THE DYING CENTURY PASSED IN REVIEW

REVOLUTION IT HAS WROUGHT ON THE FARM.

Spirit of Invention, Typical of the Country, Applied with Such Direct Benefit as to Make the Oldest of Occupations New—How Agriculture Has Profited Through American Ingenuity.

Whatever have been the accomplishments of the century in material things, the tiller of the soil has been at the foundation of it. While inventions have been building up the vast industries which employ so large a number of the earth's teeming millions, the inventor no less has been busy with the problem of their feeding. Without him the farmer's task would have proved too much. The inventor has waited upon the farmer's needs in the emergency until the influence of the patent office upon the agriculture of the new world is as marked as that influence has been upon any other industry.

INVENTORS' ENCOURAGEMENT.

In the foundation of the United States its designers, with almost prophetic vision, made certain the protection of mechanical genius by a clause in the Constitution giving congress power "to promote the progress of science and useful arts by securing for limited time to authors and inventors the exclusive right to their respective writings and discoveries." In 1790 the first statute was framed on which letters patent were granted, and it is significant for agriculture to note that the seventh application for a patent in the new office was upon the designs for a threshing machine, the invention of Samuel Mulliken, of Philadelphia.

There are accomplishments of the century not to be measured by dollars, but aside from these the world's practical inventions are the things that will mark it for future ages, and in this ingenuity the United States has been foremost above all nations. From the time of wooden nutmegs the handicraft of the yankee has been acknowledged by the world, and his country has put a premium upon the product of his brain and hand beyond that of any other nation. No other country of first importance has granted so long a life to a patent, while in fees the cheapness of the process in the United States is strikingly shown in the following table:

	Life in years.	Office fees.
Germany	15	$1,320
Brazil	15	85
Great Britain	14	775
Belgium	20	420
Spain	20	420
Austria-Hungary	15	570
Argentine Republic	15	380
France	15	300
Italy	15	300
British India	14	295
Russia	10	170
Canada	15	60
United States	17	25

In these figures alone may be seen an incentive to American genius, and one of the chief reasons for the thousands of small patents which have made fortunes for manufacturers and inventors in the United States. The law in this country has imposed no burden upon the inventor. It requires only that he file in the patent office a clear description of his invention, so that a skilled craftsman may be able to duplicate the article when the life of the patent is ended.

PATENT LAWS STILL FOUGHT.

Recognizing what patents have done in the progress of the world, it is odd to recall that in 1869, when 2,000,000 oxen were toiling in the yoke in the United States, that an element in the English parliament was attempting to abolish the patent laws of that country. Speaking against the laws, R. A. McFie held that the state was not bound to grant patents; that they were evidences only of royal favor.

"Every patent," he declared, "is a voluntary transference by the state to an individual of power for fourteen years to tax at pleasure other persons for making or doing the thing patented; aye, if he likes, to prohibit or withhold the thing altogether."

But since that time Great Britain became a member of the international union, having for its object the protection of the inventor in foreign lands. Nearly a score of countries are in the league, and in any one of them an inventor may claim a right of priority for six months following his application at home; or, if the country be across seas, he may have seven months of time in which to make his application.

Not all of the animosity to patent laws has died out. They have been texts for the adversaries of monopoly for many years, but to small practical results. The vital welfare of the United States has been too closely connected with the patent office to admit of blocking its progress.

At the beginning of the nineteenth century the farmer was scratching the surface of the earth with a wooden plow, reaping his grain with the sickle of a thousand years ago and treading it out, as did the ancient Egyptian in the time of Moses. Today the wheat acreage of the United States is sown by the automatic drill, cut by binding machines, the shed and winnowed by the steam thresher and measured in total beyond 500,000,000 bushels a year.

THRESHING MACHINES PERFECTED.

