Gardening under Glass in England and France.

A letter was recently written to a local paper suggesting that a trip be arranged to give the gardeners of Evesham, Worcestershire, England, an opportunity to see how the French gardeners cultivate vegetables by the means of glass and make their early produce so great a factor in supplying the London market. The suggestion was acted upon, and a short time ago a party of thirty vegetable growers, large and small, started for Paris. The Evesham growers saw the gardens at Vitry-sur-Seine and found these to consist chiefly of two-acre lots, practically all given up to the growth of early lettuce and other vegetables under glass. The Evesham men thought the soil not naturally better than that in the vale of Evesham, but found that it had been so carefully prepared for so long a time that practically there is not a bit of natural soil in a garden. The methods of preparing this soil and the general methods in use in raising the vegetables as reported by the Evesham men and printed in the Birmingham Daily Mail should be of interest to our Agricultural Department, and are as follows:

"The plan adopted is something of this kind: At the bottom of the seed bed, from which all the top soil has been removed, is a hard bed of clay, and upon this is placed a quantity of stable manure, the stronger at the bottom. Over this is spread about 3 inches of the prepared soil. The lettuce is planted in this in August, the frames are placed over the plants, and are now [February] coming into market. When the crop has been marketed the bed is cleared and the soil and manure mixed well together and built up in mounds to rot. This process takes one to two years, and then this soil is used again to place on the manure. As a consequence the soil is always of the very best and most fertile.

"The frames, which are 13 feet long by 4 feet 6 inches wide, are 9 inches high at the top and 7 inches at the bottom, so that they have a gentle slope to the south. There is no artificial heating except that provided by the manure, but the lights are covered with straw mats, which are very carefully made by elderly men, and which easily roll up. These mats would be very useful for Evesham radish beds, and would prevent a good deal of waste and loss. Water is laid onto nearly every frame by means of pipes from a raised tank, which is filled by a pump, generally driven by horse-power, but sometimes by a gas engine. Great care has to be taken in the ventilation of the frames or damping off may set in. The frames cost about 13s. ($3.16) if bought in large quantities, but they can be obtained for less money in England. They are only used for the raising of cabbage or flat lettuce, and these are planted in rotation, so that as soon as one lot has been marketed another is ready to come in.

"In addition to lettuce, carrots and radishes are planted in the frames, and these come in after the lettuce have been cleared off. Cos lettuce is grown under big glass globes or bells, which cost about a shilling [24 cents] each, and which can be supplied in Evesham at about 1s. 4½d. [33 cents]. About six plants are put under a bell, and when they have made a fair growth three of them are transplanted. After a little time another transplanting takes place, and only one is left under each bell, but so that no space may be lost flat lettuce are placed around each.

"The frames, again, are utilized for the raising of cabbage and cauliflower plants, but despite this help the plants seen this week were at least a fortnight behind those grown at Evesham in the open. This does not seem to show that the climate around Paris, at any rate in the winter, is any warmer than it is at Evesham.

"An asparagus bed was also seen in which a system of culture different from that in vogue at Evesham is used. The roots of this particular bed were exposed to the weather, but they will now be covered with a coating of stable manure and then the earth will be replaced a little at a time. The result is the production of some very fine 'grass.'

"This system is carried out round Evesham, in some instances, with excellent results. Covent Garden (London) was visited as the party passed through London, and the Paris market was also seen, with the idea of instilling into the local growers the necessity of paying more attention to the packing and grading of their produce."

The Mail states it is hoped to organize further excursions into the fruit-growing districts of France, Germany, Netherlands, and Belgium; and arrangements are already being made for another trip in May to France to see how black currants are grown there. The advantage of the French system is that it brings a crop every year, while in Evesham one is gotten only about every three years. The gardeners thought they could compete successfully with the French growers, though they would have to bring their manure from London or Birmingham, but could get it at from 5s. to 6s. 6d. ($1.21 to $1.57) per ton, while the French have to pay at least 5s. 6d. ($1.33) at Paris.

