At the extreme south end of the space allotted to the Department of Agriculture in the United States Government building, the visitor at the Fair will find the various exhibits of the Bureau of Animal Industry.

Congress in 1884 passed a resolution providing for the establishment of a bureau in the Department of Agriculture for the purpose of eradicating the contagious and infectious diseases of domesticated animals.

When we consider the vast amount of capital and labor employed in the live stock business of this country, and the amount of good work already done by the bureau, we see the wisdom of Congress in creating the bureau.

The special work done by the bureau, which has been most reaching in its effects upon the stock interests of the country, was the stamping out of contagious pleuro-pneumonia, a bovine disease which first made its appearance in Brooklyn, N. Y., in 1843.

This disease raged with more or less fierceness principally along the lines of cattle transportation till 1889, and in 1891 this work of the bureau was completely crowned with success, when the last case was discovered and suppressed. No new cases having appeared, Secretary Rusk in September, 1892, issued a proclamation declaring the country freed of the plague.

The reports of the bureau are issued annually, in handsome volumes of about 500 pages, and occasionally special reports appear.

It seems to have been Secretary Rusk's object to give the farmer and stockman reading matter which affects his vital interests, for we notice in the collection of reports of this bureau reports upon the "Animal Parasites of Sheep," "Swine Plague," "Hog Cholera," "The Sheep Industry," "Texas Cattle Fever," "Diseases of Cattle and Cattle Feeding," and "Diseases of the Horse." All these reports are prepared under the personal supervision of the able chief of the bureau, Dr. D. E. Salmon, who will be known to future American veterinaries as one of their pioneers.

A notable contribution to the work of the bureau for 1893 is the "Texas Cattle Fever Report" by Drs. Theobald Smith and F. L. Kilborne, two of Dr. Salmon's assistants. This disease has been worked at periodically for about twenty-five years by various scientists without much success. We now know that, according to the views of the above investigators, Texas fever in cattle is carried by the cattle tick; that Southern cattle, or more strictly speaking all cattle which come from a district south of a line established yearly by this bureau, are capable of causing the disease in those cattle with which they come in contact north of the bureau line. The Southern cattle themselves have acquired an immunity to the disease. The cattle tick harbors a microscopic animal parasite. This parasite is inoculated into the Northern cattle by the ticks which come from the Southern cattle. The parasite, a *protozoan* named *Pyrosoma bigeminum*, then enters the blood, disorganizes that essential fluid, and causes the death of the animal.

In the exhibit of the bureau the visitor will notice a model of the Kansas City stock yards. The Kansas River courses through the yards and provides a natural quarantine line between the two yards thus formed. One of these yards is reserved entirely for Southern cattle and the other entirely for Northern cattle.

A small strip of the bureau space is taken up with models of the cattle transportation cars and a fine model of the cattle transport steamer Massachusetts.

On the partition above will be seen photographic views of the interior of the steamer, showing the manner of placing the cattle during the ocean voyage.

The models of the cars show the amount of care which is now taken for the comfort of cattle in transit. The cars are so constructed that both food and drink can be passed to the cattle from the roof the car.

When one enters the department space from the great rotunda, a dressed hog and two sides of beef meet his gaze. Upon inquiry as to the methods used to preserve this meat during this hot weather, the visitor is told that it is not real meat. The demonstrator then takes the visitor into his confidence and tells him that they are *papier mache* models, and that he is looking at the exhibit illustrating part of Uncle Sam's methods of inspecting Chicago pork and beef. At one end of the table he looks into a microscope and sees before him the famous *Trichina spiralis*, a little worm which infests pork, and which sometimes causes the death of persons who swallow them in rare meat. He also sees the various implements used in pork inspection.

In a bottle which rests upon a stand he sees a section of the tongue of a hog which contains numerous little round opaque bodies about the size of bird shot. This, he is told, is measly pork. The name of this little body is a long one—*Cysticercus cellulosæ*. It is the larval stage of one of the most common tape worms, the *Tænia solium*. This larva develops into this worm when we swallow it in rare pork.

On the table will also be seen the various report blanks, the filling out of which constitutes the red tape business which Uncle Sam requires of his meat inspectors.