The American farmer of sixty years ago was hard-headed and conservative beyond reason. His interests were varied. He was hunter, trapper and settler, first; for the rest, farmer. His ancestors had built log cabins, cleared forests, grubbed stumps and planted, and for him, only the heavy timbered river bottoms had attraction. It was a common belief that the smooth prairie land, with its tough sod, was worthless for agriculture, and in this very nearly was the death knell of the forests, sacrificed to an almost wanton waste. He split walnut trees for rail fences, that today would purchase the lands that he toiled for ten times over. He dragged into heaps and burned sawlogs that would have made his grandchildren rich. "New ground" was his watchword, and he grubbed and tugged and toiled, aged long before his time, and died at last the victim of the philosophy, "Daddy did it."

Today, on a homestead claim, fenced with a few strands of barbed wire, a grandson cultivates more upland prairie than one man ever cleared in a lifetime, and his crop averages are for more bushels than the grandfather ever dreamed of.

About the year 1825 the inventor in the United States began to turn his attention to the needs of the farmer. The cast iron plow was the first innovation, which took slowly with the people. For more than ten years thereafter the wooden tool was used widely.

The threshing machine came next, but it was not a success. Two hundred and forty patents had been granted on these machines prior to 1825, but not until 1840 were the machines perfected and available to farmers' needs. Up to this time the treading-floor and the flail were the methods in threshing and ten bushels of wheat a day was a good average for one man. Since then more than 2,000 patents have been taken out on threshers until the modern steam machine, self-feeding and stacking its own straw, pours a stream of winnowed grain into bags faster than one man can remove them. Where the great "heading" machines are operated, a steam thresher runs from 2,000 to 6,000 bushels of wheat in a day.

The reaping hook of a thousand years ago was used in the United States at the beginning of the present century. With his left hand the harvester grasped the bearded grain in a bunch and with the crescent blade cut the straws at the ground. Thus by handfuls the sheaves were made and bound.

CYRUS H. M'CORMICK'S MACHINE.

The scythe came next, being used for grass cutting. Soon the finger attachment above it was conceived and the "cradle" was adapted to the cutting of sheaves. The cradle was swung after the manner of the scythe blade, the five wooden fingers about it catching the straws as they were cut and carrying them in a bunch to the left, out of the way of the next stroke.

Cyrus H. McCormick revolutioned methods with his first mowing machine, driven by horse power and involving the principle of the saw-tooth sickle. From the mower of the hay field came the "dropper" of the grain field—a tilting, sickle-bar attachment through which the grain was carried in straight bunches until it was large enough for a sheaf when a movement of the driver's foot released it. A trouble with the dropper, however, was that it left the grain in the way of the machine on its next round. From this came the self-rake machine, which collected the bundle on a platform. When it was of sufficient size the rake arm dropped down and swept it in a quarter circle off the table, dropping it out of the track of the machine on its next round.

In the perfection of the self-rake it was thought that human ingenuity had been exhausted in its work in the harvest field. Today one man and two horses, with a binding machine, go round and round a field, cutting the grain, measuring it into sheaves, binding it, and carrying it, twelve sheaves in a bunch, to the hands of the one shock-builder—the driver and the "shocker" doing the work of a dozen men in the time of the McCormick "dropper." The evolution of the binder, however, was through a stormy period. The United States scarcely was ready for it when it came and in many states of the central west the displaced laborers of the harvest field made war upon it burning barns and smashing the machines in the fields. Now, with all the labor-saving devices of farm machinery, the farmers of this same territory complain of a scarcity of help in harvest—suggestive of the fact that where machinery has unmade one industry it has established two more.

MAIN CHANCES REMAINING.

In every line of farm work the inventor has eased the burdens of the man who tills the soil. The traction engine has come to the aid of his horses, and the chemist has put new life into the very ground that yields him its abundance. Indian corn is the giant of the cereals in crop production, as it may be always. For this the inventor has done nothing save in the perfection of tools for cultivating and planting. Its billions of bushels are harvested every year by the patient hands of the farmer. The steel husking-peg is his only equipment and even that seems to have been made according to his own specifications. The cotton picker, too, has only his hands. Both the corn field and the cotton field have interested the inventor and taxed his brain, but the revolution of corn and cotton harvesting methods is for the future.

