London. However, it is not likely that the ware made at this pottery was white, general opinion being that it was yellow and cream colored, as at that time no other ware was known except the porcelain which came from China, and was known as "China ware." Ordinary household pottery and ornamental vases for flowers were made in West Whiteland, Chester County, Pa., as early as 1753; a pottery and glass works was in operation in Germantown, New Quincy, Mass., in 1760; and a pottery in South Carolina in 1765. Cream colored ware, both plain and decorated in blue, was made in Philadelphia in 1770.

It appears, however, that the potteries established before the revolutionary war did not meet with marked success, and that this industry, like the manufacture of brick, did not assume commercial importance until after that war, when a period of new economic and industrial life began. About this time many enterprises were launched, including a number of potteries.

Our first page engraving shows a graphical comparison of the magnitude of clay products for one year. The pyramid would be 4,294 feet high and looms well up toward the summit of Mount Washington.

The total value of the products of clay in the United States in 1907 was $158,942,369. It was divided up as follows:

	Quantity.	Value.
Common brick	9,795,698,000	$58,785,461
Vitrified paving brick	876,245,000	9,654,282
Front brick	585,943,000	7,329,360
Ornamental brick	....	361,243
Enameled brick	....	918,173
Fire brick	....	14,946,045
Stove lining	....	627,647
Drain tile	....	6,864,162
Sewer pipe	....	11,482,845
Architectural terra cotta	....	6,026,977
Fireproofing	....	3,162,453
Hollow building tile or blocks.	....	1,088,165
Tile, not drain	....	4,551,881
Miscellaneous	....	3,000,201
Pottery	....	30,143,474

Correspondence.

POE AS A SCIENTIFIC WRITER.

To the Editor of the SCIENTIFIC AMERICAN:

At this writing the University of Virginia is celebrating the one-hundredth anniversary of the birth of America's great poet and author, Edgar Allan Poe. It may not be generally known to those interested in scientific subjects, aviation, etc., that the immortal composer of the "Raven," originator of the short story, and the first great exponent of the science of deduction and unraveler of intricate ciphers and cryptograms, cherished an ambition, according to his biographer, to shine as a scientific writer. Among his miscellaneous writings there is a descriptive article on the flying machines of Henson and Stringfellow, the originators of the single and superposed fixed surfaces, or aeroplane, as it is known, and whose labors at that time (1845) were the sensation of Europe. Henson and Stringfellow constructed and tested a number of model aeroplanes of various shapes and designs; what they conceived to be the best one was fitted with the marvelously light steam engine constructed by Stringfellow (now at the Smithsonian Institution, Washington) and forms the subject of Poe's article, written in the flawless style peculiar to him, employing terms in the description of the model that are new, and doubtless were the invention of his own fertile brain. J. C. PRESS.

South Norwalk, Conn., January 20, 1909.

AUTOMATIC BLOCK SIGNALS.

To the Editor of the SCIENTIFIC AMERICAN:

I do not agree with Mr. Fagan, who says automatic signals are in any way responsible for railroad accidents. The Boston Elevated Railroad is thoroughly equipped with an automatic block system, installed in such a manner that an accident from a rear-end collision is impossible. A train disregarding one of these signals, at danger, is brought to an immediate stop by an air tripping device. This is much better than any system of rigid discipline of employees. A signal system has come under my notice, which will eventually, I believe, be universally used on all railroads in the United States. It is a system of electric semaphores, centrally controlled, and by pressing a button from the central office, it will set the signal at danger at any desired point on the road. This signal, equipped with a telephone in a box, is located at the base of the pole. As each conductor carries a receiver in his pocket, the train crew is in a position to communicate with the central, or dispatcher's office, and find out why any particular signal was at danger. These signals would be so arranged (as all automatic signals are at the present time) as to show danger in case the signal was out of order; and the train crew would communicate with the dispatcher before proceeding. With this system a dispatcher could *block* trains for a whole division. Of course, he would have to receive prompt "O. S." from stations along the line. The advantages of this system would be a saving in interlocking apparatus and the doing away with a great many block towers (but not switch towers). It is also superior to the automatic block system, in my opinion, for this reason: That trains are under central control, and in case of a train disregarding a signal, an indicator located in the dispatcher's office would show what signal had been disregarded. This is the case in the Boston Elevated Railway's dispatcher's office. F. H. SIDNEY.

Signal Dept., B. & M. Railroad Terminal Division, Wakefield, Mass., January 12, 1909.

THE MEAT INDUSTRY OF AMERICA.—II.

The reader of this article will be surprised to learn that from fifty-six to fifty-eight per cent only of the animal, as purchased on the hoof, is available for the table. In the early days of the meat industry, the other forty-two to forty-four per cent was regarded as useless and allowed to go to waste. To-day, however, there is practically no part of the animal that is not turned to some useful account. It is claimed, indeed, that the profit of the packing houses is now almost exclusively made out of the by-products.

The hides are carefully stripped by a workman, especially trained to the task, who is careful not to spoil the hide by the slightest slip of his knife. After they have been inspected, they are graded, according to their quality, salted, and stored, and finally sold to the tanneries. The various fats from the animals are worked up into tallow, and the finer qualities, known as butter fats, are used in the manufacture of oleomargarine or butterine, for which by-product Swift & Co.'s plant has a capacity of fifteen tons a day. From the beef suet is made the by-product known as stearine, which is used in large quantities by the tanners and the candle manufacturers. From the seven thousand skins of the sheep, which are killed in this establishment every day, there is gathered daily about ten tons of wool. The lean meat trimmings are passed through a process of preparation, from which they emerge as a good quality of sausages. Horns and hoofs, which at one time were thrown away, now find a ready market. Packing-house refuse is used extensively, also, in the great fertilizer industry. The viscera, immediately upon their separation, are passed down a chute into a lower room, where, after going through certain processes of cleansing and chemical treatment, they are made to render their tribute of useful product, the fibrous matter being dried and ground up for fertilizing material. The bones are worked up into glue and phosphate, the latter being ultimately made into fertilizing material by mixing it with the nitrogenous matter of the fibrous residue, above mentioned, and of the blood.