Passing along the rail which encircles this exhibit, the visitor is guided to the bureau's curio exhibit. Twenty-three hair balls hang before him. If he is not "up" in cattleology, he wonders what a hair ball is. A label just in front of him tells him that they are formed from the hair which cattle swallow after licking themselves, and that the only curious thing about these is that they all were taken from one animal. Now come some of the strangest things yet. The visitor is expected to swallow the story that a sane animal would, with premeditation, swallow such articles as these: Nineteen pounds of stones, a jackknife (the original owner of which has been found), a bridge bolt thirteen inches long and five-eighths of an inch in diameter, a sulky rake tooth four feet eight inches long, miscellaneous articles, such as nails, staples, sticks, stones, buttons, hairpins, pieces of glass, cartridge caps, etc., etc., without end, and finally one of Uncle Sam's depreciated silver dollars and a silver watch chain, both of which are securely wired down to prevent some other animal from swallowing them.

Dick Jones, of Nebraska, says he is making up some lies to tell when he goes back home, and that he will make a careful note not to forget this one.

On the partition in front of him the visitor sees framed photographs of the famous breeds of horses, cattle, dogs and chickens, and also some views of the Chicago stock yards, which are doing duty for a second time at a great international show, they having been used at the Paris Exposition.

Clearing himself of the crowd which has collected, he moves along slowly, looking down into a case containing some toy cattle and tough-looking miniature men. This, he is told, is a model of the cattle pens where cattle which are to be exported are inspected and tagged, and that Uncle Sam knows all about every steer that leaves his domains.

Facing right about, he sees a large number of nice-looking bottles containing worms. Upon close inspection he finds that the contents of the bottles are specimens of the various parasitic worms and insects which are found on or in the domestic animals. He is somewhat bewildered by the long Latin names, but feels sure the collection did not come there by chance; so making himself interested, he listens to the descriptions of the various specimens and is soon convinced that the life histories of the parasites are one of the most wonderful provisions of nature to perpetuate the species. To his left he sees an enormous bottle, and, upon reading the label, he finds that the specimen in the bottle is *Gastrophilus equi*, in the stomach of a horse. When he finds out that man is not infested with such atrocious-looking parasites, that they are nothing but bots and that they do not cause any serious ailment in the horse, he feels much relieved.

The next exhibit is that of a stuffed horse, beautifully executed. The sign under the belly of the horse says "Glanders and Farcy." Upon closer inspection he notices the farcy buds on the hind legs, and the characteristic nasal discharge in this disease. Mental note is made of the fact that glanders and farcy are one and the same disease, and that when man is inoculated from a horse which has the disease in either form he is apt to die.

In a small bottle which hangs near the horse is a fluid substance, reddish in color, which is called mallein.

Mallein is used in diagnosing obscure cases of glanders, and is made in about the same way that Dr. Koch makes his tuberculin, *i. e.*, mallein is a glycerine extract of the sterilized bouillon cultures of the bacterium which causes glanders. Printed directions tell how to use it, and what reactions should occur if the animal has glanders.

Continuing eastward, the visitor stands in front of two long rows of shelves, upon which rest large bottles containing specimens illustrating the pathology of the various infectious and contagious diseases of our animals, such as tuberculosis, swine plague, hog cholera, glanders, actinomycosis or lumpy jaw and contagious pleuro-pneumonia.

The specimens of pleuro-pneumonia are specially valuable now, because this disease is extinct in this country, and their value will increase as time passes.

Turning to the left, he finds that a large terrestrial globe has indicated on its surface the regions in which pleuro-pneumonia now exists in Europe, and the places and dates at which this bovine scourge existed in the United States.

The next exhibit to attract his attention is a horse-shoe-shaped frame hanging on a post.

In this frame are found the identical shoes worn by Nancy Hanks, Maud S. and Sunol when they made their records as trotters. In the same frame are autograph letters from the owners of the above horses attesting the genuineness of the shoes.

After leaving this exhibit, which illustrates the nearest approach of the farrier's art to perfection, the visitor faces a collection of shoes and hoofs which illustrate just the opposite—the imperfect methods of shoeing, and their results to the horse's foot.

