

VALUABLE BY-PRODUCTS OF COTTON.

The question of opening up the markets of Japan and the far East for our cotton has given the Southern growers a slight hope for better times; but, while the prospects of another large crop keep prices down, and affect the planters disastrously, science is steadily laboring to widen the field of consumption and to create new industries that will utilize all of the by-products of the crop. The achievements in this direction have been so noteworthy in the past that one is led to place implicit confidence in the promises for the future. By the single discovery of the value of the cotton seed for manufacturing oil and cotton-seed meal, some ten to fifteen million dollars were added to the receipts of the annual cotton crop. Now that an enormous industry has been built up and permanently established for converting the cotton seed into oil, the question of utilizing other parts of the cotton plant for commercial purposes has come rapidly to the front.

Originally the lint was considered the only valuable part of the cotton crop, and the seeds, the stalks, the roots, and hulls were either burned on the land or turned under the soil by the plow to increase the fertility of the land. It was supposed that the cotton drew so much fertility from the soil that it would soon rob it of all power for plant production and in time make it worthless. Scientific investigations and analysis of the soil have demonstrated, however, that, of all the staple crops, cotton imposes the slightest drain upon the land. By applying special fertilizers, all of the crop can be removed year after year without materially injuring the soil. Thus cotton has been raised on the same plantations for over half a century, and the land to-day is almost as fertile as when the virgin soil was first broken with the old wooden plow.

This demonstration has led to important results. After the cotton seed, the cotton-seed hulls were selected for scientific investigation. The hulls of a cotton crop constitute about half the weight of the ginned seed. These hulls are hard, dry, and apparently useless, and they are covered with a fuzzy lint that further detracts from their appearance. In fact, until very recently they had no practical value, and they were disposed of in various ways by different planters. The majority returned them to the soil to help fertilize it; but analysis showed that their constituent elements did not enrich the land to any great extent.

But as substitutes for hay the cotton-seed hulls are of incalculable value. Heretofore the hulls have been used by a good many of the cotton-seed mills for fuel, and as fuel they are worth about 80 cents to 90 cents per ton; but as animal food they are worth far more. Experiments were first made a few years ago in the vicinities of the oil manufacturing centers, such as Memphis, New Orleans, Houston, Little Rock, Raleigh, and Atlanta. It was found that when mixed with condensed foods the hulls were readily eaten by the animals, and that they were of great value in helping to digest and assimilate bran, cracked corn, and meal. Moreover, it was proved by a succession of feeding tests that 10 per cent of the protein of the hulls was digestible, 38 per cent of the fiber, 40 per cent of the nitrogen extract, and 77 per cent of the fat. The hulls are light and bulky, but otherwise they make a good substitute for hay in the South, where grass crops have always been notoriously small and inferior. The hulls are baled or pressed into sacks, and in this condition they keep for a long time. When packed away in bulk, like hay, they ferment and heat.

Now that the cotton seeds and hulls have been profitably disposed of, the stems of the plants have attracted attention, and already they have been successfully utilized. As a by-product of the cotton crop, the stems promise to prove as important as the hulls. The plants of the cotton crop have long ranked in the South as a coarse animal food, about equal to the same quantity of rye, wheat, or oat straw. After the crop was harvested the animals were generally turned loose on the land, and they would eat the stubble in places and grind some of it into the soil. These stems would be stripped of their foliage and tender twigs by the cattle, but the hardy, dry stalks would be left untouched.

The question of utilizing these stems as fiber for cotton bagging attracted attention some years ago, but it was only recently that a process was patented for this purpose. The stems are very rough and coarse, and scientists found some difficulty in making machinery that would work up the material satisfactorily. The fiber was found to be good when once stripped and sorted out. Samples of the bagging made from the stems have been tested in the South, and it is pronounced by experts to be first-class in every way. The yield of the fiber is large, and when satisfactory machinery is produced a considerable bagging industry will be built up near the cotton fields. Five tons of good stalk will yield about 1,500 pounds of first-class fiber. At this rate the annual cotton crop will produce all the bagging needed for cotton baling and leave a good percentage for other purposes. Of course the industry is largely in the experimental stages yet, but if it works as well as the cotton-seed oil industry did, it will not be many years before it will assume gigantic proportions.