A most important part of the work of the government inspector consists in looking after the sanitary conditions of the various floors or rooms throughout the building, and the personal cleanliness of the large army of employees. The workmen are required to keep their working clothes clean, or as clean as the conditions of work of this character will admit. Those that handle the meat must wash their hands at stated intervals, lavatories with running water and the necessary appliances being provided for this purpose. If an inspector sees a workman with clothing that is unnecessarily soiled, he orders him to at once change to another suit. For the disinfection and cleansing of the cleavers, scrapers, knives, saws, and other tools, vats of boiling water are provided in close contiguity to the rail and the working benches; and, in cases where defective animals have been detected, the inspector orders the butchers, before they proceed to another department, to at once cleanse their hands in a disinfectant solution of bichloride of mercury; he sees, also, that all tools and implements are similarly cleansed and disinfected. Sheet-iron clothes lockers are provided for the clothes of the workmen, with sheet-iron partitions between the compartments, and perforated sheet-iron doors in front to insure a free circulation of air.

Having now described in detail the various processes in the preparation of refrigerated meat for the market, we will proceed to describe the other great system of meat preservation known as curing, as carried out in the cutting up, pickling, salting, and smoking of ham and bacon. The hogs are driven from the stockyard pens, where they have already undergone a government inspection, to the dressing floor, which has a capacity of 1,000 hogs an hour, or 10,000 per day. They are driven, a few at a time, into a pen, on one side of which revolves a large hoisting wheel with short lengths of chain attached by means of hooks to its outer rim. In the pen are two boys, who quickly loop the chain around the hind legs of the hog. As the wheel revolves, it lifts the animals, one by one, to the top of the wheel, at which point the chains are automatically transferred to an inclined rail. Here the porker passes an operator, who swiftly dispatches it with a deft knife thrust; and after a short interval it is automatically released into a huge vat of scalding water of a temperature of 150 deg. F., where it remains for five minutes. The effect of the hot water is to loosen the hair and scurf and clean the hide. It is then taken from the tank and drawn up through a vertical cylindrical scraping machine, which is full of downwardly-projecting steel scrapers, which are pressed by springs against the body of the animal as it passes through, and take off in a few seconds time nearly all of the hair. It then passes to the scraping bench, where such portions of the hair as have not been removed by the machine are taken off by hand. The bench is arranged as a traveling table, and the hogs, laid across it side by side, travel slowly past the line of operators. When the animal reaches the end of the bench, the operation of dressing is begun. Here the first government inspector examines the glands of the throat, feeling some and cutting into others in order to be sure that the animals are perfectly healthy. The animal is then held in front of what is known as the polishing machine, which consists of a rotating shaft provided with a number of flexible arms made of heavy belt leather, each arm being shod at its end with a steel strap. As the shaft revolves, the animal is pressed against the rotating arm and is strongly beaten and scraped. It is then subjected to a steam jet blast, after which it is hung on the shaving rail, where the last of the hair is removed by hand. This finishes the cleaning; and at this point government inspector No. 2 looks for and identifies the pass mark of inspector No. 1, and places a tag upon the animal.

The animal is now ready for cutting up, and this work is done by an army of skilled workers, each one of whom, as the animals, traveling at the rate of about thirty feet a minute in a continual procession, pass before him down the overhead rail, performs his particular part of the operation with really marvelous speed and dexterity. The viscera are placed in a trough, whence, after they have been carefully examined by a government inspector, they pass to a room where they are separated and sorted, and subsequently manufactured into various by-products. The stomach, after the grease has been extracted, is made into fertilizers; the liver and heart are sold as food products, and the intestines are cleaned and made into sausage casings. The leaf lard (the fat which grows on the inside of the body) is taken out, and subsequently worked into kettle-rendered lard or neutral lard, the kettle-rendered lard being the ordinary lard of household use, and neutral lard being used in the manufacture of butterine. The animal, after being split in two along the vertebræ, finally reaches the end of the rail, where it passes before the fourth government inspector, who examines the inside of the pleural region as a final assurance of perfect health, and also examines the glands near the base of the backbone. The next journey is to the hanging floor, where the sides are sorted according to weight and quality, and are partially cooled by being allowed to hang in a draft of air for a period of a few hours. From the hanging floor the sides are carried into the chill room, a huge refrigerator capable of accommodating many thousand sides. Here they are kept for forty-eight hours at a temperature of 32 deg.

From the chill room the sides are taken to the cutting room, where the shoulders are chopped off, the hams removed, and the feet are cut from the hams by band saws. The bacon pieces are put through rolls to flatten them out into a suitable shape for salting and packing. All the portions of the meat, as thus cut up, are carefully trimmed, and the trimmings are sent down a chute to a room below, where they are retrimmed, the lean portions being subsequently made up into sausage meat, and the fat portions into lard. In the cutting room the "fresh-meat portions" are wrapped in paraffine paper, and packed in boxes and barrels for immediate shipment to the retail butchers. After the meat has been trimmed and cut up, it is sent down a chute into the grading room, where each ham, shoulder, or side is weighed and sorted according to its weight and quality.

