CHEAP GREENHOUSES—HOW TO HEAT THEM.

By PETER HENDERSON.

FIG. 1 shows three of the usual ridge and furrow houses, which are 60 feet long and 11 feet wide, each with a furnace room, or shed, at one end, which is 12×33 feet. Of course the length may be increased or diminished as desired, but this width is found to be the most convenient. It will be seen that the three greenhouses are heated by two furnaces, the flue being so disposed under the center benches of the houses as not to cross any of the pathways. This gives, of course, two runs of the flue to the middle house, and only one run each to the outside houses. This would in coldest weather give a temperature of not less than 40° to the outside houses, and 60° or 65° to the middle house, which has the two runs of flues. This difference in temperature is indispensable in a general collection of plants, and the neglect of it is more than anything else the cause of failure where growers have but one greenhouse. It will be necessary to have the flues built as close to the walks as possible, so that the heat be evenly distributed in the two outside

in a pot—it should prove fatal to the insect, it is necessary, if the remedy is to be of real practical value, that it should reach and destroy the Phylloxera on all the parts attacked by it in vines which are planted out in the open air. This is a real difficulty to overcome, as the remedy, be it in the form of solution or of vapor, cannot easily permeate the soil, sometimes clayey, sometimes sandy, on which the vine is growing, so as to reach and act upon the smaller root branches whose nutrition the Phylloxera diverts into itself.

M. Mouillefert, a professor at the School of Agriculture at Grignon, was the gentleman delegated by the Academy of Sciences to make the necessary experiments for the purpose of determining what agent was the most practically applicable to the destruction of the Phylloxera, and the account of the numerous substances employed by him with varying results fills no less than 200 pages of a memoir presented to the Academy of Sciences. It is not our intention here to do more than give a brief *résumé* of the results at which he arrived.

He divides the substances used by him into seven groups,

FIG. 1.—PLAN OF THREE HOUSES COMBINED.—Length, 60 ft.; width, 33 ft.

F, R, Furnace Room, 12×33 ft.; B, B, Benches, 4½ ft. wide; W, W, Walks, 2 ft. wide; S, S, Smoke-flue for heating; F, C, Furnace, with Chimney built on top of it.

houses. Fig. 2 shows a greenhouse 20 feet wide by 60 feet long, with furnace room or shed 12×20 feet. Here again the flues are so disposed as to avoid crossing the walks, being placed under the center bench, but as near as possible to the walk on each side, so that the heat may be evenly diffused throughout. If a difference in temperature is required in a house of this kind, it may be obtained by running a glass partition across the house, say at 25 feet from the furnace end, which will, of course, make that end the hottest. The flue, in each case, runs back to the furnace from which it starts and into the chimney, which is built on the top of the furnace. As soon as a fire is lighted in the furnace, the brick-work forming the arch gets heated, and at once starts an upward draft, which puts the smoke-flue into immediate action and maintains it; hence there is never any trouble about the draft as in ordinary flues having the chimney at the most distant point from the furnace. It will be seen that by this plan we not only get rid of the violent heat given out by the furnace, but at the same time it insures a complete draft, so that the heated air from the furnace being rapidly carried through the entire length of the flue, is nearly as hot when it enters the chimney as when it left the furnace.

FIG. 2.—PLAN OF A SINGLE HOUSE—60×20 ft.

F, R, Furnace Room, 12×20 ft.; B, B, Side Benches, 4 ft. wide; C, C, Center Bench, 5 ft. wide; W, W, Walks, 2 ft. wide; S, S, Smoke-flue; C, F, Furnace, with Chimney above.

This perfect draft also does away with all danger of the escape of gas from the flues into the greenhouse, which often happens when the draft is not active. Although no system of heating by smoke-flues is so satisfactory as by hot water, yet there are hundreds who have neither the means nor inclination to go to the greater expense of hot water heating, and to such this revived method is one that will, to a great extent, simplify and cheapen the erection of greenhouses. Many old-established florists, who have had the old plan of flues in use, have changed them to the one here described, and with great satisfaction. The wonder is that such an important fact has been so long overlooked, for when at the time it was discovered, heating greenhouses by flues was almost the only method in use. As some may desire to know the cost of structures like those above described, I would say that, at present prices in the vicinity of New York, the plan of Fig. 1 would cost, complete, about \$8 per running foot, or about \$600 for the whole building, 72×33. The house shown in Fig. 2 would cost about \$7 per running foot, or about \$500 for the 72×20. This price is only for plain substantial work, such as is put up by commercial florists. The side and end walls being made of wood in the usual way, with cedar or chestnut posts (locust is more durable than either), and double boarded, with a layer of tarred paper between.—*American Agriculturist*.

