

Following are two simple but useful golf course mixtures:

**12-8-4 Mixture With Organic Base**

	Pounds
Sulphate of ammonia .....	1,040
Raw ground bone meal (4 per cent N) .....	800
Muriate of potash .....	160
<b>Total .....</b>	<b>2,000</b>

**6-12-4 Inorganic Mixture\***

	Pounds
Sulphate of ammonia .....	600
20-per-cent superphosphate .....	1,240
Muriate of potash .....	160
<b>Total .....</b>	<b>2,000</b>

Usually the mixing of fertilizers on the golf course will show a profit, but the greenkeeper will have to investigate and determine what the materials and mixed goods cost in his community and then make his decision. The United States Golf Association Green Section is in a position to help the greenkeeper regarding proper mixtures for his turf and is always pleased to be of assistance.

## Fertilizer Production, Consumption, and Costs

Circular 129, published in January, 1931, by the United States Department of Agriculture, entitled "Survey of the Fertilizer Industry," contains information of value to all who are concerned with the use of fertilizers. Some of the more interesting facts and figures contained in the circular are herewith presented.

### WORLD PRODUCTION OF INORGANIC NITROGEN (NET TONS)

	1909	1913	1917	June 1, 1923, to May 31, 1924	June 1, 1928, to May 31, 1929
By-product ammonia...	233,200	377,300	400,400	346,400	469,700
Chilean nitrate.....	330,000	429,000	431,200	372,200	539,000
Air fixation.....	6,050	93,500	374,000	444,500	1,315,600

The modern fertilizer industry, the circular states, is only 80 years old. Although various waste materials have been used from earliest times, without special treatment, to improve the productivity of the soil, the production of commercial fertilizer as it is known today dates back only to about 1850, the year in which superphosphate was first made in the United States. Before that, in 1830, Chile commenced to export nitrate of soda, a natural product requiring little special treatment. In 1840 the acid treatment of insoluble phosphate rock to render it soluble and thus available for use as fertilizer, was invented in Europe. The by-product coke oven, rendering possible the recovery of nitrogen as sulphate of ammonia as a by-product of the coke industry, was introduced into the United States from Europe in 1893. Later, as the concentration of the meat-packing industry into large units led to the general utilization of its by-

\*This mixture should be used soon after mixing as it may become lumpy.

products, dried blood and tankage became important fertilizer materials. Simultaneously cottonseed meal came into use as a by-product of cottonseed-oil mills. Fisheries furnished fish scrap, and many other organic materials became available. The latest and most prominent step in the development of the fertilizer industry has been the fixation of atmospheric nitrogen.

FERTILIZER CONSUMPTION (NET TONS) 1928

	Nitrogen	Phosphoric acid	Potash	Total
Germany .....	450,000	566,000	818,000	1,834,000
United States .....	345,000	800,000	343,000	1,488,000
France .....	160,000	583,000	210,000	953,000
All other countries .....	946,000	1,787,000	655,500	3,388,500

Of the total world production of nitrogen by air fixation, about 87 per cent is consumed in agriculture and the remaining 13 per cent is required for such industrial uses as refrigeration and the manufacture of explosives, nitric acid, and nitrogen salts. Although the low prices of recent years have greatly increased the agricultural consumption of nitrogen, there seems to have been no material increase in the consumption for other purposes.

NUMBER AND ANNUAL NET TON CAPACITY OF NITROGEN-FIXATION PLANTS AT THE END OF 1929

	Number of Plants	Capacity
Germany .....	14	938,500
United States .....	9	195,600
England .....	2	175,000
France .....	28	168,300
All other countries .....	68	726,500

The United States, with about 6 per cent of the world's population, uses approximately 19 per cent of the total output of commercial fertilizer, ranking second to Germany as a consumer.

ILLUSTRATION OF ITEMS OF COST ENTERING INTO A TON OF 4-8-4 MIXED FERTILIZER

Nitrogen, 4 units, at \$2.60 .....	\$10.40
Phosphoric acid, 8 units, at 50 cents .....	4.00
Potash, 4 units, at 80 cents .....	3.20
<b>Total plant food .....</b>	<b>\$17.60</b>
Factory and general expense .....	5.00
Sales expense .....	2.50
Freight .....	3.00
Profit to manufacturer .....	1.50
<b>Total .....</b>	<b>\$29.60</b>

The average plant-food content of commercial fertilizer produced in the United States has increased apparently from 12 or 13 per cent in 1914 to more than 17 per cent in 1928. This result has been accomplished largely by the elimination of worthless filler, by the substitution of better grades of potash salts, and by the substitution of inorganic nitrogen materials for organics of low nitrogen content, and also to a less extent by the use of concentrated materials such as double superphosphate. Freight is an important item in the cost of fertilizer to the consumer, and the possible reduction in this item is

a strong recommendation for a concentrated product. It is estimated that the total saving in freight costs for 1928 amounts to \$9,900,000 over freight costs for 1914 on a basis of like consumption for the two years. In 1929 there were 832 fertilizer plants in the United States, mostly in the East and South.

The United States is well supplied with raw materials required in the production of phosphate fertilizer, but is largely dependent on imports for potash. At the present rate of use it is estimated that the total reserve of phosphate rock known to exist in the United States will last some 2,000 years.

It is hopeless to expect to obtain a cheap fertilizer containing any considerable quantity of organic nitrogen. A great saving might possibly be expected in filling nitrogen requirements by such a radical change in practice as the direct application to the soil of aqua ammonia (ammonia in water solution).

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### Questions and Answers

**Preventing injury to bent greens from brown-patch.**—In September of last year we planted four of our greens with bent stolons and the remaining five with bent seed. Neither the stolons nor the seed have shown proper development, and it has occurred to us that possibly we are too far south for the proper growing of bent grass. Our soil is a sandy loam and as a rule we have early springs and mild autumns. Do you think we would get better results with Bermuda grass? (West Virginia)

**ANSWER.**—We do not think you are too far south for success with bent greens, as these are proving satisfactory as far south as points in North Carolina. It would, of course, be possible for you to have fine Bermuda greens during summer, but this grass can not be compared with bent grass for putting purpose, and has the disadvantage of becoming dormant after the first frost in the fall. Located where you are, there is no reason why you can not have success with bent grass. Your trouble is probably due to the brown-patch disease, which is particularly damaging to turf from June to late September. During these months it is necessary to apply fungicides to bent grass to save it from injury. The fungicide with which we get most success is a mixture of 1 part of corrosive sublimate to 2 parts of calomel, applied to putting greens at the rate of 3 ounces to 1,000 square feet, for the first application. The application should be repeated as soon as a fresh attack of brown-patch is noticed, at which time the rate may be reduced to 2 ounces to 1,000 square feet. If the applications have to be made within a week of each other, 1 ounce to 1,000 square feet is sufficient. It must be remembered that the application of a fungicide simply kills the fungus causing the disease and hence merely temporarily checks the disease. Therefore areas that have been allowed to become injured do not become green again until the injured grass has recovered new growth. In hot, muggy weather, when the conditions are particularly favorable for the growth of fungus, applications of fungicides may have to be made every week or so. Further information on brown-patch and its control is contained in the Bulletin for December, 1927.