UNITED STATES LARGE CALIBER MORTARS.

Among the government exhibits at the Columbian Exposition, Chicago, were modern mortars, showing the many improvements which have been adopted within the last few years. We illustrate one of these great weapons, which was seen at the Fair, mounted upon a Canet carriage. The old-fashioned mortar was about as simple a device for war purposes as could be made, but not very accurate in its delivery. It was chiefly operated by guesswork, and its results were apt to consist more of noise than disaster.

The additions of modern machinery have greatly contributed to the accuracy of firing, and this now renders the weapon very formidable. By the use of hydraulic cylinders the recoil is so taken up that the direction of the shot is not disturbed by the recoil, while the elevating, lowering and revolving mechanism is of such a nature that the aiming of the mortar is accomplished with the utmost rapidity and accuracy. For harbor defense these mortars are of especial value. It is believed that no vessel afloat could endure the explosion on its deck of one of the great shells which these mortars deliver. A 12 inch mortar, for example, throws a shell weighing over 600 pounds. It is hardly possible to plate the deck of a war ship sufficiently thick to withstand such a missile.

UNITED STATES LARGE CALIBER MORTARS.

Increase in the Height of Englishmen.

Francis Galton has collected some interesting facts in regard to the effect of athletics and improved physical conditions during the last forty years on the physique of the middle classes.

When he was an undergraduate at Cambridge, from 1840 to 1844, although but 5 feet 9¾ inches in height, he was taller than the majority of his fellows. In addressing them he habitually lowered his eyes, and if in a crowd he could readily see over the heads of the people. Writing in 1893, he states that he no longer possesses these advantages.

Altered social conditions, in his opinion, have helped to improve the bodily powers and address of this class; such conditions, for instance, as more wholesome and abundant food, better cooking, warmer clothing, moderation in the use of alcohol, better ventilated sleeping rooms, more change through vacations, and, lastly, the healthy lives led by women in their girlhood. One of the most striking sights in the city of London is the number of tall women that are to be found in the fashionable parks during the season.

It is more particularly among the women of the upper classes that the improved conditions of the last two generations have left their mark. Women of 5 feet 6 inches and 5 feet 8 inches are common, and it is not a very unusual occurrence to meet a woman of 5 feet 10 inches and even 6 feet. A gentleman well known in London society states that when he became of age, twenty-two years ago, his sister, a tall and handsome girl, was the tallest girl among the visiting acquaintances of the family, and now she is overtopped by nearly every one of her younger lady acquaintances.—*St. Louis Globe-Democrat.*

The Cause of Diphtheria.

Diphtheria is due to a fungoid growth. Yet its mode of dissemination is still among the obscurities of science. Water does not seem to spread it, and, contrary to the general impression, it is uncertain whether bad drainage, unless by producing a low condition of the system favorable to attacks of any malady, has much connection with it. This was the opinion of Sir William Jenner many years ago, and it is the conclusion of Dr. Thorne still. He connects it with the crowded condition of the board schools, where many of the "sore throats" for which the children are not kept at home are suspected of being something much more serious. At Enfield the spread of the epidemic was put upon the cats, which, ever since Darwin charged them with being accessory to the setting of the clover seed, have had the scientific eye steadily fixed upon them. The pets of one family carried the disease to another, just as they carry other infectious germs, and there seems, so a report to the local government board insinuates, good reason for believing that in some instances it may have been conveyed from horses, sheep, and even from fowls to human beings. The diphtheritic germs are so vital that they are known to have communicated the disease after lying inert for four years.

THE new Simplon tunnel from Brieg, in Switzerland, to Isella, in Italy, will be 12½ miles long.

The Loudest Noise Ever Heard.

No thunder from the skies was ever accompanied with a roar of such vehemence as that which issued from the throat of the great volcano in Krakatoa, an islet lying in the Straits of Sunda, between Sumatra and Java, at ten o'clock on Monday morning, August 27, 1883. As that dreadful Sunday night wore on, the noises increased in intensity and frequency. The explosions succeeded each other so rapidly that a continuous roar seemed to issue from the island. The critical moment was now approaching, and the outbreak was preparing for a majestic culmination. The people of Batavia did not sleep that night. Their windows quivered with the thunders from Krakatoa, which resounded like the discharge of artillery in their streets. Finally, at ten o'clock on Monday morning, a stupendous convulsion took place which far transcended any of the shocks which had preceded it. This supreme effort it was which raised the mightiest noise ever heard on this globe.