Everywhere the yields from farm plantings and sowings are greater than they were from the virgin richness of the country a hundred years ago. Even as between 1880 and 1890, the crop production of the United States showed an increased per cent. of yield to each acre. Crop rotations, improved machines in cultivating and harvesting, and above all the once despised "book farming," are responsible for the change. The successful farmer of today is a student in methods. He knows something in chemistry, he has the benefit of seed selections that have been made according to the science of nature, and more than ever in the world's history he is exempt from the stress of unfavorable seasons.

In the United States he has ranked agriculture above every other occupation. He has seen the evolution of the business within the last forty years. Five million farms have been laid out over the country, valued at $15,000,000,000 and producing $4,000,000,000 annually in live stock and crops. Since 1860 he has seen nearly 2,000,000 plodding oxen released from the yoke as too slow for service. He has made the production of composts a great industry. An agricultural press has sprung to life to wait upon his needs. Cities of giant grain elevators have grown up, and the milling business of the United States has become one of the great industries. The cattle trails of the West have been obliterated by the plow, but his blooded beeves bring prices such as the cowboy never dreamed of in his round-ups of the "long-horns" of the prairies. Invention, system and method have put their stamp upon farming. As the oldest occupation of man, it has evolved into one of the newest and as such it is one of the promising industries to take upon itself the imprint of the twentieth century.

BATS AND SWALLOWS.

Myriads Occupy a Cave Together in North Borneo.

Correspondence New York Times.

One should by no means fail to make a trip to the Gomanton Caves while staying at the hospitable station of the British North Borneo Trading company at Sandakan. The trip to the caves is of interest to the sportsman, for en route you can get a shot now and then at a wild pig, the meat of which is exceedingly savory; then, too, you stir up an occasional alligator and have a fine chance for a display of marksmanship. Tracks of wild cattle show still larger game is to be had, while pigeons innumerable help the larder out most agreeably. The great things to be avoided are the leeches, those pests of the land that make a hunter's life anything but a happy one.

A trip through the heavy jungle, after leaving our boats at the river's bank, brought us at the end of a brisk walk to Semud Hitam, the lower cave, the principal tenants of which are swallows and bats, living in a style very much like the little man and the little woman who form the weather sign—when the woman is in the man is out, and vice versa. In the case in point the swallows occupy the cave at night and the bats by day. Rent is collected from the swallows in the shape of edible birds' nests, while the bats are prepared to pay up arrears in guano.

The esculent nests of these swallows consist of a marine fucus—a species of sea-weed in other words—elaborated by the bird. The Japanese are said to have discovered a means of preparing the seaweed by hand so as to exactly imitate the consistency of the nest. The nests are found throughout the islands in this section of the archipelago and are often sold in the markets. They make an excellent soup without any very decided taste beyond that of gelatine. The birds weave them with much patience and ingenuity in spite of the continuous depredations made upon them.

The exit of the immense swarms of bats every evening from the Semud Hitam is decidedly a unique sight. Looking from the entrance to the place in which some of the nest collectors live, we had a fine chance to see this migration and were amply repaid for whatever hard work we had been through. We viewed the entrance to the cave over a yawning gulf some 100 yards across and of a shape closely resembling that of a horseshoe, in which space the bats go through their wonderful circumrotations. About a half hour or so before sunset the first column of bats appeared, and after whirling around from left to right, in a dense cheese-shaped mass, the head of the column wheeled to the right, almost over our heads, and went down the valley followed by the rank and file in a long coil winding over the treetops in wonderfully close and regular order.

Four or five hawks appeared and dashed voraciously into the thick of the bats. In half a minute the second column issued, and after a preliminary revolution, followed the first, disappearing in the distance like a wreath of smoke. In forty minutes by the watch, forty-seven distinct columns were counted, each about 600 feet long by ten feet thick. A rough estimate of 10,000 bats to each column would give a total of not far from half a million bats, not one of which went away without a preliminary gyration to stretch the wings. The last two lots were somewhat smaller than the others, and were, perhaps, fatigue parties left behind to put things away so that they would not be swallowed. Snakes of a yellowish hue appeared with the first of the bats, but as far as we could see did not have any luck in catching a bat.

