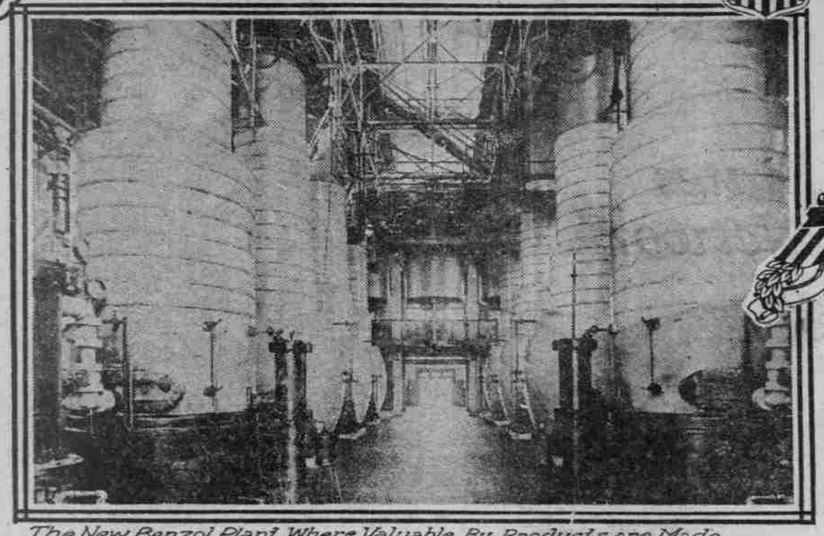
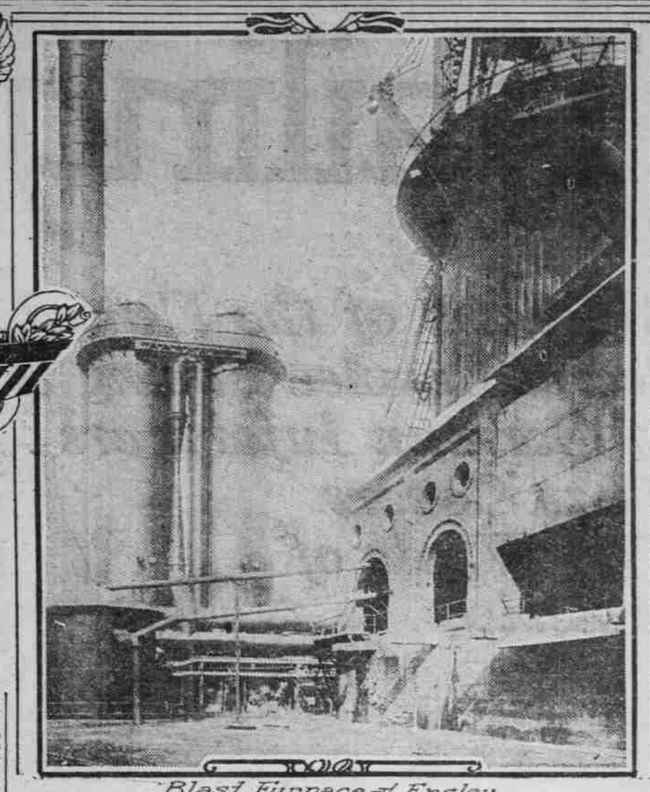
Saving the By-Products

CHANGES IN OUR GREAT INDUSTRIAL PLANTS BROUGHT ABOUT BY THE WAR. BY FRANK G. CARPENTER.

Pouring Slag, A New Fertilizer That Will Increase our Food Supply.



The New Benzol Plant, Where Valuable By-Products are Made.



Blast Furnace at Ensley.

(Copyright, 1917, by Frank G. Carpenter.)

ENSLEY, Ala.—The war is revolutionizing the steel industry of the United States. It is increasing its efficiency and wiping out the waste. It is creating new by-products and is making our country independent of many things which it formerly imported from Germany and other parts of the world. One sees evidences of this at every step in going through a great plant like that of the United States Steel Trust at Egsley. The plant covers almost 20 acres and connected with it are many great buildings devoted to the utilization of by-products which not long ago went to waste. Just back of the mighty furnaces, which are now smelting more than three-quarters of a million tons of iron a year, are long rows of the old-fashioned bee-hive coke ovens, which only a few years ago made most of the coke of the United States. These ovens are of brick. Each of them is about 12 feet in diameter and so tall that a man could stand upright within it. The coal was put in by hand through a hole in the top. It was fired by hand and the volatile gases passed off and were lost in the air. The coke was dragged with rakes and the cars were loaded by hand. There was a great waste of material, time and labor.

