THE BULLETIN

of the

UNITED STATES GOLF ASSOCIATION GREEN SECTION

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Contents

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Cameron B. Buxton

In the recent death of Cameron B. Buxton at Philadelphia, the game of golf has lost an enthusiastic and constant devotee; The United States Golf Association, an intelligent and capable member of its Executive Committee; and the Green Section a loyal supporter and a valued member of its Advisory Board.

Active and successful as Mr. Buxton was in his business affairs, he was always ready to give of his time and his ability for the help or betterment of anything that had to do with the game of golf. Coming originally from the South, he lived and played golf for a number of years in and about Philadelphia, and for the past decade had returned to Texas. Owing to this situation, he not only had a wide knowledge of golfers and golfing conditions, but a catholic spirit and a broad and generous viewpoint.

Cameron Buxton was a good golfer, good enough to win the Philadelphia championship and to qualify in National Amateurs, but his outstanding characteristics and the things for which he was loved and will be best remembered were his good clean sportsmanship, his cheerful, happy disposition, his wonderful good comradeship, and his great ability not only to make but to keep friends.

Fairway grasses.—It rarely pays to attempt to introduce a new grass into fairways. If you are in a bluegrass region, your fairways are bound to be bluegrass; if in a bent grass region, they are bound to be bent; if in a Bermuda grass region, they will be Bermuda grass. Whatever your natural pasture grass is, seek to improve it for your fairways.

STATEMENT OF THE OWNERSHIP, MANAGEMENT, ETC., OF THE BULLETIN OF THE UNITED STATES GOLF ASSOCIATION GREEN SECTION, PUBLISHED MONTHLY AT WASHINGTON, D. C., FOR OCTOBER 1, 1926.

District of Columbia, ss:

Before me, a notary public in and for the District of Columbia, personally appeared W. B. Lydenberg, who, having been duly sworn according to law, deposes and says that he is the business manager of The Bulletin of the United States Golf Association Green Section, and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management, etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, embodied in section 411, Postal Laws and Regulations, to wit:

1. That the names and addresses of the publisher, editor, managing editor, and business manager are: Publisher, United States Golf Association Green Section, P. O. Box 313, Washington, D. C.; editor and managing editor, R. A. Oakley, Washington, D. C.; business manager, W. B. Lydenberg, Washington, D. C.

2. That the owner is The United States Golf Association Green Section, a corporation organized and existing under the law not for profit and having no capital stock. R. A. Oakley, chairman; W. B. Lydenberg, executive secretary, P. O. Box 313, Washington, D. C.

3. That there are no outstanding bonds, mortgages, or other securities.

(Signed) W. B. LYDENBERG,, Business Manager.

Sworn to and subscribed before me this 1st day of October, 1926.

(Seal) (Signed) BERNARD CONNOR.

(My commission expires August 6, 1927).

All-The-Year-Around-Greens

By W. G. Thomas, Charlotte Country Club, Charlotte, N. C.

In trying to work out a satisfactory solution of the all-the-year-around putting greens, our Committee has done considerable experimenting. Our greens were originally all Bermuda, and by careful attention could be kept in good playing condition during the growing period of Bermuda grass, which normally in our location is from about May 1 to November 15. During the balance of the year we were forced to make use of temporary greens heavily sanded. These proved very unsatisfactory, since it was almost impossible to keep enough sand on the greens to make a satisfactory putting surface on account of the frequent rains and winds that this section is subject to during the winter months.

Our first trial was with Italian rye-grass sown on the Bermuda greens in November. This method was discarded mainly on account of our failure in getting a smooth putting surface and the retarding effect it had on the growth of the Bermuda in the early spring months. Our next move was to try redtop mixed with fescue, which proved somewhat more successful, but was not entirely satisfactory for two reasons: first, it was difficult to get a good stand; second, the trouble encountered in getting the fescue out of the Bermuda the next spring and summer. It has a tendency to grow in tufts which make the greens very rough. Finally we tried redtop alone, which has proved very satisfactory during the past winter and spring.

Between October 1 and 15 prepare one-half of the regular putting green for planting as follows:

By use of heavy rakes tear up the Bermuda grass on the surface, cut as closely as possible with mowers, and then topdress over this area to the extent of ¼-inch or ⅜-inch deep. Smooth off very carefully and then sow at the rate of 5 to 7 pounds of redtop per 1,000 square feet; cover by running the back of the rake lightly over the surface, then roll with a light roller. Water immediately if the ground is dry—continue to water throughout the winter if needed, just as you do your summer greens. To obtain the best results the young grass should be given a topdressing of sandy loam soil mixed with sulfate of ammonia when about a month old, then repeat once or twice a month thereafter.

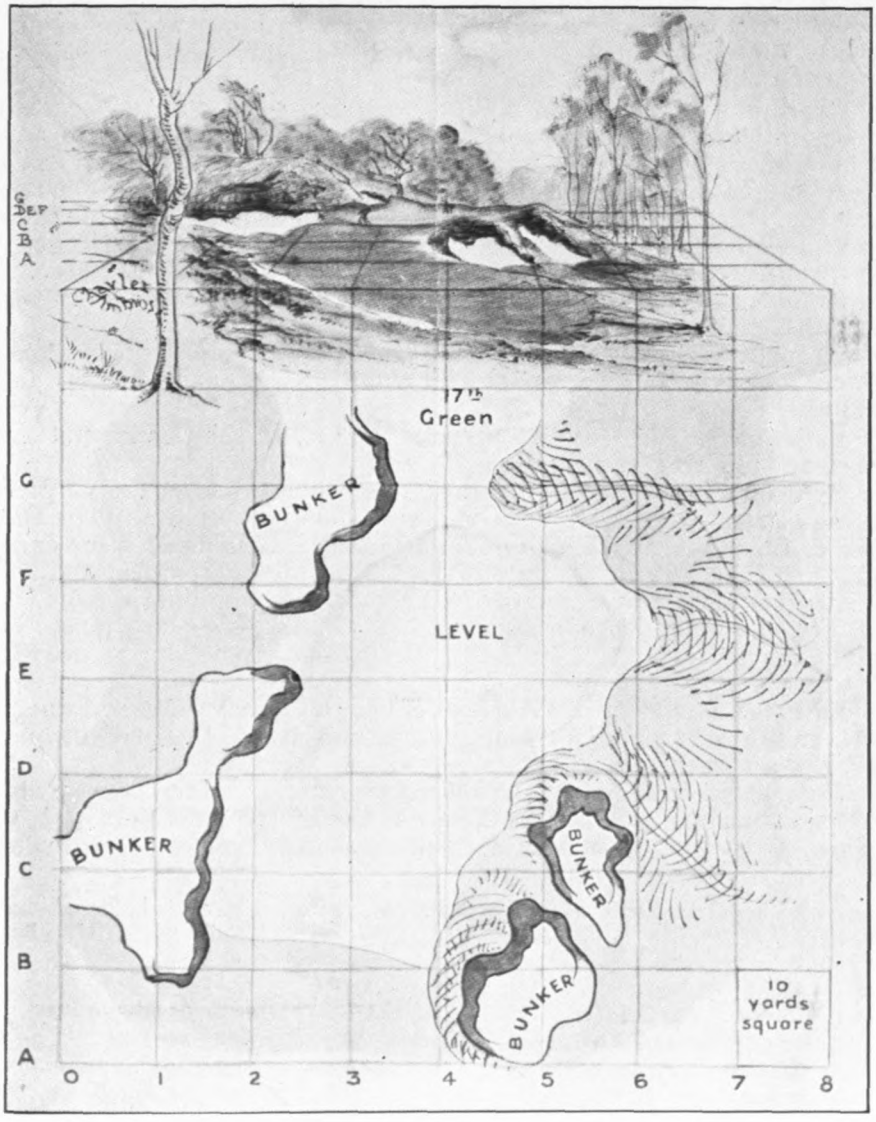
The redtop will furnish a splendid putting surface from about January 1 until June 15. At this time the redtop will begin to turn yellow, and it will gradually die out, no matter how much watering you give it.

