

ley club at Santa Barbara. When the course was completed (apart from the irrigation system) for \$44,800, a large portion of the ground was rocky and had to be covered with soil.

The managing director of the golf course construction company introduced a new machine, a Caterpillar tractor with bulldozer attachment, to remove the large rocks and boulders. He thus saved thousands of dollars in explosives and manual labor. He also erected a loading device by hand and by various other means saved large sums of money. I have known golf courses where similar difficulties were encountered, costing four or five times as much as the Valley club.

When we first designed golf courses there were no golf course construction companies available, so we had to undertake all the work in conjunction with some local greenkeeper or landscape gardener. We had also, to rely on our own puerile efforts in soil technology, drainage, irrigation, and other engineering problems. We depended on the good faith of seeds merchants in regard to seed, fertilizers, etc. We had to use our own ingenuity in devising or advising upon labor saving devices to decrease the cost.

For example, 25 years ago there was not a single scraper or scoop available in Britain. We resented the price of manual labor and made enquiries in regard to less costly methods of doing the construction work. We then discovered the existence of scoops in Canada and we arranged to have some sent to Britain. We have used them ever since. At Moortown we were faced with the problem of turfing 30 acres of fairways. We devised a turf cutting machine which would cut an acre of sods in four hours. We also devised a mole drainage machine which enabled us to do the draining at less than a tenth of the cost of ordinary manual methods.

When we first constructed golf courses in America, we worked out our own irrigation system, but since then we have discovered that far better and cheaper results are obtained by employing specialists in irrigation problems.

The greenkeeper at one eastern club recently told me that at times they required as many as 18 men to water the course. This obviously is exceptional. The average course would require 6 men.

At Pasatiempo where an uptodate completely hoseless system was adopted, all

the fairways are watered by one man. He, on occasions, waters as much as half the fairways in one night and the next night waters the other half.

It is true that the initial capital expenditure of a hoseless system is greater but the saving in cost of upkeep would probably pay this extra expenditure off in a few years. If well designed, far less water is required by a hoseless system as it can be arranged so as to give most water to the plateaus that require it and less to the hollows. As the cost of water sometimes is enormous this is a great advantage.

At one time I thought I knew a great deal about drainage of golf courses, and perhaps 20 years ago I knew more than most people. Nevertheless I have got more black eyes over drainage going wrong than anything else. Today I realize that drainage is a specializing engineer's job and that a club gets far better and less costly work in employing a man who has devoted his career to it.

Tip us off to the story of your success in pro selling, course maintenance or house operation. These close-up stories advance you and your club.

I F YOU WANT your grounds crew to work with efficiency, make sure their hand tools are kept in as good condition as the mowers and other course machinery. Spades, forks, rakes, hoes, scythes and sickles should be examined each morning when brought out for use and if the working edges of these implements are dulled or turned, take a minute to sharpen them up. The difference in volume of work possible with sharp tools as against dull ones is amazing.

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TONCAN ADDS TO LIST OF DRAIN TILE PLANTS

Massillon, O.—Toncan Culvert Mfrs. Assn., a group of manufacturers of Toncan perforated metal drainage tile for golf courses and Toncan iron culverts, now have plants at Boston, Groton, N. Y., Sandusky, Mich., Marshfield, Wis., Dallas, Los Angeles, Oakland, Calif., Portland, Ore., Denver, Roanoke, Va., Memphis, Atlanta, Newport, Ky., Philadelphia, Canton, O., and Oshawa, Ont., Can.

The association's engineering department is available for free service to greenkeepers and golf architects who have drainage problems.