ENGINEERING 'ROUND ABOUT COLUMBUS

Inspected by

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XV. We Prefer to Stay Out of the Argument

There is always a tendency for a specialist to magnify the importance of his specialty. The world, for instance, by the new concepts of matter and energy, is a complex arrangement which the physicist says is his. The chemist asserts, with equal emphasis, that it belongs to him. So far as we are concerned, we are willing to let them divide it. The world of things as they are is one of substances that have properties which we call physical and chemical, and all the articles we use to eat and wear, and otherwise add to the comfort of our existence, grow or are made of basic materials in ways that seem often too complex to understand. At least for most of us whose knowledge of fundamental chemistry is probably limited to understanding of the rhyme:

Little Willie's now an angel
On the golden shore,
For what he thought was H_2O
Was H_2SO_4.

We live in a chemical age. (In what magazine did we first see that assertion?) There is no doubt that many factories—not so much in Columbus as elsewhere—are mostly chemical in their processes, and fulfillment of our intention to report on the engineering related to this field meant that, ignorant as we may be of the subject, we should investigate. We did. We found the inspection extremely interesting.

XVI. Farmer as Chemical Manufacturer

Among the chemical processes of the world none is more widespread or important than that controlled by the farmer. The rural master of chemical enterprise assists by bringing raw materials into proper combination for the alchemy of Nature. On the farm of the future, we are told, man will play much more of a part; in vats and tanks the products of agriculture will be transformed into the articles of a more synthetic age.

Chemistry as we know it is already an important adjunct to farming. Nowhere could we find a better example than in the making of fertilizers.

At mention of such a process the uninitiated may experience a feeling of revulsion, or even disgust. The feeling is unfounded. In the factory of the Farmers' Fertilizer Company which we visited, the process, except for a bit of "conditioning" with garbage tankage—no doubt specially selected—is entirely inorganic and every whit as pleasant as any process in laboratories controlled by a William Lloyd Evans or a James R. Withrow. In fact, H_2S seemed to be absent. Making "bonedust," as the farmer mistakenly calls it, is a valuable, important, and refined occupation. It is a splendid example of the economy from use of by-products of other industries. Though not by any means a waste product itself, fertilizer makes clever use of what would otherwise be waste.

XVII. One Industry's Waste is Another Industry's Raw Material

At this particular plant we found three industries contributing. From Republic Steel of Cleveland comes the nitrogen without which no vegetable can amount to a hill of beans; it comes as sulphate of ammonia and is a waste from the pickling operations. For "filler" there is spent molding sand from the Ohio Malleable. And "over the fence" from the zinc oxide plant next door comes sulphur dioxide, piping hot, to make some of the sulphuric acid, so important in producing fertilizer.

That sulphuric acid process made us dust off our elementary chemistry. The "lead chamber" ceased to be an expression in a book and become a reality, lead boxes, twenty feet or so on a side and twice as high, where the pungent gas and water—for the catalysts see your chemistry book—are brought together to make fifty or sixty per cent acid.

Here we run up against another complexity of industry. Not all the acid is used at the Farmers' plant in making fertilizer; some is sold to competitors and some is traded to Republic Steel and other industries. The wheels within wheels make an intricate structure indeed.

There is not enough sulphur dioxide to be had cheaply from the zinc works next door, and the Farmers' makes up the deficiency by burning sulphur from Texas. A look at the purplish flame from that brimstone makes one resolve henceforth to live a better life.

XVIII. Animals—Yes, But they Lived Long Ago

When sulphuric acid and phosphate rock—this is the nearest approach to bone dust, for the phosphate was made from the bones of animals who long ago roamed the Florida swamps—are brought together, it seems that chemical changes take place, making the phosphate available to growing things.

The appetites and needs of vegetation—we might

almost say its vitamins—have been worked out by the plant experts, so the fertilizer people follow their directions in compounding the balanced ration. Phosphate from Florida. The sulphate of ammonia furnishes the nitrogen. And from Arizona, California, and other places comes the potash salt that makes the third ingredient in plant food. The compounders vary the percentage to suit the requirements, the pocketbooks, and the prejudices of the individual farmers.

Of such complexity is our industrial economy that depressed agriculture affects potash miners in Arizona, Florida phosphate diggers, and a fertilizer company in Columbus. The economic fabric is a cloth of intricate pattern.

XIX. The Chemist Banks His Shot

Over the fence we went to the neat brick office—would not landscaping and more beautification pay in industry?—of the American Zinc Oxide Company, source of SO_2 for the Farmers' Fertilizer. We found another interesting process involving chemical reactions and more of the intricacy of industry.