This collection illustrates the subject admirably and should be the Mecca of the horseshoer who prides himself on his ideas of right and wrong to his fellow man and his next best friend the horse.

The next exhibit is a large model of the cattle quarantine station at Garfield, N. J. This model shows the relative positions of the various buildings, water supplies, and drainages, and also an enlarged model of one of the cattle hospitals.

Entering the laboratory with the demonstrator, the visitor is shown the various cultures of the bacteria which are investigated by this bureau; also the manner of making cultures, and the various apparatus necessary for bacteriological investigations.

Some slides are placed under a powerful microscope, and, for the first time in his life, the visitor actually sees some little, slender rods, with rounded ends, and he is told that these little, rod-like bodies are the little plant cells called tubercle bacilli, and that it is they that cause tuberculosis, or consumption.

Across the aisle from the laboratory is an exhibit of apparatus which is used in isolating from bacterial cultures the poisonous substances which the bacteria produce. Just as we ourselves produce substances which are poisonous to our tissues by our mere living, so do these little life units, the bacteria, produce substances which are inimical to their own existence as well as that of other plants and animals.

Having seen all the most important exhibits of this bureau, the visitor exchanges cards with the demonstrator, and hurries along to inspect the exhibits of the other bureaus of the department.

The Electrical Engineering Department of the Exposition shows that electric power is made use of in thirty-seven buildings. The Exposition itself uses one hundred and three motors, with an aggregate of 1,811 horse power, exhibitors use 212 motors, aggregating 538 horse power, making altogether 315 motors and 2,349 horse power. This does not include all the electric motors, for a number of exhibitors in the Electricity building have one large motor connected to the Exposition circuit, which operates a number of other motors. The working of all these motors is of value in demonstrating the convenience of electric power. It is evident there will be hereafter a greatly increased demand for electric motors.

One of the novelties among the engines exhibited in the Palace of Mechanic Arts is a 20 horse power steam turbine shown in the Swedish section. It is direct connected to a duplex dynamo which has a rated capacity of two hundred and forty 16 candle power lamps. This turbine when run at full speed makes 22,000 revolutions a minute, but this is reduced ten times before being transmitted to the armatures of the dynamo. The speed-reducing device is at least twice the size of the turbine itself. The ten horse power engine makes 24,000 revolutions a minute. The turbine is of very simple construction and the shaft is a piece of steel scarcely twice the size of an ordinary lead pencil. This makes a shaft that is elastic. Were it larger and more rigid, the turbine could not be operated at such high speed. Since the publication of the articles regarding steam turbines in the SCIENTIFIC AMERICAN SUPPLEMENT, there has been a special interest in this exhibit. The general practice and tendency in the United States in dynamo building is toward a much lower armature speed. But it is claimed for this turbine that the speed can be reduced any desired amount with scarcely any appreciable loss in efficiency.

The concession under which the Ferris wheel was constructed, stipulated that no percentage should be paid until the receipts had reached $300,000, and then the Exposition was to get 50 per cent. The enterprise proves to be a marked commercial and as well as engineering success, and will net the Exposition a daily income of about $5,000 until its close.

Cornelius Vanderbilt and several members of his family spent the first week of September at the Exposition, and occupied their private car, which was switched on a side track in the terminal station. The public seemed to regard the car and its noted occupants as part of the Exposition, and seemed particularly desirous of inspecting both.

Transportation Day was recently celebrated in a peculiar manner. It began with a notable display of aquatic vehicles. There were launches of various types, rowboats, canoes, in fact all kinds of vessels,

(*Continued on page 198.*)

clean the plate after it has been inked. The first, L, is charged with the greatest part of the ink in excess, since the five others finish the business, and the last must preserve its cloth almost immaculate. If we suppose the plate properly inked for the first time, the following are the series of operations through which the continuous printing by the machine will be effected. Starting from the point, P, the plate passes under the rubbers, which, at this moment, are raised automatically and do not touch it. It goes under the cylinder, D, which has received a sheet of paper and which prints it at the moment at which the plate is passing beneath it, leaving the printed sheet in the hands of the pressman, while the plate continues on its way. It passes under the inking roller and afterward returns in an opposite direction. This time it passes under the cylinder, D, without touching it and reaches the rubbers, E, which are depressed and perform their office. It then rebegins its course in an opposite direction, and so on.

