alphabetically in the table. It is noted that all of these six plots continued in fair condition longer than the other plots of this series.

The garden included other tests of interest, but a full report of these results will be withheld until further data are available. Like all the other demonstration gardens, the one at Miami Beach has been made accessible to anyone sufficiently interested in grass culture to visit the garden. Many visitors interested in southern turf problems have gone over the garden from time to time during the year and made first-hand observations of the results obtained in the various series of plots. A Green Section meeting was held at the garden April 3, which was well attended by men in charge of golf courses in various parts of Florida.

All-Year Turf at Tampa, Florida

By Ray Tower

Forest Hills Country Club

Our golf course is situated on high, rolling ground six miles north of Tampa. It was built in 1925 and 1926 and opened in November, 1926. The soil is a light, deep sand. The 18 greens average in area 6,800 square feet, in addition to which we have 13,500 square feet of club house lawn maintained as a practice putting green. The average area of the tees is 1,500 square feet. The fairways occupy 55 acres; upon three holes the fairway turf is displaced by water hazards. These water hazards call for no special maintenance other than the keeping down of excessive growth of grass and sedge about the borders. The rough occupies approximately 35 acres, and the traps and bunkers 60,000 square feet. Our water supply, which is the same as that of residences in the locality, comes from deep wells and is medium-hard with lime. The course is in use 365 days in the year.

Our fairway construction presented no particular problems. The cleared ground was plowed about 4 inches deep, disced, harrowed, and leveled. Low places were filled and tile overflow lines laid in two places. Other fairway drainage was provided by deepening existing water holes, using the excavated dirt as fill, the open catch basins thus formed being so located as to form part of the course hazards. Nearly all of the fairways were dressed with 2 or 3 inches of black soil obtained from nearby dredging operations. These areas were limed and later fertilized with commercial organic fertilizers, chiefly blood and bone tankage.

The roughs received no special treatment; they were simply cleared of brush and stumps and mowed down to playable length.

The tees were brought to the desired grade and top-dressed with about 4 inches of the same black soil that was used on the fairways. This was limed and fertilized before being planted.

The greens were brought to contour and covered with a full 12 inches of the black soil from the dredging operations, limed and fertilized with organic fertilizers.

Originally the fairways were planted with stolons of Bermuda grass and were seeded at the same time with Bermuda grass and carpet grass. The carpet grass now predominates in all the fairways except one and in all the tees except one. All the greens were planted

with Bermuda grass stolons and at the same time seeded with Bermuda grass. The method of planting the stolons in trenches was used on all but three of the greens but it proved to be a very unsatisfactory method for producing turf quickly. On the last three greens to be planted, the stolons were cut to 2-inch lengths, broadcast over the surface, and covered with ½ inch of prepared soil, on the top of which Bermuda seed was sown at the rate of 3 pounds to 1,000 square feet, covered lightly with soil, and kept moist until growth was well established. This latter method produced a solid turf in less than one-half the time required by the trench-planting method.

Bermuda grass putting green in the background, carpet grass fairway in the foreground. Eighteenth green, Forest Hills Country Club

For two years after the course was opened our fairways received no fertilizer. The result was logical—poor fairways. In 1928 we did some seeding with carpet grass and made one application of fertilizer at the rate of about 500 pounds to the acre. In 1929 some further seeding with carpet grass was done and one application of bone meal was made. A top-dressing of local topsoil at the rate of about 25 yards to the acre was also made. Some of the fairways were disced and rolled after the top-dressing was applied; others were dragged with a plank float and rolled. The results were very gratifying. In 1930 all the fairways received two applications of a 6-3-0 inorganic fertilizer at the rate of 500 pounds to the acre, one application in June and another in September. This season a new program for fertilizing the fairways has been adopted, as follows: for May, a 10-9-0 inorganic fertilizer at the rate of 400 pounds to the acre; for July, a mixture containing 80 per cent of castor bean pomace and 10 per cent of sulphate of ammonia at the same rate; for September, castor bean pomace alone at the same rate.

All watering of the putting greens is done at night. Owing to lack of volume we can operate only 9 rotary type of sprinklers on ¾-inch hose at one time. Ordinarily each green is watered thoroughly twice a week, but in protracted spells of hot, dry weather, three

times a week. One man on a 10-hour schedule does the watering, and usually has the sprinklers moved over to the tees early enough to permit of watering the tees by the time the day crew arrives.

Our putting greens are swept every morning with cane poles. This is for the purposes of giving each green an early morning inspection, aiding in the control of fungi, leveling worm casts, conserving the dew moisture, and hastening the drying of the putting greens ahead of the mower. Ordinarily the putting greens are mowed every other day. A power mower does 90 per cent of the mowing, cutting 9 putting greens each day. The mowers are set at 3/8 inch, or as high as the players will stand for. Both power mowers and hand mowers are of the roller type; and the greens receive no other rolling, except that applications of top-dressing are finished off with a light roller.

Narrow strip of Bermuda grass which has crowded out the carpet grass on the fairway. This strip of Bermuda grass is over a tile line carrying overflow from a septic tank. Forest Hills Country Club

With our local soil and climatic conditions it is our experience that light applications of fertilizer at frequent intervals give better returns for the money and labor invested than an equal amount of the same fertilizers put on in one heavy application. We are convinced also that in this locality organic fertilizers are preferable to inorganic fertilizers. Inorganic fertilizers give quick but not lasting results, and may do more harm than good where courses are dependent on rainfall for water, as are most of the courses in this section.

Our fairways are not watered. They are mowed as necessary, at infrequent intervals during dry weather, and once—rarely twice—a week during the growing season. The only rolling they receive is that of the wide tractor wheels when they are mowed. They are not seeded with winter grasses, nor do the roughs receive any treatment in the way of seeding.

