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## Phosphorus—Light Bringer

### *Editorial Foreword*

**P**HOSPHORUS — an element necessary to renew the fertility of our soil — has been chosen for editorial discussion this month because chemists tell us that phosphorus is far more important to the future of America than many other matters which concern us, even a balanced budget.

The Tennessee Valley Authority is governed by a board of three directors. One of these is not an electrical engineer but an entomologist and expert on plant life, Dr. Harcourt A. Morgan. He is one of the nation's inspired prophets of conservation. The ruling passion of his life is the reclamation of depleted American soil. In the federal chemical works at Muscle Shoals Dr. Morgan saw an opportunity to develop laboratories to produce concentrated fertilizers for American agriculture and an educational center for soil conservation. Three elements most essential for debilitated soil are nitrogen, potassium, and phosphorus. Now that nitrates can readily be manufactured anywhere out of the air and requisite potassium is easily available, Dr. Morgan decided to concentrate on the problem of phosphorus, so necessary to the life of all plants.

Dr. Morgan shows his visitors a graphic chart of our national economy. In the upper half is Soil Exhaustion, containing rural poverty, urban congestion, erosion, and the other factors that create the necessity for national borrowing, relief, relocation, and reconstruc-

tion. In the lower half of the chart is Soil Conservation, which includes diversified production, decentralization of industry, water storage on the land, recreation and health, and the other items that foster reasonable national taxes for education and public works. In the center of the page, linking the two, stands Phosphorus — the "catalyst of land and farm planning."

### GREEN GLASS

**O**N MY DESK in New York stands a bottle containing cakes of green glass. Every morning I pick up this bottle and shake the lovely translucent fragments and dream of what they may portend to make my country in truth America the Beautiful. The bottle was given me several weeks ago at the TVA laboratory at Muscle Shoals. The green lumps are composed of a new chemical, calcium metaphosphate — "metaphos." They provide a higher percentage of phosphate that can be ground into plant food than any concentrate yet developed. Metaphos is now being manufactured that contains as much as 70 per cent of plant food:  $P_2O_5$  — phosphorus pentoxide. This latest triumph of the peacetime use of the nation's war plant at Muscle Shoals is even more important to the future of America than the settlement of the current dispute between the TVA and the power companies.

*Phosphorus*, the Greek word meaning "light

bringer," was used by the ancients for any substance that glows in the dark. It was first identified as one of the elements in Germany in 1669. In its pure state — waxy, poisonous, highly inflammable — phosphorus cannot, of course, be used as plant food. In phosphates it has always contributed involuntarily to soil conservation, but superphosphate was first employed consciously by agriculture as fertilizer in England about 1840.

The available phosphate rock now utilized in the United States comes chiefly from two states, Tennessee and Florida. Three million tons are mined annually, one third of the world supply; and one third of our production is exported annually from Florida. Phosphorus is used for munitions as well as for agriculture, and, ironically enough, our exports find their way chiefly to the bellicose nations of Italy, Germany, and Japan.

But we have in storage far greater untouched resources of phosphate rock in the West — in the States north of Great Salt Lake: Utah, Wyoming, Idaho, and Montana. In fact these deposits amount to 6,000,000,000 tons, or one third of the total known world supply of phosphates. Happily most of these deposits have already been segregated and protected as federal lands. It is Dr. Harcourt Morgan's dream that the processes developed at Muscle Shoals and education in the land-grant colleges throughout the nation will bring about the conversion of these Western deposits into fertilizer sufficiently concentrated to make possible its distribution to the Dust Bowl and the depleted prairies of the Middle West.

### NEWS FOR THE FARMER

**S**CANNING the country for an expert to direct the development of new fertilizers in the electrical furnaces of the TVA, Dr. Morgan persuaded an outstanding chemical engineer, Dr. Harry A. Curtis, to leave a private post and take a responsible position as chief of the chemical research of the TVA. It was by telephone to Dr. Curtis in the phosphate fields of Tennessee that we obtained the formula for metaphos —  $\text{Ca}(\text{PO}_3)_2$ . Many patents and technical articles have come out of the TVA furnaces. Phosphorus is produced by the treatment in electric furnaces of rock phosphate, and this phosphorus is then used to produce concentrated superphosphate and metaphos.