Today the coal is turned into coke in ovens which cost hundreds of thousands of dollars to build. The ovens are in a great series as high as a three-story house and several hundred feet long. They are charged automatically by steel cars, which carry the coal on tracks high above them and drop it into the ovens. After the coke is made, steel hands worked by machinery push the blazing chunks into steel cars and the train is carried under a sprinkler which floods it with water. As the cold water touches the superheated mass a volcano of steam rises like a mighty cloud into the air. At first the cloud is black, but a second later it turns to the color of milk and forms a huge mass of vapor more wonderful than the pillar of fire which led the Israelites through the wilderness. It takes only 55 seconds to cool the great mass.

In this new method of making coke about the only thing that is lost is this steam. Philip D. Armour, the man who did so much to build up the meat-packing business of Chicago, once said that he was able to save every bit of the hog but the squeal. By means of recent inventions the steel makers are now able to save every bit of the coal, and in the making of pig iron they are creating valuable by-products out of everything that goes into the pig. In these new coke ovens the monthly saving is greater than the output of a large coal mine. I have this statement from Mr. George Gordon Crawford, president of the Tennessee Coal, Iron & Railroad Company, which operates the great Ensley plant. Said Mr. Crawford:

"By means of the by-product ovens we are able to save every month more than 43,000 tons of coal. This is on the basis of an output of 130,000 pounds of coke per month. The saving comes from the fact that every hundred pounds of coal will make nine pounds more coke in the by-product ovens than we are able to get from the same amount in the bee-hive ovens. We are also able to save more than six pounds of nut coke and coke dust from every hundred pounds of furnace coke that we make, and the total saving is about 43,000 tons. Forty-three thousand tons would be a big monthly output for one of our largest coal mines, and such a mine would probably be exhausted within 30 years. The saving we are making here will go on continually and we shall create that amount of new coal every month as long as the plant is kept working."

"Mention some of your other by-products, Mr. Crawford," said I.

"We use the coke dust and nut coke as fuel and the result is hundreds of millions of cubic feet of gas which we use for running our works. Twenty-five million cubic feet of such gas goes to the steel plant, where it is used for the creation of power. And then we have the by-products from the gases created in making the coke, which yield in round numbers, from each hundred thousand tons of coke, more than one million gallons of tar, over 1500 tons of sulphate of ammonia and almost 6300 gallons of benzol products.

During my stay at the works I have gone through the by-product plant which creates these great savings. The gas from the coal is carried to it in great pipes, and the various products are manufactured from the gas in retorts and machines of one kind or other. The sulphate of ammonia, which is so largely used for fertilizer, comes from the ammonia gas in the coal. This is passed through sulphuric acid and the mixture is reduced to a powder by running it through a centrifugal machine like that in a sugar refinery. When the stuff comes out it looks much like brown sugar, but it is really a combination of sulphur and coal. It is worth about $90 a ton at the present war prices, and as the factory makes something like 50 tons every day you can see that the saving in this product alone mounts to about $4500 per diem. In the past it floated away in the gases of the old beehive coke oven.

I understand that a great deal of this ammonia fertilizer is now being saved in the by-product ovens of this part of the south. It is said to be one of our chief sources of nitrogen, and some of the authorities claim that there is a sufficient amount of it in a single acre of bituminous coal four feet thick to maintain the fertility of an acre of soil for 640 years. Within the past year or so something like 2,000,000 tons of coke have been made in the by-product ovens of the state of Alabama alone, and such ovens are now being built in Kentucky, Maryland, Tennessee and other Southern states. In 1915 more than 5,000,000 tons of coal were put into the beehive ovens of the South, and this resulted in a waste, it is said, of about 44,000 tons of sulphate of ammonia, 35,000,000 gallons of tar and more than 8,000,000 gallons of benzol.