Our program for fertilizing the putting greens is flexible, being governed by conditions of the turf, weather, and finances. Ordinarily we use 10 to 12 pounds of a good commercial fertilizer carrying a fair percentage of organic matter, to 1,000 square feet. This is applied with compost soil and top-dressing. On account of its manner of growing, Bermuda grass must be top-dressed frequently to maintain a good putting surface, at least every 6 weeks during the growing season. The top-dressing is applied by hand, using square-toed No. 2 shovels. The prepared soil is hauled to the putting greens on a platform truck, transferred to wheelbarrows, and moved over the putting greens on board tracks. We use about 1 yard of soil to 5,000 square feet of surface. The soil is then worked in with a steel mat drag, rolled lightly, and watered by hand. Since opening our course the compost which we have regularly used on our greens is a well-rotted mixture of sand, black soil, dairy manure, grass clippings, leaves, and other such materials, piled in successive thin layers with a little lime added.

Our winter putting greens and tees are seeded in November. Many of the local courses seed earlier. In this matter, temperature is our guide. As long as the weather is warm enough to keep the Bermuda growing there seems to be no necessity for planting rye grass. We use domestic Italian rye grass, seeding it at the rate of approximately 100 pounds to 5,000 square feet. The seed is broadcast over the closely-mowed Bermuda turf, covered with our regular top-dressing material, rolled down, and the soil kept moist until the seedlings are well established. We do not take our putting greens out of play at this time. As a matter of fact, we have never used temporary greens since the first spring after the course was opened.

As the weather warms up in the spring, the rye grass gradually disappears and is all gone by June. We try to make the disappearance of the rye grass a gradual process, finding it can be regulated by using good judgment in watering and general care of the greens. Only abnormally hot weather will burn the rye grass out faster than the Bermuda can replace it. To anticipate such a condition and avoid thin or spotted turf, we try to give our putting greens an application of fertilizer and a top-dressing of soil as soon as the weather begins to get too warm for the rye grass. Rye grass and redtop in combination make a finer winter turf than rye grass alone; but the redtop is much more apt to cause trouble in converting the putting greens from winter to summer play. Redtop, when sowed in sufficient amounts to produce a good putting turf, crowds the Bermuda grass and retards the slight but desirable growth which the Bermuda makes during our normal winters. A ragged putting surface results in the spring due to the inability of the Bermuda grass to replace the redtop as fast as it is burned out. On a year-round course it is important that there shall not be an interval of 6 or 8 weeks of poor playing conditions at any season of the year.

We find that all of the fungous diseases to which both our summer and winter turf are subject are controlled by mercury compounds. To 1,000 square feet of surface we apply 1 ounce of corrosive sublimate and 2 ounces of calomel mixed with a convenient volume of slightly moist sand and broadcast over the affected areas when the grass is dry. The application is then swept with a cane to afford a bet-

ter distribution and water is withheld for at least 24 hours. This is followed by a light application of fertilizer to stimulate a quick recovery of the injured turf. We treat the greens and tees only. Any chemical treatment of the fairways is entirely out of the question, except in the immediate vicinity of the putting greens. We have not had any severe attacks of large brown-patch since 1929, and then on one putting green only. Small brown-patch is with us persistently, but so far has not been severe. In this locality fungous diseases of turf are troublesome only during the cooler months, from October to May.

Our most troublesome weed is sand spur (*Cenchrus tribuloides*), also known as sand bur. It makes very little trouble in heavy turf, but is very serious and almost uncontrollable at times in our fairways and roughs. The only way to control this weed seems to be to keep the roughs mowed so that seed stalks do not develop, dig the plants out of the thin places on the fairways where they become established, and prevent seed development in every way possible.

We are also troubled with crab grass (*Syntherisma sanguinalis*), yard grass (*Eleusine indica*) also known as goose grass, and blanket grass (*Syntherisma serotina*). These we dig out of the putting greens with sharp knives, taking pains to cut below the crown of the plant. Clean culture about the putting greens will do much to prevent weed seeds from being blown or carried to them. We are now trying to control carpet weed (*Euphorbia maculata*), also known as ground spurge or milk purslane, with a spray of iron sulphate. Water pennywort (*Hydrocotyle umbellata*) is a wet-ground plant growing from small tubers and spreading by long, slender runners that root at every joint. We have found that for this the best control is to treat with lead arsenate and keep the infested areas well on the dry side.

We have found that putting greens on which corrosive sublimate has been used for the purpose of controlling brown-patch are usually fairly free from grubs and earthworms. When, however, corrosive sublimate is not wholly effective we make applications of lead arsenate for controlling these pests. Only one or two of the many species of ants are troublesome in heavy turf with us, but we have found that a poison prepared by a local chemical house is very effective in controlling the ants. This poison is simply sprinkled on the ant hills, and as it is carried by the ants into their nests whole colonies disappear in a very short time.

We have very few animal pests on our course. The only one of any consequence is the pocket gopher, known here as the salamander. This is a small fur-bearing mammal with cheek pouches, apparently closely related to the western pocket gopher. It lives in tunnels from 4 to 12 inches below the surface of the soil, throwing out mounds of dirt at frequent intervals. It can be controlled by opening up the tunnel, putting in a liberal dose of Cyanogas, and closing the opening. The most effective control, however, is the use of a No. 2 steel trap. We open the tunnel and insert the trap, leaving the hole open; the gopher springs the trap in pushing up dirt to close the tunnel. Skunks sometimes do damage to our fairways in digging for grubs and worms, but on the whole they do more good than harm. Land turtles dig burrows in our loose soil, but work mostly in the rough. They may be killed by inserting about 2 tablespoonfuls of Cyanogas well down into the hole and plugging the opening to confine the gas.