

What Feed Care will do.

Editor "The Farmer's Advocate":

The pair of pure-bred Shorthorn calves illustrated herewith were bred and fed by R. H. Scott & Sons, Middlesex Co., Ont., and sired by the grand bull Roan Baron now in use in the herd. When sold they were under a year old and weighed about one thousand pounds each, which speaks well for the breeding and feeding. The steers were sold to a London butcher for the Christmas market at \$80.00 each; the price of some three-year-olds. This pair of baby beefers were fed principally the same feed as the champion steer at the Chicago Fat Stock Show. At the start they were nursed by their dams, and were fed what ground up oats they would eat up clean. At three months old they were fed molasses meal in addition to the ground oats, with all the alfalfa hay they would eat. After a short time barley and oats were fed, one of barley to three of oats and at the rate of about ten quarts each per day, and the molasses meal increased to about three pounds each per day. These calves never refused their feed once all the time they were feeding. They also got a few pulped turnips and clover hay, as the alfalfa is covered up at present.

Middlesex Co., Ont. R. H. SCOTT.

THE FARM.

Artificial Fertilizers Their Nature and Use III.

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

"The simple husbandman can till his field and, by knowledge he has gained of its soil, sow it with the fit grain, though the deep rocks and central fires are unknown to him—his little crop hangs under and over the firmament of stars, and sails through whole untracked celestial spaces, between Aries and Libra; nevertheless it ripens for him in due season, and he gathers it safe into his barn."

The "simple husbandman," to whom Carlyle thus refers, hardly finds a counterpart in the average farmer of to-day, whose knowledge of the earth's crust extends beyond the superficial layer, which his plow upturns. He knows that the far-seeing Providence, whose solicitude provided the increasing population of the earth with the valuable coal measures, also anticipated the needs of agriculture in storing up those remarkable subterranean deposits of nitrate of soda, phosphate rock and potash salts, the discovery of which, in due season, has furnished the farmer of to-day with the means of increasing the productivity of his soil, to meet the world's growing demand for food.

NITROGEN.

The atmosphere contains about 78 per cent. of nitrogen, 21 per cent. of oxygen, one-third of one per cent. of carbon dioxide and traces of other gases. The fact that plants derive their supply of carbon from the carbon dioxide of the air, has already been noted, but the power of assimilating the valuable nitrogen, existing there in such abundant volume, seems to be confined to one special order of plants (leguminosae), known as legumes, embracing clovers, alfalfa, peas, beans, etc. Since nitrogen is the most expensive element in a fertilizer, the fact that legumes can avail themselves of the atmospheric nitrogen is of paramount importance to the farmer. Its importance prohibits here the discussion, which it merits, so we shall deal with it later.

FERTILIZERS EMPLOYED AS A SOURCE OF NITROGEN.

Nitrate of soda (15 to 16 per cent. nitrogen)—Nitrate of soda, which has its origin in the rainless districts on the western coast of South America, is still the most popular source of nitrogen. The crude material, known as "caliche," occurs in close proximity to the surface and, as no shaft-sinking is necessary, mining operations present few difficulties, the salt-bed being simply loosened by charges of dynamite, inserted in the vertical bore-holes.

We are not particularly concerned with the manner in which these deposits have been formed, but the most acceptable theory seems to be that the nitrate beds were laid down by the oxidized drainage from decaying seaweed. The proportion of nitrate in the caliche varies from 30 to 50 per cent. and by processes of concentration and recrystallization the commercial product of about 95 per cent. purity is obtained.

Since all nitrogenous compounds must first be converted into nitrates, before being assimilated by plants, nitrate of soda contains its nitrogen in a very available form and is, therefore, rapid in action. Owing to this fact, care must be taken in its application so as to avoid loss by leaching, especially in moist climates and on the lighter class of soils. In general it ought not to be applied before seeding time, and, under certain conditions, it is advisable to apply it in two or more applications at intervals of from two to three weeks.

Some authorities claim that the continued use of nitrate of soda on heavy clay soils destroys their texture and makes them sticky, while others hold that, on the contrary, such soils are rendered more friable thereby. The writer is of the opinion that with the moderate applications of nitrate of soda, used in general farm practice, no such effects, either beneficial or detrimental, are noticeable.

On account of the very quick and noticeable results, which follow the application of nitrate of soda to a growing crop, some are tempted to use large amounts of nitrate and to neglect the supply of the other ingredients, which are essential to the proper development of the plant.

SULPHATE OF AMMONIA. (19 to 21 per cent. Nitrogen).—The origin or source of this material

compounds by means of electrical energy. Their efforts have already been rewarded with a large measure of success for not only has the feasibility of the process been demonstrated, but several nitrogenous fertilizers, thus produced, have, during recent years, been offered on the market, the price per pound of nitrogen in the same being similar to that in nitrate of soda.

The subject of artificial fixation of nitrogen is of more than ordinary interest to us in Canada, possessing as we do such vast resources of water power, available for conversion into electricity. Gibbon, the historian, said that "the servitude of rivers is one of the most important victories that man has gained over the licentiousness of nature," and in the light of our present knowledge, how much more complete the conquest appears.

LIME NITROGEN

OR CYANAMID (20 to 22 per cent. Nitrogen).