During 1915 the by-product coke plants of the United States made altogether about 16,000,000 gallons of benzol. This is the product which the Germans use largely for making dyes, colors and medicines of one kind or other. It has risen greatly in value since the war, and this has led to the building of many benzol plants. The one here is said to have cost something like $1,000,000. I have gone through it during my stay. It consists of great stills and other machinery. It makes various kinds of oil from which chemical products are formed, including not only dyestuffs and medicines, but also photographic material and important explosives.

Another valuable by-product of the furnaces is the slag. This formerly went to waste. You may see mountains of it about almost any old smelting works. It defaces the landscape and it costs a great deal to carry it away and throw it onto the dump heap. Here at Birmingham this slag is crushed and ground into a fertilizer, which sells at wholesale at $10 and upwards per ton. It is bagged up like cement in little sacks of 100 pounds each, and is shipped over the country to the farmers and gardeners, who use it to increase our food supply. The slag is also turned into brick. This has been attempted again and again without much success, but they are now making a brick which is as smooth as porcelain and almost impervious to water. The slag is also used for ballast on railroads, and, in fact, it has been turned from a loss to a profit.

The crushing of this slag for fertilizer is an interesting process. The work is done by means of a magnet. My idea of a magnet has been the little horseshoe with which you lift tacks, and so electrify your knife that it will pick up iron fillings or make them dance around over a sheet of white paper. They have magnets here so powerful that they will lift enormous bodies of iron and carry them or drop them at will. Such magnets are used for the loading of the heaviest steel rails. Two of them fastened to a travelling crane overhead will lift up 15 of these long rails at one time and lay them down on the cars.

Another magnet, which is also attached to a crane, is used for the crushing of limestone and slag. The crusher is a great round steel ball so heavy that it would require 30 horses to haul it if it were placed on a truck to be carried over a country road. The ball weighs 15 tons, and it is as tall as a man. Nevertheless the magnet drops down from the crane and kisses it, as it were. As it rises the ball clings to its lips and a touch of a button by the man who is operating the magnet releases the ball and it falls on the slag, breaking it and crushing it to a powder. The power of the magnet comes from the electric plant, the "juice" being turned off and on by the man who is doing the work.

After the slag is crushed there is more or less less iron left in it. This is taken out by magnets, which are passed over it again and again until almost no iron is left. The final crushing is done in a ball mill, which consists of thousands of manganese steel balls the size of a marbie or larger They roll around through the slag and grind it to powder. At the end it is so fine that it will pass through a mesh of 300 holes to the square inch. It is now fertilizer, and is put up in bags and shipped to the farmers.

One of the surprising things about the modern steel plant is the small part that man has in the work. The machinery is largely automatic, and although there are 17,000 employes connected with the Tennessee Coal & Iron Company, you see but few of them about the furnaces and in the great rolling mills. Their work seems to be largely managed after the motto of the photographer: "You press the button and I do the rest." The same force is used over and over again. The excess gas from the furnaces smelting the iron goes to the boiler plant and runs it. The works have 22 great boilers, which produce more than 16,000 horsepower. The engines that force the blast into the furnaces are run by these boilers. They are equipped with belt wheels as high as a two-story house.

And then there are the great Ingersoll-Rand turbines which use the exhaust steam from the other engines. They blow 55,000 cubic feet of air per minute against a pressure of 30 pounds to the square inch. The machinery of these engines is quiet. They look as though they were dead, and it takes only one man to handle them. Nevertheless each turbine does as much as four big steam engines. It produces 3000 kilowatts of electricity from exhaust steam which once went to waste The whole plant, in short, shows a wonderful economization and reproduction of force. It takes the giant gas and turns him into steam, and works him until he is worn to a frazzle. After that it picks up his remains and changes him into electricity and works him over again.

This same spirit of common sense and broad-gauge economy has been adopted in handling the labor connected with the work of this iron and steel making company. President Crawford believes that the health and spirits of the men in the plants are as important a cost-efficiency item as the character of the machinery and the raw material that goes through it. He looks upon human labor as a commercial asset, and his welfare work, which is large, is based upon the profits that accrue therefrom to the works. He has here the largest steels plant in the South. It includes mines of coal and iron, many great furnaces and an enormous by-product plant. He has altogether about 17,000 workmen, of whom 8000 are negroes, about 7000 white Americans, and, in addition, more than 2000 foreigners. It was Mr. Crawford's work to take this labor material and to increase its efficiency to the highest possible degree. When he took charge many predicted his failure. The steel men of the North said you could not make good steel with negro labor, and that the white and colored men would not work well together. He has proved that they were wrong, and he has today a force which is said to be one of the best in the country.

