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ANIMAL VACCINATION.

It is questionable if any recent remedy has attracted more attention in the popular and medical worlds than has diphtheritic antitoxine. This as prepared by Dr. Roux, at the Paris Pasteur Institute, is the serum of the blood of an animal which has been inoculated with the diphtheritic virus. This serum injected into the human system possesses strong immunizing and curative properties for diphtheria. In our issue of November 17, 1894, we published a description of the remedy, with illustrations of its preparation and of its administration. The success of antitoxine has been so great that the new name of "serum-therapy" has been coined to express the type of treatment of which its administration is an example.

In the same laboratory, that of the Pasteur Institute of Paris, of which Dr. Roux is one of the chiefs, another class of preparations has been studied, of which one has been highly perfected and is now being introduced into this country. This is the vaccine preparation for the prevention of anthrax. This disease, much dreaded in cattle, sheep, horses and mules, has, in some infected districts in Germany, been known to kill as many as 60 per cent of a herd of cattle in one year, while in districts where anthrax has a constant existence the average annual mortality is put as high as 20 per cent. For Europe the annual loss is calculated as being \$20,000,000 in amount. The disease in this country is known as blackleg, splenic fever, blow striking and by various other names. In Germany it is termed "milzbrand" and in France "charbon." It occurs more frequently in the United States than is generally supposed. It is dreadfully fatal. An animal stricken with it may die immediately or within twenty-four hours.

Pasteur began his researches on the disease fifteen or more years ago. He found that the only agent of the disease was the introduction of a microbe into the blood. One of the first problems to be solved was the method of its transmission from animal to animal and the cause of its inveterate persistence in infected districts, and its apparently unaccounted for appearance in others. The theory he formed and proved was that the bacillus remained alive in the soil. While this would seem to dispose of it for good and all, he recognized in earth worms, in the same annelid to which Darwin attributed such beneficial qualities, the cause of the dissemination of the disease. These worms, carrying up within their bodies earth from the strata of soil some inches below the top, discharge it on the surface. It is these little pellets of fresh earth from the lower strata that Darwin found to be so advantageous for plant life. While undoubtedly so, Pasteur found in the same pellets of earth the bacillus of anthrax, which, except for the worms, might have disappeared forever, being carried through the soil by the filtration of rain water.

Pasteur's studies of the anthrax bacillus extended over some six years, and in their prosecution some 40,000 animals, guinea pigs and rabbits for the most part, were sacrificed. In 1882 he produced the "vaccine." It is obtained by bouillon cultures. It is found that a culture of deadly strength on standing gradually grows weaker. By charging a set of second cultures by one weakened by standing, any number of cultures of that precise strength can be got. Thus, by repeated culture processes, vaccine of any desired strength can be obtained.

The Pasteur vaccine is found to be an absolute preventive of the disease; it is not curative, the disease is so sudden and fatal that once an animal is seized by it nothing can be done. The vaccine is now supplied in peculiarly shaped bottles adapted for the withdrawal of the contents to the last drop by a graduated hypodermic syringe. Cattle are vaccinated against anthrax by two successive hypodermic injections with lymph of two strengths at twelve days' interval.

Very elaborate tables have been made of the results of anthrax vaccination in France and other European countries, and they have shown in both sheep and cattle the most remarkable results.

Of the vaccinated sheep in France during the twelve years, 1882 to 1893, when over 3,000,000 were vaccinated, the loss has been reduced to 0.69 per cent, when formerly it had been 10 per cent. Among cattle, the average loss had been 5 per cent; it has been reduced among 438,824 animals vaccinated during the same period to 0.18 per cent. Over 10,000,000 animals have now been vaccinated in Europe. Our laboratories are preparing the vaccine in France, Germany, Austro-Hungary, Italy, and Russia. The anthrax vaccine has been introduced into Australia, where in New South Wales alone some 120,000 animals were vaccinated in 1893. For a long time the stockmen had complained there of a disease that originated in Cumberland County, and hence termed "Cumberland disease." Some of Pasteur's assistants, while working on another research in Australia, had their attention called to this malady, whose ravages were becoming very great, and identified the disease as being anthrax. This was in 1888. The losses in some cases amounted to 30 per cent. This brought about the introduction of the vaccine, and five years later the anthrax vac-

cine, as used in Australia, was reported on by the United States consul-general in Australia, by special direction of the State Department, and his report shows the most gratifying results.

