The large palm house of the Botanic Garden of Edin burgh is an octagonal structure, 60 feet in diameter, and 45 feet high. Excepting stone pillars at the angles, and between the windows, of about three feet wide, the whole building is glass, presenting a surface of almost exactly 5000 square feet of glass. The quantity of fuel required in a cold atmosphere, having a mean of 35°, is 1344 pounds for 24 hours ; being at the rate of 269 lbs. of coal for every 1000 feet of glass in a day, or 11.2 pounds an hour for 1000 feet, or .0112 of a pound per hour for each foot.

To confirm this observation, it was thought proper to examine another house of different dimensions. The eastern wing of the great range of houses is warmed by a fire, which consumes half that quantity of coals, of about half the value, being dross of a bad quality ; so that its consumption is about 1/4 of the other in real value, being about 672 lbs. of dross, equivalent to 336 lbs. of good coal in 24 hours. Now, the exposed glass of this wing amounts to about 1376 square feet, being at the rate of 243 lbs. to 1000 feet—a result which is sufficiently near to the other, to allow us to assume 250 or 260 lbs. of fuel in 24 hours for each thousand feet, as a standard of tolerable accuracy in such cases. It may be useful to add, that these houses are in tolerably sheltered situations, and that the glass faces in every direction, so as to be acted on with tolerably uniformity.

Hence we have the following results :

Temperature of the air 35°—temperature of the hot house 65°.

Heat sustained 24 hours, by 250 lbs. of good coal, for 1000 square feet of glass.

Heat sustained 1 hour, by 10.4 lbs. of good coal for 1000 feet of glass.

Heat sustained 1 hour, by 0.0104 lbs. of good coal, for one foot of glass.

To find what amount of steam will be required to warm such a house, we have only to apply the calculations of Art. 66 ; 10.4 lbs. of good coal will convert seven gallons of water into steam ; therefore, a boiler of one horse’s power is necessary to evaporate a sufficient quantity of water for the supply of steam for each 1000 feet of glass ; that is to say, for the palm-house alone, a boiler of five horses’ power would be required to furnish steam ; and this supposes the hot water of the condensed steam to be returned into the boiler immediately ; and if this were not the case, six horses’ power would be the size of boiler ordered for this purpose : hence—

To warm a hothouse by steam, there is required the boiler of a steam-engine, reckoned at one horse’s power for every thousand feet of glass.

The method of distributing the heat through the rooms of the hothouse, is not a matter of so nice calculation as in a common apartment. There is much greater convenience for this purpose in a greenhouse than a common room, on account of the necessary vacuities under the ranges and beds. In general, a single circuit of steam-pipe four inches in diameter, round the apartment, with a re turn pipe of equal dimensions laid parallel to it, is sufficient.

It is, however, of great importance to provide a remedy for one of the practical inconveniences of steam. When the fire is not very carefully tended, ns during the night, the steam in the boiler falls below the proper point, and the supply instantly ceases. This is remedied by the following method. Cast iron boxes, a foot square and five or six feet deep, are filled with stones, and ranged round the forcing rooms—a pipe passing into each of them communicates a supply of steam to them, and the stones they contain. The caloric entering first of all with rapidity into the stones, is afterwards given out gradually by them to the house ; and the advantage of this arrangement is, that even if neglect or accident were to occasion a tem­

porary cessation of the supply, this heat would still continue to be given out from the matter of the boxes for several hours until the defect might be remedied. These boxes of stones perform the same function for caloric that a flywheel does for mechanical power—absorbing it when in excess, and giving ft out again when deficient.

It is a valuable hint to economy, which Mr Macnab has put in execution in his houses at the Botanical Gar den, that the boiler flues should be extended to the green house after they have left the boiler ; the remaining heat is thus given out to the hothouse, and the last degree of saving accomplished. With this arrangement a smaller boiler will suffice, but it will not always be convenient ; neither can a greater length than about 30 feet of flue be advantageously used in this way.

3. *On Evaporating and Drying Solutions, Cloths, Paper, Grain, Gunpowder, &c., by Steam.*

68. We have already observed how well the peculiarities of steam enables us to make use of it as a vehicle for the collection, transference, and distribution of heat. In addition to the facility with which it may be carried to a distance, and the uniformity of temperature resulting from it, we have this further adaptation to the purposes now under consideration, that the temperature can at no time become so great ns to produce injury, or deteriorate the substances to which it is applied. Hence it follows that thickened liquids, strong solutions, and any porous solid matter impregnated with fluid may be evaporated, and wholly separated from the fluid, without incurring the danger and suffering the deterioration resulting from direct application of the fire. And, further, by the proper application of steam, as a conductor of heat, liquids may be warmed, evaporated, and even boiled in vessels of wood, which is in some cases, as in brewing and delicate distributions, a matter of much importance.

When any mixture or solution of a solid in water is to be evaporated by steam, it may be done in some of the following ways.

(1.) The vessel containing the solution may have two bottoms, the interval between them being filled with water and steam, and the solution resting on the upper one, the fire is applied to the under one ; thus the steam and water intervening between the solution and the fire, the latter is protected, as well as the vessel itself, from being burnt when the process has nearly attained the necessary degree of dryness ; and the process of communicating the heat from the fire to the water takes place in the following manner ; the fire generates in the water bubbles of steam, which ascend from the lower to the higher bottom of the vessel, which is in contact with the solution and acquires its temperature, and, giving off their heat to the upper bottom, are condensed, and fall down again to the lower bottom to acquire the accession necessary to rise, once more, in steam to the top. This plan has been successfully used in making salt ; and it is necessary to have a safety and an atmospheric valve attached to the space between the lower and upper bottoms. The quantity of heat required for the purpose of evaporating the water of the mixture is neither increased sensibly, nor diminished by the intervention of the steam between the bottoms ; the number of gallons of water to be evaporated from the solution will determine the quantity of heat by Art. 66.

(2.) A second method of producing evaporation is to introduce among the mixture a steam pipe, so as to wind amongst it either in the form of a helix, like a corkscrew or worm of a still, or to perform such a circuit as shall expose a large quantity of surface, with tolerable uniformity, to the fluid for the absorption of heat from the steam. Copper is the best material for the tubes, and wooden tanks lined with lead or tin will contain the mixture. The fuel