In reorganizing the labor Mr. Crawford had a rigid physical examination of the laborers and of all who asked for employment. He went on the principle that a sick man could not do good work, and he first weeded out those who had contagious or infectious diseases. Among other things he investigated the teeth of the men and brought in a corps of dentists to keep them in order. In speaking of this to me he said: "When I came here I found that we were fixing the teeth of our mules, but were paying no attention to the teeth of the men. We had 800 mules and we kept veterinary surgeons to file their teeth and fit them for chewing. I was told that 15 per cent of the mules needed attention, and I thought if that was so the teeth of the men might be equally bad. As a result we put the dentists to work, and we now have the teeth of all the employes gone over at regular intervals. Men asking for work are rejected if their teeth are in bad condition, and if a man has several bad teeth he must get them fixed before we can give him a permanent job. If he has no money we sometimes allow him to pay the bill on the installment plan."

As it is now, the steel plant has a medical corps of 38 doctors and these are stationed at the mines and villages which are away from the cities. There are also some in the main plant. It is arranged so that the doctors will take care of a workman and his family at a fixed charge of 75 cents a month the year round. The men pay their bills on the principle of the Chinese. That is, they pay the doctors to keep them well, and the longer they are sick the more it costs the doctor. This service is not compulsory, but I understand that 85 per cent of the men have accepted it and have themselves and their families cared for in this way.

I talked with President Crawford about the success of his medical treatment. Said he:

"We are well satisfied with it. I look upon disease as an accident. It comes from a lot of bad microbes getting into your system. The diseased man cannot do efficient work, and we find that we have greatly increased the value of our labor force by getting them into the habit of taking care of themselves. We have established bath-houses at all of our plants, with such arrangements that the men can take off their working clothes and have a bath before putting on a clean suit to wear home. This keeps the dirt out of the house, and their families are improved by the change.

"We believe in having good homes for the men, and we have built comfortable tenant houses which we lease at low prices. We have established schools and kindergartens where our plants are away from the cities, and we find that this has been of value along the line of cost efficiency. We are not doing it as welfare work. It is a matter of business. It pays."

In connection with the welfare work of the plant is the industrial village of Fairfield, modeled after the town of Gary, on the shore of Lake Michigan. This was not built by the steel company, but by a local syndicate, which sent men over the country to study industrial villages and make the plans. The town was laid out by a landscape gardener, and is one of the model mill towns of the South. It adjoins the steel works and there are other great industrial plants nearby. It covers altogether about 240 acres, which includes an athletic field, a central park area and amusement grounds. It has a town hall, a library, a Y. M. C. A. and a public bath. It has a bank and some stores. It has about 20 miles of paved streets and an equal length of cement sidewalks.

Fairfield reminds me of some of the beautiful villages along the southern shores of Lake Erie. It is to be a forest city, more than 100,000 shrubs and trees having been set out. The houses are pretty one-story cottages, running along well shaded streets. Each house has its own lawn and garden, and there is only one house to the lot. The houses are heated by furnaces, lighted by electricity and their floors are of hardwood. They have baths with porcelain tubs and each house has its laundry. They rent for $17 and upwards a month, according to size. These houses are exclusively for the whites. The colored laborers have a settlement of their own over the hills nearby.

Modern Poultry Culture

For the family that keeps fowls for home consumption of eggs and meat, the dual-purpose breeds are best. Plymouth Rocks, Wyandottes, Orpingtons and Rhode Island Reds are splendid birds for these purposes. They are good layers and make prime table poultry. They fatten easily and cheaply. For cooking purposes no fat is superior to hen fat, and the dual-purpose breeds are exceptionally fine for this. When the chickens are hatched early enough, pullets from these breeds can be fitted for fall egg production.

BY PROFESSOR JAMES B. MORMAN, Former Expert for the United States Department of Agriculture.