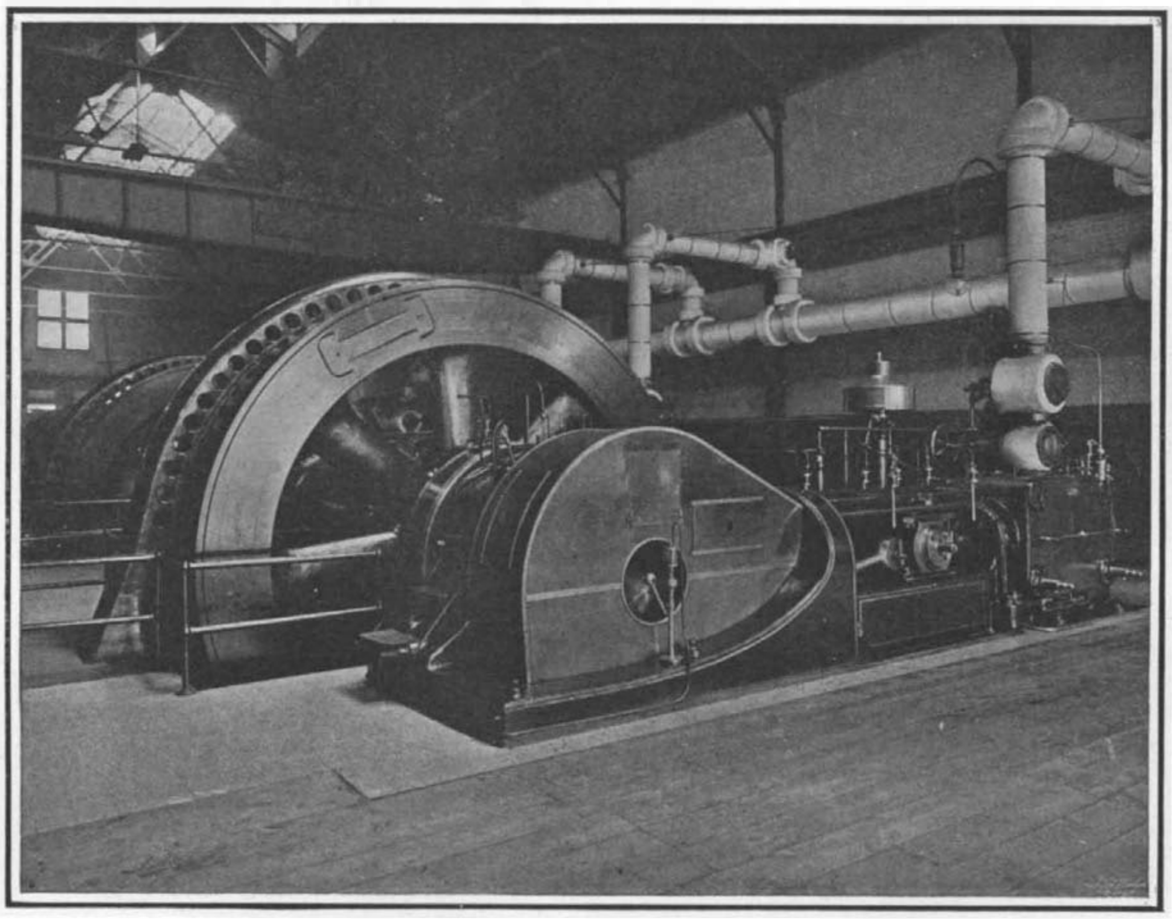
It is probable that there is no feature of the meat industry, at least as carried on under modern conditions in the largest establishments, regarding which there has been more popular misconception than that of the curing of meat. While it is undoubtedly a fact that some meat, prepared by obscure and small dealers, occasionally may be subjected to treatment that renders it undesirable, we believe that the system of curing, as carried out by the large establishments under the regulation of federal laws, is perfectly wholesome, and absolutely insures the use of only such ingredients as are healthful.

As a matter of fact, the constituents of the solution or pickle used in curing meat, viz., salt, saltpeter, and sugar, are the same that have been used by the farmer, the butcher, and the housewife from time immemorial; and it is certainly remarkable that, in spite of the fact that the problem of meat preservation has been made the subject of thorough laboratory investigation for a long period of years, the chemists have been able to find nothing which gives more satisfactory results than the time-honored preservatives of our forefathers.

The supervision of the federal government of the curing of meats is carried on with the same thoroughness to which we have drawn attention in our description of the preservation of meats by the method of refrigeration. Salt, saltpeter, sugar, vinegar, and wood smoke are specified by law as the only preservatives that may be used. Borax, of which so much has been heard lately, is expressly prohibited except in the case of meats put up for export in accordance with the directions of a foreign purchaser. In this case borax may be used, provided it is not prohibited by the country to which the meat is to be sent. England makes no objection to the use of borax, and meats sent to England may be preserved in this substance; but they must be prepared in separate rooms, and marked with special labels showing that they are for export only. The greatest care also is taken by the large packing houses in the preparation of the pickle. Swift & Co. maintain an extensive chemical laboratory, which gives steady employment to a corps of ten chemists and bacteriologists, a considerable portion of whose time is taken up with the analysis of the ingredients used in the curing department, and the investigation of the meats at the various stages of the curing.

The size and completeness of this laboratory, and the high technical qualifications of its staff, it may be remarked in passing, bear testimony to the universal sway which chemistry holds over the modern industrial arts. In the investigation of meats, such, for instance, as cured hams, a section several inches square is cut right through the body of the ham, divided into four equal portions, and separate analysis made of each portion to determine the amount of pickle in the different sections, and ascertain if the ham is uniformly cured. The section of meat is hashed, and the ingredients extracted by boiling, the dry residue being dissolved with water and further treated with chemicals.