It is possible with this machine to print from 1,200 to 1,500 copies per day, while by the ordinary process scarcely a hundred can be printed. There is here, then, a real progress that will permit of giving more easily, and without too great an increase of cost, copper plate engravings in books and in journals that publish plates outside the text.—*La Nature.*

Notes from the World's Columbian Exposition.

(*Continued from page 195.*)

from the ordinary scow to the latest improved launch. Venice contributed a state gondola, upholstered and bedecked sumptuously, and rowed by six gondoliers, dressed in mediæval costumes, also ordinary gondolas and fishing boats. Crews of Ottomans manned several distinctive Turkish crafts; half-dressed Dahomeyan natives paddled two curious dugouts; Esquimaux displayed their skill in the use of kayaks; Quacktail Indians, from British Columbia, paddled about in one of their grotesquely decorated dugouts; and there were peculiar fishing boats from Norway, South Sea Island crafts, as well as boats from Ceylon, Java, Egypt, Brazil, Japan, and other corners of the earth.

The feature of the afternoon was a procession of land vehicles which represented nearly every country that has an exhibit in the Transportation building. The procession was headed by Turkish sedan chairs, African palanquins, and other vehicles carried on the shoulders of men. Then followed an array of donkeys and camels harnessed in saddles used in various parts of the world, and carrying loads of different kinds, the several drivers being dressed in their native costumes. The remaining part of the procession comprised several historical vehicles and a long line of carriages of the latest patterns, from phaetons to tally-ho coaches. There was the state carriage of Abraham Lincoln, a vehicle that looks odd now, because of its antiquated design, and which is the worse for wear, as its once beautiful trappings are now badly faded and time-stained, but nothing in the day's observance so stirred the hearts of the multitudes as the appearance of this vehicle. The state carriage of the late Dom Pedro, of Brazil, was also in the procession. A large display of bicycles ended the pageant. This same day was also California Day, and it was observed in characteristic style. In addition to the regulation exercises of speech making, etc., several car loads of fruit were given away. Great stacks of luscious-looking fruit occupied a large part of a lawn at the southeastern corner of the State building, and at the appointed time men endeavored to give it out in small packages to each applicant, but thousands of people jammed into the space, and the crush was so great that, finally, the fruit was distributed any way to get it into the hands of the surging crowd.

The great Schuckert search light, illustrated on the first page of the SCIENTIFIC AMERICAN of September 2, has a formidable American rival, which has just been placed on the colonnade between the Palace of Mechanic Arts and the Agricultural Palace. The reflecting lens is not quite as large as in the German lamp, but is designed to be more powerful. This lamp will require about 200 amperes of current. The upper carbon is 1¼ inches in diameter and 22 inches long, while the lower carbon is the same size, but only 15 inches long. The carbons are set in such relation to each other that the reflector absorbs all the light from the incandescence of the carbons as well as the light of the arc. The lamp is rated at about 100,000 candle power, and its light, when magnified by the reflector, will reach 200,000,000 or so candle power.

Harriet E. Wilson, writing to *Minerals*, tells of some of the minerals to be seen in the Palace of Mining:

"While looking at the carbonates—calcites and dolomites—I thought: Ah, nature, what art thou not doing! Converting such beautiful things out of limestone. There was a bird's nest with four tiny eggs in it, and a basket with pears and hazel nuts, all incrustated with lime, from Clermont, France, and formed by water flowing down over steps, the spray falling on the objects, and as it evaporates it leaves a deposit of carbonate of lime.

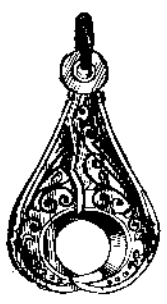
"There was a fine collection of minerals which are used as gems, cut, polished, and in cases. Also imitations of noted diamonds and a case showing the different styles of cutting diamonds. In Mr. Ward's collection are copies of celebrated gold nuggets, the largest of which is the Welcome nugget, found June 11, 1858, at Ballarat, Victoria, Australia, weighing 2,166 ounces, value $41,883.