One of the French gardeners said that his working expenses were as heavy as those of the Englishman. To cultivate two acres of land his annual expenses were £600 ($2,919.90), but despite that he could send lettuce to London and compete successfully with the English gardeners.—Marshal Halstead, Consul, Birmingham, England.

The Current Supplement.

The current SUPPLEMENT, No. 1539, is opened by an article on the Cavite Floating Dock, which has recently been completed for the United States government in the Philippines. The dock is especially notable for the fact that it has the greatest lifting capacity of any similar mechanism ever designed. The article is excellently illustrated. Samuel S. Wyer writes instructively on Gas Producer Power Plants. The article on Glass Paving and Building Bricks is concluded. An entertaining description is given by Mr. Carnochan Douglas of the Curiosities of a Seed Warehouse. T. H. S. Escott contributes an interesting historical *causerie* on Social Pioneers. Dr. Howard D. Barnes writes on the physical properties of ice and water. The Manufacture of Briquettes is thoroughly described and illustrated. Prof. Ernest Ford Nichols, of Columbia University, recently lectured at the Royal Institution on the Radiation and Pressure of Light. An abstract of this lecture is published.

Tunnels Connecting Two Continents.

Of the three barriers to a continuous railway route from Great Britain to Africa through France and Spain, the Moniteur de l'Industrie et de la Construction expresses the satisfaction of the French people that two are prospectively broken down. The tunnel under the Pyrenees will soon be an accomplished fact. The problem of one under the Straits of Gibraltar will be successfully solved by the French engineer Bertier. The length of the latter will be forty-one kilometers, and the depth four hundred meters under the sea. It is difficult, says the Moniteur, to estimate its cost, but judging from the work under the East and North rivers at New York, it cannot be less than 425,000,000 francs. The third barrier to the continuous route, the Straits of Dover, is regarded as unsurmountable at present, in view of the conviction of the English people that safety depends on their insular position.

The rails on the Belt Line Road around Philadelphia are the heaviest rails used on any railroad in the world. They weigh 142 pounds to the yard, and are 17 pounds heavier than any rails ever before used. They are ballasted in concrete, and 9-inch girders were used to bind them. All the curves and spurs were made of the same heavy rails, and the tracks are considered superior to any railroad section ever undertaken. The rails were made especially for the Pennsylvania Railroad by the Pennsylvania Steel Company. An officer of the railroad company states that this section of roadbed will last for twenty-five years without repairs.

EXPLORING FOR FOSSILS.

So much prominence has been given by the local newspapers and periodicals to the opening of the new Dinosaur Hall of the American Museum of Natural History, that the interest of the general public in things palæontologic has been greatly stimulated. Particularly fascinating to the layman are the accounts of the field work of the scientific parties sent out to prospect for fossils or to collect those already discovered. The photographs show how fossils are excavated and forwarded to the laboratories of the museums for restoration, and illustrate in a more detailed manner how this branch of the work is conducted, than those accompanying the article on the *Brontosaurus* restoration in an earlier number of the SCIENTIFIC AMERICAN.

Fig. 1.—Part of the Skeleton in Its Original Bed, Bone Cabin Quarry.

EXPLORING FOR FOSSILS.

Fossil bones are found in various conditions and various kinds of matrices. Usually, the bones are smooth, hard, and brittle, but sometimes they are decayed, and then resemble "rotten" stone. Often they are discovered on the surface, entirely uncovered by the action of the elements, and then need only be collected and wrapped for shipment. Chiefly the jaws and hard, compact foot bones of small mammals are obtained in this way, as they stand weathering better than do other bones. Fossils occur in sand, sandstone, and limestone, but more frequently in a hard, brittle clay shale, and the difficulty encountered in excavating the specimens, of course, depends upon the character of the soil in which they are imbedded. Until the excavation closely approaches the bones, rough tools can be employed—hand picks, spades, and shovels, and, as one of the photographs shows, plows and scrapers. It is only in the case of quarries or of large specimens, such as Dinosaurs, that horses are employed at all, and as a rule the fossils are uncovered on such steep bluffs or hillsides that the use of the teams is impossible.