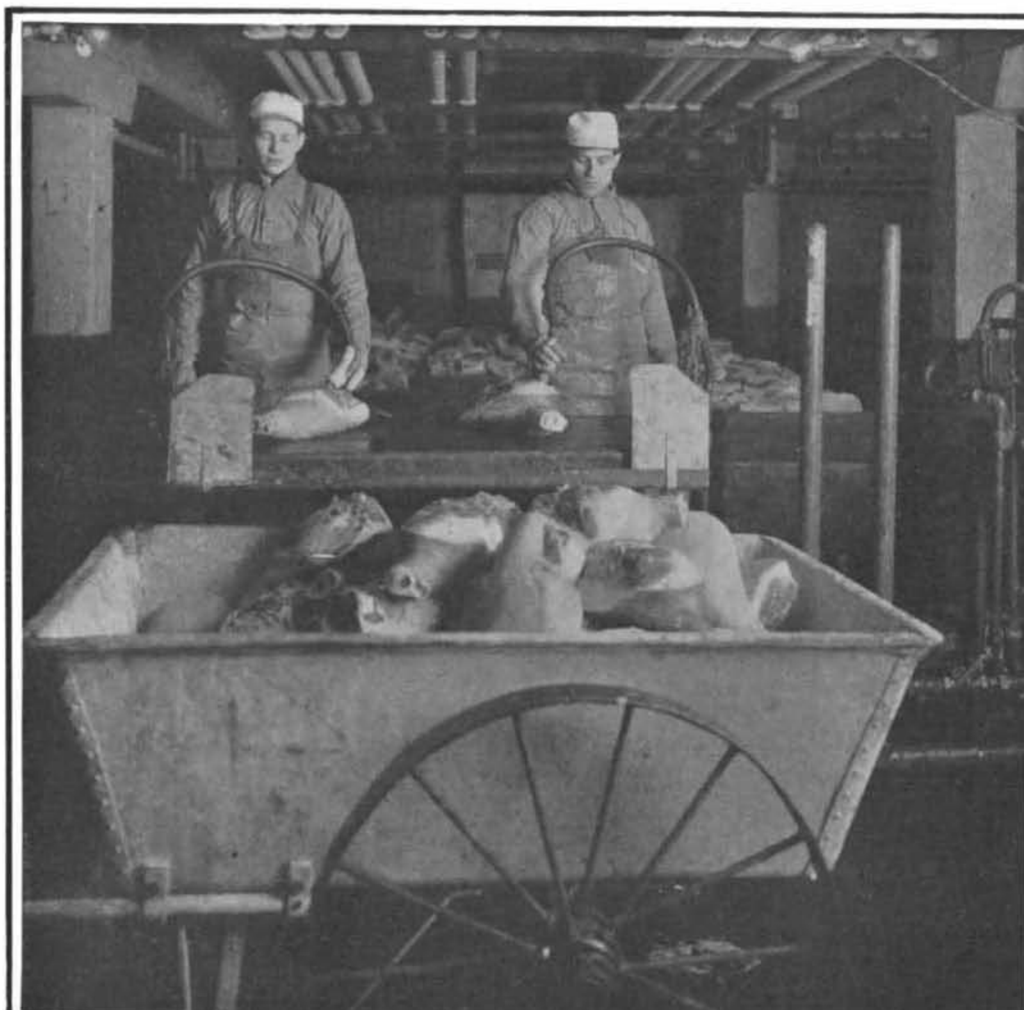
Samples of the various fertilizers produced in the plants are taken regularly to the laboratory, where an analysis is made to determine the amount of nitrogen, phosphoric acid, and potash which they contain. Tests are also made of the fat, oils, and soap to determine their value. Samples are taken of the materials during the progress of manufacture, in order to insure correct processes and suggest improved methods of treatment. The investigation of frozen meat is carried on along four lines, chemical, bacteriological, histological (concerned with the tissues), and practical. As showing the preservative action of refrigeration, it may be mentioned that in an investigation recently made to determine if there was any deterioration under frozen conditions, samples of frozen meat were placed in the same box with plates of gelatine, and kept there for a lengthy period, without any cultures developing upon the gelatine.



One of the electric generators in the central power station.

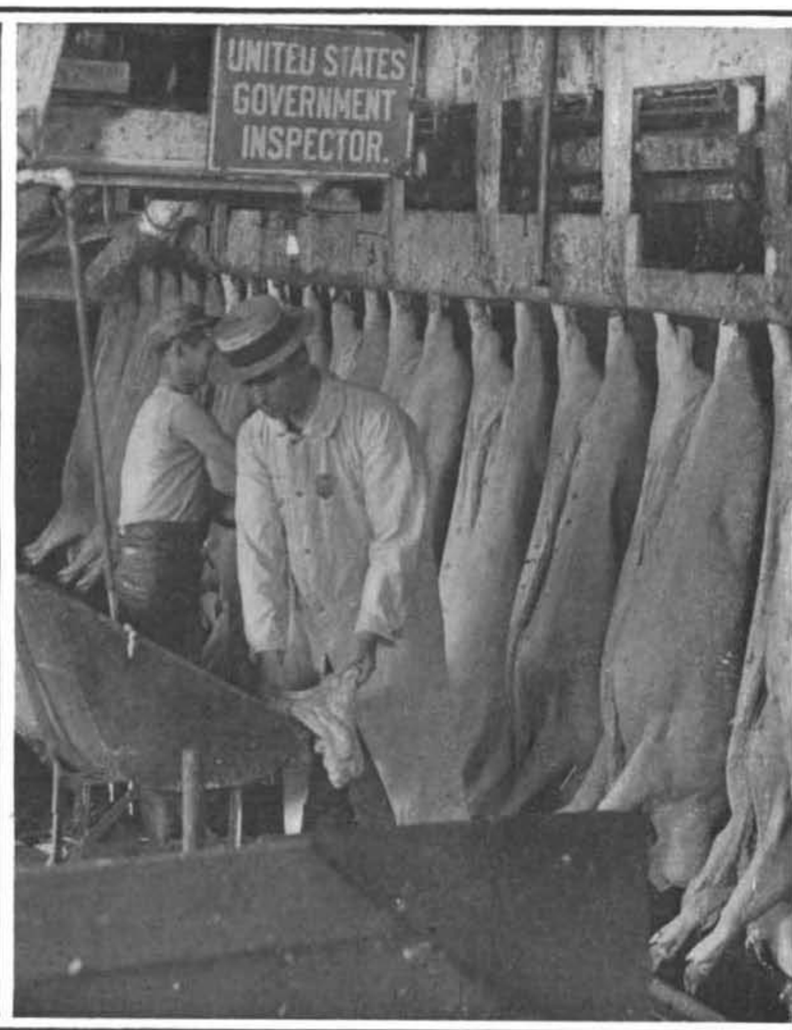
The "pickle" is prepared in a plant which the company has devised with a view to insuring absolute cleanliness and adherence to formula. After the solution has been made in the proper proportion, it is thoroughly boiled with a view to its sterilization, then chilled to the desired temperature, and piped to a series of closed tanks. The object of the pickling is to put the meat in such a condition that it will remain sound and sweet. The hams, shoulders, and sides are loaded into vats, which are then entirely filled with the pickle. They are left here for a period of from forty to seventy-five days, during which time, by a process of diffusion, the curing materials are distributed evenly throughout the substance of the meat. It will be understood, of course, that outside of its preservative effect, the process of curing is intended to give to the meat the characteristic flavor which distinguishes it from fresh meat; and no small part of the skill in curing consists in securing the desired flavor by careful work in the pickling and in the subsequent smoking.