In Egypt, the common cotton of the Nile districts (*Gossypii radialis cortex*) produces a large root, the bark of which has long been used for medicinal purposes. The action of this bark is similar to that of ergot. This fact has led to investigations here, and it is believed that another by-product of the cotton crop will be soon found in the roots of the plants. The drug would be useful in many ways and might prove of great value. Chemists have approved of it, and it is now largely a question of extracting it profitably.

In connection with employing the cotton-seed hulls as food for animals, it might be said that any surplus of the crop can be utilized in making artificial fertilizers. Cotton-hull ashes are very valuable for furnishing a cheap potash for the tobacco crop, and there is quite a demand for it in all of the tobacco growing districts of this country. The quality of these ashes varies, but, as a rule, they are of considerable value.

This leaves little of the cotton plant either to go to waste or to be returned to the soil. Every part of it is turned to some profitable use, and as the years go by new uses for the products will be discovered. Already the cotton-seed oil—the most valuable by-product of the crop—has found its way into fields never dreamed of when it was first extracted. Improved methods of refining it are gradually forcing the oil into direct competition with more expensive oils. It has been found that the upland cotton seeds yield a purer and better oil than the cotton raised along the seacoast. The climate also has much to do with the quality of the oil, and under the same conditions, cotton-seed oil made in this country is superior to that manufactured of the Egyptian or Indian cotton seed. The oil first extracted by expression is odorless, and of a dark, brownish-green color. This is treated with alkaline solutions, and a clear, yellow, pleasant, and odorless oil is produced. The residue is called soap stock and enters largely into the manufacture of soaps. The refined oil is consumed chiefly as a food product, as it makes a good substitute for salad and cooking oils, and also for packing sardines and other fish. It has its limits, however, and the manufacturers have not been able to make it take the place of oils for mixing paints and wood-fillers. It dries very slowly and imperfectly, and this seems to debar it forever from entering into competition with linseed and similar oils for the drug and paint trade. As a lubricant, the best refined cotton-seed oil is very satisfactory, and it is in considerable demand in the machine trade.

Refining processes are constantly developing new uses for the oil. The yellow oil resulting from the first process of refining, through treatment with alkaline solutions, is further purified by heating and filtration. Then the white oil of commerce is obtained by shaking the yellow oil with 2 to 3 per cent of fuller's earth. In purifying the yellow oil about 25 per cent of it is separated in the form of stearin. This cotton-seed stearin is employed in making candles and the various preparations of butter and lard surrogates.

For some time this cotton-seed oil was mixed with lard intended for cold climates, and then its fluidity was corrected by mixing it with beef fat. Now this is often sold on its own merits in the market in open competition with lard.

Finally, there is a wash powder made from the soap stock that owes its origin to cotton-seed oil. This is obtained from the residue left after the oil is refined. The soap itself, made from the oil, is used extensively by the woolen mills of this and other countries. It has been found to be of special value in washing woolen goods, which it does not injure nor cause to shrink.

Thus it is that the by-products of the cotton crop are multiplying, and in the end they may prove more valuable than the lint. At present not much more than one-third of the cotton seed is used for manufacturing oil and similar products; but, as the demand increases, and facilities improve for handling the seed, the value of the crop will increase, and in time cotton-seed oil will represent an annual value more than equal to the actual worth of the cotton lint.

THE PLAGUE IN VIENNA.

