

METALLURGY

Silver Lining to Tin Shortage

U. S. Treasury's Great Hoard of 100,000 Tons of Silver May Replace Metals Cut Off by Japanese

By DR. MORTON MOTT-SMITH

THERE is a silver lining to the acute shortage of tin that Jap invasion of Malaya is likely to cause. And to the billions of cans in which so much of our food reaches us, there is, literally, the possibility of silver linings.

For years Uncle Sam has been storing up great stocks of silver. Forgetting for the moment the cost in dollars and cents and the political reasons, this silver hoarding by the government may well prove to be a great help in this war. There are well over 100,000 tons of silver in our vaults, as much silver, weight for weight, as the amount of tin used in a normal year.

For copper as well as tin, noble silver can be an effective substitute.

Copper and tin in war have a rendezvous with death. They fly in bullets, whirl in the rotating bands on shells. These strategic metals enter into other vital production and construction for war. And there is not enough to go around, even in the case of copper for which the U. S. A. is relatively self-contained. In plating, silver can substitute for chromium and nickel, both metals short for war production.

Will Go To Work

You can expect silver to come out of its Treasury vaults and get to work, taking the place of tin that the Japs have seized and releasing copper and other metals for active service. Silver is going to be drafted for the duration.

Nickel is apparently on its way out of the nickel, the familiar five-cent piece. Silver may replace it and part of the copper too. The old coin of three-quarters copper and one-fourth nickel will be half silver, half copper.

There are many metals less costly than silver that today are actually more precious so far as our war effort is concerned. Silver sells for \$5 a pound, which is about ten times the price of tin. Realize, however, that dollars and cents do not mean in war what they do in peace.

You can today go out and buy almost any quantity of silver that you want and

can pay for. It is the cheapest metal that can be obtained without priorities. Just try to go out and get some tin, copper or lead, or even steel, without proper governmental authorization and see what happens!

(That \$5 price per pound is in terms of ordinary or avoirdupois pounds, not the troy or apothecaries' pound that is employed when silver is used in coinage or jewelry. And you don't have to bother too much about the fact that the price of silver is 34.75 cents per troy ounce in the metal markets whereas the U. S. government in Congressional mandate generously pays 71.11 cents per troy ounce for newly mined domestic silver, which is over \$10 per ordinary pound.)

Better Than Copper Electrically

Except for price, there would be a great use of silver in many practical ways. Electrically silver is better than copper.

Silver bus bars, on great power-plant switchboards, would be even better conductors of electrical power than those now made of copper. These are the heavy bars that carry the main current supply, the arteries of an electrical system.

Silver plating on cans would release huge quantities of tin for direct war uses.

Silver as a hardener in solder and bearing metals is already accepted in the airplane industry; its employment in these fields could be profitably extended.

These and many other industrial uses of silver have been investigated by the National Bureau of Standards.

For some purposes a part at least of the huge government hoard could be lent or leased with no cost whatever except that of the mechanical manipulations necessary to convert the ingots into the desired forms and back again into ingots when the war is over, and so returned to the vaults. We could use our silver and have it, too.

As bus bars in the great aluminum and magnesium plants now building under government supervision, the silver would be as safe as in the vaults where it now rests. These plants will operate

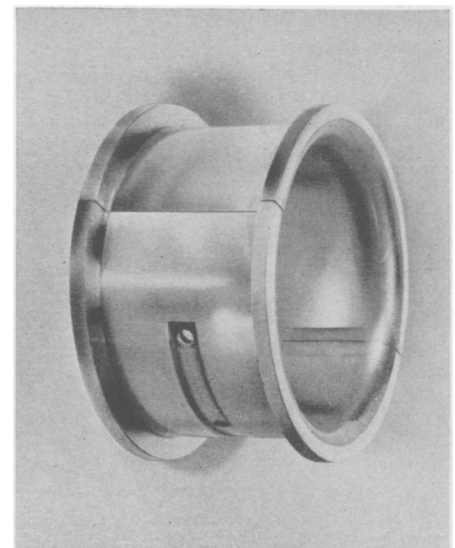
24 hours a day, seven days a week. They will be guarded constantly. The bus bars will be "hot" all the time, carrying tens of thousands of amperes of electric current. No thief could safely lay hands on this silver.

In these plants alone, 25,000 tons of copper could be saved, to make our shells fly straight to their marks. Another 50,000 tons could be saved by making a similar substitution in other plants requiring large conductors to distribute huge quantities of electricity. These are the estimates made by Robert E. McConnell, chairman of the Engineers Defense Board, New York City.