"In the collection of Mr. A. B. Crim, of Middleville, N. Y., are sections of rock showing cavities containing carbon, calcite, and quartz crystals; quartz crystals doubly terminated; tube containing 1,000 quartz crystals, weight 3¾ grains, 128,000 to the ounce, all from famous Herkimer County.

"Speaking of crystals, every person should visit the crystal cave from the Black Hills, now being exhibited in Horticultural Hall, just under the mountain underneath the dome. The original cave is about twenty miles from Harney Peak. It has been explored fifty-two miles, and the admittance is $1. Here you can see it for nothing, and if you buy $10 worth of specimens or pictures they will give you a ticket admitting you into the cave any time within three years. The entire exhibit is for sale at $50,000.

"Iowa has a coal mine, miner at work, and car loaded with coal: coal value, 1892, $9,800,000; production, 1892, 7,000,000 tons. Model of the Centerville coal mine of Appanoose County. Mantel piece, fireplace, and hearth, with ornaments, made of wave marble; slab unfinished; ores of iron, lead, zinc, or dry bone. A specimen of lead weighs 500 pounds; was at the New Orleans Exposition. Geodes from Keokuk; marble from Warekauase; paper weights and book weights made out of bird's-eye marble, fish-egg, and cat's eye. Mottled stone, color brown and white; variegated sandstone, white and red; glassware made from Iowa sand, white, blue, black, and green. Clays in jars. A monument made of Iowa cement; magnesian limestone, lithographic stone, and yellow sandstone; clays, bricks, and tiles before and after burnt."

A CONVENIENCE FOR SMOKERS.



A neat and quite ornamental little device, designed to serve as a convenience for smokers, is manufactured by Messrs. Enos, Richardson & Co., of Maiden Lane, New York. It is a sterling silver cutter for removing the ends or tips of cigars, before one lights the cigar. As will be seen by the picture, it may be hung on a watch chain, where it will be always ready for use.

The Use of Salicylic Acid as a Preservative.

As the time arrives for the collection of fruits, the question, "How shall we preserve our crop for winter use?" comes up again for consideration. That it is not yet settled to every one's satisfaction is sufficiently evidenced by the number of questions on the subject which appear every autumn in the papers partly or entirely devoted to domestic interests. A variety of plans are suggested for preventing the fermentation or moulding of fruits and preserves. Thus, some lay great stress, in preserving whole fruits, upon the selection of only the soundest material; upon treating it at once; upon heating it, covered with sirup, in glass vessels, etc. Unfortunately, even when all precautions are taken, the result is by no means always satisfactory. Another practice much recommended at one time was that of pouring chloroform over the fruits and hermetically sealing. This plan seemed to answer very well until it was found that the chloroform communicated a curious flavor to some fruits, which no amount of cooking could remove.

Then, with regard to jams, the same difficulty has been experienced. The proneness of these preparations to change is well known, and attempts have been made to minimize it by a number of devices more or less successful.

In salicylic acid, however, we have a ready means of preventing such loss of material and the consequent annoyance and disappointment. In the proportion of 4 to 8 grains per pint or pound, salicylic acid prevents fermentation and the formation of mould in any saccharine liquid. Fruit juices of all kinds, jams, preserves, and the like can be in this manner kept unchanged for years.

Experiments have shown that apple and pear *compote* prepared with only a small quantity of sugar (1 lb. to each 5 lb. of fruit), after ten months, during which time the vessels had been frequently opened and various portions removed, showed no trace of mould or acidity, or of fermentation. Similarly, cherries and blackberries may be preserved with from one-fifteenth to one-tenth their weight of sugar; in the presence of a small proportion of salicylic acid they keep from one year to another with unaltered taste and quality.

With regard to the manner of applying the preservative, it may be added as it is to the jam in the process of preparation. It is advisable to gradually introduce it in the solid state into the boiling mass with constant stirring, or the acid may be rubbed down smooth with a portion of the fruit juice and then added to the whole. In any case the finished product ought not to show any white flocks.

