THE BULLETIN

of the

UNITED STATES GOLF ASSOCIATION GREEN SECTION

Vol. 10 Washington, D. C., February, 1930 No. 2

Contents

THE BULLETIN is published monthly by the United States Golf Association Green Section, at Room 7207, Building F, 7th and B Streets, N. W., Washington, D. C.

Address all MAIL to P. O. Box 313, Pennsylvania Avenue Station, Washington, D. C.

Send TELEGRAMS to Room 7207, Building F, 7th and B Streets, N. W., Washington, D. C.

Subscription Price: In United States of America, Mexico, and West Indies, $4.00 per year; in all other countries, $5.00 per year.

Entered as second-class matter, April 21, 1926, at the post office at Washington, D. C., under the Act of March 3, 1879.

Mosquito Extermination

Green committees and greenkeepers frequently think of June beetles, Japanese beetles, and ants as the chief insect pests of a golf course. Club members, however, often think otherwise. To the player a flock of mosquitoes is usually much more distracting than any number of turf insects.

In all too many cases the mosquitoes that bother the players are produced on the club property due to the oversight or neglect of those in charge of the course. Stagnant pools are an abomination in many ways. Good water hazards are an asset to any golf course, but there is a wide difference between good water hazards and the puddles

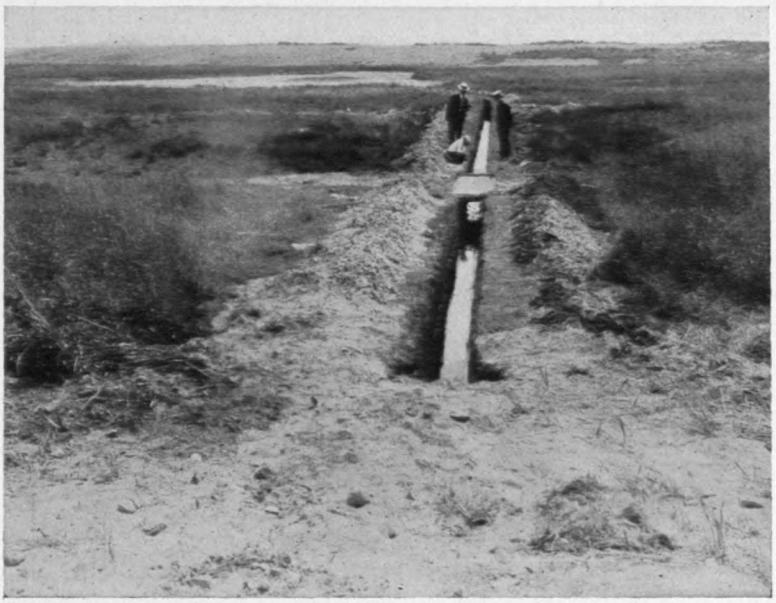
A bad breeding place for mosquitoes.

The same place filled in and converted to useful land.

of stagnant water that some clubs try to glorify with the name "water hazards." Stagnant water offers an ideal breeding place for mosquitoes, and a small, neglected pool may furnish a stock of mosquitoes sufficient to torment the club members during the greater part of the playing season and possibly bring disease. It is the duty of green committees and greenkeepers to do all in their power to protect the players from these small tormentors just as much as to provide them with good turf on which to enjoy their game.

National and State organizations have spent millions of dollars in recent years in an effort to reduce the mosquito nuisance by eliminating the breeding places of the pests. Golf clubs can help this pro-

gram of public welfare by providing proper drainage on their properties. It should be remembered that a campaign of this nature is successful only if all breeding places in a given area are eliminated. Stagnant water in some unused part of the club property is just as dangerous from the standpoint of mosquito infestation as is a pool in the middle of a fairway. Those in charge of a golf course are not fulfilling their obligations to their club members and their community if they fail to do their share in the nation-wide movement under way to reduce in every possible manner the mosquito nuisance and the diseases which the mosquito may transmit.



Swampy areas too extensive to permit filling in may be effectively rid of mosquitoes by means of properly constructed ditches. The main ditch for the area here shown is two miles long, draining at each end into a rocky beach.

Doubtless the most efficient plan for mosquito extermination is the Gorgas plan, being sponsored by the Gorgas Memorial Institute of Tropical and Preventive Medicine, which is perpetuating the sanitation work inaugurated years ago by the late Major General Gorgas. "More human lives were saved by General William Crawford Gorgas in controlling mosquitoes in Cuba and Panama than have been saved by the act of any other single man," writes Dr. Franklin Martin, chairman of the board of directors of the Institute. In a statement issued by the Institute it is said: "The work which Gorgas accomplished at Panama alone is conservatively estimated to have saved a total of 71,000 lives, and the United States Government a total of $80,000,000. This record won for General Gorgas the title of 'the greatest and most famous sanitarian of the ages,' and in completing the Panama Canal, America won credit for doing what four hundred years of time and all the plans of other nations had failed to accomplish. What Gorgas did we can do in every home, every community, every golf course, every county, every State. We can clean the United States of mosquitoes if we will." In commenting on the Gorgas plan,

Rear Admiral Cary T. Grayson, president of the Institute, writes: "The Gorgas Memorial Institute stands for better health. In a variety of directions it is carrying on the activities of the great sanitarian General William Crawford Gorgas, to whom the Institute is a perpetual memorial. The splendid Gorgas Memorial Laboratory in Panama, made possible by an annual appropriation of $50,000 from the United States Government and by the generous cooperation of the Republic of Panama and other Central and South American countries, is constantly engaged in the study of tropical diseases as they affect human and animal life; a wide educational program for better health is bringing new understanding of how to prevent disease to families and communities throughout our own country; and the Gorgas plan of permanent mosquito extermination is making every place in which it is used a better, healthier, more comfortable place in which to live."