The swallows appeared close upon the departure of the last winged battalion, and all night long there was a ceaseless whirr of wings. The attendants, by waving sticks, knocked down two swallows, whose diet had evidently been ants of the winged species. Next morning, shortly after dawn, the half million bats returned and literally rained into the horseshoe space in open order, with the same time a cross-fire of swallows issuing from the cave.

The men who collect the nests are a short, thick-set race, and have probably inherited the vocation. They lie on their backs on rattan ladders some 100 feet, more or less, overhead, calmly smoking cigarettes, while detaching the nests with long poles, and quietly dropping them into baskets suspended under the ladders. A couple of rattans dangling from the ladders afford a means of swinging to more distant places, where they hold on in some mysterious manner while driving pegs of wood in some hole or cranny to secure the rattan to. Lives are often lost, but on this subject we couldn't get the collectors to say much.

UNITED STATES NOW FIRST IN THE RACE

GROWTH OF ITS IRON AND STEEL INDUSTRY.

Mr. Charles H. Cramp Gives Some Interesting Facts, which Show That the English and German Shipyards Must Come to This Country as Purchasers of Raw Material and That Germany Will in Time Equal Great Britain as a Maritime Power.

From a Letter in the Washington Post.

The statistics of iron and steel production and of the correlative output of ore, coal and coke exhibit that the United States began to range up alongside of Great Britain in 1889; that between that year and 1896 there was a close race, with sometimes one and sometimes the other slightly in the lead; that in 1897 the United States passed Great Britain by a million tons in output of pig iron, and that in 1898 the lead was by nearly two and a half million tons in favor of the United States, the totals for that year being 11,773,000 tons for this country as against 9,342,000 tons for Great Britain. The output of the United States for the first half of 1899 was 6,289,000 tons, which indicates a total for the year of about 12,500,000 tons. Complete British statistics for the first half of 1899 are not accessible, but enough is known to justify an estimate for the whole year but little if any in excess of 1898—say, 9,500,000 tons. This would put the United States in the lead for the year 1899 by the enormous amount of 3,000,000 tons, or a ratio of excess over Great Britain equal to 31½ per cent.

This lead can never be broken. The economic laws that produced it must continue to operate, and their operation must tend always to widen the gap, never to close or even lessen it.

For several years Prof. Goldwin Smith has periodically announced the attainment by England of her climax as the supreme power among nations. Various causes have from time to time operated to postpone the actual verification of the professor's theory; and it is within the range of possibility that the iron and steel product for 1898 or 1899 may be slightly exceeded in the future. Be this as it may one element at least of Prof. Smith's doleful prophecy has at last become an established fact, namely, that England has been, by the advance of the United States, permanently relegated to the second place as a producer of iron and steel.

BASIC INDUSTRY OF ALL.

It will, I think, be conceded without argument that the production of iron and steel is, under modern conditions, the basic industry of all, and that the tendency in every direction is to emphasize that fact more and more year by year. It is not necessary to adduce particulars in verification of this great fact. Suffice to say that all traffic by land is now done on steel roads, all traffic by sea in steel ships, all fabrics are made by steel and iron machines, and that the affairs of industry and commerce are day by day more and more transacted in steel buildings.

From this point of view and without minifying the importance of any other industry, it is not too much to say that the capacity to produce iron and steel has become the gauge or standard of national supremacy; and that the fixity or permanency of that standard is already settled beyond peradventure.

Having seen that the United States stands at the head of nations in the primary industry of modern civilization, and that no possible combination of events can ever disturb that supremacy, we may now turn briefly to considerations of the components or the natural bases of that supremacy in the raw or primary condition.

The foundation of steel and iron production is, of course, coal and iron ore.

In the case of the United States to coal may be added, to limited extent, however, and thus far quite localized natural gas.

