pearing” wall bed and there are snug lockers about the walls and a three-cornered press. A roomy cupboard conceals cooking utensils in the kitchen and gives to the room the compactness of a ship’s galley. The table where the mountaineer stirs his biscuits swings downward when not in use, and the one at which he washes his dishes folds back when a prop is turned aside. For economy of space, the kitchen, and indeed the entire house, is a marvel of ingenuity.

The wilderness of the region is surprising considering its accessibility, for it lies at the gateway of a forest of priceless blue spruces of great height and vigor. The mountaineer’s only companions are the ever-curious range cattle, a few flashing-eyed range horses and a greater variety of song birds than a city dweller would think possible. For additional music he has a small waterfall within earshot. At night, he hears the long, sharp note of the coyote, followed by its challenging laughter. An owl hoots and there is the wail of the winds that are never still on Old Baldy, Gloverita’s guardian mountain.

The click of a typewriter sounded alien in the wild surroundings, but its khaki cover showed that it, too, like house and owner, was dressed for mountain exigencies.

OPPORTUNITIES OF DRAINAGE ENGINEERING AS APPLIED TO THE VAST SWAMP LANDS OF THIS COUNTRY: BY GEORGE ETHELBERT WALSH

No two generations offer the same opportunities: changing conditions and environments demand of each a new viewpoint and a new treatment concerning problems of development and exploitation. Each nation and generation must face its obligations and responsibilities and achieve success through independent and original works. Examples and principles help greatly, but are not alone sufficient.

The colossal fortunes made in oil, coal, iron and steel may not again be duplicated; but it would be a sad commentary on our national life if all great opportunities in this country were closed to us. National resources lie at our feet in a dormant and undeveloped state. Until we recognize them we can hardly turn them into profitable use. The possibilities of new industries are enormous and while one man waits and considers what to do, another with skill and boldness comes along and exploits them to the profit of himself and his country.

When we regard the possibilities of service awaiting the drainage engineer—opportunities that almost dazzle the mind—we wonder why the vast unlocked wealth stored up in swamps, marshy lands and wet meadows has remained so long untouched. Some day in the near future new captains of industry will reclaim these lands, opening wide to the people new sources of wealth. Then will come another period of prosperity and it will stimulate numberless industries.

Many are alive to the possibilities of drainage engineering, and they are attacking the problem in either a small or a large way with every prospect of success. Fortunately the opportunities in this line are almost coextensive with the size of the country. They will appeal to capitalists who can invest huge fortunes no less than to small land-owners with only a few hundred acres of swamp or wet land.

To get a comprehensive idea of the magnitude of this problem pressing for solution, we must resort briefly to statistics. In the various States of the Union there are, according to official reports of the Government, approximately 82,000,000 acres of swamp and wet land that have never been reclaimed. The present value of the land is practically nothing, but if properly drained and used for agriculture it would be worth at a minimum estimate approximately $8,000,000,000. There would be enough good, fertile land created to provide over 2,000,000 families with farms of 40 acres.

This unclaimed land is furthermore the richest in existence. Through the countless ages Nature has piled on it layer after layer of fertility by the slow process of growth and decay. The rich soil extends to a depth of from 6 to 10 feet, and its fertility would never diminish.

These enormous deposits of rich soil are not limited to any portion of the country. They are distributed so generally that more than 37 different States can claim a share of the future prosperity following wet-land reclamation. Some States are so rich in unclaimed swamps that their resources will be doubled and trebled in
value when drainage engineers have completed their work. The distribution of un-reclaimed swamp lands among various States is estimated as follows: Florida 29,000 square miles; Louisiana 15,000 square miles; Arkansas 9,000 square miles; Mississippi 9,000 square miles; Michigan 7,500 square miles; Minnesota 6,000 square miles; Maine 4,000 square miles; Georgia 3,750 square miles; Illinois 3,500 square miles; Texas 3,500 square miles; Wisconsin 4,500 square miles; North Carolina 3,750 square miles; Missouri 3,000 square miles; South Carolina 2,750 square miles; New York 2,500 square miles; Virginia 1,600 square miles; Tennessee, Ohio, Indiana, each 1,250 square miles; Western States 10,000 square miles; sixteen other States 5,560 square miles.