The more important features of the Gorgas plan of mosquito control, together with a statement of what the plan has already accomplished in the United States, are contained in a pamphlet recently issued by the Gorgas Memorial Institute, entitled "Get Rid of Mosquitoes." For the benefit of readers of the Bulletin, there is quoted below a portion of the pamphlet dealing directly on the problem of mosquito extermination. The pamphlet also contains information on the life history of the mosquito and descriptions of the different species and their habits, in terms of the layman. It presents in a popular way the thrilling story of the triumph of sanitation in combating some of the most disastrous human diseases with which medical science has had to contend. The Panama Canal, it will be recalled, could not be completed until the mosquito problem had been solved by General Gorgas. The pamphlet is profusely illustrated, and may be obtained by writing to the Gorgas Memorial Institute, 1331 G Street Northwest, Washington, D. C. We read:

"It is the consensus of opinion of our foremost observers that in localities where mosquitoes are prevalent and no control measures have been undertaken, their numbers are increasing considerably from year to year. New areas are being infested due to increased population and changing conditions. This is particularly noticeable in what Le Prince calls the 'man-made species' of mosquitoes bred in polluted streams. In populous sections there are very few swimming holes remaining fit for bathing.

"It is common for people to think that the larger the body of water or swampy area, the more mosquitoes it can produce. As a matter of fact, in many instances the places which look as if they might produce large numbers of them actually are the source of very few. Oftentimes it is because the natural enemies of mosquito larvæ control the situation. On the other hand it is astonishing how many families leave out in the open, around the yard, many home objects which will catch and retain rain water. Inspections of numerous towns show that it is common for three out of five families to produce a supply of mosquitoes close to their homes.

"Last year, Boy Scouts, volunteering as mosquito inspectors, found that 42 per cent of 3,000 homes in a wealthy metropolitan suburb were breeding their own. A few visits of the Three-Minute Squad of three scouts put an end to mosquitoes from this source. The Three-

Minute Squad uses a sponge to absorb water standing in house drains and keeps a record of work done.

"The practical extermination of all mosquitoes throughout the United States would not be an impossible task and there is nothing that would give greater return for the effort and money expended. The Gorgas plan of permanent mosquito extermination calls not only for present eradication of mosquito breeding, but for the exhaustion of all mosquito breeding possibilities that may be caused by abnormally wet weather conditions. The most important type of the engineering work called for consists of especially designed drainage of a permanent nature. Small pools and potholes are filled to grade, if filling material is available at reasonable cost. Mid-channelling serves in many cases to give added flow and perfect drainage to sluggish streams. Chemical repellants are valuable in manholes of storm sewer catch-basins. Spraying of oil and other larvacides is a temporary measure which sometimes must be resorted to, but it is expensive and does not effect total extermination or permanent control.

"Any city, town, or countryside that is infested with mosquitoes, or even has relatively few, can be freed of them under the Gorgas plan at very reasonable cost. All that is required is the plan and some organized concerted effort. If you have no outlying swamp areas and no polluted streams you have just a local problem that you can handle yourselves. The Gorgas Memorial Institute will show you how, and you probably have engineers fully capable of doing the outlying work if a specially trained mosquito engineer makes a survey and outlines exactly the necessary procedure under the Gorgas plan. The Gorgas plan has been bonded numerous times, guaranteeing the total permanent extermination of all mosquito breeding in a given area and maintenance in a mosquito-proof condition.

"As soon as boys and girls, and men and women, have learned what mosquito larvæ look like, it is not difficult to find and examine all the breeding places within a three- or four-mile radius of any community. Boy and Girl Scouts, Campfire Girls, Rangers, and other organized youth groups can render invaluable service in helping to rid their communities of the mosquito pest; and the value of this important service will endure twofold in the next generation, for it is certain that those who participate in this work now will not tolerate mosquitoes on their premises when they are the home-owners of tomorrow."

The water-holding capacity of soils, likewise their capacity to retain soluble plant food, depends on the aggregate extent of surface area exposed by their component soil particles. The smaller the component particles, the greater is their number and the greater the aggregate extent of surface area exposed. It is for this reason that fine clay soil has a greater water-holding capacity than sandy soil. These smaller particles contained in soil are called "soil colloids." Potters' clay is highly colloidal. The size of soil colloids is astonishingly small and the aggregate surface area which they present is as astonishingly great. It has been estimated that in the average soil about 30 per cent of its component particles are as small as 1/250,000 inch in diameter. A single cubic inch of such a soil would contain about 3,720,000,000,000,000 such small particles, presenting an aggregate surface area of about 1,100 square feet.

British Golf Unions' Greenkeeping Research

In previous numbers of the Bulletin references have been made to the plan of the British Golf Unions to establish an organization for scientific research and advice similar to the United States Golf Association Green Section. We received recently a copy of the first number of the new organization's publication entitled, *"The Journal of the Board of Greenkeeping Research."* The British Golf Unions is a joint organization of the English Golf Union, the Scottish Golf Union, the Golfing Union of Ireland, and the Welsh Golfing Union. The *Journal* is maintained by the British Golf Unions' joint advisory committee for the publication of results of scientific investigation of greenkeeping problems being conducted by the board of greenkeeping research in cooperation with a scientific advisory committee, the latter being composed of seven prominent agricultural scientists of the British Isles. The director of research is R. B. Dawson, previously of the Rothamsted experiment station.