—This material, also known in Germany as kalk-stickstoff, is a cyanamid of lime, i.e., a compound of lime, carbon and nitrogen, and presents the first economically successful attempt to combine the atmospheric nitrogen for fertilizer purposes. The process, which was devised by Prof. Frank, of Berlin, may be briefly stated as follows: Air is conducted over heated copper filings; the copper forms a compound with the oxygen of the air, and the nitrogen passes

into an electric furnace containing lime and carbon compounds. At a temperature of nearly one thousand degrees centigrade the nitrogen is induced to combine with the lime and carbon to form cyanamid of lime. Plants for the manufacture of this material are in operation in Germany, Italy, France, Norway and Switzerland, besides one at Niagara Falls, which produces the same substance under the trade name of "cyanamid." It has been claimed that the cyanamid produced here has more of a crystalline structure and does not possess some of the objectionable features, associated with the original lime nitrogen. Some years ago, then in Germany, the writer conducted experiments with the then new lime nitrogen to test its efficacy in comparison with nitrate of soda and sulphate of ammonia. The results obtained indicated

that under suitable conditions lime nitrogen would prove a profitable nitrogen fertilizer, although not quite equal to the others used in the test. Lime nitrogen is an exceedingly fine black powder, even finer than basic slag, which it somewhat resembles; this characteristic renders it difficult of application. If mixed in large quantities with other fertilizers, such as acid phosphate, the mixture rapidly generates a great heat and gases are given off, some nitrogen being lost as ammonia and oxides of nitrogen. In storing, it must be very carefully protected from moisture for this reason. Being at first rather poisonous to plants lime nitrogen is totally unsuited to a growing crop, and should always be applied to the land at least two weeks before seeding; and at once cultivated in.

Fertilizer manufacturers find it impracticable to use more than 80 to 100 pounds of nitrogen or cyanamid per ton to complete fertilizer mixture, and have to employ some other source of nitrogen to supply the required balance.

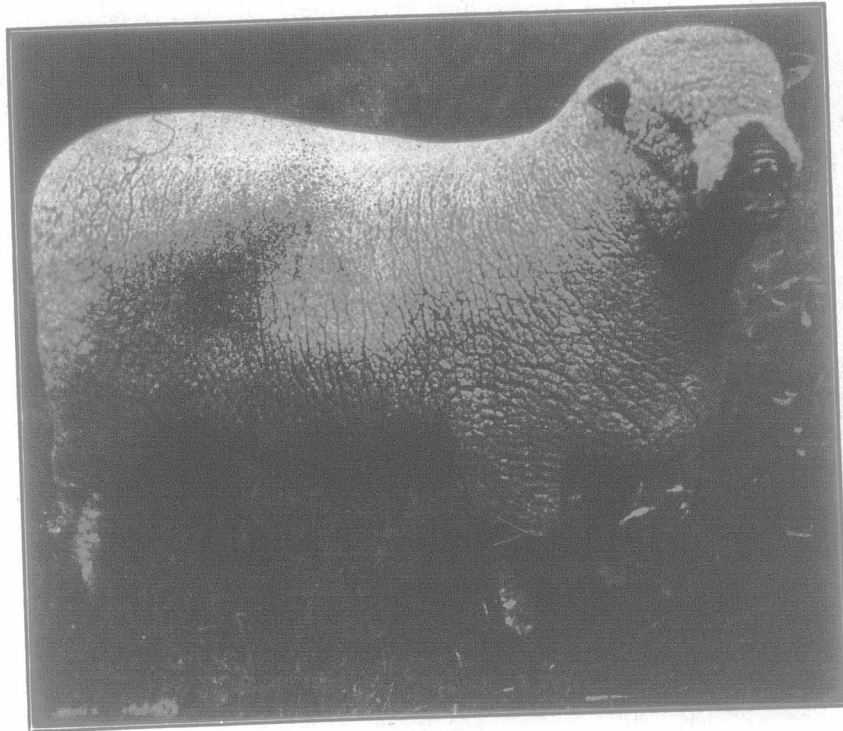
NITRATE OF LIME. (13 per cent. nitrate).—This material is also the product of the fixation of atmospheric nitrogen, but the process is different to that employed in the manufacture of lime nitrogen. One operation consists in passing a current of air through iron tubes containing enormous electric arcs, furnishing a temperature of about 3,000 degrees C., which brings about a union of the nitrogen and oxygen of the



Two Baby Beeves.

Fed by R. H. Scott & Sons, Middlesex Co., Ont., and sold at eleven months of age for more money than many three-year-olds bring.

is coal, which contains one and one-half to two per cent. of nitrogen. It is chiefly a by-product of gas works and is produced to a large extent in Europe, where it ranks next in importance to nitrate of soda as a nitrogenous fertilizer. Although less rapid in action than the latter, sulphate of ammonia is by no means slow-acting. Before becoming available to plants, the ammonia is first of all converted into a nitrate, chiefly nitrate of lime, by soil bacteria. In well-aerated, warm soils where nitrification is rapid, sulphate of ammonia may be said to be almost immediately available. The nitric acid which is formed from the ammonia in the process of conversion requires lime to form the nitrate. The sulphate or sulphuric acid part of the sulphate of ammonia also combines with lime and, in the form of sulphate of lime, passes off in the drain-



Shropshire Shearling Ram.

First in his class at the Royal, 1918.

age from the top soil. It follows, therefore, that sulphate of ammonia ought only to be supplied to soils known to contain a sufficient supply of lime. This being provided, sulphate of ammonia may be preferred to nitrate of soda on soils of loose texture, particularly in moist climates or wet seasons.

ARTIFICIAL FIXATION OF ATMOSPHERIC NITROGEN.—Owing to the increasing demand for nitrogenous fertilizers, such as nitrate of soda and sulphate of ammonia, and in view of their rather limited supply, scientists have for years been devoting their attention to the fascinating problem of capturing the free nitrogen of the atmosphere and combining it in stable chemical

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