The pure Bermuda grass side of your green by this time will be in condition to take care of all your play until the spots on the redtop side have been filled in, by planting Bermuda in them, preferably by the vegetative method.

We have found that a compost made of two-thirds sandy loam and one-third rotted cotton motes makes a very fine topdressing. These motes are secured mostly from a local cotton waste plant and sometimes from a cotton mattress factory. The compost is made in the same manner as if stable manure were used. We have found that about six months is all the time needed to properly rot the motes, which is a much shorter time than with stable manure. Sulfate of ammonia may be added to this mixture with good results.

This year the Women's Southern Championship was played in May at the Charlotte Country Club. The Southern Golfer commented on the condition of the course as follows: "Of course, the Charlotte Country Club, by some wizardry, always has greens, even when the others in this section are burned into a crisp by droughts, and although they were still on the winter greens, these were level and true as in midsummer."—Editors.

A British Golf Course Architect's Plan



Plans in both two and three dimensions, similar to that shown above are used by at least one firm of British course architects. Their advantages over the usual two dimension plans are great, not only to the man in charge of construction but to the committee, whose approval of the plans is required, in visualizing the architect's idea

Appointment of H. L. Westover

At a recent meeting of the Executive Committee of the United States Golf Association Green Section, Mr. H. L. Westover, of the Office of Forage Crop Investigations, United States Department of Agriculture, was appointed Acting Chairman of the Green Section until Dr. Oakley's return to duty in Washington. For several years Mr. Westover has been closely associated with Dr. Oakley in Department of Agriculture affairs as well as in the experimental work of the Green Section. His name is already familiar to readers of THE BULLETIN.

Working Instructions for the Maintenance Staff*

By C. H. L. Knuth

The working force of any organization is continually subject to change and new recruits require a certain amount of training before the superintendent can leave them at their tasks with confidence that the work is going forward smoothly and efficiently. The following general orders should be understood and adhered to by the maintenance staff:

General

1. Remember that the players are the first consideration on the course. Be on the alert at all times in case a match may come up unexpectedly and your work or position interferes with play.
2. Do not stop work unnecessarily to watch the play. Members are liable to report such matters to the Green Committee.
3. Always gather up loose papers, sticks, rubbish, etc., that the course may be kept in a clean, tidy condition at all times.
4. Replace divots inadvertently left by the player.
5. Never leave wheelbarrow or tools in an exposed position, and on no account leave tools lying in bunkers.
6. Report to the greenkeeper at the first opportunity anything unusual that has come to your notice, such as broken fences, flag sticks, hoof marks, washouts, etc.
7. Answer all questions from players civilly and concisely.

INSTRUCTIONS TO GREENSMEN

Mowing Greens

1. Do not touch adjustment on mower; report immediately to greenkeeper if machine is not working properly.
2. Keep mower well oiled, but not too much, as drippings from machine will make dead spots in grass. Always wheel the mower to back and off green to oil it and leave oil can in a place where it will not harm the grass if knocked over.
3. Outline green by circling twice. This is to give a clean-cut border.
4. Strike a swath through center of green at a different angle from previous day's cut. Finish one-half from center to border in straight, even cuts from edge to edge, then repeat with other side. Be careful not to scar in turning at the ends.

* Reprinted from BULLETIN OF THE GREEN SECTION OF THE ROYAL CANADIAN GOLF ASSOCIATION, September, 1926.

5. Pile the clippings in a tidy heap, well away from the playing area, for removal to compost heap.
6. Carry a knife, and remove individual weeds, as dandelions, and plantains, when first seen.
7. Report weedy conditions, presence of worms or ants, and any general defect that may be observed, when first noticed.
8. Wash off mower with hose on return to barn.

Bunkers

1. Rake sand in traps by drawing from the center to the sides and pull the sand well up on to the turf.
2. Report if you think grass on mounds is too long, as after a soaking rain it might grow so fast as to escape the greenkeeper's notice.

Tractor Mower Operators

1. Do not alter adjustment on gang mowers, but report to greenkeeper or engineer if the units do not appear to be working right.
2. Go over the tractor thoroughly every day to see that all oil and grease cups are free and lubricating properly.
3. Replenish gas, oil and water before putting tractor away at night.
4. Report to greenkeeper if engine is not functioning properly.
5. Maximum speed 4 to 5 M. P. H.

Commercial Fertilizers

By H. L. Westover

The term "fertilizers" is an extremely broad one, having been applied to all substances that are added to the soil for the purpose of improving its capacity to produce plant growth.

The essential elements of plant food are 10 in number, to which may be added three others—sodium, silicon, and chlorin—which seem to be useful under certain conditions. Of the essential elements, four—carbon, hydrogen, oxygen, and nitrogen—are derived directly or indirectly from the air and constitute 90 percent or more of all plant material. The remaining six essential elements—calcium, magnesium, potassium, phosphorus, iron, and sulfur—are derived from the solid portion of the soil. While all these elements are essential, certain ones are more extensively used by crops than others and sooner or later require special attention in the way of increasing the available supply, particularly by applying additional amounts to the soil in some form, while others are used in such small quantities relative to the available supply that they rarely need consideration. The elements of special importance are nitrogen, phosphorus, potassium, and calcium.