The *Journal* is published at St. Ives Research Station, Bingley, Yorkshire, England. Its first number contains 48 pages of interesting reading matter with 4 full-page illustrations, and will doubtless pave the way for a widespread discussion of greenkeeping problems throughout the British Isles. It is proposed to issue the *Journal* at irregular intervals, with not less than three numbers each year. Included in the first number are several articles, as well as a large number of questions and answers, on various golf turf problems. The introductory article is a brief historical account of the establishment of the board of greenkeeping research, from which we quote:

"The board of research into greenkeeping problems was constituted at a meeting of the British Golf Unions' joint advisory committee held in Liverpool on Tuesday, February 26, 1929, when a resolution in the following terms was adopted: 'That a board of research for golf greenkeeping in the British Isles be, and is hereby established to be elected annually by the joint advisory committee, and that the control and management financial and otherwise of research be vested in the joint advisory committee.' This resolution followed on the preliminary work carried out by the National Unions during the previous year, when they explained to their constituent clubs the full nature of the proposal. Subsequent promises were received from the four National Unions for a sum of approximately £2,000 per annum for a minimum period of 5 years.

"It will be recalled that in 1924 the green committee of the Royal and Ancient Golf Club of St. Andrews endeavored to establish a similar scheme but abandoned their effort owing to the lack of necessary financial support. Following their difficulties in obtaining a full measure of support from the clubs in the country, the green committee of the Royal and Ancient Golf Club asked the joint advisory committee to undertake the direct management of the project, to organize the work, and generally to develop the scheme. With the consent of previous subscribers, the Royal and Ancient Golf Club handed over to the joint advisory committee a sum of £303 13s. 6d. which they had previously collected from them for research purposes.

"The joint advisory committee invited and have received, in connection with the work of the board of research, the hearty and active

cooperation of the scientific advisory committee originally appointed by the Royal and Ancient Golf Club and also of Mr. W. Norman Boase, chairman of the green committee of that club. Both Sir Robert Greig and Mr. Boase have been appointed members of the new board. The interest shown by these gentlemen in the aims of the board of research has been of an active nature, and the board desires to place on record its deep gratitude for the advice and help which they have gratuitously given in arranging the many details requiring settlement before the work of research could be commenced.

"Early in March, 1929, the board of research, after careful deliberation and with the guidance of a special report by Sir Robert Greig (which was approved by his colleagues on the scientific advisory committee), agreed upon the site for the principal research station, on the St. Ives estate, near Bingley, Yorkshire. This station is central, convenient of access, has several types of soil available for experimental purposes, and is generally suitable for investigations under average conditions of soil and climate."

The St. Ives research station has over three acres of ground available for experimental purposes and also has ample laboratory and office space within a most convenient distance of the experiment grounds. The location is considered extremely fortunate, since it not only offers average conditions of altitude and climate but also has a good range of soil types and other conditions favorable for experimental purposes within a short distance of the laboratory. Operations on the experiment grounds were begun in May, 1929. The turf garden was planted in August.

The Green Section welcomes this new organization in the field of golf turf research and educational work and will follow with interest the results to be obtained. Science and knowledge, like the game of golf, recognize no national boundaries. No doubt many of the findings of the British board of greenkeeping research will be found of benefit to American golf clubs in their efforts to provide better and more uniform playing conditions.

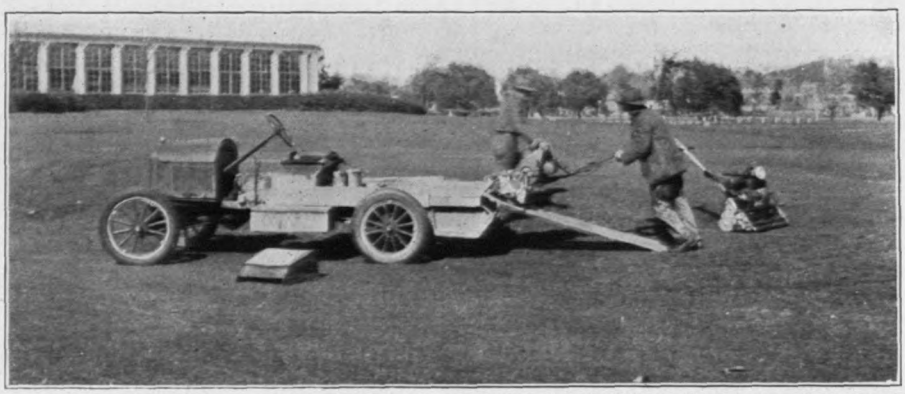
Japanese and Asiatic Beetle Quarantine

To attempt to move soil or plants out of territory infested with the Japanese beetle or with the Asiatic beetle, without a Federal permit, is costly. In May and June, 1929, the Pennsylvania Railroad moved seven carloads of topsoil from Menlo Park, N. J., to Dearborn, Mich., without such a permit, in connection with the celebration of the Edison electric light golden jubilee. As a feature of this celebration, Henry Ford reconstructed, outside of Dearborn, Edison's laboratory of 50 years ago, transferring not only the buildings but practically an acre of topsoil. This cost the Pennsylvania Railroad $1,400. An examination of the soil by Federal officials in the immediate vicinity of the reconstructed laboratory disclosed 32 Japanese beetle grubs, which had been carried to Michigan in the soil. In an effort to exterminate this newly developed Michigan infestation, the United States Department of Agriculture made plans to treat the area upon which the New Jersey soil had been laid and to thoroughly scout the surrounding territory for traces of the beetle.