However, for general purposes it is worth while to consider only the two prime elements, coal and iron ore; and in this connection the coal element must be limited to the kind of that material suitable for cooking or gas-producing.

The total area of British coal fields, and it may be said that there is no undeveloped coal area remaining in Great Britain, is 9,300 square miles, all the British coal area, or at least so nearly all that the residue is not worth mentioning, is suitable for coking or gas-producing; particularly in view of the latest approved processes known as the Otto-Hoffman and the Semit-Solvay.

COAL AREA OF UNITED STATES.

The grand total coal area of the United States, exclusive of Alaska, is 107,000 square miles. This means only the areas where coal has actually been developed by sinking shafts in greater or less number in each coal belt.

But of this vast area not all is susceptible of the uses of iron and steel production.

The United States geological survey gives 1,700 as the square mileage of anthracite coal fields of Pennsylvania which, of course, must be excluded.

A great part of the far western coal areas may also be excluded from the iron and steel making category, the coal deposits in that region being forms of lignite in greater or less stages of development, but not up to the point of coking or gas-producing.

Making the most liberal allowances for all these deductions, it is sufficient for the purpose of this paper to say that the coal area of the United States known or developed wholly or in part which bear coking or gas-producing coal is considerably more than 70,000 square miles.

The vertical extent, or, in other words, the depth of these deposits as compared with those of Great Britain, are at this time indeterminable for the reasons that they have nowhere been worked to the point of exhaustion or driven to such depths as to render the hoisting of the product nearly or quite unprofitable, which is beginning to be the case in certain parts of the British coal fields.

On the whole, it is safe to say that the coking or gas-producing areas of the United States are to those of Great Britain at least in the ratio of 8 to 1, and all the probabilities of future development point to a considerable augmentation of this ratio in favor of the United States without taking account of the possibilities of vertical exhaustion.

We now come naturally to the other element involved, that is to say, iron ore.

CONSUMPTION OF IRON ORE.

In 1898 Great Britain consumed in round figures 18,000,000 tons of iron ore, of which one-third was imported, the exact figures being 5,988,000 tons.

The prime importance of this very large importation and of the ratio which it bears to the total amount of ore used in Great Britain during the year selected as an example is that it represents or expresses the fact that the indigenous ores of Great Britain are in the highest degree or in any considerable quantity suitable for the production of mild steel; therefore, in the present state, and under existing requirements of steel production, Great Britain has within her own area only the single element of coal.

On the contrary, the United States possesses in what is known as the "lake regions" apparently inexhaustible supplies of the most perfect Bessemer, or, in other words, steel-producing ores, in the known world.

To these resources may be added the extensive fields of Cuban ore, the quality of which is quite equal to that of any of the Southern European or African ores which England uses. And the Cuban ores may be said to lie at our very doors, if not within our own area, a question at this time rather of politics than economics.

The foregoing general resume of prithe basic or fundamental reason for the attainment by the United States of the absolute and irreversible summary conditions may serve to indicate premacy over Great Britain as an iron ore and steel-producing power.

We may now, partly for the purposes of an interesting illustration and partly to lay foundation for comment farther along upon the financial and industrial conditions necessarily involved call attention to the fact that the state of Pennsylvania, representing mainly one-sixty-sixth of the area and one-thirteenth of the total population of the United States, has ever since the year 1892 produced more than one-half of the entire output of American pig iron, nearly three-fourths of the output of all kinds of steel ingots and castings in the United States, more than three-fifths of the total output of Bessemer steel rails and between one-half and four-sevenths of all kinds of railroad iron and steel in finished forms.

During the same period Pennsylvania has produced in the annual average nine-seventeenths of all the coal mined in the United States, and in round figures a little over two-thirds of all the coke made in America.

PIG IRON IN PENNSYLVANIA.