Dr. Morgan's program does not call for more agriculture in the United States but for more diversification and the production of crops for local needs rather than export. Throughout the Tennessee Valley, soil experts are at work introducing the new phosphates and encouraging the farmers to test them. They urge the planting of leguminous crops — such as peas and beans, clover and alfalfa — instead of the cotton and the corn that have depleted a once fertile soil. Legumes obviate the expense of artificial nitrates, as they themselves fix nitrogen in the soil. The experts lecture to the farmers on the advantage of seeding in terraces on the hillsides to check erosion. This campaign, of course, is co-ordinated with the planting of new forests.

The work of education is slow but sure. The schools take up the cry for scientific methods. The colleges turn out trained agriculturists. One by one the farmers try out the new technique.

### THE FARMERS ARE TAKING HOLD

**P**LANT FOODS developed by the Authority are now being tested in more than 35 States. In the Tennessee Valley, large-scale demonstrations are carried out by community committees. The Authority furnishes the phosphates for demonstration, but the farmer must pay transportation and buy his own seeds. In the beginning of 1936 there were 1,000 such demonstration farms in the Valley; by the end of the year there were 14,000 farms, with a combined area of 2,250,000 acres. The eroded hillsides of the South are becoming green once more.

The eagerness for phosphorus in the world at present is illustrated by the recent developments in the Soviet Union. The little phosphate mining town of Kirovsk in the Arctic, according to today's news item, has grown in a decade from 200 to 35,000 souls. Two million tons of phosphate were mined there in 1936.

Phosphorus is as necessary for human beings and animals as for living plants. The lowly lima bean contains an even higher percentage of phosphorus than hospital spinach. But this subject we defer to a coming editorial on national nutrition!

*Henry Goddard Leach*

# Boss Hague

by SUTHERLAND DENLINGER



Portrait by Hugo Gellert

**H**OWEVER WE may be moving nationally (and the Lord only knows), it is a fact that in our States and municipalities the boss business, which is American for the dictator business, has been pretty much on the wane lately. Chicagoans have only the memory of Big Bill Thompson (although Nash and Kelly are ardent students of the method); the Tammany tiger's skin adorns the trophy room of New York's Little Flower; and in many cities from the Golden Gate to Massachusetts Bay the little fellows scurry fearlessly about, for their big, bad wolves are dead.

But there are major exceptions to this pleasant trend: in Kansas City, Pendergast; in Memphis, Crump; in Jersey City, Hague. Even

without his current embroilment with the C.I.O., an embroilment which has made him the current popular symbol of black reaction, there could be no question but that Frank Hague is the most important of the three. Both Crump and Pendergast reach out beyond the borders of their most intimate domains, but Hague's influence permeates the government of a more populous and wealthier kingdom.

No political boss in the history of America has made a more thorough and efficient job of it than has Frank Hague, and that goes for the Murphys and the Crockers and even the extravagant and redoubtable Kingfish of more recent memory. Yet he resembles these gentlemen only in his faculty for organization, a certain ruthless political realism, and that rough-and-ready distain for the niceties of speech and action which often marks the American leader of the peepul.

There the resemblance ends, and the differences begin. So far from establishing the traditional alliance between shady politics and "vice," for example, Hague has made of Jersey City (if, conspicuously, not of surrounding Hudson County) a place to delight the cold heart of the Puritan. You won't find any women at the bars in his hamlet of 360,000 persons, and it is against the law to permit dancing in an establishment where either food or drink is sold. Jersey City is headquarters for a huge horse-race bookmaking industry but nothing sportier. The city's mammoth medical center, exceeded in size only by New York's Bellevue and Chicago's Cook County Hospital, is a Hague creation and his particular concern. Hague's creation, too, is Jersey City's Special Service Bureau, the operating mechanism for a technique of dealing with juvenile delinquents which has its roots in a sane kindness and which, deservedly, has gained national renown.

He is, you understand, no monster. But the methods by which he maintains and expands