This enormous area of low wet land has been passed over for decades without any thought of its future value. Years ago the preliminary work of surveying and examining it was undertaken by the United States Geological Survey with, however, no idea of reclaiming the land. The work was prosecuted simply in the interests of science and geography. No surveyor's chain had ever been stretched across the vast wilderness of the Florida Everglades and the interior of the Dismal Swamp was known only to the Indians and a few white hunters.

Had it not been for the topographical and hydrographical surveys made in the interests of geography, the question of draining this vast swampy area might have been postponed indefinitely. Few had any idea of the extent of swamp lands in the country before the Geological Survey published its topographic report showing that out of 1,637 "sheets," 402 had swamp areas scattered throughout all the principal States of the country. These survey sheets located accurately the boundaries of the swamps and their relation to the natural drainage channels.

Now that a Reclamation Service is in actual operation by the Government, and the wholesale drainage of many swamp lands is in operation, a good idea can be gained of the beneficial work of the Geological Survey. For fifteen years its experts carried on investigations without attracting any particular notice. The engineers examined underground currents and springs, gauged the flow of streams and prepared reports concerning the best way to utilize water resources and to drain swamp lands. So important has become this work of the Survey that no project for the drainage of wet land can be successfully accomplished unless it is based on the careful preliminary hydrographical investigations of this Department.

The possibility of draining swamp lands is a matter of practical engineering, and no more difficult than the irrigation of arid lands, the construction of inland waterways, the prevention of floods, the conservation of water or any other important engineering work. All such projects involve engineering besides physical problems that must be worked out according to local conditions.

The drainage engineer has before him golden opportunities transcending in value the work of nearly all other men. It is his privilege to suck out dirty water reeking with the odor of a million dead plants; to smooth the way for the plow and harrow; to make possible the planting of a million acres with grain and fruits and to bring into profitable fertility waste lands that in the aggregate form a princely domain equal in extent to many empires.

Centuries ago the draining of swamps, morasses, meadows and low grounds was practiced to reclaim soil for crop cultivation. The Greeks drained Lake Copias, near Thebes, and converted it into a valley of surpassing worth wherein plants and flowers grew luxuriantly. The Aztecs had under way the drainage and reclamation of the great valley of Mexico when Cortez landed; and in recent times the Mexican Government has spent upward of $20,000,000 in the development and completion of this project.

In this country the drainage of wet land was carried on in a small way before the Reclamation Service was formed. Around New Orleans thousands of acres were reclaimed for rice cultivation. More recently a good part of the Kankakee Marsh in Indiana has been redeemed; also the wet lands of North Dakota on the west side of the Red River. Wet lands in the vicinity of Charleston, South Carolina, where formerly no one could live, have been converted into truck gardens worth $200 an acre.

One of the well-known areas of wet land is the Everglades of Florida, the largest swamp in the United States, if not in the world. It is 40 miles wide and over 100
MAKING NEW LAND THROUGH DRAINAGE

miles long; covered in parts with cypress and mangrove trees, sawgrass and wild marsh plants. Until the Geological Survey made a study of it the Everglades Swamp was supposed to be at or below sea level, and hence undrivable; but Lake Okeechobee, occupying the center of the swamp, is known today to be 20 feet above the level of the sea.

The work of draining a part of the Everglades has been in progress now for about 5 years, and over 15,000 acres of what was formerly submerged land have been planted with fruits and vegetables. Still nearly 4,000,000 out of the 8,000,000 acres are left to be reclaimed and planted with crop-producing plants. The fertility of the soil under the swamp is the richest in Florida. Located in so warm and subtropical a climate its ultimate value will be enormous. Private, State and national funds are being used today in the drainage of the Everglades, the cost of which when finally completed will be in excess of $1,000,000. Still it is believed that the Everglades could raise three times as much cane for the manufacture of sugar as the country would need for years to come. The American sugar production averages annually about 500,000 tons, and to meet the consumption we import upward of 2,250,000 tons. If the reclaimed land of the Everglades yielded 25 tons to the acre—the average crop produced in Louisiana, our greatest cane-producing State—the supply would more than equal our needs twice over.