In the process of dry curing, the meat is simply rubbed thoroughly with a mixture of dry salt, sugar, and saltpeter, and packed carefully in boxes, in which it remains for a period of thirty days. The juices of the meat supply the necessary solvent, and the process of diffusion gradually takes place, as in the case of meats cured in liquid pickle. After the curing is completed, the meat is inspected by the government official and branded for shipment. The cured meat which is to be further treated by the process of smoking, is taken to the smoke house, where it is carefully looked over, put into vats, and covered with fresh water, in which it is left for half a day to remove the surplus salt and put it into condition for smoking. It is next washed and thoroughly scrubbed in hot water, and then hung on racks mounted on trucks and wheeled into the smoke houses. These are large, square shafts, several stories in height, provided with gridiron floors to permit of the free circulation of the smoke. At the base of the houses slow wood fires of hickory or maple are kept steadily burning for a period of thirty-six hours. The smoking of the meat serves the double purpose of improving the flavor and acting upon it with a strongly antiseptic or preservative effect, the creosote of the smoke being one of the most powerful bactericidal agents in existence. The smoke not only penetrates the substance of the meat, but it forms an outer envelope, which in itself is an effective factor in the preservation of the meat. It should be mentioned



The solution of salt, sugar, and saltpeter is injected to the bone to insure that the impregnation of the meat shall be very thorough.

Injecting salt and sugar pickle into the center of the hams.



These inspectors, who are qualified veterinary surgeons, are stationed at various points in the process of cutting up the meat, which undergoes a most rigid inspection.

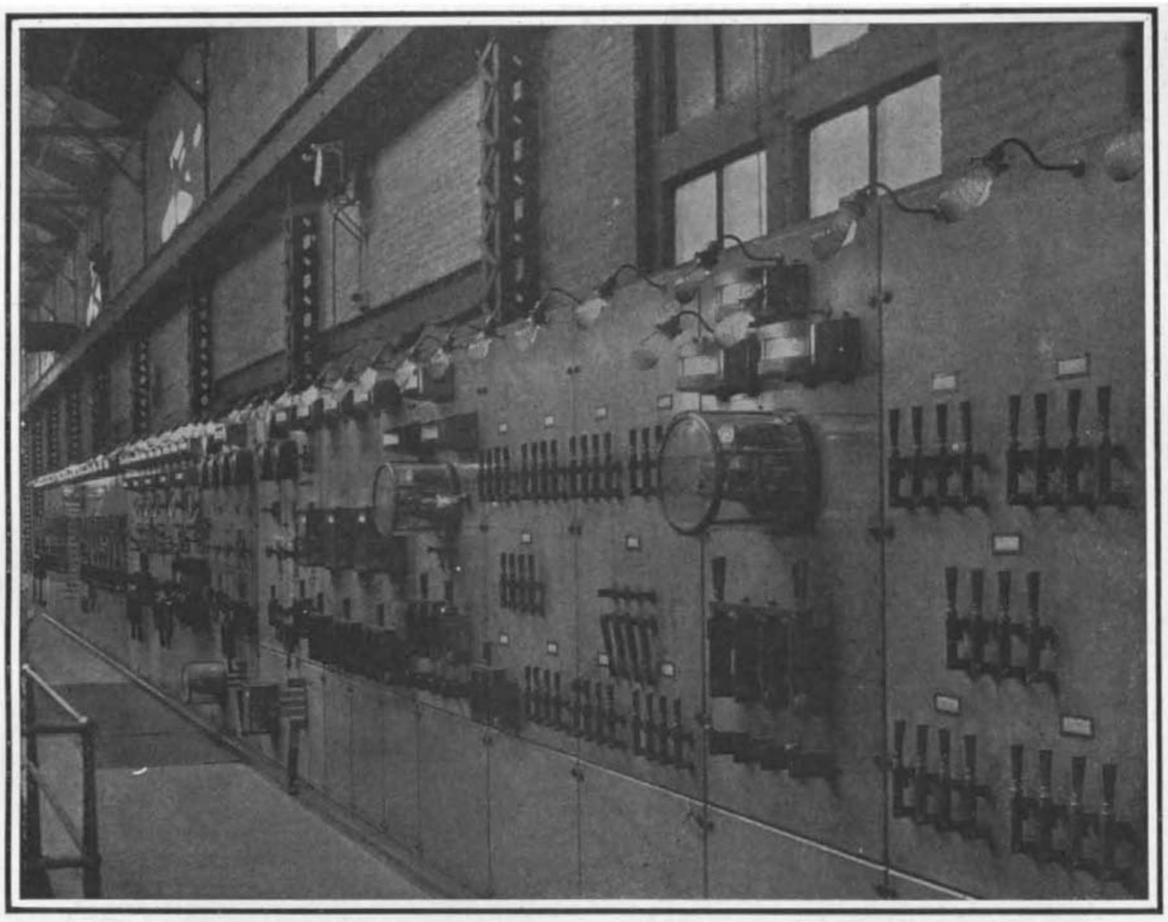
A United States inspector at work.