The vaccine is now made in the Pasteur laboratory, in Paris, under the supervision of M. Chamberlain, one of Pasteur's eminent colleagues, but it is hoped soon to have a laboratory established in this country for the preparation of all the remedies and diagnostic preparations now made in Paris. Among the latter is the Koch tuberculine, of which so much was expected at one time in the cure of consumption. It is now used as a diagnostic reagent to determine the presence of tuberculosis in cattle. When such is discovered, it, of course, will lead to proper isolation to prevent the spread of the disease. Another reagent is mallein, used as a diagnostic for glanders. Both the latter are cultures of bacilli, and may arrest the disease in its early stages, although they are only supplied at present for purpose of diagnosis or recognition of disease.

Cheap Coal.

The great distances from our seaboard at which our chief bituminous coal fields are situated, says the Engineering and Mining Journal, have been held, by foreigners especially, to preclude the possibility of very cheap coal in our ports. The extremely low transportation rates on our railroads have, however, offset the long hauls, and we have recorded a price of \$2 per ton f. o. b. Newport News and Norfolk, Va., for coals coming over the Chesapeake & Ohio and Norfolk & Western roads with a haul of fully 400 miles. As the prices paid for the coal at the mines were then about 80 to 90 cents per ton, this left only \$1.10 to \$1.20 for hauling and terminal charges, or about 1/4 cent per ton-mile for hauling. These extraordinary figures created much comment abroad, and brought orders to this country that had formerly gone to England.

Equally low prices were taken for Alabama coal f. o. b. Pensacola and Mobile, but the haul is shorter and the railroad rate a little higher.

We confess we considered \$2 a ton f. o. b. at our tide water ports as being a minimum, below which it would be almost impossible to go, nevertheless, this record has recently been lowered. Good steam coals have recently been sold f. o. b. Newport News at \$1.80 per ton of 2,240 lb., and Clearfield coal has been delivered f. o. b. Philadelphia at \$1.75 if not at \$1.70 per ton, the haul being less than 300 miles.

With coal delivered in the railroad cars at the mines for from 60 to 70 cents a ton and railroad freights at 2 1/2 to 3 mills per ton-mile it would seem as if the very bottom had been reached. These rates leave no fair return to capital invested in either mines or roads; it is not surprising, therefore, to find reductions being made in wages at some of the mines. On the other hand this remarkably cheap fuel benefits manufacturers, who are now quite active and are extending their markets in all directions both abroad and at home.

The Influenza Epidemic in Europe.

The present outbreak of influenza seems to be rapidly extending, and to be resembling in its far-reaching spread the visitation of five years ago. Thus it has become extremely prevalent in St. Petersburg, in Christiania, Copenhagen, and Berlin, and on the whole its line of spread has been rather from west to east than at the period referred to, when it may be remembered its rather uniform advance across Europe from the east led it to be generally termed "Russian influenza." On this occasion England would almost claim the unenviable position of being the starting point for the pandemic. Especial mention has been made during the past week in local newspapers of its great prevalence in Rochdale, in Cheshire, and in North Wales, but in point of fact there is no doubt that it is widely prevalent in almost all parts of the kingdom. Its ravages in Dublin and Newry are referred to by our correspondents in Ireland.

The registrar-general's returns for the week ending March 16 show a diminution in the number of deaths directly attributed to influenza—349, as compared with 473 in the preceding week; while there has also been a decline in the deaths from respiratory diseases, viz., from 1,366 to 1,031, the latter being, however, in excess of the corrected average by 507. The general mortality rates of the thirty-three great towns in England and Wales show mostly a diminution as compared with last week, there being only three towns in which the estimated annual death rate for the week was 40 or more per 1,000, viz., Preston, 40; London, 41.2; and Brighton, 48. The exceptionally high rate at the last named town, exceptional both comparatively and actually, may perhaps be ascribed in part to the immigration of influenza sufferers to this famed resort for convalescents. In the February summary issued by Dr. Seaton, the medical officer to the Surrey County Council, reference is made to the rapid extension of the disease during that month; including an interesting statement by Mr. Child, M.R.C.S., of New Malden, to the effect that, whereas in January there were 89 cases of influenza in a population of 3,437, in February there were 461 in the same population—i. e., nearly one-seventh.—Lancet.

