who diverts them from their proper use, does injury to the great German struggle for freedom, and will therefore be punished with death.

"This decree enters into force with its promulgation over the radio. It applies also in the incorporated eastern areas."

Science News Letter, July 13, 1940

INVENTION—RESOURCES

Asks Tin Can Substitutes To Lighten Weight of Rations

With No Need To Worry Over Sufficient Food for Chow, War Department Has Concern Over Transportation

INTENSIFIED efforts to find new substitutes for tin in packing foods may result from Assistant Secretary of War Louis Johnson's appeal to the Institute of Food Technologists to help reduce weight of army supplies.

The U. S. Army would like to lessen the weight of a soldier's daily rations in the field, which total five pounds of "chow" plus a pound and a quarter of tin, cardboard, and wood packing. With no need to worry over sufficient food for our soldiers, or for allies whom we might have to ration in defending the hemisphere, the War Department nevertheless does express concern over transporting and processing the food.

Asking food technologists to help develop containers from substances other than tin, Mr. Johnson said: "Every ounce saved in transportation might prove invaluable when men and guns move to the front."

An especial need: the Army's commissariat would like invented flexible moisture-proof containers rugged enough to ship rice, sugar, and beans to soldiers in the field.

Besides solving a transport problem, if the Quartermaster Corps can get along using less tin, it will be helping to raise the nation's stockpile of this strategic material. Mr. Johnson has not forgotten the estimate that tin cans used by the U.S. Army in World War days would have paved a road from Hoboken to Berlin. This country came close to severe shortages several times.

Now, very differently, the War Department cautiously takes into account this hazard:

"In time of war, access to the raw material may be denied us."

By present reassuring reports, plenty of tin is coming to the United States. Netherlands East Indies, supplying about 6% to 10% of our tin, British Malaya, supplying 75%, are sending shipments right along. But the status of British and Dutch colonies and freedom of the long Pacific shipping lanes are uncertainties which cannot wisely be ignored.

The United States has had tin on its mind for months, for it is a material of which we produce almost none—less than 200 tons a year out of a consumption of 50,000 or more tons. Nearly half the world's output we use.

When war broke out, tin stocks in this country would not have supplied a month's normal requirements. Since then, putting tin on the reserve stockpile list, government purchasing agents have been buying for national security.

That an industrial nation can get along with very little tin, if it must, was demonstrated by Germany in the World War. But it is hard experience. Substitutes partially fill the bill, require much re-tooling and revision of machinery.

Besides the invaluable stockpile for defense, the United States has various "strings to its bow," in the event that tin imports from the Far East should be interrupted.

One possible source of tin is Bolivia, only country on our side of the world to mine tin in important quantities. Bolivia's production quota, set by the International Tin Committee, is the impressively high figure of about 46,000 tons a year, which is, interestingly, very near the amount we have been using.

Actually, however, Bolivia has not been producing up to its quota, due to a variety of handicaps, including the refractory ore, lack of cheap fuel, lack of smelters. Bolivian concentrates have mainly gone overseas to Britain for smelting. As to whether Bolivia's tin industry is expanding to a more productive future, or whether the best of the tin has been mined, reports differ. Some tin is there, certainly, and it is on this side of the world.

Research in packaging, which has already introduced jackets of parchment, rubberized paper, aluminum foil, glass, and other materials, would gain in importance, should it become necessary to release tin to the Army and Navy's greatest industrial needs.

Twelve billion tin containers are the present annual American supply, about 60% being used for packing food and the rest for commodities ranging from moth balls to aspirin. Tin cans and containers are the chief form that tinplate takes.

Reclaiming tin from old cans is another tin-saving possibility, which might be tried on a large scale if it ever became economically worth while. At present prices of tin, it is not considered worth extensive salvage.

Tin substitutes, much discussed, have been put to some specific industrial uses. Tin is tin, and thus far nothing duplicating its broad usefulness has been evolved. But such developments are reported as use of a lead bearing metal, tin free, in producing certain automobiles. Use of enamels and materials such as silver and aluminum in can linings has some possibilities.

Peacetime development of substitutes for our deficient raw materials has been advocated for some time by government mineral experts. They have emphasized that tin is too useful for industry to be deprived of it in peacetime merely as a precaution. And they have placed considerable reliance in the stockpile. But they have advocated seeking substitutes, emphasizing that such substitutes to be worth using should cost less or give better performance.

Science News Letter, July 13, 1940

The largest *census* in history will be taken in 1941 when India's people—probably 400,000,000—will be counted.

Replacing explosives in *coal mining*, a new process pumps oil into an expansible tube in a drilled hole, and when the pressure expands the tube, the coal is rapidly broken into large lumps along its natural parting line.

● RADIO

P. C. Sandretto, superintendent of the Communications Research Laboratory of United Air Lines, will describe the "Visual Highways of the Air" as guest scientist on "Adventures in Science" with Watson Davis, director of Science Service, over the coast to coast network of the Columbia Broadcasting System, Thursday, July 18, 4:00 p.m., EDST, 3:00 EST, 2:00 CST, 1:00 MST, 12:00 PST.

Listen in on your local station. Listen in each Thursday.