Low Platform Truck and Loading Device for Golf Course Equipment

By Kenneth Welton

One of the special problems encountered in the use of the power mower for cutting putting greens is the time required to move comparatively few power mowers to as many greens as are ordinarily cut with four or five times as many hand mowers. The time required to move the mower from green to green is negligible when putting greens on a course are cut in groups of two or three greens, close together, by one man and one machine. When, however, one or two mowers must cut 18 or more widely separated greens, the time lost in moving from one group of greens to another becomes an important economical factor.



Loading power mowers over a gang plank on a truck with low platform. At the rear of the truck is an underslung box for carrying small equipment. The mowers are loaded on the truck mostly under their own power.

On the East Potomac Park public golf course in Washington, D. C., the greenkeeper, Charles Victor, is attempting to eliminate this loss of time by using a motor truck with a low platform on which the mowers are loaded over a small detachable gang plank, as shown in the accompanying illustration. When one end of the gang plank is hooked to the rear of the truck the mowers, which weigh over 200 pounds each, may be slid off the truck with little effort. The grade of the plank is so slight that the mowers may be run upon the truck under their own power.

The low platform of the truck is found convenient also for loading other equipment and various maintenance materials. Large hose reels, barrel sprayers, wheelbarrows, and similar equipment are all easily handled with the gang plank and low platform. The underslung tool box can carry rakes, shovels, small sprinklers, and other small tools frequently in demand on the course.

Compost saves seed and fertilizer, and therefore money, and at the same time gets results. The greater the compost pile, the more ready funds will be available for emergencies, and the quicker can damages to turf be repaired.

How Agricultural Research Can Help the Golfer

By K. F. Kellerman
Associate Chief, Bureau of Plant Industry, United States Department of Agriculture

(An address delivered at the annual meeting of the Green Section in New York City, January 10, 1930)

It is a great pleasure for me to have a chance to talk to you very briefly this afternoon. I am an ardent golfer, although I think I am one of the world's worst. My interest in the Green Section has been agricultural rather than because of any skill in the game.

The problems of the Green Section in many ways are closely allied to the problems of the United States Department of Agriculture. I have felt that the Department's cooperating with the Green Section might be looked upon by some of you as an absurdity, but I am hoping to be able to present a plausible explanation to the golf specialists as to why they should be interested, and constantly interested, in carrying forward thoroughgoing research in the problems of growing grass and other plants desirable for golf courses.

Agriculture is one of the oldest occupations of the human race; and yet it is remarkable to find how few of its questions can be answered definitely for present-day farmers. In this country the problem is even more acute, because we are here dealing with a country only recently brought under the modern development of agriculture. The older population of America, with its hunting and other habits, generally had few crops that were cultivated and therefore had no experience which taught them how to handle extensive crops. I do not know how many of you appreciate that tobacco and corn are almost our only important crops wholly developed in this country. Most of our great cereal crops, vegetables, and ornamentals are of European origin, transplanted to this country in comparatively recent years. In this transplantation these crops have come to regions widely different from those in which they had developed—widely different in climate, soil, and the methods that necessarily would be utilized in their development. Accordingly very many difficulties have developed, unexpected difficulties, difficulties that could not be solved by relying on European experience. Through the extensive experimentation on the behavior of crops under different conditions, first the experimentation of such men as George Washington, Thomas Jefferson, and other leaders in the Nation's life, and later through the more definitely official recognition of the importance of experimental work in the establishment of the agricultural colleges throughout the country and the United States Department of Agriculture, the problems of crop production were realized to be more and more difficult. In time, however, these problems began to be better understood—these problems of the most elaborate study and development of plants, under what conditions they would do well, under what conditions they would suffer. From all of these studies there has accordingly arisen a more modern type of agriculture and crop production the importance of which is increasing instead of decreasing, so that the oft-repeated statements regarding the worn-out lands and the rapidly wearing-out lands of agriculture can be set down as idle theories of a bygone generation.

There has been a steady increase in yields per acre as well as in

quality production in the United States. In connection with these studies, a few of the more recent lines seem to me to bear very directly upon the behavior of grass and the methods of grass maintenance. In the fertilizer studies, perhaps no crop is quite so useful as tobacco for detailed studies, since the quality of the leaf, as well as its size and appearance and weight, are matters of fundamental importance in the value of the crop to the producer. The fertilizer studies on tobacco, therefore, at the present time, I believe have been carried to a greater degree of perfection than in the case of any other crop. Within the last decade what I might call the old method of fertilizing tobacco has been pretty well exploded. More care in the component fertilizer materials is found to be necessary, and substances that until very recently had not been included in the fertilizer mixtures have been found essential. For example, a peculiar kind of disease called sand-drown has been troubling tobacco growers for many years in the coastal plain region of the country. The term sand-drown was used because the disease appeared especially on sandy soils and was more pronounced following unusually heavy rains. This explanation of the disease, however, seemed absurd, because under such conditions the tobacco on sandy land would seem less likely to drown than the tobacco on the heavier lands. But at least sandy lands were the places where the disease appeared. A long and ingenious series of experiments that would take me too long to detail to you, finally showed that the disease is the result of a deficiency of magnesium salts in the soil, and that in the sandy soils, where the magnesium was in comparatively small quantity, these heavy rains would wash out the slight traces that were there, and then these diseased spots in the tobacco leaves would appear. Also, from some early experience in the use of potash fertilizers there had been a gradual development of the idea that sulphate of potash was a fertilizer necessary for quality in tobacco. Chloride of potash would give the same or greater bulk in the tobacco crop, but a poorer burn. The leaf was not of as good quality. The use of sulphate of potash went a little too far. It now appears certain that if sulphate of potash is used exclusively and for a period of years, so that the chlorides in the soil are reduced too far, then the yield suffers, and the quality also.