Nitrogen

The amounts of nitrogen ordinarily available in nature are small. It is the element of the soil most used by crops and is the most expensive of plant foods of commerce. It is also most elusive, as it is sooner or later lost to plants through change in form. Nitrogen-containing compounds in plants are of special importance in relation to life and growth, since they form an essential part of the protoplasm, which is the living part of the plant cell. It is because of this relation that benefits of nitrogen are so soon displayed in the increased

vigor of growth. Nitrogen is intimately associated with the formation of leaves and stems, resulting in greater vigor and darker green color. Used freely, it has a tendency to retard the development of flowers and to delay maturity, while excessive amounts are apt to render plants less resistant to disease. It is largely because of the beneficial effects of nitrogen to stems and leaves that it is regarded so highly in growing turf grasses, since these are the parts of the plants that the grower of fine turf is most concerned with, rather than the production of flowers or seeds.

The nitrogen used as a fertilizer occurs in both organic and inorganic forms. The organic nitrogen is derived either from animal life, such as fish scrap, tankage, meat meal, and similar products, or from plant life, as cottonseed meal, soybean meal, and such. The inorganic nitrogen occurs as mineral deposits, such as nitrate of soda, or else is manufactured from the air, like urea, Ammo-Phos, and others.

Animal Nitrogenous Materials

The animal nitrogenous fertilizers come largely from the meat-packing industries. In the United States much of the nitrogen used in commercial fertilizers is from this source. Other materials in this class include guanos, which consist largely of the excrements of birds, mixed with the bodies of dead birds, fragments of fish, and similar materials, and the by-products from fish-canning factories and fish-salting plants.

Tankage.—Tankage is composed largely of dried animal waste from large abattoirs. In preparing the material, consisting of a mixture of horn, hair, hoofs, meat, and other animal parts, it is first cooked under pressure in tanks to remove the fat, after which it is dried and ground. Tankage varies greatly in composition but generally carries from 4 to 9 percent nitrogen and 3 to 12 percent phosphoric acid. As a fertilizer for turf grasses it is fairly satisfactory, though not as easily handled as bone meal. Being rather slow-acting, it is best suited for working into the soil just before the seed is sown, though good results follow its use as a topdressing. Because of the variability in composition, tankage should be purchased only on guaranteed nitrogen content.

Dried blood.—Dried blood used in fertilizers is prepared by evaporating, drying, and grinding. The color varies from red to black, according to the method employed in drying. The red blood contains about 13 to 15 percent nitrogen, and the black blood from 6 to 12 percent. The red blood is more uniform in composition, due to the fact that the black blood often contains more refuse. As a top-dressing for putting greens, dried blood has not given very consistent results. This may be partly due to the fact that the availability of its nitrogen is somewhat uncertain, depending very largely on the character of the soil to which it is applied. Its most commendable feature is that it may be used with safety on the finest turf.

Fish fertilizers.—Fish fertilizers, including dried fish, fish scraps, and other such materials, sometimes called fish guano, consist of inedible fish and by-products from fish-oil works, fish-canning factories, fish-salting plants, and other fish industries. Fish fertilizers vary greatly in composition, but usually contain about 8 percent nitrogen. While chiefly valuable for the nitrogen, they also contain considerable phosphoric acid. Fish fertilizers decay readily and soon become

available. They are used on fine turf grasses with beneficial results, but the odor is somewhat objectionable.

Guano.—The use of guano for agricultural purposes is an ancient practice. It was commonly supposed to consist of excrements of sea fowls, but other common constituents are fish bones and bodies of birds and remains of large marine animals. Most of the guano that comes into the market contains 5 to 8 percent nitrogen and about 9 percent phosphoric acid. As the supply is limited, guano is seldom used on golf courses, though applications to any of the grasses are ordinarily quite beneficial.

Miscellaneous materials.—Other nitrogenous animal materials sometimes used in fertilizers are horn and hoof meal, waste leather meal, feathers, and wool and hair waste. The nitrogen in some of these materials is low in percentage and very slowly available in all. They are of little value for use in connection with turf grasses.

Vegetable Nitrogenous Materials

The materials in this class consist of the seed residues in oil factories and are limited in amount. They include cottonseed meal, soybean meal, castor-bean pomace, and linseed meal.

Cottonseed meal.—Cottonseed meal is manufactured from the decorticated seed from which the oil has been expressed. A good quality of meal contains 6 percent nitrogen, 3 percent phosphoric acid, and 2 percent potash. Highly satisfactory results have been obtained in many cases from the use of cottonseed meal as a topdressing for turf grasses. The experiments at the Arlington Farm turf garden, near Washington, indicate that it is preferable to bone meal for this purpose, as it has increased the vigor of the grass and has shown less of a tendency to encourage clover and undesirable weeds. A suitable application is 12 to 15 pounds per 1,000 square feet applied at least three times during the growing season. While the nitrogen is not quite as readily available as that contained in sulfate of ammonia, the results are somewhat more lasting.

Soybean meal.—In recent years soybeans have become a very important crop in the United States. In certain sections, manufacturing plants have been established for the purpose of extracting oil from the seed. The meal that is left after the oil is extracted has given excellent results as a fertilizer for turf grasses, being comparable to cottonseed meal. Soybean meal ordinarily contains a little more nitrogen and a little less phosphoric acid than cottonseed meal, and the two seem to be about equal in value for turf grasses. The value of soybean meal as a feed for livestock has a tendency to keep its price above its relative value for fertilizer.

Castor-bean pomace.—Castor-bean pomace is the by-product of castor-oil factories. Its chief use is for fertilizer purposes. It has no value as a stock feed. It is not quite as rich in plant-food constituents as cottonseed meal, usually containing about 5½ percent nitrogen, 2 percent phosphoric acid, and 1 percent potash.

Linseed meal.—Linseed meal is the residue left after extracting the oil from flax seed. Its extensive use as a cattle feed makes it too high-priced for common use as a source of nitrogen in commercial fertilizers. In composition it is quite similar to castor-bean pomace.

Inorganic or Mineral Compounds of Nitrogen

The materials in this class until recently came largely from natural deposits, but more recently large quantities have been derived

from by-products of certain manufacturing operations, or else are manufactured products. Included in this group are sulfate of ammonia, nitrate of soda, ammonium nitrate, and potassium nitrate. At the present time considerable quantities of inorganic nitrogen are, in part at least, direct products of manufacture from the air, such as cyanamid, calcium nitrate, urea, and ammonium phosphate.