Tin Is Now Precious

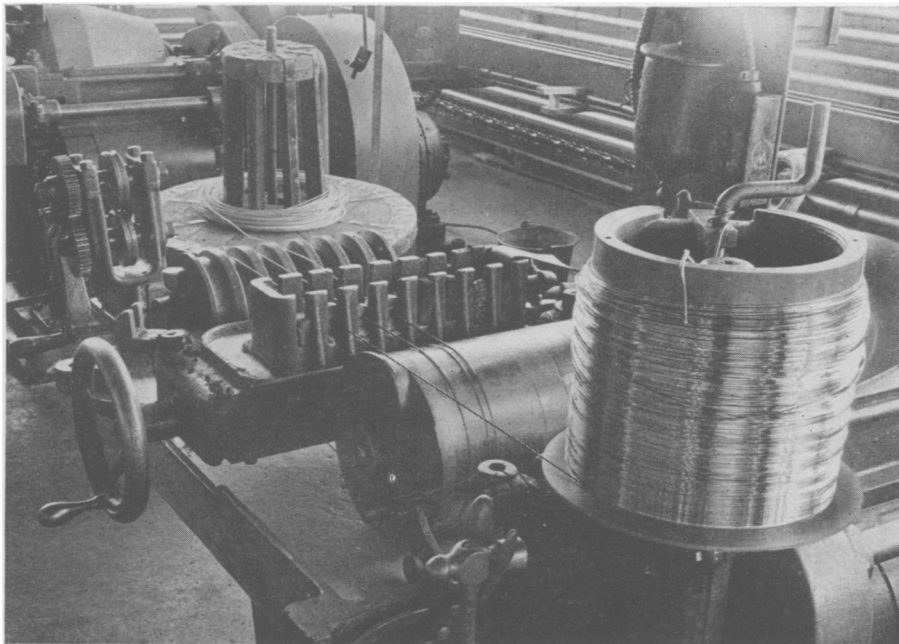
Tin is now a most precious war metal and must be conserved at all costs, even if we have to substitute, at times, more expensive silver for it.

Eight-tenths of our tin came from British Malaya, the Dutch Indies, and other parts of Asia, two-tenths from other parts of the world. An almost microscopic amount came from some small mines in Alaska, South Dakota, Montana and New Mexico. Other than these, we have no tin mines, and geolo-



FOR AIRPLANES

This is a silver-lined bearing for an airplane motor. A heavy coating of silver is applied by electroplating and is then machined to the desired thickness. Bearings such as this one stand up to heavy loads better than ordinary ones.



SILVER WIRE

Electrically, silver is better than copper. Here is shown some silver wire which may be used to substitute for the scarce copper in the war emergency.

gists assure us that there are no important ores in this country.

As a lining for tin cans, silver would not be much more expensive than tin, because the coating may be made thinner, especially if an under-coating of some other metal is put on first. Indeed, the extra cost would not be due so much to the silver as to the altered methods of manufacture involved.

The silver must be electroplated. Tin plate for the canning industry is made mostly by running a strip of sheet iron through a bath of molten tin. It is a fast and cheap process. The coating must be fairly heavy, not so much to preserve the contents as to permit rapid automatic soldering of the folded side seam.

Impractical With Tin

If thin electroplated coatings of tin or of any other metal are used, another method of sealing must be used, such as welding, brazing or the production of a seamless tube for the can body. This would require a complete making over of the whole canning industry. Great quantities of machinery, containing much valuable steel, would have to be junked and new machines built. This is perhaps impractical.

The canning industry is indeed a huge baby. In 1940 it made 17 billion tin cans, used up three-quarters of our tin plate and 60% of all our tin. A saving of even 10% in the tin used for cans

would therefore loom larger in the total than a similar saving in any other branch of the industry.

Beer drinkers object to the taste of beer from a tin can. This is the reason for the lacquer or "keg-lining" that is put over a tin base. One part of tin in 10,000,000 of beer is enough to cause the latter to become cloudy. This is so far beyond the usual chemical tests for tin, that beer itself could be used as a super-sensitive test for the presence of tin.

Silver-lined beer cans, however, are free from these troubles. Beer cans with a silver lining would have to be heavily coated and, because of their value, would probably be made returnable. Many other uses could be found for such returnable containers.

Silver can also be extensively substituted for tin in solder, and in many cases would not be any more expensive. The Advisory Committee on Metals and Minerals of the National Academy of Sciences made an investigation of this and found that a 2½% silver solder was the equal of a solder composed of a 45% tin and 55% lead and would cost no more, at least for the materials.

Silver solder has always been considered superior to the tin-lead solders but has in general been used only for the finer work on account of its higher price and the higher temperatures required. But the committee found that this higher price was due mostly to the small demand

for it rather than to the cost of the materials.

In 1940, more than 11,000 tons of tin were used for solder. All of this could be saved if an all-out substitution with silver were made.

Silver can replace tin in bronze and other bearing metals—often to advantage. Silver linings are already used in heavy duty aircraft bearings and probably cost no more than a really good copper-lead bearing. Gold has also good bearing qualities, and gold-plated bearings are quite possible.

Germany has developed a number of bearing metals that do not contain tin. Tin there is used only for high-speed bearings.

Silver is very useful for brazing copper pipes as in refrigerating and air-conditioning apparatus and even in boilers.

It is useful in lining pipes for certain chemical operations. It is an excellent catalyst.

Would Purify Water

It has germicidal and fungicidal properties and can be used for the purification of water. It has extensive uses in medicine and in photography and appears in many chemical reagents.

Use of silver for tableware, utensils, vessels, ornaments and jewelry, both solid and plated, might convey the impression that huge quantities are already being used. Yet the total amount of silver used in 1940 in this country for all industrial purposes amounted to only 1,400 tons. The U. S. Treasury purchases for 1940 amounted to 7,000 tons, a five years' industrial supply.

The old superstition of the fairy tale was that bullets of silver were the only ones that would wound a wizard. In a very different and real way, silver used in production and war may play a part in lifting from the world the curse of Nazi and Jap aggression.

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● RADIO

Saturday, February 21, 1:30 p.m., EWT

On "Adventures in Science," with Watson Davis, director of Science Service, over Columbia Broadcasting System.

Prof. George F. Bush, of George Washington University, will discuss George Washington as an engineer.

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