

and not immediately before watering. A heavy rain may render an application of Bordeaux of no value and another treatment should be applied soon after the rain stops.

EFFECT ON THE GRASS

The only effect on the grass noticed during the growing season last summer from the use of the Bordeaux was beneficial. The grass receiving the treatment was healthy, vigorous, and had good color. During the dormant stage of winter, however, there was a marked difference in the appearance of these plats when compared with those which were untreated. The leaves of the grass receiving Bordeaux turned to a reddish bronze color, and the plants were slower in starting growth this spring. At the time of this writing they have practically all recovered, and the new growth gives no indication of any injury. This peculiar color of the grass makes it advisable to study the cumulative effect from frequent applications of Bordeaux, as too much copper sulfate may prove detrimental when carried on over a period of years. There are no data on this point, as there are no experiments on record where so many treatments with Bordeaux have ever been applied before as we used last year on this grass.

EFFECT ON EARTHWORMS

An interesting side-benefit resulted last year at the Arlington farm from the use of Bordeaux powder for brown-patch. We discovered in the fall that there were no earthworms in the plats where Bordeaux had been applied during the summer. Repeated tests with mercuric chloride both last fall and this spring failed to bring out a single worm from the Bordeaux plats, while plenty of them could be found on the adjoining untreated turf. Of course, it is unsafe to draw conclusions from just one season's work, but the results were so definite that there seemed to be no mistaking the fact that Bordeaux mixture was effective in eradicating earthworms as well as controlling the brown-patch. If this holds true in the future there will be the added inducement for using Bordeaux.

Soil Beds for Use on Golf Courses and How They Can Be Made at a Very Small Cost

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At the Detroit Golf Club in 1920 some of the fairways were in bad shape with cuppy-likes in places. The soil is of a very sandy nature and no amount of rolling seemed to do any good. The grass was fescue and grew in tufts.

Top-dressings with compost of manure made in a pile by the usual method, we figured, would be very expensive and unnecessary. So we set about to make soil beds on various parts of the course in the rough and near the fairways which were to be top-dressed, thus saving long hauls. We selected about a quarter acre and covered it to a depth of one inch with clay (3½ cubic yards), and about the same quantity of manure. After the clay had dried out we rolled the beds in order to break up the lumps, and then disked them with a disk harrow. The next operation

was to plow, then thoroughly disk and work until the plots were well mixed to a depth of nine inches.

There were five of these soil beds located at various points about the course, which gave us enough fine rich soil to cover four and one-half acres of fairway to a depth of one-half inch.

I believe every golf course should have a compost heap of well-rotted manure for use in construction work, such as the building of greens, tees, and fairways; but for poor or worn-out fairways the soil-bed method is by far the best and cheapest way to make top-dressing. Making soil beds in the manner described does away with the expensive method of composting manure in a heap. The idea is to have the top-dressing handy to the place where you are going to use it, and save long hauling; you also save a lot of hand labor in mixing the materials.

At the Grosse Ile Golf Club, where we started construction in the fall of 1919, the first thing we did was to start three large soil beds of about one acre each. The soil there is a heavy clay. On these beds we used three inches of coarse sand, two inches of humus, and one inch of manure, and mixed the beds to a depth of ten inches. We allowed weed seeds to germinate and then ran the disk harrow over the beds to destroy the weeds just before they went to seed. We put two inches of the soil bed mixture as a germinating layer on all the tees and greens we built before seeding them.

MAKING SOIL BEDS

If the soil on your course is of a clay or heavy texture, try to locate a sand deposit on the grounds. On the other hand, if your soil is of a very sandy nature, try to locate a supply of clay. In either case find out if there are any peat or muck deposits on your property. These soil resources are to be found in many localities, but in some cases where they are not found the materials will have to be purchased from the outside.

Soil Beds for Sandy Courses.—Select a piece of ground 25 yards wide by 50 yards long, in the rough and out of the line of play. This will give about one-quarter of an acre. Haul and spread on this 35 cubic yards of clay, which will cover the bed to a depth of about one inch. Allow it to dry out for a few days, then roll and harrow until the clay is well pulverized. The next step is to haul and spread 35 cubic yards of stable manure, plow not over 6 inches deep, and then harrow thoroughly with a disk until soil, clay, and manure are well mixed. Plow again, this time going deeper, say about 8 inches deep, and disk-harrow as before. If muck or peat can be had on the grounds, 25 cubic yards of muck may be used, and the amount of manure can then be cut down from 35 cubic yards to about 20 cubic yards.

Soil Beds for Heavy Clay Soils.—Proceed in the same manner as for sandy soils, but instead of using clay for first dressing apply about 50 cubic yards of sand, more or less, as the case may require, then disk thoroughly after this is done. Then apply 35 cubic yards of stable manure, plow under shallow, and replot and work same as described above.

Allow weed seeds to germinate, but before the weeds come to seed either plow them under or disk-harrow until they are cut into the soil. In other words, summer-fallow the soil beds until they are needed for use.

Material for soil beds can be used at once for top-dressing, but it is much better to leave it stand for a couple of months, after which time it may be sown down to a green-manure crop, such as cowpeas, or spring or winter rye. When these green-manure crops come to maturity they may be plowed under and followed by other crops until the soil is wanted for top-dressing. This increases, or, at least, conserves the humus content.

Four soil beds of the dimensions given, located at convenient places on the course, will provide enough top-dressing material to cover approximately eight acres of fairway one-half inch thick. Where time permits, good soil beds can be worked up by applying 10 tons of manure to the acre and sowing a couple of crops, such as cowpeas or soy beans, for green manure, to plow under. In addition to this, old sod, leaves, grass, clippings, or muck (if there is any to be had near at hand), may be added. If the soil is a heavy clay, the ashes from the clubhouse could be used on soil beds with good results. Also good soil beds can be made by using the rubbish cut from the rough each year.

COST OF MAKING SOIL BEDS AT THE NORWOOD GOLF CLUB,
LONG BRANCH, N. J.

The approaches to all the greens were top-dressed for an average distance of 40 yards in front of each green last November. About four acres of approaches in all were dressed about one-half inch thick with soil bed material. The soil at Long Branch is very sandy. The soil bed was made in the same manner as described above, and was 20 by 50 yards in size.

Cost to Make

35 cubic yards manure, at \$3.00 per yard on bed.....	\$105.00
One team and man 6 hours working bed, at \$7.00 a day.....	4.75
	109.75
Total cost of soil bed (about 275 cubic yards of material).....	

Cost to Top-Dress Fairways

3 teams hauling material to approaches, 3 days, at \$7.00 a day.....	\$63.00
3 men loading wagons, 3 days, at \$3.50 a day.....	31.50
2 men spreading material, 3 days, at \$3.50 a day.....	21.00
1 team with chain harrow, 2 days, at \$7.00 a day.....	14.00
	129.50
Total cost	\$239.25

This made the top-dressing cost about \$13.30 for each approach.

Fresh flags and newly painted poles.—These dress up a course and help to divert the attention of the captious critics. Change flags and poles once a month. Bamboo flag poles painted with alternate stripes of black and white locate and show off the hole better if the black stripe is at the bottom. Freshly painted flag poles and fresh flags set off a golf course like a clean shave sets off a green-keeper.

Heroic bunkers.—When these are placed about a mashie-shot hole they give an intensive mental hazard—the only real feature possible to such a short hole.