IF the poultry house is small, the growing stock should not be crowded. Limit the number of fowls to the size of the house and yard. For the heavier breeds each layer should be allowed about four feet of floor space, with as much outside run as possible.

If the house is well ventilated, is thoroughly dry, has plenty of sunlight, and space enough for the birds' comfort, the simplest structure will serve the purpose of housing fowls. Cleanliness and dryness are the essentials to success in housing poultry.

Two piano boxes can be made into a cheap, but very serviceable backyard poultry house, if made watertight. Lime and sunlight are among the best natural disinfectants. If the house is well lighted, as it should be, and faces the south, sickness should be almost an unknown quantity, even if the fowls have no yard.

Where fowls have yards, and this area is small, the ground soon becomes foul and threatens the comfort and health of the flock. The yard should be dug up or scraped at least once a month, and then sprinkled with lime or some other disinfectant.

If the yard space is sufficiently large, it is advisable to divide it into two parts. While the fowls are in one part, the other may be planted to a grain crop. During these war times, oats or rye will be the cheapest grain to sow. When the crop is from three to six inches high, the flock should be turned into it, and the other part of the yard sowed in the same manner. This plan not only keeps the soil sweet, but it provides succulent green feed for the flock.

Keep Poultry Is Advice.

Many persons who formerly kept fowls have sold their flocks because of the high price of grain feeds. This was a mistake. The increase in prices has not been one-sided. There has been a large increase in the price of eggs and table poultry. The fact is, a small flock may be as profitably handled as before war-time prices. If the reader has the facilities for keeping fowls, let him start right in again to keep them. If there is a small back yard, fit up a place for a few fowls at once.

Balanced rations may be combined from the cheapest feeds, which will provide for normal growth in the young stock and do for fattening or egg production in the older fowls. In fact, the backyard poultrykeeper is especially fortunate, since wastes from the table may be used to good advantage. Even weeds from the garden and grass clippings can be used.

A cheap war-time ration is a dry-mash mixture of two parts of bran and one each of middlings, alfalfa and beef scrap. This may be fed dry in hoppers. A mixture of equal parts of scratch feed, corn and oats makes a good grain ration. These feeds provide the needed amounts of protein, carbohydrates and fat for a balanced ration. It is advisable that the fowls be fed about equal parts of the mash and grain. A pen of 10 or 12 dual-purpose fowls should be allowed about one quart each of mash and grain daily. The lighter breeds, like Leghorns, should be allowed these amounts for 15 birds.

Growing pullets should be given all they will eat of these rations. They need abaundant food to be fitted for normal development and for egg production in Fall and Winter. It is bad economy to stint young stock. Give them all they will eat and later they will repay the debt, with interest.

Waste Foods May Be Used.

Wastes from the table may be used with the mash ration, and the whole used as a wet mash. Potato skins and small potatoes should be boiled and mixed with the mash, which makes an excellent poultry feed. If the table wastes contain sufficient meat, the beef scrap may be omitted from the mash.

If the poultry keeper has a garden the weeds should be pulled and cut up for the flock. Many weeds are thoroughly appetizing, are nutritious, and correct the bad effects of over-feeding with corn. In preparing young pullets for laying, an abundance of green stuff is better than too much corn. Moldy corn should never be fed.

At the prevailing prices for meats and poultry cockerels should be sold for broilers as soon as possible. Only pullets should be kept. The quarters intended for them should be cleaned, whitewashed and made ready at an early date. Moving layers is a bad practice. It is equally bad for pullets. It tends to check their development. As soon as possible in September or October the pullets should be placed in the house or pen they are to occupy for the Winter.

Extra Care Required.

Pullets intended for Fall production should have a little extra care. If they seem droopy, watch for mites. These pests work at night, crawling on the birds and gorging themselves with blood. The best care and feeding cannot overcome this blood drain if the mites are numerous. They weaken the growing stock and prevent development.

If possible pullets should be kept in a house and yard by themselves. The house should have a roosting place, scratching pen, dust bath and nesting places. Keep the pullets off tall grass on wet or stormy days. Use every precaution to keep them from getting bowel trouble or colds. Colds in the Fall easily develop into roup, a disease which must be avoided. It may not prove fatal, but it will surely delay laying.

Scratching Pen Essential.