The same problems in Florida have brought to light more unique fertilizer materials. In certain parts of Florida, the use of salts of copper and manganese is essential for proper crop production. Minute quantities only are needed, perhaps only a few pounds to the acre.

Thus it is that the fertilizer problem is being made very much more complex as time goes on. The more we know about it, the more complex we can see that proper fertilizing is bound to be.

I have gone into the tobacco problem at length because we know a little more about tobacco fertilizing than we do about grass fertilizing. We are, I think, barely starting on our understanding, not only of the needs of turf grass in general but the different needs of the different kinds of grass. From what we know of the behavior of such crops as cotton, tobacco, and corn, we can predict with certainty that the different grasses are going to need different kinds of compounds for their best development, and that under the different soil conditions, possibly also in different climates, these compounds will have

to be varied to bring about the most healthy growth of turf and correspondingly the greatest freedom from disease.

The disease problem is not necessarily connected with the vigor of the growth of turf or of other crops. There are some diseases which can attack a crop more successfully that is growing luxuriantly than if it is more or less stunted; but a large number of the milder diseases, and especially the milder root parasites, are dependent to a very large degree for their opportunity to injure these plants on a subnormal condition of the plant itself, and this can be brought about by unwise use of fertilizers or unbalanced fertilizers, as well as by drought, or drowning from too much rain or too heavy watering.

So we find a need for the closest possible cooperation in these difficult and unknown problems. Even the farmer in the long run is going to benefit from the very close cooperation that has existed, and that I hope will continue to develop, between the United States Golf Association and the Bureau of Plant Industry. If, through the keen interest in turf production and turf maintenance, these researches will give us a similar knowledge of grass management as we are now securing of tobacco management, then these same ideas can be applied on pasture lands, lawns, and other parts of the farm and homestead, no less than on the golf courses.

I want to add one word of caution, however. Because work is done scientifically, it does not mean necessarily that it is going to be done rapidly. I think much excellent work is spoiled by a desperate attempt to reach conclusions too suddenly and before the problems are thoroughly understood. In urging more attention to research problems, I wish to appeal to all of you not to be insistent on immediate application of results, and especially do not feel that the work is useless if such application of results shows that the work was not sufficiently understood and that parts of it may have to be done over again.

Colloidal Phosphate as a Fertilizer

From time to time the Green Section receives inquiries as to the merits of colloidal phosphate as a grass food. One of the most common phosphatic fertilizers is superphosphate, previously widely known as acid phosphate. As far as we have been able to ascertain, there appears to be no difference between grasses and farm crops in their utilization of different forms of phosphate. The evidence available however indicates that grass requires relatively less phosphate than do many of the farm crops but shows no special preference for any certain form of phosphate from which to obtain its supply. A rather complete estimate of the value of colloidal phosphate as a fertilizer has been published by the Massachusetts Fertilizer Control, in its 56th report, in Bulletin 51 of the Massachusetts Agricultural Experiment Station, Amherst, which appeared under date of November, 1929. Its report on colloidal phosphate is quoted below. In this report we wish to call special attention to the difference in cost of colloidal phosphate as compared with superphosphate. This difference is even more striking when one takes into account the relative percentages of phosphoric acid contained in these two forms of phosphorus, and its relative availability. In discussing colloidal phosphate the report says:

"This product was temporarily registered in Massachusetts as 'Florida phosphate with colloidal clay.' Later, through mechanical separation of the product supplemented by a chemical analysis of the various separated portions, both made at this institution, it was determined that the material was largely of a colloidal nature (having diameter of particles from .005 to .0001 mm.). Registration has since been completed under the name 'colloidal phosphate.'

"This product is a low-analysis natural Florida phosphate known to the industry as 'pond phosphate,' a by-product in mining Florida rock phosphate. In the recovery of this Florida rock phosphate, water is used. The soft, finely divided phosphate, with more or less clay and silt, is washed into ponds or basins, the finer material separating more abundantly at points farthest from the washer. When the water evaporates, the very finely divided deposit remains, and this is the source of the product under discussion.

"The material is not sufficiently rich in phosphoric acid and, moreover, contains too much iron and alumina to warrant its use in the manufacture of superphosphate. Its use as a fertilizer is therefore restricted at present to direct application to the soil. The product is in no sense a complete fertilizer as it contains no nitrogen or soluble potash, but furnishes phosphoric acid in the form of tricalcium, iron, and alumina phosphate, forms considered unavailable according to official methods of analysis.

