The story of
Copper . . Zinc
and Brass

AS DISPLAYED AT

Ford Exposition

A CENTURY OF PROGRESS

Chicago, 1934

ANACONDA COPPER MINING COMPANY

THE AMERICAN BRASS COMPANY

COPPER

HOW IT IS MINED AND REFINED BY ANACONDA COPPER MINING COMPANY

In the Butte, Montana, mines of Anaconda Copper Mining Company, copper ore comes from more than half a mile below ground. From a ton of this ore, containing 6% of copper, Anaconda extracts enough pure copper to equip completely three Ford Cars.

As received from the mines, ore ranges in diameter from 18″ to particles as fine as dust. This ore is first crushed and ground in a series of operations until it resembles fine sand, no particles being larger than eight thousandths of an inch in diameter.

Then much of the waste material in the ore is eliminated by a process known as selective flotation. Here the finely ground ore is placed in water. Agitation and aeration in the presence of certain reagents produces bubbles with an oil film to which the mineral particles adhere. These bubbles, heavily coated with mineral, rise to the surface and are removed, thickened and filtered. The result is a concentrate containing about 30% copper.

These concentrates are roasted in multiple hearth furnaces to remove a portion of their sulphur content and to convert some of the sulphide minerals to oxides. An interesting point in this roasting operation is that once the sulphur ignites, the heat developed by the burning of the sulphur in the concentrate is sufficient to maintain a continuous self-roasting operation without the use of additional fuel.

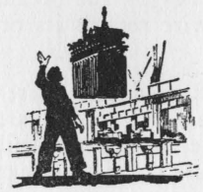
The roasted product, "Calcine", is smelted in reverberatory furnaces at temperatures of from 2500 to 2700 degrees Fahrenheit. In the fused state the copper combines with sulphur to form copper sulphide and the remaining sulphur in the charge is united with a portion of the iron content to form iron sulphide. The product of this smelting operation is a combination of copper sulphide and iron sulphide called "Matte".

A converting process is the last stage in the eliminations that finally leave metallic copper. Molten matte from the reverberatory furnaces is poured into the converters—65 tons to a charge. Air under pressure is blown through the liquid matte, burning the sulphur and oxidizing the iron. Sulphur gases pass out the flue and the iron oxide forms slag, which is poured off—metallic copper settling to the bottom of the converters. This is known as "blister copper". It contains some gold and silver plus small amounts of certain impurities which are removed in refining furnaces. The enriched copper, 99% pure, is cast into anodes and sent to the Company's electrolytic refining plants for recovery of the gold and silver.

In the electrolytic refining process, copper anodes weighing 630 pounds each are suspended in lead-lined tanks filled with a current-carrying solution known as "electrolyte". These anodes are connected to a positive electric terminal. The metal dissolves in the electrolyte and all foreign materials, including precious metals, sink to the bottom, while the pure copper is attracted to the other terminal. There it is deposited in the form of heavy sheets, which are called Cathodes. When the cathodes have reached sufficient thickness, they are removed from the tank. The copper, 99.95% pure, is then melted and cast into commercial forms.

ZINC

HOW IT IS MINED AND REFINED BY ANACONDA COPPER MINING COMPANY



Large quantities of sulphide ores rich in zinc and containing some lead and other metals are found in the Butte properties of Anaconda Copper Mining Company. The zinc ore is mined, crushed and ground in the same manner as copper ore. Concentration by bulk flotation separates the zinc and lead minerals from much of the waste material. The resulting lead and zinc concentrates are then subjected to selective flotation, in which process the lead-bearing minerals rise to the surface, while the zinc minerals stay below. The zinc concentrates are removed, thickened, filtered and sent to the roasting division.

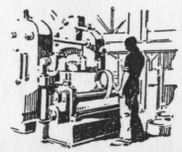
These concentrates are roasted in special furnaces to convert the zinc into sulphate and oxide forms, expelling excess sulphur and oxidizing the iron and other metallic contents of the ore.

The roasted zinc concentrate, or "calcine", is screened and sent to leaching tanks where it is treated with dilute sulphuric acid and the zinc recovered in the form of a sulphate solution containing some copper and cadmium. In purification tanks, the copper and cadmium are removed by mechanical agitation with zinc dust; then, after filtering, the clear zinc sulphate solution, known as electrolyte, is pumped to large storage tanks which feed the electrolytic refining cells.

In these electrolytic cells, or tanks, the pure zinc is deposited onto the cathodes. Every 48 hours these zinc-covered cathodes are removed from the solution and the zinc deposit stripped off, melted, and cast into 50-lb. slabs for commercial use . . . Anaconda zinc made by this electrolytic process is more than 99.99% pure.