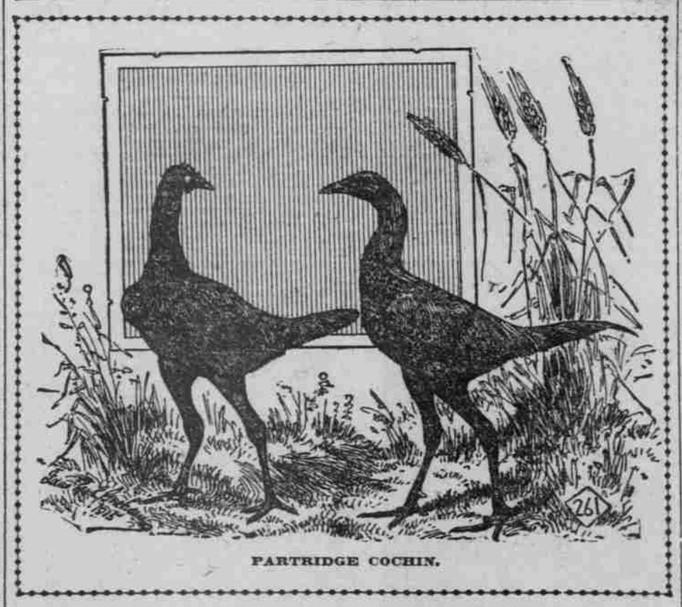
If fowls have no means of exercising their scratching habits they soon lose their vigor. To keep fowls busy, especially as the cold days approach, a scratching pen becomes a necessity. It should be provided with two or three inches of clean litter, into which the grain is thrown. The birds should be encouraged to work for all their grain feed.

For litter a good combination is dried leaves, hay and straw in about equal proportion. Any coarse material, however, will serve equally well. Some poultrymen recommend dry sand. If litter is used the scratching pen should be cleaned once a week. The fine material may be used under the perches. This is organic matter. It makes a good absorbent for the droppings, acts as a preservative and forms a good fertilizer for gardens.

A dust bath should be located in a dry place, where the sun shines into it. The object of this is to enable the fowls to free themselves from lice.

As necessary aids to egg production the fowls should have oyster shells, grit and charcoal. These materials are especially needed when snow is on the ground and the layers are confined indoors.

Green food of some kind should be fed, because it keeps fowls in health and stimulates the appetite. Alfalfa or clover in the wet mash, supplemented with cabbage, will serve this purpose. A continuous supply of green food may be obtained by sprouting oats or rye.



PARTRIDGE COCHIN.

THE Partridge Cochin is a descendant of the Shanghai, which was the aristocrat of poultrydom in the early days of pure-bred poultry culture in America. The Shanghais were later known as Cochin Chinas and later still as Cochins. They were yellow, gray and red-yellow; the gray entered into the production of the dark Brahma, and the reds, which had black in their plumage, were progenitors of the present Partridge Cochin.

Because the plumage of the hen resembled that of the grouse, this variety was originally called the Partridge Grouse Cochin. In 1847 some fine specimens were imported from England and gave impetus to the breeding of this variety, which now reaches its finest development here. The fowls attain enormous size, weighing 7 to 9½ pounds for females and 9 to 11 pounds for males.

They are regarded as the best layers of all the Cochin family and are esteemed for the production of capons. Their handsome coloration makes them favorites with fanciers.

As a utility fowl the Partridge Cochin has always been preferred to other Cochins. It has the reputation of being a better layer and is equally handsome when dressed. It has yellow skin, and legs and the eggs are rich, dark brown. The chicks are rugged and grow fast, though, like all other Asiatics, they take a long time to mature.

The question often arises—How many hens should be kept in a given space? How much yard room is necessary? How many nests to provide for the flock? What perch room is required? In next week's article these and other problems are answered in detail on a unit basis.

ARMOUR SELLS BIG PLANT

Biggest Fertilizer Company in West Takes Over Warehouses.

LOS ANGELES, Aug. 26.—A letter sent out the other day by the Los Angeles office of the Armour Fertilizer Works makes public a deal of considerable interest to the agricultural industries of Southern California.

The Armour Fertilizer Works is retiring from the field in California, and the local warehouses and sales have been taken over by the Pacific Guano and Fertilizer Company, 718 Central building.

