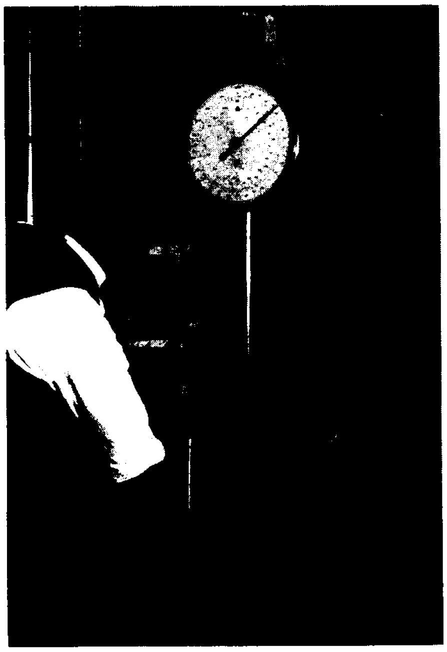

MEASURING STRENGTH

A cotton-testing machine at the U. S. Department of Agriculture, Washington, D. C. A little bundle of fibers to be tested is clamped in the holder alongside the operator's left hand, and pulled until it breaks. Its "breaking strength" thus determined is read off on the dial.

practical cotton-picking machine, the Rust brothers, of Memphis, have developed one that looks as though it will work. Instead of the complicated and expensive arrangements of hooks and barbs that made other machines failures, they use smooth wire spindles, kept moist with water, that twist the fluffy cotton right out of the pod. Two men, with a tractor and one of the Rust machines, are said to be able to harvest as much cotton in a day as a pair of skilled pickers formerly could in a whole season.

It has not all been smooth sailing. Earlier models of the picker got the cotton, to be sure, but they also took too many leaves. Leaves in baled cotton either dry out and crumble as "leaf trash" or undergo wet decay and make spoiled spots in the cotton in that way. The inventors have been working hard to "get the bugs out" of their machine.

A different method for eliminating hand-picking of cotton is advocated by Dr. Frank K. Cameron of the University of North Carolina. He says that the cotton country of his state is too hilly for the use of picking machines, and believes that the only salvation of the oldest cotton states lies in their going "whole hog" in the matter of producing "chemical cotton." His scheme is to cut the whole plant, stalk, leaves, bolls and all, with a mowing machine, dry and bale it like hay, and grind the whole business to pulp for the plastics manufacturers, after extracting the oil.

Of course, if the vast army of cotton-field hands lose their jobs as a result of the Rust system, the Cameron system, or any other method of mass handling of the crop, there is going to be a lot of social adjusting necessary. The Rust brothers realize this, and are trying to figure out a way of making their machine support the population instead of pressing the poorest into still worse poverty. Their machine may make them barons in the realm of King Cotton, but they desire above everything else to avoid the stigma of being robber barons. Their social invention will be watched with even keener interest than men turn on their mechanical invention.

Science News Letter, October 10, 1936

PHYSIOLOGY

Bad Weight Distribution Blamed For Foot Troubles

By DR. DUDLEY J. MORTON, Associate Professor of Anatomy, College of Physicians and Surgeons, Columbia University.

THE MAIN reasons for foot troubles are these: First, civilization; second, over-use; third, improper weight distribution.

The common types of arch and foot troubles are essentially town and city ailments. They do not prevail in rural and primitive conditions. Hard floors and pavements, jobs which require long hours of standing, economic pressure which keeps the individual going when signs of foot trouble have appeared—these are serious factors when a person has feet that are susceptible to disorder, though they do not affect people with more perfectly designed feet.

As for over-use, the capabilities of everybody's feet are not the same. This was recognized in selection of recruits in the War, for during their physical examination men with imperfect feet were assigned to a group designated Selective Service. They were then allotted to branches of service which did not include long hours of drill and marching. No such plan is followed in civil life. Many young people get started in work or trades which their feet are not fitted for, and they find this out too late. They must either continue with a progressing foot disability, that soon brings their economic usefulness to an end, or else start in some new line—sacrificing all the advantages of their previous experience.

Improper weight distribution, the third factor, is the most fundamental cause of functional foot troubles, and the underlying cause of all of them.

Body weight is supported, of course, by the bones of the feet. In back, there is one big heel bone; but in front the weight has to be divided between five relatively slender bones, called the metatarsals. They extend from the middle of the instep to the base of each toe.

If body weight is properly shared by each of these bones the foot functions normally. If, however, the stresses of body weight are concentrated on a single one its joints are liable to become irritated and inflamed from the strain.

To learn how weight is normally distributed on these metatarsal bones, special instruments were devised. We found that in standing, each metatarsal bone bears about the same amount of weight except the first one, located behind the big toe. It is larger and stronger and carries a double share, twice as much as each of the others.

In walking or running, the entire weight of the body is thrown forward and swings toward the front ends of the first and second metatarsal bones which act together as the fulcrum of the foot's leverage action. These are normal conditions.

What happens when we have foot troubles? In every such case we found that these conditions of weight distribution were changed, and that the reason was located in the large first metatarsal bone. Either its ligaments were lax, or the bone itself was too short.