Arrastra—"The Poor Man's Mill."

According to the Mining and Scientific Press, stamp mills and roller quartz mills have not wholly taken the place of a means of crushing quartz, crude but effective, still in use in some parts of California. Reference is made to the arrastra—"the poor man's mill," which, as well as the Chilean mill, a development from it, are not extinct, as arrastras are now in operation in Kern County. One is worked by horse power, one by water power and one by steam power, which in itself is considerable advance over the burro power of Old Mexico, and whilom of sections farther north.

There isn't much said about arrastras, and where there is a big mine, or a mine not so big, but some capital, there needn't be, for an arrastra seems as slow and stupid as the donkey that drives it in its native place, but, primitive as the arrastra may seem, and weakly productive in comparison to roller or stamp mill, it has an honorable though humble record, and has ground out many a dollar's worth of bullion in its simple old way.

With all its crudeness, it deserves a word of praise. Unlike some mills, it never beats the company; the battery assays and car assays agree; the ore owners know that what goes in comes out, and there is no addition, division or silence. And with free gold it will hold its own with many a costly mill.

It costs very little to set up; the running expenses are light; it rarely breaks down, and when it does can be cheaply and quickly fixed up; it needs little housing, watching or insurance; it can be built by the owner, who can be his own engineer, millman, foreman, amalgamator, feeder and boss, and the one man who combines all these positions can break the rock and keep the burro or the mule or the horse going all at once. Nothing blows up, and unless the mule gives out there isn't much prospect of loss; the amalgamation is usually satisfactory, and while there isn't much science or style about the outfit, there's considerable common sense and often lots of profit. It is not recommended as a superior article; it bears the same relation to better, faster, finer appliances for the same purposes that a country blacksmith shop does to the Union Iron Works, but "it beats nothing all to pieces," and in many an isolated mine would pay better to work ore than to have the owner sitting around "waiting for capital" to develop his claim, and thus work out his own salvation.

The arrastra is slow but sure. It is built in a primitive way, solidly and securely, its two greatest drawbacks being its limited capacity and liability to waste.

Judge Sumners' Kernville arrastras are in a granite country, much of it with feldspathic veins or dikes crossing, the arrastras occupying the site of a twenty-stamp mill built thirty years ago, but long since entirely removed, with the exception of the battery blocks.

The arrastras at Smartsville and Mooney Flat districts, Nevada County, are twelve feet across and three feet deep. The bottoms are paved with hard, rough-dressed rock, laid evenly in cement and sixteen inches in depth. The center post is fourteen inches square, eighteen inches high, the post having four arms, to each of which is attached a heavy drag. The drags are heavy diabase blocks clamped to the arms, so fixed as to cover all parts of the pit as they go round. Each block weighs from 700 to 1,200 pounds. About seven tons of gravel are run in from a car or a chute, water being added to keep it from caking, and the arrastra run very slowly till the mass is of a "thin mush" consistency, when a speed of about fourteen revolutions a minute is attained (this arrastra ran by steam power). After an hour of this the gate is opened and the charge run into the 200-foot sluice containing the riffles, the sluice being cleaned up weekly. The result for cement or soft top gravel gave satisfaction, the cost of milling being eight cents per ton.

In the regular old-fashioned Mexican arrastra, run by a burro, the bed is built of paving stones laid on a puddled clay five inches deep, set closely, the joints tamped with clay; in the center a large-sized stone as a step for the "peon" or pivot, made of two pieces of timber, 4 x 8, clamped together. A hole is bored in the bottom and a piece of round two inch iron worked off to a rounded point at the lower end, inserted. Through the peon at right angles are passed two pieces four-inch square, one extending horizontally seven feet six inches, to which the burro is hitched; to the other is attached the mullers or grinders. These are of rough stone, prismatic in shape, thirty-six inches long and about fifteen inches wide, so dressed as to throw the center of gravity well toward the base. At the upper end of each stone's front face two six-inch plug holes are drilled, in which are fitted plugs of dry sugar pine, which, when wet, swell and are immovable. The outside edge of one stone works a little in advance of the inside edge, thus throwing the charge toward the center. Of course, in setting the other stone, this arrangement is reversed.