THE MEAT INDUSTRY OF AMERICA.—II.

here, that in order to make sure of the thorough impregnation of the ham by the curing pickle, a certain amount is forced into the meat at the bone by means of a hollow needle, through which the liquid is driven by a hand pump. The importance of this treatment is pointed out in an article in the Lancet of June 27 of the year 1908, by Dr. E. Klein, of London, who showed that, in hams so treated, it rarely happens that the pickling fluid fails to reach right through the bone from the outside. This process is shown in one of the accompanying engravings.

The smoked hams are now taken to the packing room, where, after being tested by an expert, who thrusts a steel "trier" into the body of the meat, they are wrapped in oiled paper and wrapping paper, and placed in muslin bags. After these have been sewed up, the company's label and also the United States inspection label are pasted on, and the hams are ready for packing. The company's labels for this and every other kind of meat must be submitted to the Agricultural Department of the government, in order that it may be determined that they accurately describe the character of the contents. In the first section of the present article, published in our last issue, reference was made to the fact that the profits of the large packing houses depend very largely upon the successful treatment of the by-products. We will now give a brief description of the methods by which the forty-two per cent of the animal which formerly was considered as useless refuse is manufactured into valuable commodities. The various scraps of meat, etc., consisting of odds and ends of the cutting room, are collected and placed in large digesters. There they are treated under steam at forty pounds pressure for from eight to ten hours. The fat which is separated by this process is drawn off and utilized as tallow and grease, and in various arts, such as the manufacture of soap, candles, lubricants, etc. The remaining contents are placed in a hydraulic press, where the liquids are squeezed out; and the solids, thus obtained, are dried and ground ready to be made into fertilizers, for which they are valuable because of their content of nitrogen and phosphoric acid. The liquid which drains from the press is evaporated to dryness, and the solid residue, which is rich in nitrogen, is used in the manufacture of fertilizers.

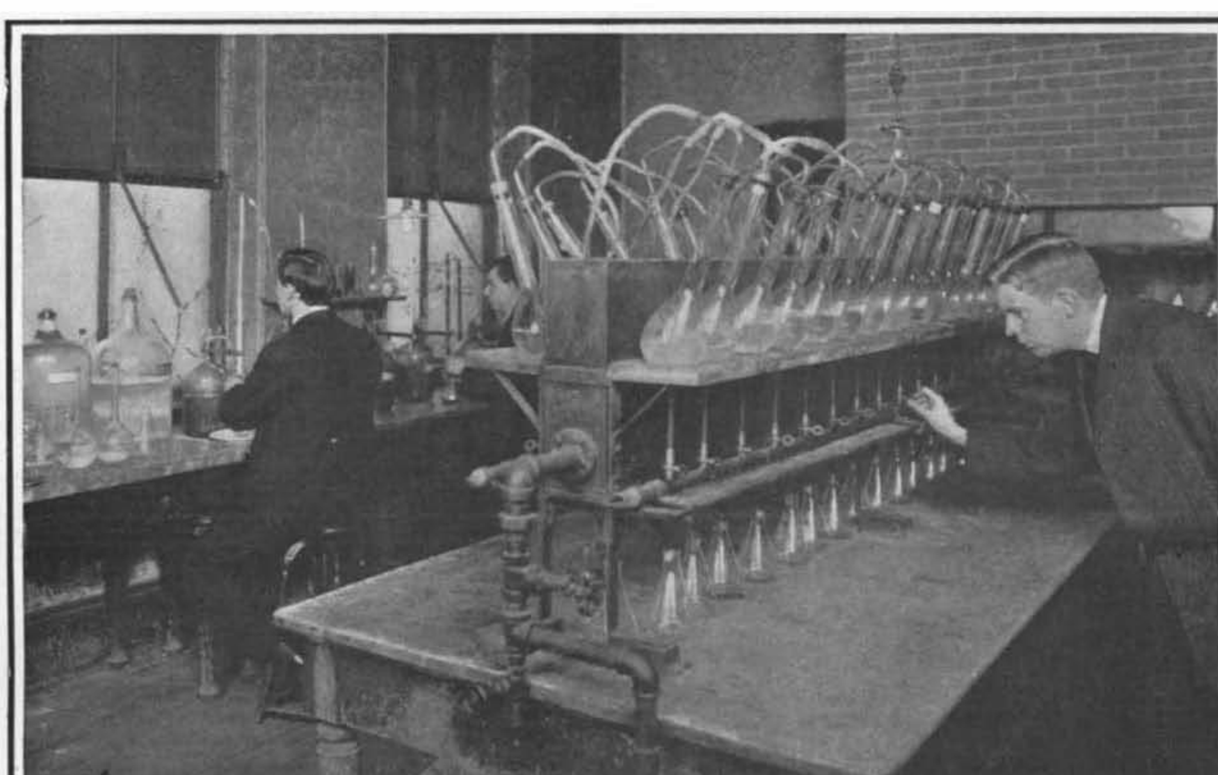
The hides are cleaned, sorted, and shipped to the tannery. The bones are



The switchboard in the central power station.

Trimming and wrapping fresh pork-hams.

Branding hams.



A large laboratory is maintained in which a corps of chemists and bacteriologists is engaged in making constant tests of the meats and supplies used, and in searching for improved methods of curing and refrigeration.

One corner of the laboratory.

Making primal cuts of pork-hams, shoulders, loins, and barreled pork.

THE MEAT INDUSTRY OF AMERICA.—II.

first boiled to remove the meat from the fat; then dried and sorted as to size and shape, and sold to the manufacturers of buttons, combs, and similar articles. The hoofs and horns are washed, dried, and sold to comb factories.

The hair of the animal is treated according to its length. Short hair, obtained in the summer, is placed in the digester, dried, and ground into nitrogenous fertilizer material. The long winter hair is cooked in a vat with an alkali, to dissolve the roots and gelatinous matter, and is then washed, dried, and baled for shipment to the hair spinner. It is chiefly used in the manufacture of mattresses. The sinews and hide trimmings are manufactured into glue. The material is placed in a solution of lime, where the fatty matter is saponified, and then washed to free it of lime and render it clean. It is next treated with a weak solution of sulphurous acid to neutralize it; after which it is cooked at a low temperature in large wooden tubs and formed into a glue solution, which is finally reduced in a multiple-effect vacuum machine to the sheet glue of commerce.