The bones are handled in the field in various ways. If they are delicate, badly mixed up, or crushed, the surrounding matrix is cut out in a block, packed in hay or straw, and boxed or crated. This method is also followed with the remains of the smaller animals. In many cases, as the excavation proceeds, the portions laid bare are covered with sheets of tissue paper or muslin and gum arabic. Over these, bandages of burlap and plaster of Paris are placed, enveloping the entire fossil, and the specimen is ready for crating. This is the procedure where the fossils are not in good condition, if they are "rotten," rough, or cracked by weathering. If they are smooth and hard, the plaster bandages are applied directly, paper or muslin being placed only over such portions as may be in poorer condition. The plaster envelopes of the large bones are sometimes strengthened by wooden ribs or braces. The whole is then bound with wet rawhide strips, and the consequent shrinkage of these on drying binds the whole firmly together. If possible, it is so arranged that no crate or case shall weigh more than 500 pounds.

Sometimes, particularly in the case of smaller, more delicate specimens, flour paste is used instead of plaster. The advantage of this is that the flour is easier to handle and pleasanter to work with, and the envelope is easily removed from the bone by moistening it. Moreover, a pound of flour goes further than a pound of plaster. The latter consideration is of great importance when we consider that the supplies for these expeditions must frequently be transported hundreds of miles into the wilder parts of some of our western States.

It is of vast importance for the work of restoration that the bones be excavated and shipped to the laboratories as nearly as possible in the relative positions in which they were found. Especially is this true where the remains of various animals are commingled, or the single bones are broken and scattered, for to separate the bones properly or to segregate the skeletons requires more care and time than the field party can devote to it. For this reason a large part of the matrix is often not removed until the specimen reaches the museum. Here the plaster envelope is cut away on one side, all the matrix that can be reached is removed, and the bones or fragments freed and separated while still firmly held in their relative positions by the remaining part of the envelope. A plaster bed or layer is now made for the freed side, which is first covered with tissue paper, that the bones may be held in place without adhering to the bed. The specimen is then turned over, and the envelope and matrix are removed from the other side, leaving the entire fossil free for the work of restoration and mounting, but in its original position. In the case of the large fossils, such as those of the gigantic Dinosaurs, where the bones are unbroken, this procedure is usually unnecessary, as the size of the individual fossils is so great that they must be transported separately. Here, however, the position and condition are carefully studied, sketched, and photographed in the field. For restoring missing parts and binding fragments together, mixtures of dextrine and plaster, or gum arabic and plaster, are used in the laboratories.

Photographs 2, 3, and 6 were taken at or near Como Bluffs in Wyoming. The second of these shows parts of a *Diplodocus* skeleton ready for crating, the wooden ribs imbedded in the plaster, and the whole bound by strips of rawhide. The first is of the partially covered femur and tibia of one of the first of the Dinosaur specimens found at Como Bluffs. These bones were used to supply some of the missing parts of the great mounted *Brontosaurus* at the American museum, as the skeletons were, fortunately, almost identical in size, though the one shown in the illustration was only about one-third complete. The third, No. 6, is of a series of vertebræ partially excavated and covered with sheets of paper. The bone on the extreme left had weathered out first. The sloping bank had been cut away as far as shown, when it was found that the strata dipped almost vertically downward from their horizontal position. Under this condition the further work of excavation would have been extremely difficult, and so the fossil was abandoned in the state shown.

Photographs 1, 5, and 7 were taken at the Bone Cabin Quarry, not far from the Como Bluffs, and are illustrative of three stages in the work of excavation. In the partially uncovered bones the cracks due to weathering are plainly discernible. Photograph No. 4 was taken at Hay Springs, in the northwestern part of Nebraska. It depicts the uncovering of the fossil remains of a mammoth. Both tusks, in a fairly good state of preservation, had been laid bare when the picture was taken. The deposits, of the early part of the glacial period, were extremely interesting. They included the remains of prehistoric camels, deer, peccaries, large ground sloths, mammoths, *Castoroides*—a gigantic species of beaver, one of the largest of all the rodents—Pleistocene horses, and many other smaller animals. Of all the prehistoric horses, the Pleistocene horse most nearly resembled the modern animal, the difference being only in details, such as the teeth. The fossils at Hay Springs were found imbedded in sand, and were uncovered with little difficulty. A curious fact that puzzled the members of the expedition was that nearly all the hollow bones were split and broken. This could not have been due to trampling or crushing by other animals, as the solid bones, no matter how delicate, were usually found intact, and the absence of all traces of man precluded the idea that human hands had been the destructive agency. At length Prof. Osborn, Curator of the Department of Vertebrate Palæontology of the American Museum, advanced the generally accepted theory that the bones had become filled with water, and that subsequent freezing had caused them to burst. In the preparation of this article we are indebted to the courtesy of Mr. Walter Granger and Mr. Adam Hermann, of the American Museum of Natural History.