DISCOVERY OF A REMEDY FOR THE GRAPE-VINE DISEASE.

SOME time ago we published in our columns a short account of the results of the investigations of various scientific men in France into the nature of the Phylloxera—that terrible scourge which is committing such wide-spread ravages among the French vineyards. Latterly we have received some reports communicated to the French Academy of Sciences, dealing with the attempts which have been made during the last three or four years to arrest the mischief done by the insect, and ultimately to destroy it altogether by means of some potent drug. It is obvious that the remedy to be employed must possess two qualities at starting, viz., it must destroy the insect and it must not damage to any great extent the vine. But, further, it is not sufficient that when put in close contact with the roots of a plant—as

ful odor of sulphuretted hydrogen and bi-sulphide of carbon.

The alkaline sulpho-carbonates in the solid state are of a beautiful reddish yellow color and deliquescent, but are not easily obtainable in that condition; the sulpho-carbonate of barium can be easily procured, however, in a solid state, and presents the appearance of a yellow powder, but little soluble in water. The sulpho-carbonates decompose under the influence of carbonic acid, forming a carbonate, and evolving sulphuretted hydrogen and bi-sulphide of carbon. These two latter substances are gradually liberated and, as they have a very powerful effect on the Phylloxera, one can understand that the sulpho-carbonate, placed in the ground, may prove, by its slow decomposition, a powerful insecticide. In the case of the sulpho-carbonate of potassium, over and above its toxic effect, it has a direct invigorating influence upon the vine, as the carbonate of potassium is an excellent manure.

The employment of the sulpho-carbonates as a means for the destruction of the Phylloxera was suggested to M. Dumas by the clearly recognized need that there was of some substance that would evaporate less quickly than the bi-sulphide of carbon: he saw that it was desirable to apply the insecticides in some combination which would fix them and only allow them to evaporate gradually, so that their action might continue long enough in any one place to infect with their vapors all the surrounding soil.

But the task of eradicating the Phylloxera has by no means been accomplished by the mere discovery of the value for the purpose of these substances; there is the further difficulty of applying them to the vine in cultivation. One thing seems very certain that, in order to render the sulpho-carbonates practically efficacious in killing the insect, it is necessary to use water as the vehicle by which they may be brought to all the underground parts of the plant, and that the best time of year for their application is the winter or early spring, when the earth is still moist and the quantity of water necessary to be brought on to the ground by artificial means is consequently less. Mixed with lime in the proportion of 2 to 1, these sulpho-carbonates give a powder which can be spread over the ground before the heavy rains, that is, between October and March, and which will probably prove itself very efficacious.

The conclusion at which M. Mouillefert arrives at the end of his report is that the efficacy of the sulpho-carbonates is proved, and all that is necessary is to bring to perfection their employment in agriculture, which can only be accomplished by the intelligence and practical knowledge of the vine-grower who is well able to discover the economic processes of culture which are conducive to their successful application.

He ends by saying that "Science has accomplished its mission, and it remains for Agriculture to fulfil its part" in the eradication of the Phylloxera from the vineyards of France.—*Nature*.

STRUCTURE OF THE MUSHROOM.