The outbreak of the bubonic plague in Vienna, due to the experiments in Prof. Nothnagel's bacteriological establishment, has spread terror in the Austrian capital. They have several cases in addition to those which resulted in the death of Dr. Mueller and Herr Barisch. Dr. Mueller was considered an authority on the plague and spent some time in Bombay for the purpose of studying the plague on the spot, and he survived all the dangers of this place to succumb to the deadly bacillus at Vienna. Extraordinary precautions have now been taken to prevent an epidemic. The plague patients lie in an isolated building and are attended by Dr. Pooch, a volunteer physician, and by Sisters of Charity. They are cut off by a rope which no one is allowed to pass. The doctor writes the prescriptions and pastes them on the window pane. The doctors outside read them and have the medicines put up and they are placed on the window ledge; after they have retired to a safe distance, the medicines are taken inside. Food is conveyed to the patients and their attendants by the Sisters of Charity in a similar manner

and a telephone is used to give information regarding the changes in the patients' condition. Everyone who came in contact with Herr Barisch has been isolated. Some of them attempted to escape, but they were all captured and locked up, but it is feared the precautions were taken too late. Both he and his wife have visited friends, rode in public conveyances, and came in contact with dozens of persons, which has resulted in great excitement in medical circles. It is the opinion of the doctors at the Austrian capital that the plague is likely to spread. A temporary hospital was erected by torchlight. Dr. Mueller heroically took observations of his own condition and the questions of the disease until he died. His coffin was partially filled with sawdust saturated with carbolic acid. All bacteriological observations have been suspended, and the animals used in the experiments have been burned.

PATENTS AND COPYRIGHTS IN CHINA.

Under date of July 18, United States Minister Conger sends from Peking the following clipping from the North China News of July 12, purporting to be a translation of a recent decree of the Emperor in regard to the enactment of copyright and patent laws.

It would appear from this decree, says Mr. Conger, that China is about to give her men of literary and inventive genius the same recognition and protection accorded them by other nations; and it is indicative of the great changes soon to take place in the country. Unfortunately, since the issuing of this statement by Mr. Conger affairs have taken an unfortunate turn in China, and it is impossible now to tell when the new laws will be enacted. It remains to be seen how far the Dowager Empress and Li Hung Chang will allow the measures of reform and reconstruction to be carried.

"The following important imperial decree, which is really the promise of the enactment of copyright and patent laws, was issued on July 5.

"From ancient times until now, the first duty of government has been to bring order out of chaos and shape the rough materials at hand. With the increasing facilities of international commerce, our country has been filled with an influx of scientific, mechanical, and artistic things which are an education to the masses, whose eyes are daily being opened to their usefulness. China is a great country, and our resources are multitudinous. Men of intellect and brilliant talent, capable of learning and doing anything they please, are not lacking; but their movements have hitherto been hampered by old prejudices which have formed a bar in thinking out and introducing to practical use new inventions. Now that we have entered upon the high-road toward the education and enlightenment of the masses, for the purpose of making our empire strong and wealthy like other nations, our first duty should be the encouragement and employment of men of genius and talent. We therefore hereby command that from henceforth, if there be any subject of ours who should write a useful book on new subjects, or who should invent any new design in machinery, or any useful work of art and science which will be of benefit to the country at large, he shall be honored and rewarded by us in order to serve as an encouragement and exhortation to others of similar genius and talent. Or, if it be found that such geniuses have real ability to become officials, we will appoint them to posts as a reward, or grant them decorations or fine raiment in order to show the masses the persons who have gained honor by their talents and genius; while they shall also be allowed to enjoy the fruits of their labors by being presented with papers empowering them to be the sole manufacturers and sellers within a certain limit of time. Again, to such as have administrative talents and the necessary funds either to build schools, or begin irrigation works for the benefit of agriculture, or build rifle factories or cannon foundries, all of which will be of great benefit to the population of the empire at large, shall be granted rewards on the same scale as men who have gained distinction in the army or navy, in order to give them special encouragement to work for the good of themselves and their country. We hereby further command the Tsungli Yamên to draw up the regulations which shall govern the various matters noted within this edict, and report at once to us."

DEATH OF COLONEL WARING.

Just as we go to press it is our painful duty to record the death, on October 29, by yellow fever, of Colonel George E. Waring, Jr., at his apartments in New York city.

Colonel Waring contracted the dread disease while in the service of the government at Havana, so we must add one more name to the honorable roll of those who have died for their country as a result of the Spanish-American war. Colonel Waring was sent to Havana to give advice in his capacity of expert sanitary engineer, and he contracted the disease while devising means to drive the scourge from its home in Havana. We will give a biographical notice of Colonel Waring in our next issue.