The Dismal Swamp of Virginia is a vast morass, the usefulness of which, if drained, was predicted by George Washington, who was interested in a project for reclaiming this land. It is 20 feet above sea level, and located on a hillside sloping gradually toward the sea. Private enterprises have drained parts of the swamp along the borders, the land thus redeemed being found to be the richest in cotton production in the South. The Dismal Swamp, like the Everglades, is a great inland marsh with the waters pent in because of insufficient outlets. If artificial outlets were made to carry away the surplus water these swamps would soon become dry enough for agricultural purposes.

Both of these vast tracts contain permanent lakes, which, while the level of their waters will be lowered, must not be drained off entirely. Lake Okeechobee in the Everglades, and Lake Drummond in the heart of the Dismal Swamp, will be forever needed as vast reservoirs to furnish supplies for irrigation. Drainage for these swamps, therefore, means as well systematic irrigation, for these two engineering feats go hand in hand in the work of redeeming the swamp lands from their present useless condition.

Along the coast line from Virginia to Texas there is a strip of land varying in width from fifty to one hundred and fifty miles that awaits the magic work of the drainage engineer to convert it into profitable farms and gardens. Today this land is almost worthless, and so malarial that it is a menace to the health of the country. Mosquitoes breed there by the tens of millions, and fevers make the marshes so uninhabitable that none but the hardiest can exist in their vicinity. Yet this strip of land is readily accessible to large markets and the soil under its water is enormously fertile. The few thousand acres that have already been drained have demonstrated this fact over and over again. The wholesale reclamation of this land would add millions of dollars to the agricultural resources of the Eastern coast.

Within commuting distance of New York City, with its millions of inhabitants, there are thousands of acres of wet lands or meadows stretching along the New Jersey coast, which if reclaimed and converted into producing farms would prove almost as valuable as some city lots in the metropolis. The filling in of these meadows for factory sites has long occupied the attention of real-estate men, who were only held back from the work by its exceedingly high cost.

Now through the cooperation of private individuals, State authorities and experts of the Reclamation Service of the Government, the New Jersey meadows promise prosperity for this section. They are being reclaimed for agricultural purposes, not for factory and other building sites. Recent experiments with small tracts show that drainage for agricultural purposes is not as difficult as imagined. Their proximity to several of the largest markets of the country will render them of infinite value. The great cranberry bogs of Cape Cod, Wisconsin, Long Island, southern New Jersey and other parts of the country represent a feature of the modern reclamation movement. The same is true of the rice fields of the Southern States. Both
of these plants must have plenty of water, and at certain seasons of the year they must be flooded—but by water under control. The land then must first be drained, later irrigated with ditches. Superfluous water must be shut out.

The cranberry bogs are under the control of individual owners, the annual crops paying well. Naturally the draining and irrigating of low wet lands for cranberry culture is costly, but the results justify the expenditure. As a specific illustration of this form of drainage a marshy tract at Manorville, Long Island, that formerly consisted of a series of shallow swamps surrounded by low sandy hills is today held at $1,600 per acre. The value of the virgin marshy land was placed at $10 and $15 an acre. These swamps produce a clear profit in cranberries of $300 per acre.

Profitable cranberry bogs are in truth marshes or wet meadow lands that have been reclaimed by drainage and irrigation in such a way that the field can be flooded at any time by permitting the surrounding water to back up through open gates in artificially constructed dams. The ideal cranberry farm has a swampy, peaty soil over which a top layer of sand has been spread. When surrounded by a dam to control the waters, the plants can be protected from insects and early frosts by flooding the crop. In this way thousands of acres of cranberries are saved each year.

Scattered throughout the country are innumerable small swamps, varying in size from four to many hundreds of acres, that could be converted into ideal cranberry farms at an expense of from $50 to $100 per acre. Their reclamation means the conversion of waste land into profitable farms.

A good many of our marshy lands are only partly inundated or flooded with water at seasons of the year when streams overflow their banks. To all intents and purposes, however, such land is as useless as that which lies under water all the year; though when drained it is so rich that plants grow on it in almost tropical luxuriance.

This fact is illustrated in Illinois, Iowa and South Dakota, where the overflow of streams excludes from cultivation immense tracts of land. In the valley of the Neosho River in Kansas there are over 350,000 acres of fertile soil subjected to periodical inundation. Some years the crops raised thereon are totally ruined by the floods; more or less injury occurs every season. The protection of these lands from the overflow of streams would save big fortunes to the settlers.