The upper end of the peon is fixed in a four-inch pinion, which works in a bearing collar made of wood 2 x 8 inches; the collar is mortised near each end 1 x 3 inches, corresponding holes being made in the

other timber and the two secured by a wooden link and pins. With such an arrastra a six hundred pound charge is usual and the patient "manana" worker gets enough to satisfy his needs, his chief lookout being to see that no grease gets near his machine.

The Chilean mill is sometimes associated with the idea of the arrastra, from which it may be considered to have been developed. It is to all intents and purposes a millstone set on edge and so arranged that it will revolve in a circular track, the axle upon which it revolves being pivoted at one end, the mule hitched to the other. As an expedient in out-of-the-way places, the Chilean mill and the arrastra both serve a purpose, the Chilean mill reducing the assorted spalled ore to pea size, thence to the arrastra, where about one-half the charge is first placed and thoroughly moistened as the peon revolves, about two and one-half ounces of quicksilver being added as the grinding progresses, and the remainder of the charge is put in. From twelve to sixty hours is the limit for grinding, which depends on the nature of the ore and coarseness or fineness of the gold, amalgamation in the case of coarse gold being sometimes reached in twelve hours and in the case of fine gold requiring even more than sixty hours. The accompanying apparatus for settling, retorting, etc., is necessarily rude, but in most cases effective. In this brief notice of a primitive gold producer no attempt is made to give the detail of setting up or working, the subject being treated in outline in the most general way.

The Canadian Pacific.

The annual report of the Canadian Pacific Railway Company, for the year ending December 31, 1894, shows the results of a year which has proved quite as disastrous to the Canadian Pacific as it has been to the railroads on our side of the line. The earnings of the road had been increasing steadily till 1893, when this advance is ended, and for 1894 they show a large falling off.

The president in his report, assigns as the first cause of diminished earnings the low price of wheat and of all other agricultural products, from which followed a scarcity of money among farmers and the contraction of business throughout Canada. An additional heavy loss was sustained in an important period of the year just at the beginning of the summer passenger business, from the floods in British Columbia, which stopped through traffic to and from the Pacific coast for forty-one days, from May 26 to July 6. The damage from these floods is not all made good yet, and the year's results suffer by \$550,000 in cost of repairs, extra expenses and loss of earnings.

The Pacific steamships show an increase in profits of \$80,467, but all of the other allied businesses, that is, telegraph, express, sleeping cars, grain elevators, lake steamers, hotels, etc., show diminished profits. The sales of land suffered more than anything else from the bad conditions, and indeed they almost ceased.

But, in addition to these forms of loss, the company has been subjected to very heavy burdens on another side. Its two subsidiary lines, which were acquired with the intention of providing important feeders from the territory of the States, have met with heavy losses, and, under its guaranty of the obligation of these roads, the Canadian road has had to advance \$456,187 for the Duluth, South Shore & Atlantic and \$694,487 for the Minneapolis, St. Paul & Sault Ste. Marie. Again, besides all this, the interest on the land grant bonds due the government for the last year is now for the first time entered as part of the fixed charges, and to this item is added the accumulated interest of these bonds for the past. The sum of this amounts to \$2,769,347.

Two years ago \$4,000,000 was deposited as a special fund applicable to dividends, and it was partly the existence of this fund which made it seem so strange that the company should pass its January dividend. But it is now seen that a large part of this fund had been already taken during this year, not only for the August dividends, but for payment of the balances due the subsidiary roads, for interest on land grant bonds. The only other courses possible to meet these charges were to sell securities belonging to the company, which could only have been at a great loss under the present situation, or to incur a heavy floating debt. This latter course would be in direct contradiction to the policy of the road during its whole lifetime. Consequently, the special reserve fund has been diminished, and after charging off the above mentioned items and the deficit of \$526,731 for the last year, there is left a surplus of \$2,739,792, as against \$7,261,213 on December 31, 1893.

The Winter Dock of the Petrel in China.

The U.S.S. Petrel wintered at Newchang, 13 miles up river from the mouth of the Liao, a stream that is so filled with moving ice that it is impossible for a vessel to lie in it. A dock was cut in the soft mud of the bank, and the vessel floated in at high tide. The entrance was closed with piles, and the vessel allowed to settle, shores being used to keep her on an even keel.

Artificial Silk.