Sulfate of ammonia.—Sulfate of ammonia is obtained chiefly as a by-product in the manufacture of illuminating gas, and is extensively used as a fertilizer. It usually contains about 20 percent nitrogen. Its chief advantages are, that it is concentrated; is a definite product; and is quick-acting. It should not be mixed with alkaline substances, like wood ashes or basic slag, otherwise nitrogen is liberated in the form of ammonia. It leaches less quickly than nitrate of soda.

Sulfate of ammonia is one of the most satisfactory fertilizers for topdressing turf grasses, particularly the bents, fescues, and Bermuda grass. Its advantages over most other fertilizers are that it furnishes nitrogen, so essential to the proper growth of grasses, in a readily available form, and at the same time has a tendency to make the soil progressively more acid, thus controlling the growth of chickweed, crab-grass, clover, and other weeds. As sulfate of ammonia is not lasting in its effects, frequent light applications are advisable. At the Arlington Farm turf garden monthly applications of 3 pounds to 1,000 square feet have given excellent results. To avoid injury from burning, sulfate of ammonia should be applied mixed with compost, or in solution, and watered in. In establishing new greens it is better to defer application until the grass is well started, otherwise much of the fertilizing value will be lost by leaching before the grass is able to utilize it. Furthermore, germinating grass seeds, and grass seedlings, are less able to resist the burning effect than established grass, and may be killed. No bad results have followed long continued use of sulfate of ammonia on turf grasses where they are frequently topdressed with compost.

Nitrate of soda.—Nitrate of soda is a natural deposit in parts of South America, and ordinarily contains about 16 percent nitrogen. It is the most active of all nitrogenous fertilizers. It is extremely soluble and should be used sparingly, as it can not be retained in the soil. Grass responds to applications of nitrate of soda, as is shown by the rank growth of dark green foliage, but excessive amounts may produce injurious results. Unlike sulfate of ammonia, it tends to create an alkaline condition in the soil, thereby encouraging the growth of crab-grass and other weeds that prefer an alkaline soil. On account of its pronounced caustic effect it must be used with extreme care on putting greens. The rate of application recommended is the same as for sulfate of ammonia.

Ammonium nitrate.—Ammonium nitrate is now being manufactured in Norway. It is highly concentrated and leaves no injurious residue in the soil. When pure it contains about 35 percent nitrogen. At present the price is too high to warrant its use as a fertilizer and it is seldom used for this purpose.

Potassium nitrate.—Potassium nitrate is found in a natural state in Egypt, India and South Africa. The impure salts contain 14 percent nitrogen and 44 percent potash. Potassium nitrate is so much in demand for manufacturing purposes that little of it is used as a fertilizer.

Cyanamid.—Cyanamid is one of the nitrogeneous fertilizers made by using the nitrogen of the air. It contains about 15 percent nitrogen, which is fairly quick in its action, being about equal to the nitrogen in sulfate of ammonia. Several tests indicate that the nitrogen of cyanamid is not as valuable pound for pound as the nitrogen of nitrate of soda or sulfate of ammonia. Cyanamid injures young plants unless distributed in the soil some time before planting. Unlike sulfate of ammonia, it tends to create an alkaline condition in the soil, thus encouraging certain weeds.

Calcium nitrate.—Calcium nitrate is another air product containing about 15 percent nitrogen. Its chief drawback is its tendency to take up moisture in a moist climate. It also has a tendency to make the soil alkaline.

Urea.—Urea, or Floranid, is one of the nitrogenous fertilizers made in Germany from the air. It is the most concentrated of all nitrogenous fertilizers, containing 46 percent nitrogen in a soluble form. Unlike most fertilizers, urea affects the acidity of the soil only temporarily. At the Arlington Farm turf garden, while giving good results, it has not proved equal to sulfate of ammonia or Ammo-Phos.

Ammonium phosphate.—Ammonium phosphate is generally classed with the fertilizers manufactured from the air, though only partially an air product. The ordinary brand of commerce, sold under the name Ammo-Phos, comes in two grades, one with 17 percent nitrogen or 20 percent ammonia and 20 percent phosphoric acid, and the other with about 11 percent nitrogen or 14 percent ammonia and 48 percent phosphoric acid. This is one of the quick-acting fertilizers, and like other quick-acting materials results are not lasting. In tests at the Arlington Farm turf garden ammonium phosphate and sulfate of ammonia have given comparable results. Both increase the vigor of the grass and at the same time tend to check the growth of weeds that prefer an alkaline soil. To avoid burning the grass, ammonium phosphate should be applied mixed with compost, or in solution, and watered in. Monthly applications of 3 pounds per 1,000 square feet have given good results.

PHOSPHORUS

Phosphorous compounds are found everywhere in the soil and are of great value in their relation to plants. Phosphorus occurs in the seeds in larger amounts than in any other part of the plant, and for this reason plants like the small grains, in which seed production is the important feature, require more than the grasses, where vigorous vegetative growth is the end sought. Most soils have sufficient phosphorus for growing turf grasses, especially where manure has been used in preparing the seed bed, while compost used as a topdressing on putting greens ordinarily maintains an ample supply. When used too freely, phosphorus encourages the growth of clover and other weeds that are objectionable on golf greens. The leading commercial sources of phosphorus as a plant food include bone meal, superphosphates, basic slag, and raw rock.

Bone meal.—Two kinds of bone meal are found on the market. They are known as "raw bone" and "steamed bone." The former receives no treatment before grinding, while the latter is first subjected to superheated steam until the fat and scraps of meat have been removed. The "steamed bone" is the form most commonly used

and is said to be somewhat more readily available than the "raw bone." Whether raw or steamed, the value of bone meal depends to a large extent upon the degree of fineness. The finer the particles are the more quickly they become available. A good grade of bone meal contains from 3 to 5 percent nitrogen and 18 to 20 percent phosphoric acid.

Where soils are low in fertility and where well-rotted manure is not available, bone meal worked into the soil before the seed is sown will ordinarily be found of material benefit in establishing turf grasses. It may also be used to advantage for topdressing fairways, where a uniform turf is not particularly important. When used as a topdressing on putting greens it increases the vigor of the grass but at the same time tends to encourage clover and other weeds to a greater extent than does cottonseed meal. It is the common practice to apply bone meal in the spring, but there is some evidence to indicate that better results follow winter applications. Fifteen to 20 pounds per 1,000 square feet is the rate of application usually recommended for topdressing. When incorporated with the soil, somewhat larger amounts may be used to advantage. Bone meal is easily applied, and no burning or other injurious effects have ever been observed from its use.