When the ligaments to the big first metatarsal bone are lax, it is unable to have a firm supporting contact with the ground, so that its double load falls on the weaker metatarsal next to it and behind the second toe, and the workings of the foot become badly disorganized. It is this type of fault that leads to disorders of the main arch along the inner border of the foot.

When the first metatarsal bone is short, this affects the foot especially in active functions such as walking or running, when the foot is used as a lever. Such a foot can be identified by its appearance, because, for one thing, the second toe is invariably longer than the great toe. Another common sign is the pressure of callus on the sole of the foot, just behind the second and third toes.

There is no such thing as an anterior metatarsal arch. It is an erroneous concept we have inherited from the past century. The pains and calluses that have been blamed upon a "falling of such an arch" are really due to the uneven distribution of body weight upon these bones we have been mentioning.

In order to reestablish normal function in such cases it is necessary to know the nature and position of the underlying fault. Efficient care has been given to such cases by the prevailing methods of treatment which include strapping, arch supports, rest periods, and special exercises. But from these studies there has been a new and very simple method developed which applies directly to a correction of disordered weight distribution. This is simply an extension on a light insole that forms a platform under the first metatarsal bone. It raises the supporting surface of the ground to a level that makes the bone perform its normal duties, and by so doing relieves the strain of uneven weight distribution and inhibits the growth of painful callus.

This new method of treatment has been used on many cases as part of our scientific investigations during the past ten years. The research work on which it is based has only recently been published in completed form, in *The Human Foot* (Columbia University Press).

Science News Letter, October 10, 1936

There are waltzing rats, as well as waltzing mice.

CHEMISTRY

Power-Alcohol Plant Now In Commercial Production

AMERICA'S first power alcohol plant is producing new fuel for motor cars. Two batches of anhydrous ethyl alcohol made from corn, totaling 2,000 gallons, have poured from the stills of the Chemical Foundation-sponsored plant of the Bailor Manufacturing Company, Atchison, Kansas.

Officials expressed themselves as pleased with the performance of the new plant and predicted that in a month the capacity of 10,000 gallons a day would be realized.

Alcohol-blended gasoline under the name of agrol will be on sale shortly in seven midwestern states at prices that will compete on a quality basis with straight gasoline fuels. The production of power alcohol from surplus farm products in this plant is being watched by leaders in agriculture, the oil industry and other fields, including government, because it is a practical demonstration of the Farm Chemurgic Council's thesis that crops from American soil can be utilized for manufacture of industrial materials.

The Atchison plant also produces butyl as well as ethyl alcohol and as a valuable by-product dries the spent mash into a protein feed for stock. The butyl alcohol is used in connection with the ethyl alcohol production.

The ethyl alcohol, the same stuff that gives the kick to liquor, is used blended with gasoline to produce motor fuel. The whole output of the Bailor plant is being taken by the Chemical Foundation of Kansas for distribution at a price not to exceed 25 cents a gallon.

At the plant the alcohol is denatured and then blended with an equal volume of a petroleum to make what is called "agrol fluid." This blend will be used by filling station operators to make three grades of agrol gasoline, known as agrol 5, agrol 10, and agrol 15. These numbers indicate the quantity of alcohol in each of the standard blends when 60 octane gasoline is taken as the base fuel. If the filling station uses higher octane gasoline, less agrol fluid is needed, and if lower octane gasoline is the base, more agrol fluid is blended.

The oil industry is quite naturally watching closely the operation of the new plant and the distribution experience. In an article in the current *Oil and Gas Journal*, W. T. Ziegenhain tells how the economies of power alcohol-gasoline blends will work out. The anti-knock value of base fuel, he explains, is raised one number for each one per cent of alcohol added to the 60 octane base fuel. Mr. Ziegenhain explains how an Omaha distributor might figure his relative cost. He pays 25 cents a gallon for the alcohol at the Atchison plant in the form of agrol fluid, and adds one cent freight charge. The present delivered cost of 60-octane refinery gasoline at Omaha is about seven and a quarter cents. If nine parts of this fuel are blended with one of alcohol, the resulting 70 octane blend costs nine and one-eighth cents. Regular 70-octane refinery gasoline is selling at Omaha for about eight and one-half cents. Large quantities of gum-solvent refinery gasoline is selling in the same area for one cent premium. The alcohol blend would fall in this classification and Mr. Ziegenhain believes that "the marketer might be attracted to the alcohol blend and the potential competition made real." The Atchison plant is believed by its officials to be the only commercial alcohol plant that has attempted to produce both butyl and ethyl alcohols and protein feed commercially in its initial operation.

Science News Letter, October 10, 1936

CHEMISTRY

Agriculture Department Studies Power Alcohol

MORE research upon the possibility of making power alcohol from farm products is being undertaken by the U. S. Department of Agriculture as the result of the Midwest's increasing interest in practical aspects of converting corn and other surplus or waste agricultural materials into stuff that will help run autos.

P. Burke Jacobs, formerly in charge of the Bureau of Chemistry and Soils' industrial farm products research laboratory at Ames, Iowa, is investigating intensively power alcohol production.

The new inquiry is a part of the general research on agricultural by-products being conducted by the Bureau of Chemistry and Soils.

Department of Agriculture scientists