THIS has been explained very fully by Mr. Worthington Smith, F.L.S., in a paper which he read before the Cryptogamic Society of Scotland, and which was illustrated by numerous drawings. He says "that the entire substance of the common mushroom is made up of excessively small bladder-like cells; these cells are so small in size and light of weight that no less than 1,500,000,000,000 (one and a half billion) of cells go to every ounce of the mushroom's weight. Mushrooms are generally grown by dealers from spawn or mycelium; this spawn is nothing but living matted cells in a resting condition, needing warmth, moisture, and darkness only for vivification. Mushrooms may, however, be grown from the purple-black dust which falls from their lower surface. This black dust again simply consists of nothing but cells, but in this case the cells are termed spores. These latter are of a somewhat different nature from the simple cells of flesh of the mushroom, and their outer coat in this species is changed in color from transparent to purple-black, possibly from contact with the air. The cells in the stem of the mushroom are sausage-shaped, and grow vertically; on reaching the cap these cells spread over in an umbrella fashion, and descend into the internal substance of each individual gill. This internal mass of cells within the gill is termed the 'trama' by botanists. To understand how the mushroom produces its seeds or spores, a slice should be cut off the side of the cap of a mushroom from the top downwards. Where the sectional part is now exposed, the gills which are cut through will look like so many small fine teeth of a comb. With a sharp lancet a very small thin transparent fragment must now be sliced off from the top downwards, and placed upon a glass for examination under the microscope. When magnified 250 diameters this fragment will be seen to consist wholly of simple cells. These 'trama' cells are of some importance, because certain members of the mushroom tribe have no longer cells of this nature. As these latter cells gradually grow to the exposed surface on each side of the gill, they get considerably smaller in size, denser and less and less transparent. The exposed surface of the gill is the fruiting, spore-bearing, or hymenial surface. The spores in all the mushroom tribe are produced in clusters of four on each basidium, but on the common mushroom and all its varieties, as far as I have seen, these four spores are generally produced two at a time, and as the first two drop off the last two appear, so that it is seldom that more than two are seen *in situ* at the same time. This phenomenon teaches a valuable lesson, and one which has, as I conceive, been quite erroneously interpreted by Professor Sachs, who says the common mushroom only produces two spores on each basidium, and so illustrates the subject in his Fig. 174. The cells of the mushroom increase in number by apical growth. The last formed cell repeats the process continuously till the fungus is complete and the special cells (spores) destined for the reproduction of the species are reached. The basidium is first a simple cell, seen in two positions. This simple cell becomes potentially (but often indefinitely) divided by a longitudinal partition; each of these divided portions produces a branch, and each of these branches bears a spore, which in its turn is again cut off by cell division, this time transversely. The basidium is now again longitudinally divided; these portions in their turn also produce new branches, which give rise to two more spores, each spore again cut off by a transverse septum. As the two last formed spores increase in size they gradually push the two old ones off their supports, so that unless the whole process is very carefully watched it might be concluded that the mushroom produces only two spores (instead of four) on each basidium, as stated by Professor Sachs.

"The mature spores on germination of course reproduce the species by means of a series of new cells. All experiments prove the life of the spore to be very short, but when the spore once germinates and forms spawn, the latter material has great tenacity of life, and this mycelium is commonly, if not always, perennial."

LOSS OF SHADE TREES IN CITIES.

IN the report on the shade trees of Washington, by Wm. R. Smith, Chairman, and Wm. Saunders, Secretary of the Parking Commission, among the valuable suggestions is this, that where pavements are made of concrete or broad flags, there should be a foot or so of space left along between them and the curb-stone. We have known cases where the pavement completely covers the sidewalk, and the trees become very sickly for want of air to the roots.

In relation to the loss of street trees by coal gas at the roots, the subject is so important that we extract the whole paragraph:

"There is an annual loss of trees, more or less extensive, from leakage in the gas pipes; the escaping gas permeates the soil and destroys the roots. Perfect immunity from this evil is probably impracticable, and when detected it may be, as in most instances in this city it has been, promptly remedied. The worst feature, however, is that the evil is not discovered until after the roots have been destroyed or fatally injured; the soil is well saturated before the presence of escaping gas is detected, and it is then too late for the application of any effectual remedy. The best that can be done is to remove the injured tree and plant a healthy one in its stead, and even this will not always prove a success, as it is difficult to remove all the poisoned earth, and it usually requires several renewals before a healthy growth is secured. Gas poisoning is the unsuspected cause of many deaths among city trees."

In Philadelphia the loss of street trees by this cause has been enormous. Why should not the gas companies be made amenable, says the *Gardener's Monthly*, for these losses? It ought to be, and it is just as practicable to make a gas pipe gas-proof underground as above. And then look at the enormous loss to the tax payers by leakage of gas in this way.

A NEW SOUTH WALES (Riverine) paper says that six merino rams, shorn lately by Messrs. Nichol & Son, of Beckwith Court, near Clunes, gave the very handsome return of 76½ lb. of wool.