To this exhibit it only remains to be added by way of showing the relative progress during the seven years taken as a basis of consideration that the production of pig iron in Pennsylvania has grown from a minimum of 3,370,000 tons to a maximum in 1898 of 5,337,000; the production of steel ingots and castings from a minimum of 2,979,000 tons to a maximum of 5,285,000; the production of steel rails from a minimum of 714,935 to a maximum of 1,043,000; the production of all kinds of railroad iron and steel in finished form from a minimum of 2,719,000 tons to a maximum of 4,622,000, in 1898; the production of coal from a minimum of 91,803,000 to a maximum of 118,547,000 tons in 1898, and of coke from a minimum of 6,062,000 tons to a maximum of 10,715,000 in 1898.

In conclusion it remains only to be said that the established supremacy of the United States as an iron and steel producer must bring the English and German shipyards to the United States as customers for raw material. This will increase the advantage of Germany over Great Britain more and more, as each nation becomes more and more dependent upon the United States for raw material; so that ultimately and not far distant the situation thus brought into effect will promote the realization of the ambition so often expressed by the German emperor of making Germany at least equal to Great Britain as a maritime power, and whatever these effects may be in these directions their ultimate effect upon the general wealth of the United States must be incalculable.

STRANGE PHILIPPINE PETS.

A Baby Rhinoceros and a Performing Sun Bear Cub.

Iloilo Correspondence New York Times.

One sees strange pets in these new possessions of ours in the tropics. One that amused us all very much during a recent visit was a baby rhinoceros that was being brought up by hand.

"Master, what happens when one finds a little rhinoceros that had no mother" was what the native who had the little one asked my friend. "Who is there that has killed the mother of the young one?" was the guarded reply.

It is a misdemeanor to kill these animals except under certain circumstances, and the natives had probably been playing high jinks in the jungle. Of course all knowledge of the demise of the mother was absolutely denied, but the possible suspicion that if the circumstances were found out somebody would suffer brought the price of the baby down to the very lowest limit.

The animal was the personification of ugliness. The horns on its huge upper jaw were just about forming and its legs looked for all the world like those of an old-fashioned square piano. Two teeth had already made their appearance, and there were evidences of others about to come. The daily diet was supplemented by leaves that the young fellow chewed in great shape.

But he dearly loved his bottle of milk, and the fuss he made about it was truly laughable. Then, too, another interesting thing he did was to set up a terrific whining whenever those who had visited him walked away.

The drollest creature of all was a Malayan sun bear that was a perfect running river of harmless merriment. He had been picked up in the jungle as a very small cub, and when on all-fours, his most infrequent position, was about a yard long and half as high. He was an admirable performer as a biped, and the first sight of him was enough to upset most people's gravity as he came forward to greet the stranger with a rolling, lurching gait and a most absurd resemblance to a miniature mariner in an overcoat of black fur and slightly the worse for liquor.

No stranger could ever be persuaded that the extraordinary performances of the animal were not the results of teaching, instead of being solely the work of native genius. He possessed—for he quite understood "meum," if not "teum"—a rough wooden ball about the size of a Dutch cheese, and with this he would constantly practice a series of feats with as serious and solemn an air as if he were training for a gymnastic championship.

He would deliberately stand on his head for some minutes, the ball balanced on the soles of his hind feet. Then he would drop it into his front paws and shuffle along to the edge of the veranda, climb the posts, hugging the ball with one arm, and in some way contrive to lie on his back on the top rail, about two inches broad, while he kept the ball incessantly rolling between his four and hind paws. Another trick was to clasp the ball with both arms, and in this position to turn slowly heels over head the whole length of the veranda. These and other tricks he did at his own will and pleasure, refusing steadily to learn from man any acomplishments.

He was the most inquisitive beast imaginable, and woe to the storeroom or wardrobe that was ever left open. In two minutes Bruin's long, sickle-shaped claws would drag its contents in a heap on to the floor, while his flexible snout would be rooting it in every corner. On one occasion he was discovered in the act of carrying off a clock for investigation at leisure, and on another, being accidentally shut into the "go-down," or storeroom, he entirely ruined a brand-new saddle and gnawed into shreds a quantity of floor matting.