The great swamp area of the United States is east of Nebraska and it is over 60,000,000 acres in extent. The total area of water-soaked land is almost equal in extent to the combined States of Illinois, Indiana and Ohio. There is scarcely a State east of the Rockies without swamp lands which take up a large proportion of their productive area.

The Hollanders in western Michigan have reclaimed tracts of wet land and converted them into fertile, profitable farms for the cultivation of garden truck; and a German colony has reclaimed the cottonwood swamp in southern Michigan and achieved similar highly profitable results. The same is true of the delta lands near Stockton, California, where gardens and fruit orchards now flourish. In all such private enterprises the cost per acre has not averaged more than from $5 to $40, and the value of the land has increased from a few dollars an acre to several hundred.

It is estimated by drainage experts that it will cost nearly $480,000,000 to drain and recover all the eighty odd million acres of swamp and marsh land in this country. This is placing the cost per acre as low as $6. If properly drained the land thus redeemed would be worth for farming purposes at least $100 per acre, making the total value about $8,000,000,000. This would make a gross gain of something like 1,700 per cent. on the investment. Besides furnishing highly profitable farms for many families, and increasing enormously the productive output of the country, the reclamation of these swamps would do more toward eradicating certain diseases than any other step the Government could take with an equal expenditure. The elimination of the great breeding-places of mosquitoes would alone compensate for the time and money spent and until the mosquitoes are reduced or destroyed we cannot curtail greatly the spread of malaria and kindred fevers.

A great deal of this vast swamp land is still owned by the national Government or by the States. Its uselessness in the past made it undesirable and it was not taken
up by settlers. Today, however, it is held in much greater respect. The few thousand acres drained by the Government, the States and individuals have proved so highly profitable that it is only a question of time before most of this vast domain will be partly or wholly reclaimed for agricultural uses.

The reclamation of swamp lands by the national Government will be as important a branch of agricultural development in the future as the reclamation of the arid regions through irrigation has been in the past. And while wholesale irrigation on a stupendous plan has been carried on by the Government, States and large corporations, the owners of small areas have not been idle. They have applied like principles to their small farms and have reaped the rewards of their work. Irrigation is today recognized as an essential part of good agriculture even outside the arid belt.

The private drainage of swamps and low places should be undertaken only after a careful survey and study of the surrounding topography. The Government stands ready to help every owner of low land. The Geological Survey can, in fact, furnish a topographical map of almost any swamp in the country, one showing the slope of the land, the general flow of underground streams, the presence of springs and other conditions that are of vital importance. No work of swamp drainage should therefore be undertaken without consulting the topographical maps of the Government. The character of the soil under the swamp has been included in these Government surveys so that it is possible to know beforehand what kind of land will be found when the swamp has been drained.

Swamp land is eminently suited to the cultivation of many crops besides cranberries, rice and semi-aquatic plants. The usual vegetables thrive wonderfully in swamp soil, as is proved by truck gardens in South Carolina. Many of these gardens occupy sites that were originally water-soaked yet today they yield three and four hundred dollars profit per acre.

Meanwhile, there are waiting for us tens of millions of acres of water-soaked land that only needs the removal of the surplus water to show that it is richer in fertility than the virgin soil of our upland districts. Here, surely, is a chance for the country to increase its agricultural values.

HICKORY FURNITURE FOR COUNTRY HOUSES AND LIVING GARDENS

WITH the increasing interest in this country in garden life there is naturally following a demand for useful fittings for out of doors. Outdoor living nowadays does not mean the woods and meadows and far-away country lanes; it means your own garden fitted up comfortably or a pergola with your sewing table in it or wide porches furnished with good durable furniture. And there is really very little chance of comfort in this outdoor living, subject as we are to sudden changes of weather and temperature, unless we can find furniture having some degree of durability. There are many pretty kinds of porch pieces, but the real demand has been for actual outdoor furniture that could be left in place regardless of rain or wind or dust. It has not been an easy matter to design furniture for such purposes, to have it at once attractive and durable, with colors that are inter-

A CHAIR OF HICKORY BOUGHS AND WOVEN SPLINTS OF INNER BARK.