A peculiar method of preserving with salicylic acid is to pour over the cold uncooked fruit the cold salicylated juice of the same fruit, so that the former is entirely covered. The cold salicylated juice is prepared by pressing out the fruit, heating the juice, adding to every pound 15 grains of salicylic acid, and allowing to cool. In this way fruits, such as cherries, plums, etc., can be preserved through the winter uncooked, so that they are suitable for any and every kind of application, even for use in pies.

The advantages of salicylic acid in the preservation of fruits and fruit preserves may therefore be summed up as follows. If properly applied, it is always successful; it does not communicate any unpleasant flavor to the preparations; it is in no way injurious to the consumer, being present only in minute quantities.—*Chem. Tr. Jour.*

Photographic Discovery of Asteroids.

One of the most remarkable of recent astronomical developments is the result of the application of photography to the discovery of asteroids or minor planets.

By the old methods of search the annual rate of discovery ranged from one to twenty, the average for the twenty years, 1872-91, being 10·2. In 1892 twenty-nine were discovered, two only by the older method, while between Jan. 1 and April 15 of the present year twenty-five were picked up by the two observers, Wolf, of Heidelberg, and Charlois, of Nice, who have pressed the camera into service.

The negatives are made with an exposure of from three to five hours, each covering an area two or three degrees square. On the plate the images of the stars are round, clean, while any planets or planetoids which may be present are at once recognized by the elongation of their images due to their orbital motion; and three or four of these oblong lights are sometimes found on a single plate. If the number of observers using this method should be much increased, the number of annual discoveries may easily mount into the hundreds. The total number of these little bodies which circulate in the space between Mars and Jupiter stands at 375 so far as now known, but it is almost certain that those still undiscovered must be counted by the thousand, and obviously it will soon be hopeless to attempt to keep the run of them all.

We may reasonably suppose that all the larger ones have been already discovered and that those still remaining are all extremely minute. It is true that from a certain defensible standpoint the size of a planet has nothing to do with its astronomical importance. Mathematically considered a planetoid's orbit is just as worthy of investigation as that of Jupiter itself, but practically it is plain that the computers will be obliged to select a limited number which present special points of interest and confine their attention to them alone.—*Prof. C. A. Young, in Inter-Ocean.*

Philistine Records of the Hebrew Invasion.

Science contains an interesting account of the Tell-el-Amarna tablets, from the pen of the Rev. Thomas Harrison, of Staplehurst, Kent. These tablets, 320 in number, were discovered by a fellah woman in 1887 among the ruins of the palace of Amenophis IV., known as Khu-en-Aten, between Missieh and Assiout, about 180 miles south of Cairo. They have been found to contain a political correspondence of the very greatest interest, dating from some 3,370 years back. Many are from Palestine, written by princes of the Amorites, Phenicians, Philistines, etc., the burden of almost all being: "Send, I pray thee, chariots and men to keep the city of the King my Lord." Among the enemies against whom help is thus invoked are the *Abiri*, easily recognized as the Hebrews. The date fixes that of the Bible (1 Kings vi. 1) as accurate. Many names occur which are familiar in Scripture, as, for example, Japhia, one of the kings killed by Joshua (Josh. x. 3); Adonizedek, King of Jerusalem (ditto); and Jabin, King of Hazor (Josh. xi.) Very pathetic are the letters of Ribadda, the brave and warlike King of Gebel, whose entreaties for aid are observed to grow gradually less obsequious and more businesslike as his enemies prevailed against him, robbing him eventually of his wife and children, whom he was powerless to protect. But the greatness of Egypt was waning under the nineteenth dynasty; enemies were pressing her at home, and the chariots and the horsemen went not forth.

Cholera a Nitrite Poisoning.

Emmerich and Tsuboi, according to publications in the *Munchener med. Wochenschrift*, come to the conclusion that cholera is a nitrite poisoning, basing their conclusions upon the facts that the cholera bacillus is able to a greater extent than any other bacillus to reduce nitrates to nitrites and the internal administration of nitrites in quantity of 0·5—0·6 gm. is capable of producing very similar physiological effects in man. While other varieties of bacteria are capable of forming nitrites, none of these thrive in the intestines.—*Apotheker Ztg., 1893, 322; Amer. Jour. Pharm.*