Superphosphates.—The superphosphates include acid phosphate, dissolved bone, and bone black. Of these, the acid phosphate is by far the most important commercially. It is made by treating phosphate rock, which occurs in nature, with sulfuric acid, thereby changing the phosphorus into a form that is available to the plant. While somewhat variable in composition, the grade ordinarily sold on the market contains 16 percent phosphoric acid. The concentrated or double superphosphates, which are made by further treatment of 16 percent acid phosphate, contain as high as 44 percent phosphoric acid. If well made, the superphosphates are free from acid, and while readily available to the plant are not easily washed from the soil. Superphosphates should be used rather sparingly on golf courses, particularly on bent-grass greens, as they tend to encourage the growth of clover.

Basic slag.—Basic slag is a waste product from the manufacture of steel. It is variable in composition but usually contains from 16 to 19 percent phosphoric acid. The availability is dependent to a large extent upon the fineness of division. Repeated applications of basic slag reduce the soil acidity and thereby have a tendency to bring in clover and other plants requiring an alkaline condition. For this reason it is not recommended for use on putting greens where a pure stand of grass is desired.

Raw rock phosphate, or floats.—Raw rock phosphate is made by grinding phosphate rocks, which occur in parts of South Carolina, Florida, Tennessee, Idaho, Wyoming, and Montana. The raw rock phosphates are insoluble in water and are incapable of furnishing plant food directly, but must decay first; hence their usefulness depends upon decay or a change to such a form as is available to plants. The rate of decay depends to a considerable extent on the fineness of division. As the raw rock phosphate is slow in decaying, its effects are not apparent for some considerable time after applying. It is of little value in growing fine turf grasses.

POTASSIUM

Potassium plays a very peculiar role in plant growth. It is most abundant in young and growing parts, where activity is greatest, and least abundant in parts that have ceased to grow. Potassium compounds are absolutely essential in order that the plant may produce starch, sugar, cellulose, and other carbohydrates. It is also believed to aid in transference of starch from one part of the plant to another. It is most abundant in stems and leaves, and, where deficient, stems are apt to be weak and brittle. Most soils carry enough potassium for turf grasses. Any deficiency that exists is usually remedied if manure is used in preparing land for sowing, or by subsequent topdressings with compost. Heavy applications of potassium on fairways or putting greens are undesirable, as they promote the growth of clover.

Wood ashes.—Until the discovery of mines of crude potash salts the chief source of potash other than that contained in stable manure was wood ashes, which may contain from 2½ to 12 percent potash, though as offered on the market the amount usually varies from 3 to 8 percent. Softwood ashes contain less potash than hardwood ashes, while coal ashes and unprotected ashes from sawmills where softwood is burned are of little value. Although generally regarded as a potash fertilizer, ashes also carry 30 to 35 percent calcium oxid and a small amount of phosphoric acid. Wood ashes correct acidity, improve the mechanical condition of the soil, and aid nitrification, but since they encourage the growth of clover they are not desirable for use on putting greens.

Muriate of potash.—Muriate of potash (potassium chlorid) is a product prepared from the crude materials of the German potash mines, purified by special treatment. It varies in composition, but most of that offered on the market is guaranteed to contain the equivalent of 50 percent actual potash (K_2O). Muriate of potash is the most generally used of the potash salts.

Sulfate of potash.—Sulfate of potash (potassium sulfate) is another of the manufactured products of the German potash mines. It comes on the market in two grades, the more common form containing 48 percent potash (K_2O).

Potassium carbonate.—Potassium carbonate is used to some extent as a fertilizer and to some extent on compost heaps. It contains 65 percent potash (K_2O) and is recommended where chlorids and sulfates are to be avoided, as for instance in the growing of tobacco.

Potassium nitrate.—Potassium nitrate is one of the oldest and best-known sources of potash. In addition to the 12 to 14 percent nitrogen, it has 44½ to 45½ percent potash. It is especially valuable where it is desired to avoid sulfates or chlorids, but the supply is limited and the price high.

MIXED FERTILIZERS

Mixed fertilizers, as the name implies, are preparations made by mixing plant-food materials of different kinds. The materials used include manufactured products, substances in or from natural deposits, and by-products from various industries. Their agricultural value depends chiefly upon the forms and amounts of the three plant-food elements, nitrogen, phosphorus, and potassium. Mixed fertilizers are either complete, carrying all three elements, or incomplete, carrying only one or two elements.

In nearly all states manufacturers are required by law to indicate on each package of mixed fertilizer the percentage of nitrogen, phosphoric acid, and potash contained. They should also be, and in some states are, required to show the kind of material used in the mixture. The analysis of a fertilizer may show a high percentage of nitrogen, for instance, and yet it may have a low agricultural value due to the fact that the nitrogen is in a form that is very slowly available to the plant. Leather waste, hoofs, horns, and hair carry a high percentage of nitrogen, yet unless treated so as to make them soluble they are of little value as a fertilizer, since they decay so slowly. Until a fertilizer goes into solution it can not benefit a growing plant.

Many of the large fertilizer companies put out special fertilizers for special purposes. These are sometimes put out under a brand-name, though many of the larger companies have discarded the practice and designate their fertilizers by their composition, as 3-8-3 or 3-8-6 goods. These figures refer to the parts per 100 of nitrogen, phosphoric acid, and potash, in the order named. In some localities the order of nitrogen and phosphoric acid is reversed. The purchaser of mixed fertilizer always gets considerable filler and pays considerably more for the various ingredients than if purchased separately.

While mixed fertilizers are used to advantage under certain conditions, particularly in preparing land for grass, it is usually better to avoid them in growing turf. Fertilizers containing phosphorus and potash tend to encourage clover and various weeds, and most soils contain sufficient of these elements for turf grasses. Any deficiency that may exist is remedied where manure is incorporated with the soil in preparing it for a putting green. Topdressings of compost furnish additional phosphorus and potash, nitrogen being the only plant food required in larger amounts. In seeding fairways where the soil is poor and manure not available, mixed fertilizers are sometimes used to advantage. Even here, however, the percentage of nitrogen should be high in proportion to phosphorus and potash, and in a form that will be available within a reasonable length of time.

LIME

The basic substance in the various lime materials is calcium. In plants calcium strengthens the cell walls, encourages the growth of root hairs, and appears to be associated with the transference of starch within the plant, it is found mainly in the stems and leaves.

Lime is one of the indirect fertilizers—that is, it favorably influences crop growth through the effect on the soil rather than through the addition of plant food. It is contained in most soils in sufficient quantities for plant growth, though certain plants are benefited by applications of lime.