Consul Germain, of Zurich, under date of December 17, sends the Department of State a description of the artificial silk produced by the process of Dr. Lehner, of Zurich. This description, obtained from the inventor, is substantially the same as that published in Consular Reports No. 171 (December, 1894), page 538, under the heading "Artificial Silk in England." The following additional matter is supplied by Consul Germain and is published in Consular Reports for February, 1895, No. 173.

The process is patented in the principal European countries. Patent has also been applied for in the United States, and in the English colonies of North America, where a company with a capital stock of \$1,500,000 is in course of formation. A company for the acquisition of the patent rights in European countries and the British colonies (except British colonies in North America), owned by Dr. Lehner, was formed in England last July with a capital stock of \$540,000. The patent rights were then purchased, Mr. Lehner receiving \$160,000 in cash and \$180,000 in full paid-up shares, thus leaving \$200,000 of working capital to carry on the manufacture of this artificial silk.

The intention was first to manufacture the raw material in England, but as a large quantity of alcohol is consumed in its manufacture, and the tax on alcohol in England is almost prohibitory for manufacturing purposes, the company decided to establish the factory in a country where spirits used for the arts, science and manufacturing purposes are untaxed. The plant was therefore established at Glattbrugg, near Zurich, under the supervision and management of Dr. Lehner, who, in addition to being a heavy stockholder, receives a nominal annual salary of \$2,919.60 for his services. Here alcohol consumed for such purposes is untaxed.

The artificial silk is thus forwarded in a raw state to England and there manufactured into textile fabrics.

Dr. Lehner says that it is the intention to manufacture this artificial silk in America, provided alcohol used for its manufacture is tax free; otherwise, it will have to be manufactured in Switzerland and then forwarded to America as raw silk, to be there manufactured into textile fabrics. He also says that so far his English company has not come into competition with the real cocoon silk, his articles being mostly used to mix with cotton and wool, but, of course, there is no telling how sharp a competition this artificial article will bring against real silk in the future.

I give below a copy of part of the prospectus issued by the English company during its formation period (July, 1894), which may throw additional light on the subject:

Lehner's artificial silk is a new material for use in textile manufacture, possessing distinct and valuable characteristics, which render it unique among all fibers hitherto existing. As the result of study and analysis of the natural methods of production of silk by the silkworm, the inventor has, by simple chemical and mechanical means, closely and successfully reproduced a natural process. Wood pulp, cotton, or jute waste, etc., are chemically digested and the liquid product is spun by a mechanical silkworm to a thread of even diameter throughout and of unbroken and unlimited length. The same machine which draws the threads from the liquid twists these threads in any desired number into the requisite "count," or thickness of yarn, in one uninterrupted and continuous process with perfect regularity. The machine is inexpensive and extremely simple. It can be run day and night without intermission, and requires but little power and attention.

The principal features of this process are (1) never failing supply of the raw material; (2) practically uniform price of same; (3) simplicity of machinery, so as to avoid risk of breakdown; and (4) no skilled, and only a small amount of low-priced, labor is necessary.

The production of Lehner's artificial silk is entirely independent of climate, temperature, special soil, or cultivation.

Lehner's artificial silk has been spun in Bradford, and has been worked up in a large variety of fabrics. In the dyeing, weaving, and finishing of these sample fabrics, no special treatment has been necessary. Unlike most vegetable fibers, Lehner's artificial silk can be dyed in all colors, and the shades obtained excel in brilliancy and delicacy those of the finest natural silk.

For softness and beauty of appearance the new material equals the best Chinese and Italian silks. By its use, therefore, in combination with cotton, wool, or natural silk, brocaded and other ornamental and decorative results can be obtained, which have hitherto been unattainable except by the employment of the finest frans, and the expensive character of these necessarily limits their sale for this purpose. The cost of Lehner's artificial silk being small, it follows that that fiber will open out a large and profitable new field to manufacturers, affording encouragement to them in the production of an unlimited variety of both choice and salable novelties in fabrics of almost every description.

The Meat Exports of the Argentine.

