mixture of sulphur dioxide and air, passes through the flues into the nitre oven. This is an enlargement in the flue containing two cast iron pans set in in such a manner that the heated gases can play well over and around them. These pans are about 7 ft. long by 2 ft. wide and 1 ft. deep. Through an iron door in the wall of the oven charges of nitrate of soda, together with sufficient sulphuric acid to completely decompose the nitrate, are introduced at regular intervals. The heated gases warm up this mixture and keep the reaction going. Nitric acid gas being given off, which is carried off along with the burner gases into the next stage of the process. The sodium sulphate ($NaHSO_4$) resulting from the action of the sulphuric acid on the nitrate of soda is withdrawn from time to time through a channel in the bottom of the pan, and is allowed to cool and solidify. In some cases this substance is utilized by working it up with common salt into salt cake in the manufacture of carbonate of soda, and also in glass making, but in many places it is useless and simply thrown away.

The gases which leave the nitre oven next pass into a tower called after the name of its inventor, the Glover Tower. This tower consists of a hollow column of sheet lead, from 20 to 30 ft. high, and 9 or 10 ft square, held in an upright position by a strong timber at each corner carrying joists to which the lead is attached by straps of the same metal. The lower end of the lead tower stands in a saucer made of the same material, about 1 ft. wider every way than the lead column, and about 1 ft. deep. This saucer is provided with a lip on one side to carry off the acid which runs through the tower and out at the bottom The interior of the tower is lined with a glazed metallic brick, such as will resist the action of the acid, This brick is built up into the form of an arch over the pipe which brings the gas from the burners, the roof of the arch being arranged as a grating to break up the gas into a number of streams. The walls of the tower are then lined with the same brick up to the top, the lining being graded upwards from a brick and a half thick at the base to half a brick at the top. These bricks are all laid dry without mortar or cement of any kind. The space within the brick work is then filled in with quartz or flints, graded in size from the largest pieces at the bottom to the smallest sizes at the top, the packing being filled in to within about 4 ft. of the top of the brick lining. The top of the tower is covered in with a sheet of lead which is perforated with a number of holes placed about 2 ft. apart over its surface and fitted with funnels and lutes in such a way that acid can flow down into the tower without allowing the gas to pass up through the lutes.

Above the top of the tower is erected a chamber containing two distributers and storage tanks of lead for holding and delivering the acids which are allowed to run down the tower. The distributers are of many kinds. the main idea being to divide up the stream of acid from the storage tank into a number of fine streams of uniform amount and deliver these at the different holes in the top of the tower. In the side of the tower above the brick work, and below the top sheet, a leaden flue is affixed to convey the gas from the top of the tower into the first of a series of chambers. The objects of the Glover Tower are two-fold: (1) to denitrate the nitrous acid obtained from the Gay-Lussac tower in a later stage of the process, and restore the nitrous gases to the system: and (2) to concentrate the acid running down the tower. These objects are attained as follows:—

Strong sulphuric acid, containing nitrous acid gases in solution, possesses the property of giving off these gases as reddish fumes when it is diluted with water or a weaker acid. Advantage is taken of this property in the Glover tower by having two tanks at the top, one containing the nitrous sulphuric acid and the other water or weak acid from one of the chambers. Various names are given to this nitrous sulphuric acid. By some it is known as nitroso-sulphuric acid, whilst in the trade it is usually termed nitrated acid or nitrous vitriol, the last name being used hereafter. A pipe from each tank leads to one of the distributers, the nitrous vitriol being piped to one, and the water or weak acid to another. A stream of water or acid is started, and both mix at the funnels leading into the tower. The acid on dilution gives up its nitrous gases which are carried into the chambers again by the ascending column of gas. The mixed liquids fall down on to the quartz packing and are divided up into countless little streamlets descending the tower, and cooling the gases as they rise through the interstices of the packing. Lower down the gases are hotter, having just left the burners, and here the heat is sufficient to drive off the water from the descending shower of acid and returns it as steam to the chambers, whilst the acid runs out into the saucer at the base of the tower, and from there into the storage tank, as strong as it was before dilution at the top of the tower, and at the same time deprived of the nitrous acid which it formerly contained. The degree of denitration and concentration is regulated by varying the supply of water or weak acid at the top of the tower, the acid running away from the base of the tower, being tested frequently for strength and nitrous acid. If this shows a high test for nitrous acid, more water or weak acid is required, whilst if the strength is below the normal, some water or weak acid must be cut off. The acid which runs off from the base of the tower is passed through a cooling arrangement to reduce the temperature as much as possible, and is then in a suitable condition to be used over again in the other tower or Gay-Lussac tower in a stage to be described later.

The mixture of gases which reaches the top of the Glover tower and which consists of sulphur dioxide, nitrous acid gas (N_2O_3), steam and air pass through the flue into the first set of chambers, the temperature of the entering gases being about 140° F., though it sometimes falls as low as 100° F. in very cold weather, such as we occasionally experience in Sydney.

The chambers, which have been mentioned previously, are enormous receptacles constructed of sheet lead. They are usually built in sets of 3, 4, or more, according to the capacity of the plant. Sometimes all the chambers are of the same size, about 90 ft. long by 24 ft. wide and 24 ft. high, containing about some 50,000 cubic feet of space each inside. In other plants, as at the Dominion Iron and Steel Company's plant the chambers are of varying sizes, the first chamber being the smallest and the last one the largest There is not, however, any distinct advantage apparent of one plan over the other. The Steel Company's plant consists of three chambers, the first one being 36 ft. long, 25 ft. wide and 20 ft. high, having a capacity of 18,000 cu. ft.; the second being 117 ft. long, 25 ft. wide and 20 ft. high, with a capacity of 58,500 cu. ft.; and the third being 150 ft. long, 20 ft. wide, and 20 ft. high, with a capacity of 60,000 cu. ft.; the total contents of the three chambers being 136,500 cu. ft. In the construction of these chambers, the base of each chamber is essentially an immense lead tank, with sides two feet high. Into this the leaden sheets forming the sides of the chamber hang almost touching the bottom of the tank, the acid formed in the tank acting as a lute around the lower edge of the sheet to prevent the gas from escaping. The top of the chamber is a lead sheet. The sheets are joined together by burning, a blow pipe, using oxy-hydrogen gas, being used to melt the edges of the sheets sufficiently for the metal from the two sheets to run together and solidify. Solder would be of no use, as it would not resist the action of the acid gases. The leadwork is held up by a strong wooden framing, built up all round outside, to which the sides and top of the chambers are attached by lead straps burnt to the sheet lead and nailed to the joists. A set of chambers is usually raised some ten or more feet above the ground to allow for a natural fall of the acid when