It would be difficult to find another of the industries of America in which the application of modern science has wrought better results than in the great meat industry. The adoption of strictly scientific methods has not only improved the quality of the meats, but it has made it possible to transmute the enormous wastes of an earlier day into a wide variety of profitable and useful articles of industry and commerce, and thereby reduce the cost of the entire output.

Silk-Faced Cotton.

The success of artificial silk has caused silk-faced cotton to be somewhat neglected, but "brilliant-ed" cotton closely resembles fine natural or artificial silk. The following are some of the processes:

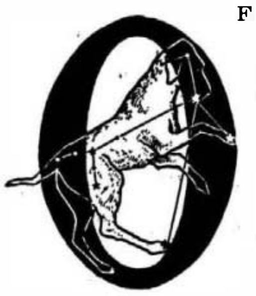
Thomas and Prevost (1907). A hard silky coating is produced by treating the cotton with strong chlorinated bleaching agents and then mercerizing in the usual way, with caustic alkalies. Cross and Bevan recommend the formation of a coating of viscose by mercerizing with caustic soda mixed with carbon disulphide. Cross and Briggs (1907) employ a complex acetic bath, the action of which is confined to the outer layers of the fiber. The bath contains 92 parts of anhydrous acetic acid, 11.5 parts of acetyl chloride, and 6.5 parts of zinc oxide. Prudhomme (1904) mercerizes with caustic soda mixed with ammoniacal solution of copper.

In all of these processes the silky coating is made from the cotton itself. In others, the cotton threads are dipped in collodion, gelatine, solution of natural silk in zinc chloride, solutions of cellulose or artificial silk, etc. Many patents for the production of artificial silk mention the possible employment of the solutions in giving gloss to cotton threads and fabrics. A coating of viscose increases the strength, in addition to improving the appearance of cotton, but produces uneven results and necessitates subsequent bleaching.

It is found that in an ordinary room, from which sunlight is excluded, the brightness of the daylight commonly runs as low as 1/10, or even 1/100 candle-power per square inch. The intrinsic brightness of nearly all artificial lights is much greater than this, which accounts for the injurious effects they produce on the eyes if situated within the range of vision. In a paper read before the Illuminating Engineering Society of Philadelphia, J. E. Woodwell discussed this subject, arriving at the conclusion that the best illumination is a diffused light of from 2/10 to 1/10 candle-power per inch. Although ultra-violet light has heretofore been held accountable for strain and other injury of the eye, he points out that there is less ultra-violet light in the rays of various incandescent illuminants than in direct or even reflected sunlight.

THE HEAVENS IN FEBRUARY.

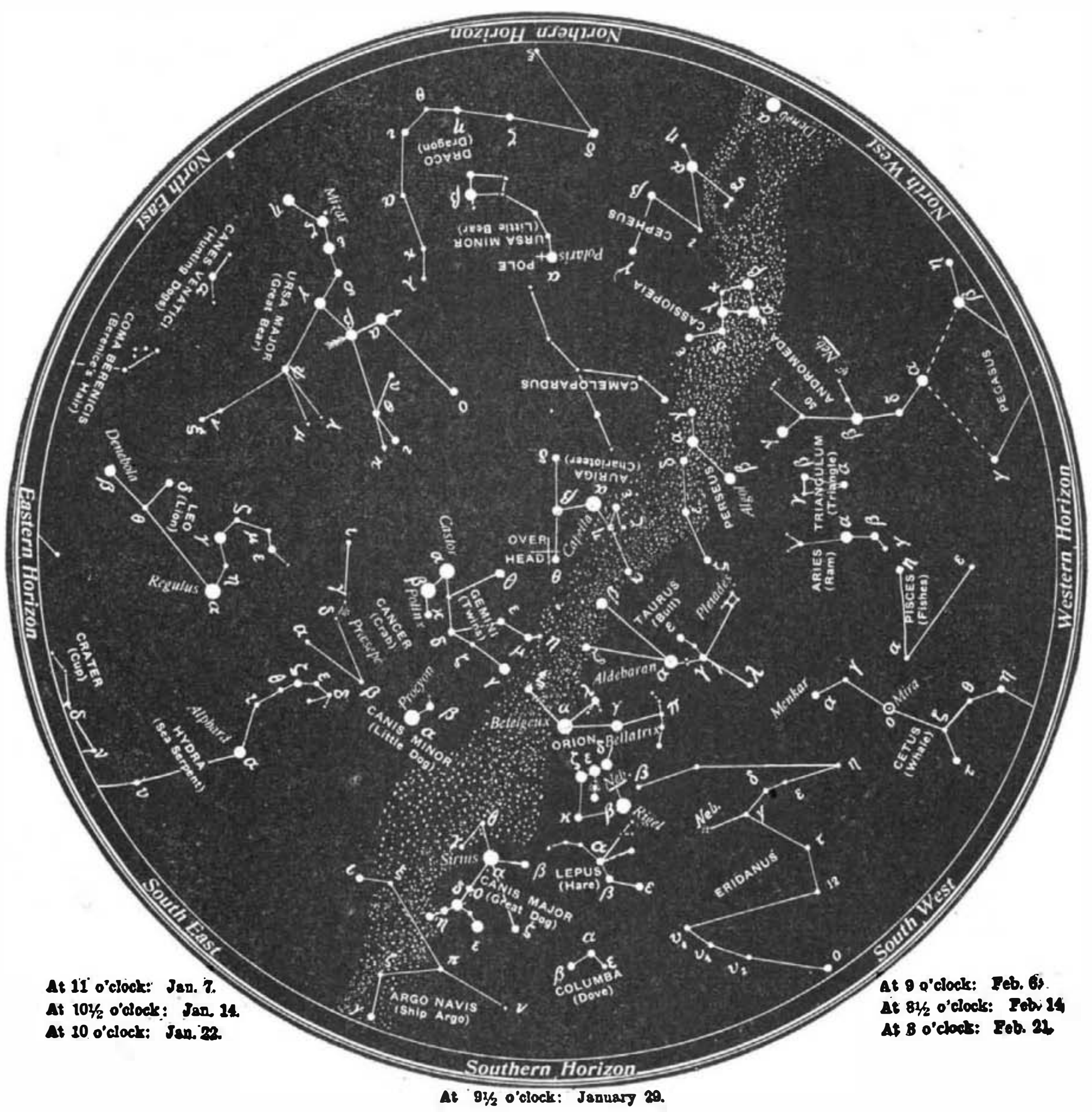
BY HENRY NORRIS RUSSELL, PH.D.