Fig. 2.—Femur and Tibia of a Dinosaur Found at Como Bluffs and Used in the Brontosaurus Restoration.

Fig. 3.—Several Caudal Vertebræ of a Diplodocus Found at Como Bluffs, Incased in Plaster.

Probably as much has been done to improve the design of propellers as any part of marine machinery. In early days the rules for propeller design were exceedingly crude, but with the slow engine speeds which then obtained the effects were not noticeable. As engine speeds increased it was seen that these old rules were utterly inadmissible. There is no excuse, however, for progress having so long delayed, for the designs remained too crude even after Isherwood's famous Mare Island experiments in 1868. Probably one of the great troubles with screw propeller design at the beginning was the mistake made in considering the action of the screw as analogous to that of a bolt working in a nut, from which it was inferred that the smaller the slip the greater the efficiency. As a matter of fact, a screw propeller is really a pump for driving a mass of water astern, the reaction from which drives the vessel ahead. When this was realized, it was seen that there must be a certain amount of slip and that under proper conditions there could be a large slip and still high efficiency.

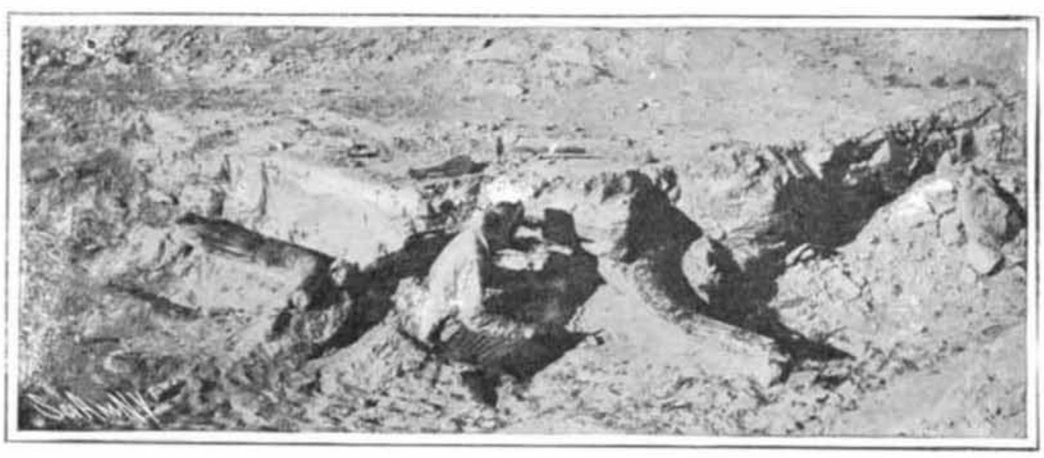

Fig. 4.—Excavating Mammoth Tusks at Hay Springs, Nebraska.