The calcium compounds available for agricultural use as indirect fertilizers are calcium oxid, calcium hydroxid, calcium carbonate, and calcium sulfate.

The calcium oxid, otherwise known as burned lime, caustic lime, quick lime, unslaked lime, and lump lime, is prepared by heating at a sufficiently high temperature any form of carbonate of lime, as limestone, oyster shells, or shell marl. When pure it contains 71.4 percent calcium. Burned lime, when applied to the soil, changes very quickly to hydrated lime, and sooner or later to carbonate of lime, in which form it does most of its work.

When calcium oxid comes in contact with water it undergoes a change known as slaking, resulting in the production of a chemical compound known as calcium hydroxid, which in everyday parlance is slaked lime or hydrated lime. This represents burned lime diluted by combination with about one-third its weight of water.

Ground lime and ground oyster shells are just what the names imply and are the carbonate form of calcium, which is more dilute than either the burned lime or hydrated lime.

Calcium sulfate, otherwise known as gypsum or land plaster, is a compound of calcium and sulfuric acid. It is particularly beneficial to leguminous crops. Unlike the calcium compounds previously discussed, its continued use has a tendency to increase the acidity of the soil.

To furnish the same amount of calcium as is contained in 100 pounds of burned lime requires 130 pounds of hydrated lime, 180 pounds of ground limestone, and 310 pounds of gypsum.

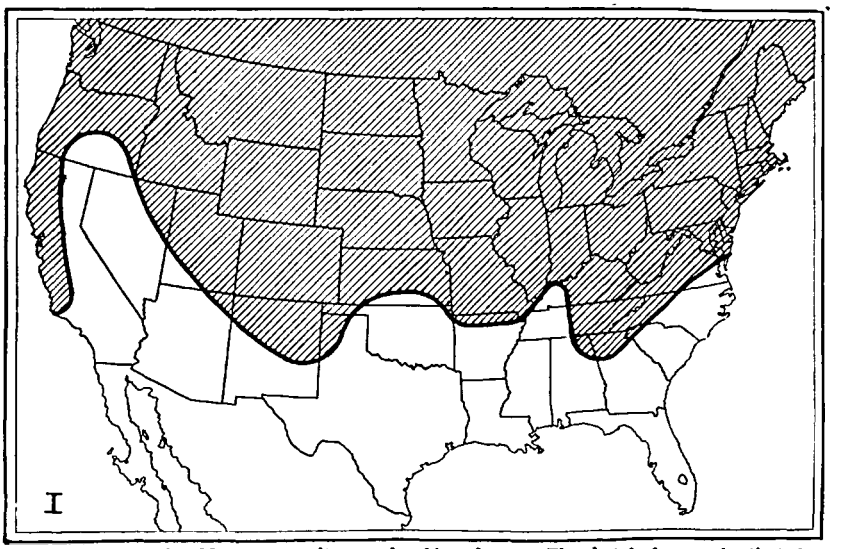
Lime is of benefit in various ways. It makes available insoluble forms of plant food, especially in compounds containing potassium and phosphorus; it neutralizes the effects of compounds that interfere with plant growth, such as acid and toxins; it favors the decomposition of organic matter; it makes conditions more favorable to the action of certain bacteria; it improves the physical character of sticky clay soils; and it has a tendency to check certain diseases.

Injurious results may follow the injudicious use of lime. Used too freely, burned lime results in the loss of organic matter through too rapid decomposition; it results in the loss of nitrates by furnishing them faster than the plants can use them; it checks nitrifying organisms; and it encourages certain diseases. Certain plants, particularly the legumes, require an excess of lime in the soil for their best development, while others do best in an acid soil. The latter seems to be the case with most turf grasses, particularly the bents and fescues. Bluegrass is believed to be a lime-lover, mainly because of the wonderful bluegrass characteristics of the calcareous soils. But calcareous soils are notoriously rich, and it is equally probable that the fine bluegrass turf is due to the high quality of the soil and not to the lime specifically. At any rate, bluegrass of high quality can be found on soils poor in lime, especially if they are high in plant food. When lime is applied to the soil it creates a condition favorable to the growth of clovers and weeds, particularly crab-grass, and for this and other reasons is not recommended in growing turf grasses.

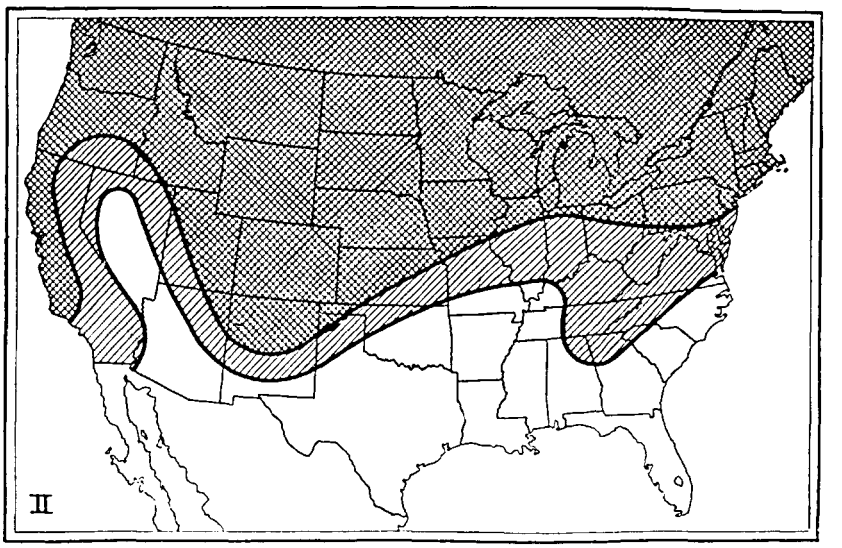
The golf course village.—It is often the case that in establishing a golf course both the necessity and the desirability arise of planning in some measure for the growth of a village in its neighborhood. If such a village is thoughtfully planned during its inception or early stages of growth it goes a long way toward materially enhancing the attractiveness of the golf course. The subject of rural village planning has been studied in detail by Department of Agriculture experts, and the results of their studies have been published in a 45-page bulletin, extensively illustrated, which is available without charge to interested persons upon application to the United States Department of Agriculture. This is Farmers' Bulletin No. 1441, "Rural Planning; the Village." It discusses, among other matters, the problems of streets, parks, river-bank improvements, railway and trolley approaches, waterfronts, sanitation, roads, and public buildings.

Range of Adaptation of the Most Important Turf Grasses

That many clubs are doubtful as to which of the turf grasses is best suited to their local conditions is indicated by letters frequently received by the Green Section. To assist these clubs in solving their problem the accompanying maps are reprinted from Volume II of THE BULLETIN.