Zinc oxide. Ah, yes, in paint it is useful because when it encounters the sulphur gases that change white lead into black lead sulphide it remains blithely white, that being the color of zinc sulphide. It is used in ointments, too. So much we knew—or thought we knew—about zinc oxide.

How to make it? Well, you take some zinc and you take some oxygen, see? You put 'em together. And so you have zinc oxide.

You do nothing of the sort. The chemist doesn't play his billiards so directly; his shots are nearly always banked.

You start with sphalerite, a greyish rock found in Tennessee, that contains a decent proportion of zinc sulphide. A bit of heat applied to the sphalerite starts it a-burning, driving off the SO_2 (piped over the fence to the sulphuric acid plant) and making zinc oxide, all right, but impure and yellow as ocher. It must go through fire again to achieve whiteness.

XX. Refined by Fire

This time we must add the fuel, finely crushed coal. In the roaring furnaces the mixture blazes with greenish flames—color imparted by the zinc—the ash becomes clinker (later cinders on the city streets) and off go the precious gases though a long duct that gives them a chance to cool before going into the big bags where the white zinc oxide collects, much as—on a smaller scale—the not-white dust collects in the vaccum cleaner at home.

Now it is in the bag. Suitable machinery shakes it down, conveys it to elevators, sacks it—looking something like flour—and it is ready for market.

It goes into paint, all right, all over the United States. And a tiny bit is used for our ointment. But the biggest market of all is in the industry that made Akron famous, for zinc oxide is one of the conditioners used in curing rubber to make tires.

Thus we find this a plant whose output is a finished product for some purposes, but largely a raw material for other industries.

XXI. A Big Factory With A Grand Name

One of the places where zinc oxide is used as a white pigment is another factory we inspected, that of the Columbus Coated Fabrics Company. Coated fabrics. This euphonious name covers the familiar article of commerce, we know as oil cloth, not to mention window shades, book binders, automobile upholstering (leather to you), wall covering, table cloths, and what not.

Oil cloth is one of the products, cloth covered with a layer of many colors whose base is oil. The other is pyroxalin, one of the new products of this age of plastic made from wood, in which, so it seems, we shall shortly eat, move and have our being.

Cotton cloth is the foundation of these coated fabrics, big rolls of it from the mills of North Carolina and Georgia, miles of it representing acres of growing, plowing with balky mules by tenants and sharecroppers, labor by dusty pickers, ginning, spinning, weaving—one industry preparing the raw material for another.

A day's run, we were told, is about a hundred and twenty-five miles of cloth. At fifty inches wide—just for estimate—we have some sixty acres of surface, planted daily with the protecting coats and gay designs to make the articles for which we have so many uses.

XXII. Men Meet the Machine—And Like it

The printing—for that is what it is, and with rolls winding and unwinding it looks something like a newspaper plant—must be done over and over; first coat, second coat, other coats, design, and often back dressing and embossing. The whole requires many operations. Pigments must be ground and stored in tanks, ready to carry out the designs of the artists, the requirements of the chemists. The flowers and figures, as the artist conceived them, must be transformed into impressions etched on copper rolls that are plated with chromium to make them last in contact with miles of cloth.

It is a busy place, with many departments and—it must be admitted—many penetrating smells. Oils and other liquids must be boiled—with care. (Boiling in oil, a mediaeval form of torture, may be appreciated when we learn that the temperature is five or six hundred degrees.) When you go into those departments you leave your matches behind. Colors and rolls and cloth are made ready. Then, in and out, though printers and dyers, the cloth makes its way, until at last it is ready to be inspected and cut and packed.

Even the packing boxes are made by mass production methods. The nailer—looking like a bad dream of Charlie Chaplin—drives a dozen nails at a blow. Four blows, one box.

But the people who tend the machines and super-

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vise operations are more agile than Charlie Chaplin in their effort to keep up with the modern industrial pace. They are efficient but not hurried. They seem to have made the machines their servants, and, so we were told, they are able to take time enough off to eat in the normal way. By no stretch of the imagination could a thousand persons turn sixty acres of cloth per day into coated fabrics without the aid of the machines. The men are masters, not servants.

And so a window-shade company in Detroit, a book binder in Cincinnati, a wall covering dealer in Delta, Colorado, buy coated fabrics in Columbus. And in the process Columbus people trade their surplus coated fabrics for automobiles, books, and vacation trips in the Rocky Mountains.