"With reference to its purchase as a source of phosphoric acid, without consideration of the claims of the producers as to merits based on its colloidal nature or any unique feature of its chemical composition, it might be compared to superphosphate. The more common grade of superphosphate sold in Massachusetts contains 16 per cent available phosphoric acid of which from 9 to 11 per cent is in water soluble form. This product cost on the average during 1929, $20 a ton, delivered, thus making the unit cost of available phosphoric acid from this source $1.25, which is at the rate of 6¼ cents a pound. The colloidal phosphate is guaranteed 22 per cent total phosphoric acid, no claim being made for either water soluble or available phosphoric acid. The ton price quoted for the product is $55 f. o. b. Boston, thus making the unit cost for *total* phosphoric acid $2.50, which is at the rate of 12½ cents a pound, or more than double the cost from superphosphate.

"This station has made two analyses of the colloidal phosphate, with results as follows:

	"Total phosphoric acid
"Sample received from Natural Products Corporation..	20.40
"Sample received from Market Garden Field Station...	21.18

"The product was registered under a guarantee of 22 per cent total phosphoric acid, no claim being made for water soluble or available phosphoric acid, nitrogen, or potash. Our analyses, therefore, did not include these determinations. The variations noted in the composition of the two samples as compared with the guarantee are not surprising, as such a product is likely to vary in composition, and it would hardly be an economical proposition to attempt its standardization."

Blasting Stumps

There is little danger in blasting stumps as long as the blaster does not become careless or fail to observe certain precautions. In Circular 191 of the United States Department of Agriculture, entitled "Use of Explosives in Blasting Stumps," the most important precautions to observe are listed as follows:

When you buy an explosive find out from the dealer at what temperature it will freeze and secure directions for thawing it out if it must be used in cold weather. It is dangerous to handle frozen explosives. Some explosives freeze at comparatively high temperatures while others do not freeze at all. Safety fuse cracks and breaks easily in cold weather.

Store explosives and caps in dry places. Do not store them together. Keep both under lock and key.

Handle blasting caps carefully and keep them away from children. These caps are very sensitive and have more "kick" than a high-power rifle bullet.

Do not carry blasting caps in your pockets.

Do not attempt to take blasting caps from the box by prying them out with a nail, wire, or anything sharp or hard.

Do not try to withdraw the wires from an electric blasting cap.

Use nothing but a pair of crimpers to crimp a cap to the fuse.

Do not cut safety fuse short to save time in its operation.

Use blasting caps or electric caps of the size recommended for the particular explosive being employed. Weak caps result in misfires and incomplete explosions.

Do not smoke or carry matches while handling explosives.

Do not shoot into explosives with either pistol or rifle.

Do not leave explosives where livestock can get at them. Some explosives contain ingredients of which cattle are very fond but which will poison them.

Open boxes containing explosives with a wooden wedge, never with a nail puller, ax, or pick.

Wait five minutes before loading a "sprung" hole. If the gas in the chamber has not had time to cool, it may cause a premature explosion when the charge is put into the chamber.

Use no iron or steel tamping bars, only wooden bars.

Be sure that everyone is in a safe place, that the extra explosives and caps are protected, and that all persons in the vicinity are warned before firing a charge.

Do not connect the lead wires to the electric blasting machine until you are ready to fire. Immediately after firing disconnect the lead wires.

Allow no one but the blaster to approach the electric blasting machine while charges are being wired up.

Do not investigate a misfire until the next day if you are using a safety fuse and cap.

Do not attempt to dig up or pick out a charge which has failed to explode. Put down another charge at least 2 feet from the one that failed.

This 15-page circular also contains directions for placing the blasting charge, for loading, priming, and tamping the charge, and for the use of explosives in splitting stumps that have been pulled or blasted out. It is illustrated with 11 figures showing approved steps

in the use of explosives. A copy may be obtained from the Department of Agriculture.

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. 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.

Average cost of maintaining an 18-hole golf course.—We have just finished the reconstruction of our golf course and should like to get some idea as to the approximate cost of maintaining an 18-hole course, including all labor and supplies outside of the greenkeeper's salary. We are figuring on operating during the coming year on a budget of $10,000 to $12,000. (Indiana.)

ANSWER.—From an estimated average maintenance cost of $18,000 a year, exclusive of greenkeeper's salary, for 18-hole courses throughout the Northeastern States, it would seem that your figures are hardly adequate. It is difficult to quote figures regarding maintenance costs which will be helpful in a general way. Moreover a comparison of maintenance costs on various golf courses is often unfair to one or more of the courses being compared. Soil conditions, the contour of the land, variety of grasses, method of construction, size of the property under the greenkeeper's care, and similar factors, and most important of all the demands of the club membership, influence the maintenance costs to a very great extent. Some clubs demand that the course be in excellent condition the year round. Other clubs prefer to get along at less expense and hence cut down on the number of men employed. Consequently at various times the rough on the course is neglected, the sand traps are not raked daily, greens are not weeded regularly, and perhaps the putting surface becomes irregular at times due to lack of top-dressing. The yearly fertilizing of fairways is a well-warranted expense. Some clubs, however, neglect this item for a number of years, which means that on certain soils the fairways will in time become very poor and the clubs will have to go to special expense to recover their turf. It is thus apparent that a large number of widely varying factors must be taken into consideration in preparing an annual budget to cover the cost of course maintenance.

Value of a chemical analysis of soil.—The condition of our greens and fairways has not been satisfactory to us. We are wondering whether the difficulties we are encountering in producing satisfactory turf are due to an inherent defect in the soil. So that we may ascertain whether or not the composition of the soil is responsible for our troubles, we should appreciate your suggestions as to the value of a

chemical analysis of the soil and the best method to pursue in having such an analysis made. (New York.)

