of amalgamation) a great loss of mercury by cutting it up. The balance of evidence is, however, favourable to the introduction of a small percentage of quartz-sand, as tending to keep the charge open, thereby admitting the air, and keeping the pyrites free; or, as Mr. F. B. Miller says, 'to check the agglutination of the particles; for when they have once begun to fuse together it is very difficult, if not impossible, to roast properly.' It must, however, be remembered that none of the present methods of concentration are so sufficiently perfect as to thoroughly cleanse the pyrites, and that in all parcels a small proportion of quartz-sand is found. The evidence is contradictory as to the value of introducing combustible substances, such as charcoal, into the furnace with the pyrites. The majority of practical men examined do not see that any advantages are gained thereby, and they are, to say at the best, of doubtful utility, and decidedly disadvantageous in cases where lead and antimony are present. It is difficult to fix accurately the proportions of fuel required. When wood is used (as is generally the case), much depends on the variety of the timber, the plan of the furnace, and the mode of feeding. As a fair approximate estimate, about one ton of wood to one ton of pyrites may be given. It is not evident that any great amount of care is exercised in feeding the fires, as it was seen at some of the companies' works. The wood was simply thrown on in large logs, and, when almost consumed, fresh fuel added. This is a practice to be condemned, as it causes a waste of fuel and defective roasting, the latter ultimately resulting in a loss of gold and waste of quicksilver. It may be observed that partially-roasted pyrites causes a greater loss of quicksilver than even raw pyrites; therefore the supply at certain intervals of regulated quantities of fuel not only results in a saving of the fuel itself, but insures the more gradual and proper decomposition of the ores. An examination of the various works visited disclosed the fact that far too little attention has hitherto been paid to the regulation of the draught of the furnaces. It is essentially necessary that a steady current of air should be made to pass over the surface of the pyrites under treatment, so as to insure their thorough oxidization. Some systematic and effectual plan should therefore be brought into general operation, by which the regularity of the draught could be insured.

"To summarize briefly the various points embraced in this section of the subject, it appears that careful roasting in reverberatory furnaces, with a thorough draught and a regular and frequent supply of fuel, is the best method of treatment (previous to amalgamation) at present in use in the colony.

"*Amalgamation.*

"After roasting, the next step in the treatment is amalgamating, which is generally done by grinding the roasted pyrites in Chilian mills, arastras, or Wheeler's pans. After a certain portion of the material is placed in the mills mercury is added, and sometimes certain specifics. (*Vide* Messrs. Ulrich and Newbery's statement attached.) The witnesses are almost unanimous as to the absolute necessity of thoroughly breaking up the quicksilver in order that it may penetrate the stuff operated on, and take up all the gold brought in contact with it. So thoroughly, indeed, should this work be done that, to use the expression of one of the gentlemen examined, 'a pen dipped into the stuff in the mills as into ink should show little globules of mercury.' But these very means which are necessary to secure effective amalgamation also give rise to a form of floured mercury already referred to—in this case brought about by mechanical and not chemical action. The evil is as great, however, in this as in the case where chemical combinations retard the saving of gold, for it appears that during the operation of flushing off part of the floured mercury is carried away with the water and lost. It is found on examination that the loss of quicksilver alone has been as great as 2½lb. per ton of roasted ore treated. This, in addition to a considerable loss of gold as amalgam, renders it evident that if some effectual means of saving both be brought into general use many thousands of tons of tailings now lying unworked, which it would not otherwise pay to operate upon, could be made to yield a considerable profit and open up a large field of labour.

"Some of the gentlemen examined state that they use copper plates, others copper plates and blanket-tables, for the recovery as far as possible of floured mercury. The water is run over these plates and blankets, which retain to a certain extent the particles of quicksilver and gold; nevertheless the loss, even in well-managed works, is still considerable.

"*Effects on Public Health and Vegetation, and Methods of Condensation.*

"It has been a matter of popular belief that the fumes evolved during the process of roasting pyrites are dangerous to health and productive of injury to the surrounding vegetation: on this point the evidence is very contradictory, the witnesses, professional and lay, examined, differing, and their experiences varying greatly. Some of them aver that, with ordinary sanitary precautions, such as washing the body with soap and water, and changing the clothes after work-hours, not the slightest injury is caused to the health of the men employed at the works, and it is stated that no cases of diphtheria have been known to exist in their immediate vicinity. On the other hand, it is alleged that fumes passing over gardens adjacent destroy fruit trees and other vegetation, and the water from the roofs is injurious to health. Where the roofs of houses in the neighbourhood of pyrites works are of galvanized iron, sulphate of zinc is formed by the condensation of the sulphurous fumes; but there is no reason to suppose that arsenical fumes are condensed in this way: on the contrary, there are chemical reasons why water collected on these roofs cannot contain arsenic. It is generally found that complaints are made only against works where no precautions are taken to effect the condensation of the fumes, and it is admitted, where proper condensation is carried out, no injury is occasioned either to health or vegetation. Dr. Bone in his evidence says that when pyrites works were first started at Castlemaine, no means were adopted for the preservation of the public health, and there were undoubted cases of gastric irritation, caused, doubtless, by drinking water from the roofs of houses in close contiguity to the works; that he brought the matter under the notice of the Borough Council, and suggested certain alterations, which were carried out; and since then no further cases of gastric irritation have been brought under notice. He further states,