

in the Newberry-Vautin chlorination process. If this be the case I am not without hopes that something may yet be done in a similar direction with ores far less rich than those at Mount Morgan. In cases where the pyrites contain small percentages of copper it is possible sometimes to extract this economically by the wet process by the aid of sulphuric acid. There are many other possible ways in which the acid might be utilised, but the success of any one of them would depend largely on local circumstance. We have heard something lately of so-called paint mines. By these are meant of course deposits of colored oxides of iron which can be manufactured into paints. At Ballarat the residues after roasting iron pyrites and extraction of the gold are now being utilised for this purpose, the oxide of iron being in a very fine state of division and of sufficiently good color to command a sale. Reference has been made to the preparation of chlorine for the extraction of gold. In the chlorination process chloride of lime is used as the source of chlorine. Now this substance is generally regarded as a mixture of calcium chloride and hypochlorite; but whatever view be held as to its nature only half the chlorine it contains is available for the purpose of gold extraction. Is it not somewhat anomalous that the chlorine should first have to be prepared in Europe, then converted into chloride of lime, of which remember only half the chlorine is available, then imported to Australia, with very often a considerable loss of chlorine before it is actually used. It will perhaps be said that all this is compensated for by convenience in working and saving of time and labor. Where this substance is used the direct use of chlorine involves extra plant and perhaps more wear and tear. Be this as it may, there still seems to me to be matter for reflection for those concerned. A suggestion has been made to use bromine water instead of chlorine gas, the bromine being of course all recovered and used again. The obstacle here would be the shipping difficulty, bromine being a dangerous substance to deal with if a breakage should occur. In appliances for gold-saving by amalgamation the necessity for bringing the mercury into intimate contact with the finely divided gold is becoming more and more apparent. Attempts have been made with more or less success to effect this by means of grinding machinery, but lately a process has been patented which presents some new features. The roasted auriferous ore in a fine state of division is brought by means of a powerful blast in contact with the vapor of boiling mercury. It is claimed that by this means a very perfect amalgamation takes place, the mercury condensing and carrying the gold down with it. It is claimed that the process can be made continuous by using the same mercury over again. It is an ingenious process, but one of the difficulties, it seems to me, will be loss of mercury by oxidation, caused by contact of the oxygen of the air with the hot vapor of the metal, it being a well known fact that mercury in contact with oxygen at a high temperature becomes oxidised. In silver smelting greatly improved results are now obtained as compared with those of a few years ago, doubtless owing to the employment of skilled metallurgists, but that there is a considerable loss of lead is evidenced by the fact (if evidence were wanting) that a large number of persons at Broken Hill show some of the minor symptoms of lead poisoning. In Europe great efforts are made to condense lead fumes as completely as possible, so as to recover the metal. Probably enough it would not pay to erect condensing flues for this purpose at such places at Broken Hill, but the fact remains that there is waste, and such waste as might make a considerable difference in large works employed in smelting poorer ores, and may we not hope to see metallurgical processes so carried on in Australia in the future as to render possible the profitable treatment of such poorer ores?

Closely connected with the possibility of preparing chlorine by a paying process is the production of cheap salt. Surely there should be little difficulty about that. For this purpose the salt need not be purified at all, but the residue from sea water or salt lakes used just as it is, and in the hot dry parts of this colony near the seacoast large quantities of sea water could be evaporated at a very small outlay. Moreover, I cannot see why good salt for table and other domestic purposes should not be manufactured in quantity as it is on the shores of the Mediterranean by the aid of the sun's heat alone. If there is a prejudice against colonial articles there must be some cause for it. Probably the sending into the market of carelessly-manufactured and imperfectly-purified products has had a good deal to do with it; and in this particular instance the evaporation of sea-water needs to be carefully carried out to produce a good marketable article, while that salt obtained from salt lakes, the result of inland drainage, is sure to contain considerable quantities of magnesium compounds, which will render it bitter and unsuitable for domestic use, unless means are taken to remove these objectionable substances. If our colonial manufacturers are to succeed, it is absolutely necessary that good articles should be produced.