OF all the aspects that the heavens present to us, none is more impressive than a clear winter night. It is not only that the air is at its clearest, and that the leafless trees hide but little of the sky; the stars themselves at which we are looking are brighter than those which we see in summer.

Let us go out into the frosty air, turn our back upon the Pole Star, and glance at the southern sky. The first thing that we see may well be Orion, whose outline we traced among the stars last month; but as we let our eyes fall toward the horizon, we are arrested by a star of surpassing brightness, so much the superior of all the others that no one could fail to pick it out at once. This is Sirius, the principal star in the constellation Canis Major, and the brightest in all the heavens.

Our map, and the outline figure above, show us how the other stars of this constellation are situated. The conspicuous group resembling an irregular cross about fifteen degrees southeast of Sirius is the Great Dog's hind quarters; and two isolated ones farther to the right, mark his fore and hind paws. It takes a good deal of imagination, when only the stars are before one, to see any resemblance to a dog; but the constellation, however it might be named, is a natural group, and stands well separated from all others.



NIGHT SKY: JANUARY AND FEBRUARY

Sirius deserves further mention. It is notable not only for its brightness, but for its large proper motion, which carries it in a southwesterly direction—almost in the opposite direction to that in which Procyon lies—at the rate of about one degree in 3,000 years. This seems slow, but when magnified by the telescope, the motion in even a single year can be detected with certainty by suitable measurements, and it is much greater than that of most stars. All this makes it seem likely that Sirius is really near us—as the stars go—and the determinations of its parallax show that this is really the case. In fact, so far as the latest researches show, it is nearer to us than any other star that is visible in our latitude, its distance being about 8½ light years. That is, its light takes 8½ years to reach us, and we see it now as it was—and *where* it was—in the middle of the year 1900.

Sirius has of course been very frequently observed, and it was discovered long ago that unlike most stars, it was not moving in a straight line. If its positions, as found by observation for successive years, were mapped, they will lie on a wavy curve, deviating, now to the right and again to the left, from the direct line. The "waves" occurred regularly, at intervals of about fifty years.

Now, according to the basal principles of mechanics, no moving body deviates from a straight line unless some force acts on it. In the case of Sirius, there was evidently a periodic force at work, pulling it alternately to the right and left—and also setting it forward or behind—and repeating itself after fifty years. The only available explanation was that Sirius was attended by a companion star, too faint for us to see, but sufficiently massive to affect its motion by its attraction, which pulled it now one way, now the other, as the companion star moved round Sirius in its orbit—the period of revolution being of course fifty years.

This explanation was given by the German astronomer Bessel about 1850. Fully twelve years later—in 1862—Alvan Clark, the maker of all the greatest American telescopes, having completed a new instrument of great power, turned it on Sirius. At once a faint companion star appeared—too faint to be seen with the smaller telescopes previously in existence—and this was just in the direction in which Bessel had predicted. Since then it has almost completed a revolution about its primary, moving exactly as was predicted, before it had ever been seen.

Above Orion, on the opposite side from Sirius, is Taurus, with the clusters of the Pleiades and Hyades, of which we spoke last month. Right overhead is Auriga. Gemini is close on the southeast, and Canis Minor, with the bright star Procyon, lies below.

In the southeast is part of Hydra, and due east is Leo, in the lower part of which is the brilliant planet Jupiter. Ursa Major is high in the northeast. Draco and Ursa Minor are due north, below the pole, and Cassiopeia and Cepheus are in the northwest, with Alpha Cygni (Deneb) on the horizon below them. Pegasus is setting, north of west. Above him is Andromeda, and higher still, almost overhead, is Perseus. The remarkable variable star Algol, in this constellation (which is eclipsed by a dark companion at regular intervals of 2d. 20h. 49m.), will be faint (i. e., eclipsed) about midnight on the 6th, 9 P. M. on the 9th, 6 P. M. on the 12th.

Due west we find Aries and Pisces. Saturn, which is in the latter, is just setting. Cetus and Eridanus fill up the large dull space in the southwestern sky.

THE PLANETS.

Mercury is evening star until the 11th, when he passes through inferior conjunction and becomes a morning star. At the beginning of the month, when he sets at about 6:40 P. M., he may be seen shortly after sunset.

Venus is morning star, but is steadily getting nearer the sun, and becoming harder to see. All through the month she rises at about 6 A. M., but as sunrise comes earlier and earlier, she will be harder to see. On the 19th she is in conjunction with Mercury, who is then four degrees south of her. Mars is morning star in Scorpio and Sagittarius, rising about 3:20 A. M. on the 15th.

Jupiter is in opposition on the 28th, when he rises at sunset, and is visible all night long, and a fine object in the smallest telescope. Saturn is evening star in Pisces, setting about 9 P. M. in the middle of the month. Uranus is morning star in Sagittarius, observable before sunrise. Neptune is in Gemini, invisible without a telescope. On the 16th he is in R. A. 7h. 3m. 25s. and declination 21 deg. 53 min. north, and is moving 5s. westward and 9 min. northward per day.

THE MOON.

Full moon occurs at 3 A. M. on the 5th, last quarter at 8 A. M. on the 13th, new moon at 6 A. M. on the 20th, and first quarter at 10 P. M. on the 26th. The moon is nearest us on the 20th, and farthest away on