REFINING PRECIOUS METAL WASTES

CHAPTER I

THE PURPOSE OF THE BOOK

What the book does. What it does not do. Is a knowledge of chemistry essential? How to use the book.

• # * •

When a jeweler makes a piece of jewelry, he starts with a sheet of metal and he hammers and carves it and drills holes in it, and files off the rough edges; possibly he engraves it; and finally he polishes it. He winds up with a piece of jewelry that weighs one-half or maybe only one-tenth as much as the original sheet. The rest is now in the form of clippings, scrap, filings and the minute particles that are now mixed with the polishing materials all contaminated with more or less dirt.

When a dentist makes a denture he does much the same thing; he starts with gold or some other metal, usually of high intrinsic value, and when he is done, a good part of the original metal is now in the form of scrap, grindings, and the like.

These precious metal wastes are useless until refined. In most cases, especially when the proportion of dirt is small, the task is easy. In some cases the mixture is of such a nature as to make it wise for him to sell the stuff to a professional refiner. In a few cases the proportion of dirt is so high that the owner might as well throw the thing away.

The purpose of this book is to teach the jeweler or dental technician how to handle all these kinds of waste. The equipment needed will be described, the processes will be explained, and he will be told how to decide whether a given type of waste is too complex for him to refine or not.
2 REFINING PRECIOUS METAL WASTES

This book does not cover the refining of virgin ore or crude metal, nor any phase of mining engineering.

It does not cover assaying which is the analysis of a small weighed sample, made to learn its ingredients and their proportions.

It concerns itself only with secondary refining that is, the refining of precious metals that have already been in use and are now waiting to be returned to further employment in art, science, or industry.

And while the book does describe fully the processes used by such huge plants as the United States Mints and others who handle gold by the ton and platinum by the hundredweight, its main concern is with the small plant the jewelry factory of from one to a hundred men, and the average dental laboratory and it covers the recovery of gold, silver, and the platinum-group metals from the wastes that such plants produce.

IS A KNOWLEDGE OF CHEMISTRY ESSENTIAL?

For the task that we have set ourselves, the answer is no. Many excellent refiners have no formal chemical training. Of course by the time they learn to refine they have acquired a knowledge of the behavior of several metals and acids, and the worker with a knowledge of chemistry can progress more rapidly and with greater assurance. However, this book is written for the man without a knowledge of chemistry.

It is pertinent to digress here and recall the origin of chemistry. . . . It began with man’s dream of making gold out of base metals. In the pursuit of this dream he experimented with every substance he could lay hands on, combining them, heating them, cooling them, crushing them, cursing them and blessing them, and learning a great deal about them. Chemistry of today is an outgrowth of these efforts. The student of this book will have some of the same mental adventures that were enjoyed by the Alchemists, but, it is hoped, with a greater monetary reward.

HOW TO USE THE BOOK

We shall begin with easy tasks tasks that are easy to perform and easy to understand. The assumption is that the reader has never even seen the processes of refining precious metals. It is taken for granted that he hopes to learn how to handle even the more complex mixtures normally found in the jewelry shop or dental laboratory; therefore we shall go step by step to the more complex cases. Finally it is assumed that he has eyes with normal
color-perceptions, a fairly steady hand, and will perform in order the various "acquaintance" tests, without too great impatience to reach the more interesting chapters in the back of the book. He must of course obtain the required equipment and chemicals.

Precautions against the hazard of fumes, acids, poisons, etc., will be brought to his attention.

After performing the acquaintance tests, the reader will take small quantities of filings, clippings, etc., and will read about the first procedure in the instructions, and perform it. Then he will read about the next step, and perform it. Soon he will have clean metal, ready to melt up and use again, or to be sold.

The process of learning can be carried out best with small quantities of material. Later, after the process and its reasons are familiar, the reader will handle larger and larger quantities of material at a time; this means larger vessels, and sometimes different ones, all of which are described in their place.

* * * * *

There are three agencies used in refining: acids and other chemicals; heat; and the electric current. Most refining is done with acids the so-called wet way which will occupy a large part of this book. The dry way, which means heating the metal sufficiently to melt it, and then removing impurities by means of fluxes, has fewer applications today than it had a generation ago. Electrolytic refining may be the method of the future, and is now an accepted method for handling large quantities of materials. All three of these will be described, so that the reader may choose the agency best suited to his needs.

* * * * *

"No matter how a text is written, one reader will yearn for more details while another will be bored by the tedious explicitness." These words of truth can be found in the Introduction to J. Harry Howard's Handbook for the Amateur Lapidary, and they seem so applicable that we must here echo his request that the reader take this into account when tempted to criticise the book. The author has purposely gone into every small detail necessary to instruct the newcomer who knows nothing of chemistry or laboratory technique. From the chemist, who may skip these elementary instructions, we ask patience with the beginners.