they attack the nitrates in the soil, liberating the nitrogen, which usually results in serious loss. Besides these, there are the nitrogen-fixing bacteria, which have already been mentioned in connection with the legumes.

Bacterial Cultures for Legumes.—Each species of legume has its own particular nitrogen-fixing bacillus or germ, without which it cannot properly develop. Alfalfa and sweet clover associate with the same kind of bacteria, but ordinary clover, beans, peas, etc., each has its own special variety. Soils, which have already successfully grown a certain legume, may be supposed to contain a sufficient quantity of the bacteria required by that plant, but sometimes, particularly in the case of alfalfa, on soil where it has not previously grown, there may be a lack of the proper germs. The seeds of legumes carry a certain quantity of these bacteria, which ultimately serve the plant in the soil. Where there is any doubt, however, as to the supply being adequate, it is well to treat the seed with a bacterial culture solution. These cultures of the specific bacteria for the different legumes may be obtained at a nominal charge, with full instructions for their use, from our Provincial Agricultural Departments and Agricultural Colleges. Equally good results may be obtained by taking soil from a field, where a legume has recently been successfully grown, and applying it to the field on which it is intended to seed that particular legume again. As clover is so frequently grown in general farm practice, it is unlikely that the bacteria which it requires will often be deficient. Usually failure to secure a catch of clover is due to lack of fertility or to unfavorable physical conditions in the soil. The writer has grown a crop of alfalfa without having previously treated the seed, on soil, which, it is safe to say, never grew that crop before and obtained, with the aid of fertilizers, over six tons per acre, four cuttings being made in the first season. The luxuriant growth of sweet clover on the roadsides of that district would indicate the presence of a sufficiency of the proper bacteria.



A Barn Plan for a Ninety-Acre Farm.

DIRECT APPLICATION OF NITROGEN-FIXING BACTERIA TO THE SOIL.

After the discovery by Hellriegel and Wilfarth, in the year 1886, it was thought that the application of cultures of the nitrogen-fixing bacteria would solve the problem of the nitrogen supply in the soil and several of these cultures, under various attractive names, were produced. While in some instances favorable results from the inoculation were indicated, expectations were not fulfilled. Prof. Bottomley, of London, who took a prominent part in these experiments, now claims to have discovered in peat a suitable medium for the propagation of nitro-fixing bacteria. The peat is first treated with certain aerobic soil bacteria, which break down and neutralize the acid peat. These bacteria, having finished their work, are killed off by sterilization and the neutral mass is inoculated with nitrogen-fixing bacteria. After incubation for several days the material is ready for use. It is yet too early to predict the value of this discovery, but experiments conducted by several reliable authorities have shown very favorable results.

Apart from the bewilderment produced upon the mind of the average person by the unmentionable names of these mysterious bacilli or bacteria, one wonders at the variety of names used in speaking of them collectively, which recalls the explanation of an humorist that "these 'bugs' are called 'microbes' in Ireland, 'germs' in Germany, and 'parasites' in France."

Lime in Relation to Soil Bacteria.—Besides suitable condition of moisture, air and temperature, soil bacteria require phosphoric acid, potash and lime for their favorable development. The undesirable anaerobic organisms thrive in wet, undrained, sour soils, while the desirable anaerobic bacteria thrive only in well-aerated soils, free of acid. The action of lime in correcting acidity by combining with the vegetable acids explains its beneficial effects and its special importance for leguminous crops.

Physical and Chemical Effects of Liming.—Lime is important in improving the texture of clay soils. It removes their stickiness by destroying their cohesiveness, thus increasing their porosity and permitting the free circulation of air and water. Lime also, as already noted, enters into chemical combination with other soil substances displacing and liberating some plant food from the compounds which it breaks up. It must be remembered, however, that the plant food thus set free represents only that which is in easily available form, so that the continued use of lime and neglect to supply plant food in some suitable form would ultimately result in soil impoverishment.

Instances of the Harmful Effect of Lime.—In some parts of the Maritime Provinces there exist extensive deposits of sulphate of lime, otherwise known as gypsum, or land plaster, and years ago many farmers in those Provinces, having observed its effect in promoting large yields, commenced to use it indiscriminately, believing that they had found a most valuable "fertilizer." For a year or two they were gratified with increased crops, but subsequently awoke to the fact that their crops were steadily diminishing, until, on the lighter soils, many farms were ultimately abandoned. Such indiscriminate use of land plaster gave rise to the idea, still entertained by some, that fertilizers act as a scourge or "whip" on the soil.

Forms in Which Lime May Be Applied.—Limestone, chalk, marl and shells are all useful in supplying carbonate of lime to the soil. Limestone is a carbonate of lime and when this is heated in a kiln, the carbonic acid gas is driven off and pure lime, also known as quick lime or burned lime, remains. When water is poured on quick lime the heap heats and swells and hydrated lime or slaked lime is produced, which finally becomes reduced to a fine powder. Burned lime and slaked lime are termed "caustic" on account of their burning properties, while limestone is termed "mild lime." Caustic lime when exposed to the action of air gradually absorbs carbonic acid gas and returns to its original form of mild lime. In the caustic state lime exercises a more immediate and beneficial action on stiff clay and humus-rich soils, such as peat, but for light soils ordinary ground limestone should be preferred. On soils of the latter type lime, if required,