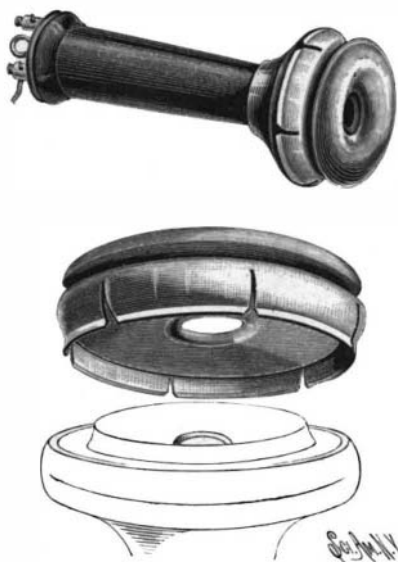
Last year England imported from abroad live stock and dead meat valued at something in excess of \$116,000,000. To the items which made up this large total the Argentine Republic contributed 1,675,600 frozen sheep, 90,000 live sheep, 29,000 quarters of frozen beef, and 28,000 live bullocks. It is alleged by those who have practical experience of the matter that in no other country in the world can cattle and sheep be produced and fattened as cheaply as in the Argentine, on account of its exceptional climate and rich natural grasses, very little artificial food being required, and the winter being so mild that the animals can be fattened in the open air in wire-fenced paddocks. During the last 15 years the best English pedigree cattle have been introduced, thousands of Shorthorn and Hereford bulls have been used, and a great proportion of the criollo cattle have been transformed into magnificent crossbreds. The heaviest of the native criollo cattle are kept on alfalfa in the provinces of San Juan and Mendoza for some time, and are then driven across the Andes into Chile. A better class of animal, cross-bred, weighing on an average about 1,150 lb. live weight, is sent to Rio de Janeiro and some other Brazilian ports, while the best, heaviest and fattest animals are shipped to England. This export of live stock has suddenly become of great importance, the official value of live cattle and sheep exported from Argentine ports in 1894 being over \$5,000,000. The English butchers find fault with the Argentine cattle as shipped at present. They are too wild, and are badly selected, cattle of all ages, sizes, and descriptions coming together. Moreover, they are purely grass-fed, and consequently the beef, though good, has not as bright a color as the North American corn-fed meat, and sells at from 1/2d. to 1d. per pound lower than its great rival. The sheep are better, and the butchers classify them the same as Canadians, and pay the same price for them—6d. per pound, sinking the offal.

Frozen Pneumatic Tubes.

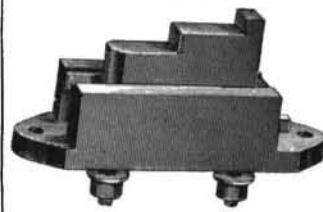
During the recent frost in London the proper working of the pneumatic tubes connecting the Central Telegraph Office with the various City and West End receiving and branch offices served by tube has caused great anxiety to the postal telegraph officials. A large number of carriers have from time to time been stopped in the tubes owing to the accumulation of ice, and these have in a few cases been freed only after considerable trouble. Many of the tubes were kept open night and day, and a current of air kept flowing through them. This air, heated by compression in the pumps, has been a very great help. In the event of a carrier stopping in the tube, another carrier partly filled with salt has been sent after it. The impact causes the salt to scatter against the imprisoned carrier, and the non-freezing mixture so formed quickly sets it free.

A CUSHIONED EAR PIECE FOR THE TELEPHONE RECEIVER.