It is understood that the Armour plants at Colton and Porterville will be closed. All mixed goods will be shipped from the Stege and Berkeley plants of the Pacific Guano & Fertilizer Company. Packing-house by-products, such as dried blood, tankage, bonemeal, etc., will be chipped direct from the Eastern packing plants to the California warehouses as in the past.

The Pacific Guano & Fertilizer Company operates the largest fertilizer plants in the West, and in the Hawaiian Islands, and is also identified with the lime industry, handling all types of agricultural lime, gypsum, etc.

South African farmers are planting larger areas in sisal than they have done in the past, recognizing that the cost of operation decreases as the size of the plantation is enlarged.

CAREFUL HANDLING NECESSARY IF APPLE CROP IS TO BE SAVED

Growers Advised to Give Volunteer Pickers Instructions and to Get Fruit Into Storage as Quickly as Possible.

THIS year's apple crop will be harvested in most sections with volunteer pickers, men and women, boys and girls, who will be intelligent and interested, but very likely quite unfamiliar with fruit picking The crews are now being recruited all over the country by state councils of defense, Chambers of Commerce, women's organizations and other people anxious to help with the apple crop.

Each grower should now get in touch with the Chamber of Commerce, or some other representative business organization in his nearest town, tell how many pickers he will need, when he will need them, for how long, and what arrangements he can make for housing or boarding them.

When his crew of volunteer pickers reports for duty he must open a little school for a day or two, and give them practical instruction in their new work. Many of them perhaps have never climbed into an apple tree, and even those who have may not understand that apple picking is a kind of work tht requires as much delicacy as gathering eggs.

Let the grower tell his pickers how the skin of an apple, or any other kind of fruit or vegetable, is like the tin that protects canned goods. As the tin that incloses a can of tomatoes guards the sterilized contents from the air, and as even a slight pin hole in this tin would allow the air to enter and carry germs of decay, so the skin of an apple protects its flesh, which is perfectly sterile, and the least cut, even a dent made by a finger nail, allows germs to enter and start decay. A cut so tiny that it can only be detected under the microscope at picking time will, nevertheless, start a germ invasion which will show up later when the apple is packed and put into storage.

For this reason great care must be taken in picking fruit. The growers should show their pickers how to grasp an apple and give it the skillful twist that separates it from the tree. He must caution them against dropping the apples carelessly in the boxes and baskets, and see that they have picking baskets and field boxes which are free from splinters and nails.

This year's crop will have to be managed along somewhat different lines in many sections. With a crew of trained pickers and packers it is customary to grade and pack much of the fruit as fast as it comes from the trees. There will probably be a shortage of packers, and many growers will have to devote all their efforts to picking the crop and getting it into temporary storage first, and then packing it later.

More good apples are spoiled every year by carelessness between the time they are picked and th time they are packed than in any other way. Fall nights are cool, but Fall days are apt to be warm. Apples are left in the orchard several days and alternately cool and heat with the changes in temperature until their quality deteriorates. The proper way to care for apples is to put them into common storage as soon as they come from the tree. Almost any good tight building will answer for the temporary storage needed between picking and packing.

When fruit leaves the tree it contains vegetable heat just as an animal has animal heat, and as the carcass of an animal will spoil after killing, unless it is properly cooled, so fruit will spoil unless cooled. With a tight shed, into which fruit can be carried direct from the orchard, the grower can use the cool nights of Autumn to take the heat out of his fruit. Doors and windows of the temporary storage shed should be opened at night to admit plentiful currents of cool air, and when the sun comes up and the outside air grows warm again, this storage place should be closed to exclude the warm outer air as much as possible, and keep the fruit nicely cooled. If pples are handled in this simple and sensible way they will have prime keeping quality and the work of grading and packing can be postponed for several weeks.

There is a fairly large apple crop throughout the country this year. It amounts to about two bushels for every man, woman and child in the United States. From the consumers' standpoint it is important to have as much of this fruit as possible go to market in first-class condition, so that it may help us conserve wheat, meat, fats and other staple foods for our allies. From the producers' standpoint it is just as important to harvest the crop in the best condition because the size of our apple crop this year is such that only the best fruit will bring good prices.