ANSWER.—A chemical analysis of soil is generally expensive, and our observations have led us to the conclusion that the expense of such analyses is not justifiable. Should you have such an analysis made you would then probably have to do what most other clubs have done in such cases, namely secure the services of some one to interpret the meaning of the analysis. Many years ago soil analyses became very popular in agricultural work, but they have since fallen into discard, when agricultural chemists found that the growth of plants depended on the chemicals they could absorb from the soil rather than on the chemicals the soil contained. Chemicals may be present in the soil but be so completely locked up that they are not available to plants. This point was not appreciated several years ago. A similar situation has presented itself in the study of foods for human consumption; a few years ago nutrition experts were talking merely about so many calories in a pound of a certain kind of food, but later it was learned that the amount of energy in food was not the measure of its value but rather the amount of energy that could be absorbed by the body and the maintenance of a proper balance with other essential chemicals, and also the presence of vitamins. We doubt that a chemical analysis of your soil would do you any good.

Preventing the deposit of hard dirt balls when top-dressing putting greens.—The compost mixer we are using is the best machine we have been able to find. It nevertheless invariably leaves a quantity of small, hard balls of dirt on the greens, which cause loud complaints from players. Do you know if there is a mixer on the market that will grind compost sufficiently fine to give a top-dressing material that will not interfere with putting? (Illinois.)

ANSWER.—We do not know of a compost mixer which is any better or will do the work any more economically than the machine you are now using. We suggest you examine the top-dressing material you are using to see if it does not contain too much clay. We find it is best to keep the top-dressing material on the sandy loam side. This may be done by increasing the amount of sand and well-rotted manure in the mixture if you are using silt or clay as a base. We do not know of any machine that will reduce compost to a dust if it is inclined to form balls.

Efficiency of mercuric compounds when applied with a sprayer in brown-patch control.—Are mercuric compounds all equally effective whether in suspension or in solution and do they all have the same corrosive action on spray pump valves? (Virginia.)

ANSWER.—We have been unable to detect any difference in the efficiency of mercuric compounds in the control of brown-patch whether they are applied in the form of dry powder or in suspension or solution provided in each case an even distribution is obtained. Red oxide of mercury and calomel are just as effective when applied with a spray pump if there is a device in the apparatus to keep the liquid thoroughly agitated. Most spray pumps are now equipped with satisfactory agitators. Some of the compounds of mercury have a corrosive action on spray pump valves, corrosive sublimate being by far the most damaging in this respect. Red oxide and calomel, however, are practically harmless to the valves of spray pumps.

Controlling earthworms in putting greens.—What are your recommendations for ridding putting greens of earthworms? (Ohio.)

ANSWER.—The quickest way to rid putting greens of earthworms is to apply bichloride of mercury, mowrah meal, or one of the commercial preparations on the market. Bichloride of mercury is very effective and often the most economical. It is applied at the rate of 3 ounces to 1,000 square feet. It should be mixed with dry soil or other inert material and applied to the surface. Immediately after it is applied it should be watered into the soil, using a fine spray, care being taken not to water so heavily as to cause puddles to occur on the green, for in these puddles the chemical would tend to accumulate in stronger solutions. It is safest to use bichloride of mercury in the spring and fall. During summer the rate should be reduced somewhat to avoid burning the grass. Mowrah meal is used in the same manner, except that 15 pounds is required for 1,000 square feet. On a good many soils, however, complete control of earthworms is maintained by keeping the surface soil poisoned with arsenate of lead. This chemical, when properly applied, does not injure the common putting green grasses, and remains active in the soil for a year or more. The usual rate of application is 5 pounds to 1,000 square feet. After the surface soil of a green has been poisoned it is a common practice to add enough arsenate of lead in each top-dressing to equal the addition of 5 pounds of arsenate of lead a year. It is usually mixed with some inert material before being applied so as to assist in obtaining even distribution. It is generally watered into the turf after being applied; this is, however, not necessary unless there is danger of the material being wasted by wind, since when applied at the rate mentioned it will not burn turf grasses.

Preparation of rotted tanbark for use as a top-dressing.—We are sending you a sample of rotted tanbark of which abundant quantities are available to us at an old dam near our property. This tanbark lies beneath a 1-foot layer of sand and leaf mold. Is this tanbark in its present state suited for use as a top-dressing on our fairways? (Pennsylvania.)

ANSWER.—We have tested your sample of rotted tanbark for acidity and find it is quite acid, showing a pH of 4.5. The material is not of much use for top-dressing purposes unless thoroughly mixed with soil and decomposed more than it is at present. A very good way to prepare the tanbark for top-dressing purposes is to spread it liberally on an area where it may be plowed in and cultivated from time to time. At the same time ground limestone at the rate of 1 or 2 tons to the acre, superphosphate at the rate of 400 to 500 pounds to the acre, and muriate of potash at the rate of 150 to 200 pounds to the acre should be applied and disked into the soil with the tanbark. It would also help greatly to apply as much strawy manure as can be procured and plow and disk it into the soil. This treatment of the tanbark will increase its decomposition, adding to the organic content of the soil as it becomes incorporated therewith, and will give you an excellent top-dressing material. Probably one application of the rotted tanbark in its present state will do no harm to your fairways and perhaps some good; if so applied, the application should be followed with at least 1 ton of rock limestone to the acre.