#### ECONOMY IN THE USE OF GAS.

In recent years a great deal has been done in the direction of economising fuel in large works requiring the use of powerful furnaces. It is well known that the gases which escape from ordinary closed furnaces are not completely burnt. The complete combustion of these gases is now effected by introducing under certain conditions a secondary supply of air, this air being itself heated by the final escape gases from the furnaces. This secondary combustion gives a very high temperature, and is the means of an enormous saving of fuel. The combustible gases may also be increased in quantity by causing a small quantity of steam to pass through the primary furnace, and the necessary quantity of steam can be obtained by means of the heat from the spent gases. This principle has been successfully applied by the manager of the gasworks at Bowden, a bed of retorts being heated entirely by the secondary combustion of the half-burnt gases from one of the ordinary furnaces. It is obvious that the principle is capable of very extensive application. A somewhat similar principle applies to economy in the use of gas for illuminating purposes. The contrivances for this purpose are so arranged that the gas is heated to a high temperature before it reaches the mouth of the burner by means of the heated gases resulting from its own combustion. It is well known that under these conditions a very much better light is obtainable with the same consumption of gas. There are various types of burner constructed on this principle, but they are not easily adaptable to the rooms of an ordinary dwelling-house. They are, however, well suited for lighting large spaces. They were in use in Holborn before I left London, some five or six years ago, and I notice that one form has been introduced into some few of the shops of Adelaide. In this connection it may not be out of place to mention the greatly improved simple burners (Sugg's, for example) which are easily obtainable at a moderate price, and can be easily fitted in place of the wretchedly dim older-fashioned burners. A great deal better light can be obtained by their means with a smaller consumption of gas.

#### CONCLUSION.

Fortunately or unfortunately, we have not yet in these colonies reached that stage of our history in which rigid economy in industrial and manufacturing processes and utilisation of all waste products becomes a necessity. It is a matter of history in Europe that in some instances what were originally regarded as waste products have become, if not the principle objects of manufacture, at least those upon which the success of the undertaking, from a commercial point of view, depends. At some future time this may be the case here; at any rate it is always useful to keep in mind the fact that materials, valuable in themselves, are being neglected, because it is always possible that the knowledge that such is the case may stimulate to discoveries of new processes for their utilisation."

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#### CHEMICAL SCIENCE AND PRODUCTION.

TO THE EDITOR.

Sir—Will you oblige me by inserting a correction of a statement which occurs in my recent address before the Royal Society? I alone am responsible for the error, which, unfortunately, I did not notice till this morning. The passage referring to chloride of lime should read thus:—"This substance is generally regarded when in solution as a mixture of calcium chloride and hypochlorite, but whatever view be held as to its nature considerably less than half its weight of chlorine is available for gold extraction. Is it not somewhat anomalous that the chlorine should first have to be prepared in Europe, then converted into chloride of lime, of which, remember, less than half the weight is available chlorine, &c.?"

I am, Sir, &c.,

EDWARD H. RENNIE.

The University, Adelaide, October 8.

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Professor Rennie

WE publish elsewhere Professor Rennie's address at the annual meeting of the Royal Society. Its subject was well chosen and judiciously treated. In every progressive community the advantages of applied science to the industrial arts are now distinctly recognised. The time has gone by when the practical worker could afford to ignore or disregard the researches of the scientific investigator. It is true that between the two classes of persons there has often been a good deal of misunderstanding, tending sometimes to their mutual injury. On the one hand the scientist has been impatient and irritable because his discoveries have not received immediate recognition and prompt application. He has felt tempted to condemn the slowness to adopt his suggestions and the persistent clinging to old methods, which he has consequently denounced in severe language. On the other hand, it must be confessed that such suggestions have not unfrequently been met by unjustifiable contempt as the dream of theorists. Happily for both this state of things is over to a very large extent. The augmented producing power which science has conferred has proved itself so great a boon that keen competition has compelled the most unwilling to avail themselves of it. Everywhere it is found that in order to keep pace with the times the latest and best methods must be employed, for refusal to do so involves falling behind in the race. Accordingly Professor Rennie's remarks on "the present state of some of those industries of these colonies in which chemical science is more or less involved" are sure to be heartily welcomed and carefully studied. The consciousness has deepened among us as a community that if we are to make permanent progress we must not neglect anything that will enable us to make the most of our resources, and this ensures for such a review respectful consideration. Our leading industries have had to contend with many adverse influences, but one of the worst has been our own ignorance and carelessness. The sharp lessons of past disaster have not been thrown altogether away, and though no heroic method of curing all possible evils is likely to be discovered, there is general willingness, and even anxiety, to guard against them as much as possible.