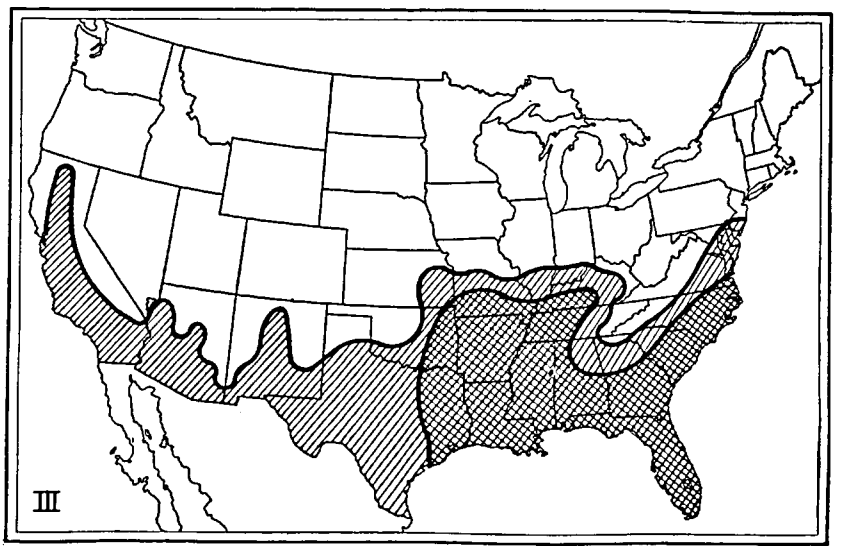
Map I. Kentucky bluegrass, redtop and white clover. The hatched area is that in which Kentucky bluegrass succeeds best. White clover and redtop occupy the same area, but both thrive well much farther southward.



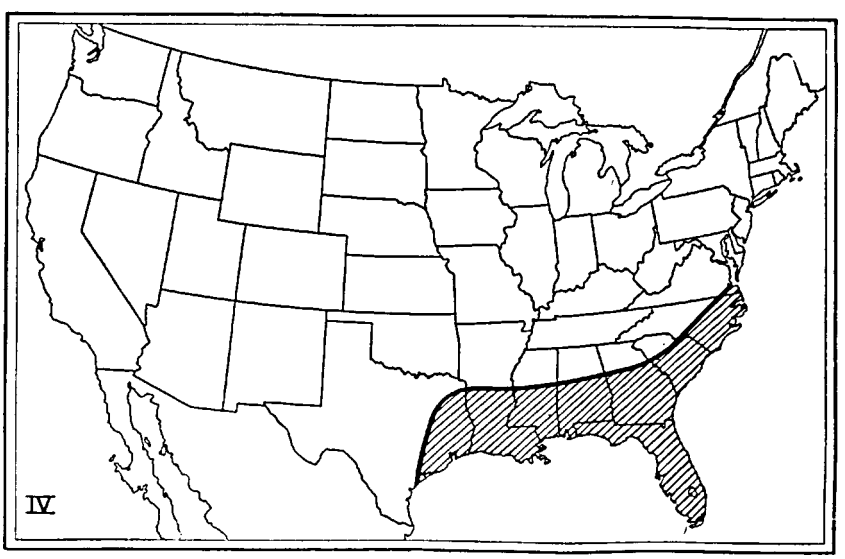
Map II. Bent grasses and red fescue. The double-hatched area is that in which creeping, velvet, and Rhode Island bents, and red fescue succeed well; the single-hatched area, that in which they need good care to succeed, although red fescue rarely succeeds south of the double-hatched area.

On many courses, both northern and southern grasses will be found in competition, and in these cases experimental work is always advisable and may lead to most interesting conclusions, comparable in importance to Mr. W. E. Barret's experimental work at the Hermitage Country Club in Richmond, Va.

On the other hand, for Maine to plant Bermuda grass or Louisiana to try creeping bent is a waste of time and money; yet experiments of this kind have been brought to our attention.



Map III. Bermuda grass. The double-hatched area is that in which Bermuda grass succeeds best; the single-hatched, that in which it competes with blue grass and other grasses.



Map IV. Carpet grass. The hatched area is that in which carpet grass is adapted.

Sand for compost should pass a ¼-inch-mesh screen. If you can not get a fine and uniform grade of sand, it is advisable by all means to screen it.

QUESTIONS AND ANSWERS

All questions sent to the Green Section will be answered in a letter to the writer as promptly as possible. The more interesting of these questions, with concise answers, will appear in this column each month. If your experience leads you to disagree with any answer given in this column, it is your privilege and duty to write to the Green Section.

While most of the answers are of general application, please bear in mind that each recommendation is intended specifically for the locality designated at the end of the question.

1. Topdressing with pure sand in fall.—The question arises as to whether we should cover our greens for the winter or leave them uncovered. Heretofore we have given the greens a light topdressing of sand alone and found that this gave us good surface drainage and little or no winterkill. However, some think a heavy compost topdressing better. We should be glad to know your experience in such matters. We have found cases in which a heavy topdressing on greens over winter has caked and held the water, to the injury of the grass. (Illinois.)

ANSWER.—We have topdressed greens with sand and other materials over winter and have obtained best results from a topdressing of compost to which a little more sand has been added than is customary with compost used during the growing season. Compost of this character, applied at a rate not to exceed 1 cubic yard to 5,000 square feet of surface, is not liable to pack or cake over winter.

2. Grasses for sandy soils in the North.—We are constructing a golf course on land which contains quite a bit of sand. The vegetation on this soil consists of scrub pine and a few scrub oaks. We realize it will be more or less difficult to grow grass on this sort of soil, and are writing for your advice as to what is the best procedure in the preparation of fairways and putting greens. (New York.)

ANSWER.—It is very difficult to grow turf on land that is very sandy. If any grasses will succeed on the land in its raw state it will be Rhode Island bent and red fescue; it is extremely difficult, however, to get a good stand of red fescue. White clover will also be a useful element, especially on the fairways. It would be much better if the soil could be improved. This could be done by mixing clay or clay loam in the top two or three inches of the soil, using sufficient clay to bind the particles of sand together. With careful fertilizing you should then be able to grow good turf, using the grasses mentioned above, and bent alone for the putting greens. It will pay you first to get the soil in good condition before attempting to grow grass on it.

3. Use of cinders and sand in lightening heavy clay soil.—I understand that cinders have been used to good advantage in lightening heavy clay soil and that they are highly beneficial in the treatment of soils that approach the gumbo or prairie clay type. Please let me know how the cinders should be applied, and in what quantity. (Quebec.)