Controlling the tendency of creeping bent to mat.—Our putting greens are planted to Cocoos bent. This grass has formed such a heavy mat over the ground that our greenkeeper is having difficulty in keeping a good putting surface. Can you suggest means of handling this situation? We use a power putting green mower. (California.)

ANSWER.—After Cocoos bent is established on a green its habit of growth is similar to other strains of creeping bent. The treatment should therefore be similar. When the growth of creeping bent is so heavy that it tends to mat in spite of close cutting, it is well to cut down on the fertilizing. Too heavy fertilizing of creeping bent during the growing season tends to develop a growth which would be too heavy and lush for putting purposes. Greens upon which there is a healthy growth of creeping bent should occasionally be raked to pull up the runners so that the mowers may thin out the turf. Frequent light top-dressings tend to fine down the turf and keep the bent from forming a nap or grain. The greens must be cut close regularly with a mower suited for the purpose.

Providing the top soil of the greens is open and porous in structure, none of the recognized power putting green mowers on the market would be injurious, since their weight is usually well distributed and would be considerably less than the weight applied by the trampling of players. In your case it would seem that the mower has not destroyed the soil texture, since your turf is thickening so well. It might be that the power mower you use will not cut close enough to keep your Cocoos bent from forming too dense a mat.

Rats and field mice in drainage lines.—We are troubled considererably on some of our fairways with field mice occupying drainage lines and continually undermining the fairways. What would you recommend for getting rid of these pests? (Connecticut.)

ANSWER.—Field mice do not ordinarily live in drain tiles, although they may congregate in the lower areas through which drainage lines run. The common house rat frequently gives trouble on golf courses by living in drain tiles and opening burrows to the surface at frequent intervals. In the event they are rats and not field mice that are giving you trouble, it is thought the most practicable method of control would be the forcing of calcium cyanide into the burrows with a dust gun. If you are certain they are field mice, the use of poisoned bait would prove most satisfactory. A suitable bait may be prepared by dissolving 1/16 ounce of strychnine in 1 pint of boiling water and pouring it over as much oatmeal as it will wet, which will be about 2 pounds. The preparation should be well mixed, or until all of the oatmeal is moistened. A teaspoonful of the bait may be placed at such points as are within reach of the mice. Care should, however, be taken to see that the bait is sheltered from access by children, domestic animals, and birds. Detailed information on the control of rodent pests may be found in Farmers' Bulletin 932, "Rodent Pests of the Farm," which may be obtained by writing to the United States Department of Agriculture.

Ridding fairways of dandelions.—There are parts of our fairways that are so infested with dandelions at the present time that very

little grass exists. We must take some steps to get rid of these weeds and are wondering what you would recommend. (North Dakota.)

ANSWER.—The dandelion problem on fairways is a serious one in many sections of the country. There are several methods which have been proved to be effective but have not become popular due to the fact that any of the chemicals which kill dandelions also injure grass to some extent. Therefore areas treated with these chemicals are badly discolored for several days and the treatments are objectionable. Many clubs have found that dandelions become less and less of a nuisance as fairways are improved by some regular fertilizing program. It is true that this weed also thrives on rich soil, but apparently the grass, by feeding, is able to compete more successfully with such weeds as dandelions and ultimately greatly reduces their numbers. In your letter you did not state whether you had fertilized your fairways. If you have not done so we suggest that you first give this method a thorough trial. If dandelions persist in spite of adequate fertilization it would be well to use one of the chemical weed eradicators.

Colloidal phosphate as a fertilizer.—We are offered colloidal phosphate at $40 a ton in carload lots. We understand it contains about 20 per cent phosphoric acid. What information have you as to its fertilizer value? (New York.)

ANSWER.—We have no information based on experimental results as to the value of this fertilizer. Colloidal phosphate is a natural material obtained as a by-product in the preparation of Florida hard rock phosphate for the market. It is a clay-lime material. The phosphoric acid in colloidal phosphate is not soluble in water, and could not be considered as available phosphoric acid in the sense to which the term is applied to the phosphoric acid in superphosphate. The material is moreover lacking in nitrogen and potash, the former of which is indispensable for best results with turf grasses. In our opinion the price quoted you is out of proportion for this kind of phosphatic fertilizer, especially when the market price of the more readily available phosphate carriers is considered.

Poultry manure.—Can you recommend poultry manure as a fertilizer for golf course turf? (Pennsylvania.)

ANSWER.—Yes. It should be remembered, however, that there are various grades of poultry manure. Fresh manure from the dropping boards is less concentrated than pulverized manure, since before being pulverized the manure must lose considerable moisture. Pulverized poultry manure usually contains some straw, dust, and waste, and analyzes from 2 to 3 per cent nitrogen, about 1.6 per cent phosphoric acid, and .8 per cent potash. There are brands of poultry packing house by-products on the market now that compare very favorably, in analysis and in results obtained from their use, with such fertilizers as cottonseed meal and sewage sludge. These poultry by-products are largely manure mixed with blood and offal from the killing room. The mixture is thoroughly dried and pulverized. It analyzes about 5 to 6 per cent nitrogen, 1.5 per cent phosphoric acid, and 1.25 per cent potash. When purchasing the above mentioned organic fertilizers it is largely a matter of the cost per unit of nitrogen that is to be considered.

Putting green of the 3rd hole on the course of the Cypress Point Club, Pebble Beach, Calif.

Though a man write a better book, preach a better sermon, or make a better mouse-trap than his neighbor, though he build his house in the woods, the world will make a beaten path to his door.

Ralph Waldo Emerson