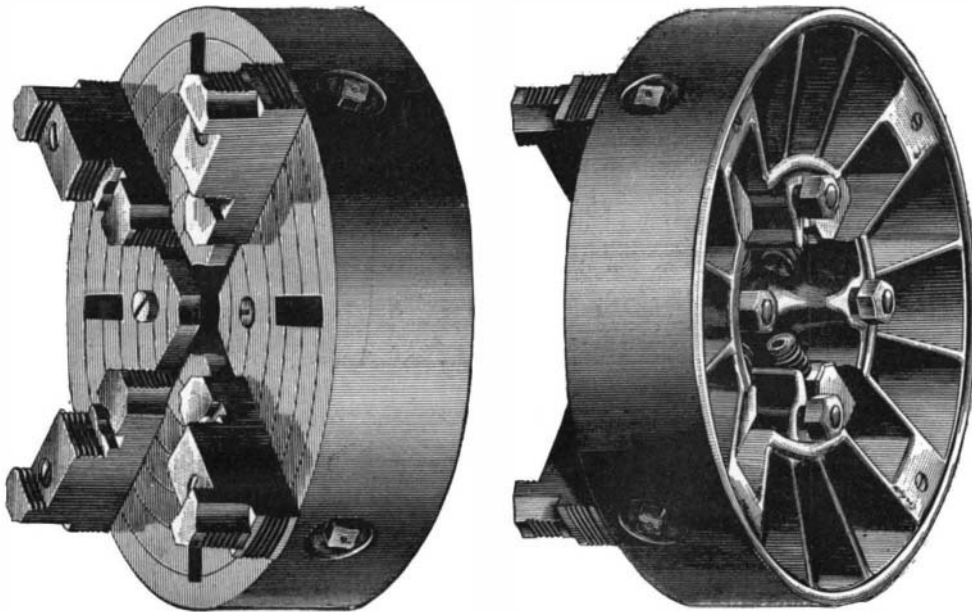
The illustration represents a simple pneumatic cushion adapted to fit all telephone receivers, and indicates the manner of placing it upon receiver. It is made of soft rubber, fitted into a metal rim which springs or clamps over the end of receiver, forming a complete air chamber designed to effectually prevent the buzzing or clucking sounds so annoying to users of the telephone. The improvement is being introduced by Mr. C. Maynard Evans, 107 to 109 World Building, New York City. Its touch to the ear is soft, and the distance to the ear drum is more conveniently regulated than with the ordinary hard rubber receiver. It has been adopted and is in use in many of our banks and public offices, scores of large new office buildings, etc.

**A NEW CHUCK.**

The illustration represents an improved chuck for heavy work, having a larger number of shell braces, a thicker face to the shell, and a greater depth to the chuck than the "National chuck," made by the same manufacturer, William Whitlock, of No. 39 Cortlandt Street, New York City. The dishing of the braces is such that the chuck may be mounted close to the bearings of the lathe, causing the least possible overhang, and the screw heads are recessed, so the workman can stop the chuck by the rim without injuring his hand. It has a reversible jaw. The small figure shows a new face plate



FACE PLATE JAW.

FACE VIEW. BACK VIEW.
WHITLOCK'S NEW "WESTERN" INDEPENDENT CHUCK.

jaw of the same manufacturer. It carries the regular "National" solid jaw, and is designed to take the place of the larger chucks where the character of the work permits of its use.

A SECTIONAL WATER TUBE BOILER.

In this boiler are embodied the following essential points: It is simple in construction; is easily repaired by any ordinary mechanic; affords perfect circulation; has a large amount of heating surface in proportion to its weight. All parts are readily accessible for repairs and cleaning, and it is non-explosive. It has been patented by Mr. Samuel P. Hedges, of Greenport, L. I., N. Y. The boiler has two mud drums, into which the vertical sections of the fire box tubes are tapped, horizontal sections forming the crown of the fire box, and being tapped into a fire box header or drum, which connects with a cross drum. On each end of the cross drum is a pipe connecting with the mud drums. This pipe is to supply the heating section farthest away from the center, where supply enters from fire box drum. The small figure represents the manner of connecting the heating sections to the cross drums. The flanged end on the tube enters the socket formed in the header and seats on an asbestos ring. The sleeve on pipe is screwed into the boss on the flanged end of tube, thus making a tight, strong joint. This connection at top and bottom of each section makes it easy to remove and replace any section that may require repairs and take it out into the fire room through the front connecting doors without disturbing any part of the casing, or a washer may be put in the opening and the collar screwed down while repairs are being made, without affecting the operation of the boiler. Feed water heaters are placed on the top of heating section (not shown in cut) of such size as to allow the feed water to enter the boiler at the boiling point. These boilers are designed for 200 lb. steam pressure.

A CURIOUS fact has been noted by Arctic travelers—snow when at a very low temperature absorbs moisture and dries garments.

The Illinois Eight Hour Law.