ANSWER.—In the case of heavy clay soil, any granular material not too coarse that can be mixed with the top few inches of soil will help materially. Coarse sand is about the ideal for this purpose, while cinders or any similar material will accomplish good results. It takes relatively enormous quantities of such material, however, to modify the texture of a soil. The best way of applying the material is to scatter it over the surface and harrow it in well. An application of 2 inches of sand or cinders should be harrowed into the top 3 or not to exceed 4 inches of the soil. The amount to use, however, depends a good deal on the heaviness of your clay soil. Before making a complete application therefore it would be well to experiment on a small plot of ground to ascertain the quantity of material needed to produce the results desired.

4. Peat-moss for putting greens.—Please let us have your opinion as to the value of peat-moss for putting greens. (New York.)

ANSWER.—We have done considerable experimental work with peat-moss but we can see no benefit from its use in either putting green maintenance or construction. All the evidence we have found indicates that ordinarily good soil, well drained, is all that is needed to start a putting green, and that turf of the highest quality can be maintained from this start by topdressing with soil and fertilizer. If used to excess we can see how actual harm might result from peat-moss.

5. Value of seed harvested from a creeping bent nursery.—Having no use for our creeping bent nursery the past season we allowed it to go to seed and have harvested the seed from the nursery. Would you consider this seed of any value? (Pennsylvania.)

ANSWER.—We have succeeded in satisfactorily germinating seed harvested from creeping bent nurseries.

6. Controlling weeds in traps and bunkers.—Will you please tell us the best way to sterilize the soil of traps and bunkers so as to kill all vegetation and prevent the ingress of grass and weeds? (Massachusetts.)

ANSWER.—The chemical weed-killers mentioned in the article in THE BULLETIN, Vol. IV, page 169, are suitable for the purpose. Probably the cheapest of these is common salt. A saturated solution may be made of this and applied to the soil. An application of about 1 quart to the square foot should be sufficient. The salt will of course in time wash out of the soil, so that the application will eventually have to be repeated.

7. Utilizing manure containing a large proportion of straw.—There is a hunting club about four miles from our course and it is anxious to contract with us to give us free all their manure if we will contract to keep their bins clear. This would mean about 300 loads of manure a year. There would, of course, be a large proportion of straw in the manure, since we would be obliged to clear it out frequently from the bins. Would you advise us to use manure of this character, and if so in what manner? (Ontario.)

ANSWER.—We would suggest that you lose no time in accepting the contract. We believe you could easily make use of 300 loads of manure a year by composting it. Even if it contains a considerable proportion of straw, it will compost well with soil, especially if you

add ammonium sulfate. A number of clubs have obtained good results from mixing ammonium sulfate with straw and manure in compost piles, using about 100 pounds of ammonium sulfate to about the equivalent of a ton of dry straw, which of course would mean in your case considerably more than a ton of the material to get this amount of straw, since it would be mixed with manure. The compost should be kept moist and worked occasionally. It should be screened before using and the coarse material thrown back for further composting. Rotary screens are very helpful for the purpose of screening. We have about reached the conclusion that it is practically impossible to have really first-class putting greens without compost. The applications should not be heavy, nor should the compost contain a large proportion of organic matter, such as straw and manure. Twenty to 30 percent, preferably 20 percent, of organic matter is all that is needed in the compost; the other ingredients, such as clay or clay loam and sand, should be added in proportions to suit the character of the soil on the course. The working of the compost can be economically done by driving over it with a harrow, provided the material can be spread out thickly over a rather large area.

8. Seeding as late as October 30.—We are building some new fairways which we are anxious to have ready for play next summer. Do you think it is too late to plow and seed these now, or should we postpone the work until spring? (Northern New York.)

ANSWER.—We would advise you to defer your seeding until early spring rather than attempt it as late as the end of October in your latitude. Fortunately spring seeding in your latitude gives fairly good results. South of that, however, spring seeding should be avoided whenever possible. Unless there is some special reason, such as danger from washouts, we should think it would be advisable for you to plow your land any time in the fall or early winter when it can be satisfactorily worked, so that it may be made into a good seed bed as early in the spring as possible.

9. Winter planting of bent stolons.—Please advise me whether or not creeping bent stolons could be successfully planted during the winter months. My plan would be this: Catch the soil in a moist condition after a light thaw, broadcast the stolons very thickly over the surface, and press them firmly into the ground as they are planted. I would follow this with a topdressing during a spell of freezing. Would not this method prove satisfactory if moisture conditions were properly taken care of? (Missouri.)

ANSWER.—We should hesitate to plant stolons during the winter in your climate, as during the very cold weather they would be pretty apt to die. We believe you could safely plant them up to the end of November, but after that the chances are they would die. Your best plan would probably be to put them on the prepared ground just as early as you possibly can in the spring. That is not as good as late summer planting, but we believe you could look forward to success.

10. Applying cottonseed meal.—How is cottonseed meal applied as a fertilizer for putting greens? (Virginia.)

ANSWER.—It may be applied either straight or mixed with sand. You would be safe in using up to 10 pounds to 1,000 square feet, on putting greens.

MR. GREEN COMMITTEE CHAIRMAN:

This fall we furnished many of you with enough bent of the Washington or Metropolitan strains to plant two nursery rows, each 100 feet long, and you were perhaps discouraged because you wish to plant all your greens to one strain soon. So you can in two years, provided you don't use your nursery stock next year.

Each of those two rows, planted from one square foot of turf, will by next fall, if properly cared for, have grown from a thin green line into at least 300 square feet of turf—a total of 600 square feet—enough to plant one green 6,000 square feet in area. But don't make the mistake of planting it. Be patient. Replant your 600 square feet of turf about the quality of which you have no doubt just as you did this fall. Then tell your Board of Directors that in 1928 you can convert all your greens to the Washington or Metropolitan strain. And so you can, for in 1928 your 600 square feet will have become a turf garden containing 180,000 square feet of as fine creeping bent as is known.

If your greens are very large, perhaps averaging 8,000 square feet, the area to be planted is 144,000 square feet.

Plant them at the rate of 1 square foot of nursery stock to 1 square foot of putting surface, if you wish, although 1 to 10 is absolutely safe. You will still have a surplus of 36,000 feet, part of which it would be well to care for exactly as you would a green so that resodding can be done whenever advisable.

But if we receive a request from you next season for more Washington or Metropolitan we will know that you are probably working on an 18-year program, so make haste slowly, cultivate your nursery, weed it, water it, and if necessary fertilize it.

THE GREEN SECTION.