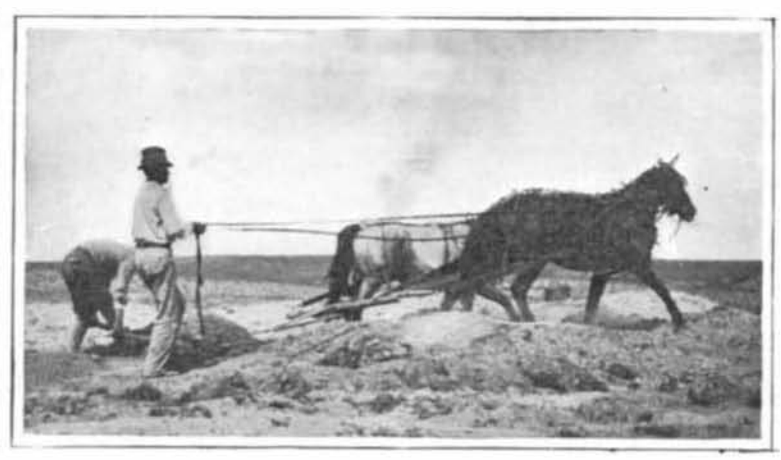

Fig. 5.—Using a Plow at the Bone Cabin Quarry.

Fig. 6.—Partially Exposed Dinosaur Vertebræ at Como Bluffs.

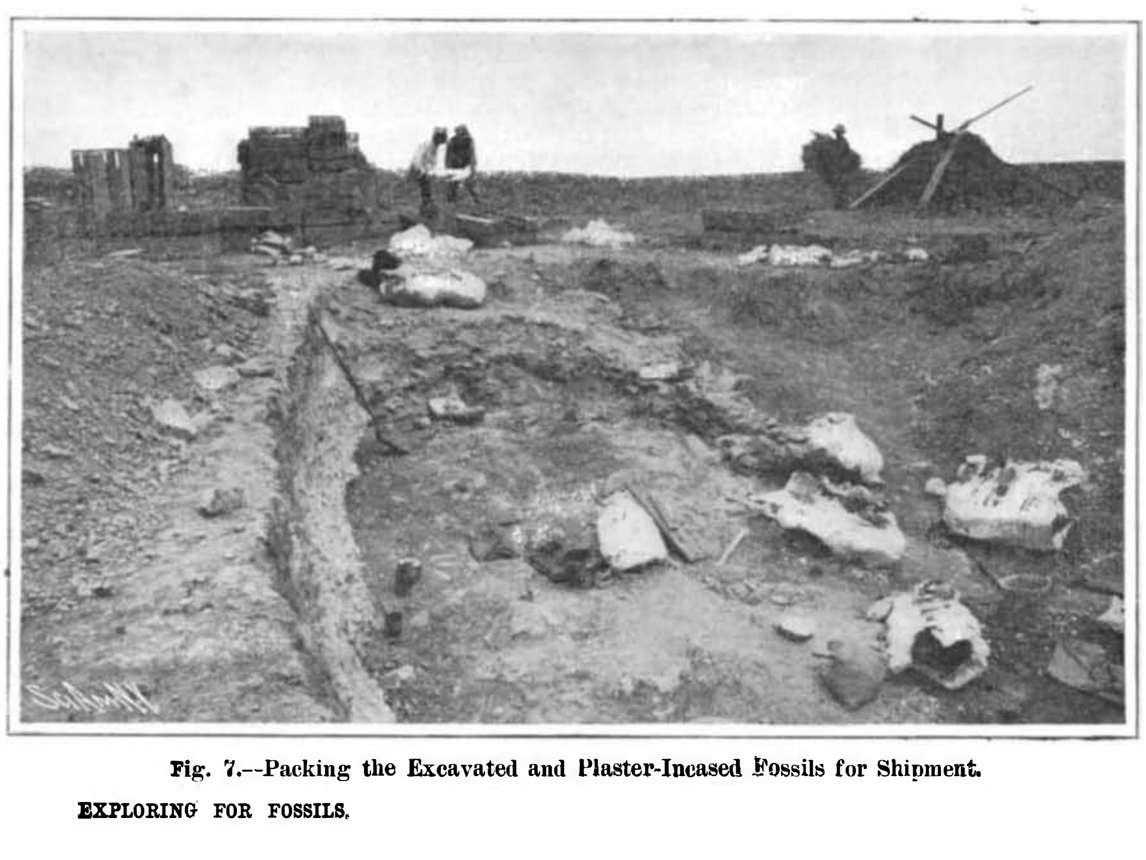

Fig. 7.—Packing the Excavated and Plaster-Incased Fossils for Shipment.

EXPLORING FOR FOSSILS.