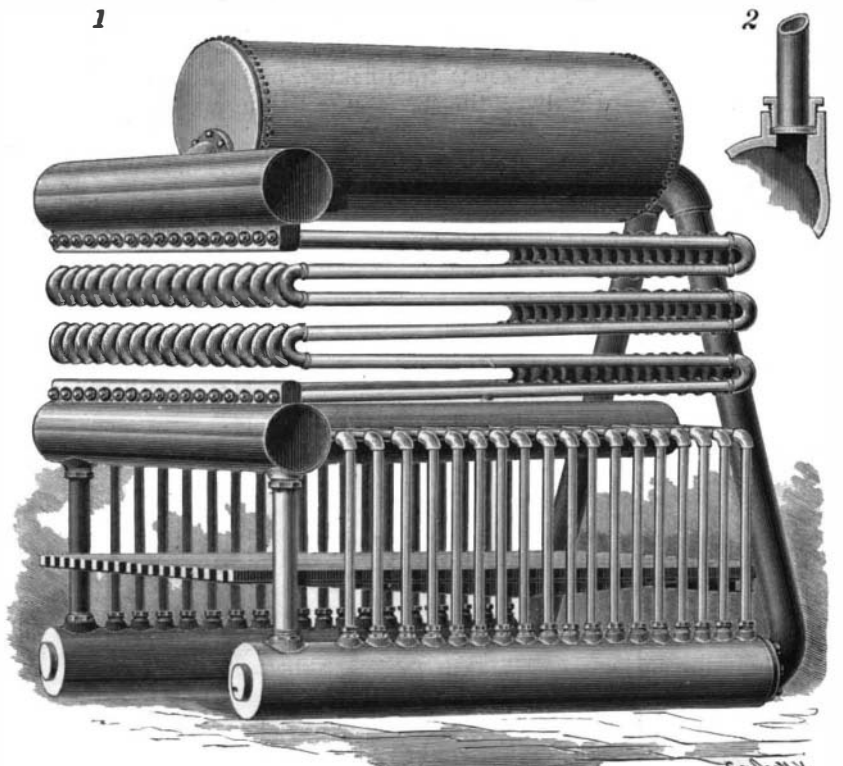
The Supreme Court in Illinois has declared the eight hour law of that State unconstitutional, and a similar decision against the progressive inheritance tax of that State. As to the Ohio decision, we have not yet seen any report full enough to enable us to pass judgment upon its merits. The Ohio law, it will be remembered, levied a tax ranging from 1 per cent on estates above \$20,000 to 5 per cent on estates above a million. But the fact that the law was good does not indicate that the decision against it was bad, for the Ohio constitution contains a general provision that citizens shall be taxed in proportion to their property, and this inheritance tax law may run counter to the phraseology of the constitution. The Illinois decision is of greater importance, because the principles laid down by the law provided that no woman should be employed in any factory or workshop more than eight hours in any one day or forty-eight hours in any one week. The court held that "This re-enactment is a purely arbitrary restriction on a fundamental right of the citizen to control his or her own time and faculty. It substitutes the judgment of the legislature for the judgment of the employer and employe in a matter about which they are competent to deal with each other. . . . The right to make contracts is an inherent and inalienable one, and any attempt to unreasonably abridge it is opposed to the constitution." The court also condemned the act because it applied only to women, and seemed to apply only to certain occupations.

Darwin G. Eaton.

Dr. Darwin G. Eaton died in Brooklyn, N. Y., March 17, at the age of seventy-three years. He was one of the best known teachers in the country, and for many years he was the leading professor in the Packer Institute, of Brooklyn. As a scientist Dr. Eaton will be chiefly

remembered for his researches on volcanoes, as he made a life-long study of them, and visited Vesuvius several times, as well as Mauna Loa. He was born at Portland, N. Y., and graduated at the State Normal School in 1846. In 1851 he accepted a professorship in the Brooklyn Female Academy, which afterward became the Packer Institute. He held this place until 1883, when ill health compelled him to retire. He had been devoted to astronomical studies all his life, and had participated in many governmental scientific observations of solar and lunar eclipses. He was a member of many learned societies, and received the degrees of M.A., M.D. and Ph.D.

MR. GEORGE P. LOW, in the February issue of the Transactions of the American Institute of Electrical Engineers, concludes that the art of rail bonding now appears to have been perfected, and the damage that



HEDGES' WATER TUBE STATIONARY OR MARINE BOILER.

has been caused by corrosive electrolysis may be attributed to defective bonding, for without doubt proper main-to-track, rail-to-rail, and track-to-dynamo bonding will cure the ill almost without exception. The problem of eliminating electrolytic corrosion is, in brief, simply one of judicious bonding.