BRASS

HOW IT IS MADE BY THE AMERICAN BRASS COMPANY FOR USE IN THE FORD V-8



The American Brass Company, principal fabricating division of the Anaconda Company, operates seven large plants in different parts of the country. One of the chief products of these plants is brass, an alloy of copper and zinc used extensively in Ford cars. To cite an important application, brass is used for radiator tubes—the production of which is demonstrated in the Ford exhibit at the Century of Progress Exposition.

To produce brass, pure copper and zinc in scientifically determined proportions are melted together

in electric furnaces and cast into brass bars. These bars are passed through heavy metal rolls to reduce their thickness and increase their length. This rolling, of course, imparts hardness to the metal; this must be removed by heating, or annealing, before the rolling process can continue. Surface irregularities are then eliminated by a machining operation, and the bars pass on to another set of rolls. Rolling is continued, with occasional annealing, until the heavy bars have been reduced to a thickness of 0.0079 inches. Now for the final rolling operation which you have seen demonstrated on an American Brass rolling mill in the Ford Building. Here the brass, now coiled to facilitate handling, is finished to a thickness of 0.0070 inches, and a predetermined temper. As the long thin strip of brass passes through these rolls, it is caught automatically by a winder which holds the metal under tension and prevents it from moving sideways. The metal is transferred from the winder to a slitting machine which trims the edges and cuts the brass into accurate widths.

These thin brass strips are shipped to the Ford Motor Company at Dearborn, Michigan, where they are formed into lock-seam, soldered tubes on automatic Ford machines. The finished tubes are inserted in thin copper "fins", and assembled into the honeycombed radiator core with which all motorists are familiar. Anaconda Brass and Copper are used in the Ford radiator because of their ability to dissipate the heat of the water pumped from the engines, and because their corrosion-resistance assures long life and economical operation in spite of constant contact with water and anti-freeze solutions.

And in the Home . . .

COPPER AND BRASS ENJOY A LONG RECORD OF DEPENDABLE SERVICE—SAVING MONEY EVERY YEAR FOR THOUSANDS UPON THOUSANDS OF HOMEOWNERS WHO HAVE HAD THE FORESIGHT TO USE THESE DURABLE, NON-RUSTING METALS FOR THE MANY PARTS EXPOSED TO WATER OR MOISTURE.

WATER PIPE—Brass pipe or copper tubes have become far more essential to convenience and economy than they were a decade and more ago. For today water piping is embedded in walls and floors, making repairs and replacements difficult, annoying and expensive. "Out of sight . . . out of mind" is an old adage that applies to water pipe—until telltale rust tinges the water, foreshadowing clogged pipes, a reduced flow, perhaps costly leaks. Rustless pipes of Anaconda Copper or Brass eliminate all this . . . save money in spite of their slightly higher first cost.

HOT WATER TANKS—Whether it be a range boiler or the storage unit of an automatic heater, convenience and low upkeep cost demand a tank that cannot rust. "Everdur", a special Anaconda copper alloy, is the accepted metal for non-rusting tanks because it has the strength of steel and the durability of copper. Today, leading manufacturers of range boilers and automatic heaters (both gas and electric, also oil-burning) standardize on Everdur tanks for all rust-proof models.

SHEET METAL WORK—In most sections of the country gutters, rainpipes and roof flashings which are of rustable metal last but comparatively few years. Here Anaconda Sheet Copper offers permanent protection against rust. Needless to say, the elimination of rust affords an important saving. Remember that the labor costs for any installation are the same—regardless of the material used. So why risk damaged walls, leaking roofs and a large outlay for repairs? Sheet metal work of copper *cannot* rust!

SCREENS—Window and door screens are made of fine wire. To last they must be non-rusting and strong. Paint and other protective coatings over rustable wire are only temporary at best. Therefore bronze, a strong copper alloy, is considered the ideal metal for screens. In view of the long, trouble-free service which screens of Anaconda Bronze Wire provide, their higher cost is ridiculously small—only about 35 cents for the average-size screen. The life of bronze screening is limited only by accidental breakage—and because it is immune to rust, bronze wire retains its original strength year after year.

HARDWARE—Rusted hardware is unsightly. That's why brass and bronze are the preferred metals. And remember that a thin brass plating over a rustable base is *not* brass hardware. It must be *solid* brass or bronze. If first appearances deceive you, use a magnet. It will not stick to copper or copper alloys.

THE AMERICAN BRASS COMPANY
GENERAL OFFICE: WATERBURY, CONNECTICUT
Offices and Agencies in Principal Cities.