Batavia is 94 miles distant from Krakatoa. At Carimon, Java, 355 miles away, reports were heard on that Sunday morning which led to the belief that there must be some vessel in the distance which was discharging its guns as signals of distress. The authorities sent out boats to make a search; they presently returned, as no ship could be found in want of succor. The reports were sounds which had come all the way from Krakatoa. At Macassar, in Celebes, loud explosions attracted the notice of everybody. Two steamers were hastily sent out to find what was the matter. The sounds had traveled from the Straits of Sunda, a distance of 969 miles. But mere hundreds of miles will not suffice to illustrate the extraordinary distance to which the greatest noise that ever was heard was able to penetrate. The figures have to be expressed in thousands. This seems almost incredible, but it is certainly true. In the Victoria Plains, in West Australia, the shepherds were startled by noises like heavy cannonading. It was some time afterward before they learned that their tranquillity had been disturbed by the grand events then proceeding at Krakatoa, 1,700 miles away.—*Sir Robert S. Ball, in the Youth's Companion.*

[It must have taken over two hours for the sound to travel that distance.—ED. S. A.]

A Scientific Expedition Lost.

The whaler Aurora, which recently arrived at Dundee, brings information of the loss of an Arctic exploring party. In June, 1892, two Swedish gentlemen named Bjorling and Kalstennius chartered a small schooner named the Ripple, at St. John's, Newfoundland, and, along with a crew of three men belonging to St. John's, set out to make scientific explorations of the fauna and flora of Greenland on the shores of Davis Strait. The west coast of Greenland was reached in safety, and the party was heard of last at the Danish settlement on the west coast in the summer of 1892. Since then all trace of the party has been lost. The Dundee whalers were requested by the Swedish consul before leaving for this season's fishing to keep a look out in Baffin Bay and Davis Strait, and make any inquiries as to where any trace of the missing party could be found. These instructions were attended to by the masters of the Dundee fleet, and while Captain Mackay, of the Aurora, was prosecuting early whale fishing in Baffin Bay he noticed a wrecked schooner on Carey Island, in the middle of the bay. A boat's crew was sent ashore, when it was found that the schooner was the Ripple, in which the exploring party set out. No boats were on board nor were there any provisions, and everything seemed to indicate that the vessel had been abandoned. She was fast in the ice. Examination of the vicinity was made by the crew from the Aurora, with the result that in a cairn of stones the dead body of a man, believed to be one of the explorers, was found. Close by was another cairn, which contained manuscripts written in English. One gave instructions that the manuscripts should be forwarded to the nearest Swedish consul. The contents of the manuscripts have not been fully ascertained, but it is believed they indicated that the exploring party were endeavoring to make for the mainland, about 200 miles distant, and that they perished in the attempt.

To Connect the Lakes with the Mississippi.

The recent tour of inspection down the Illinois River by several members of the Chicago Drainage Canal Commission resulted in a fresh impetus to the project of converting that stream into a great navigable waterway, connecting the lakes with the Mississippi. The members of the commission descended the stream in a steamer, met the inhabitants, business men and officials of the several cities and towns along the route, explained to them the nature of the great work undertaken, removed objection to the enterprise that had been fostered by prejudiced statements and misrepresentation, and thus enlisted popular friendship for the successful carrying forward of the work. The commissioners saw enough to convince them that, in an engineering sense, the scheme is an eminently feasible one, provided that the co-operation of national and State authorities can be enlisted in its prosecution. There is now little doubt but that such co-operation will be secured. The pushing forward of the Hennepin canal project, by government appropriation, and the contemplated expenditure of $6,000,000 for that work, shows that the purpose eventually is to perfect a navigable system between the lakes and the Mississippi that shall bring into connection with eastward water transit both the upper and lower reaches of the great stream, by way of the Illinois River and the drainage canal. Hitherto the Illinois has been rendered navigable by a succession of dams and locks, but this has proved ineffective, for the reason that the dams arrest the flow of water and cause the silt to collect above them and thus fill up the bed of the stream. When the drainage canal shall have been completed there will be a powerful flow of lake water through the river into the Mississippi. In order to make way for this, the dams must be removed. There will be a sufficient volume of water to sweep onward the silt and maintain a channel 14 feet in depth, it is claimed by competent engineers. Thus will be opened a navigable connection between Lake Michigan and the Father of Waters that will result in Western transportation changes of undoubtedly important possibilities. —*N. W. Lumberman.*

Smoke Prevention in Massachusetts.

The last Legislature of Massachusetts passed a law regulating the smoke nuisance in the large cities. This law provides that in cities of over 300,000 inhabitants, after July 1 of the present year, no person should "use bituminous coal for the purpose of making steam in boilers in any building, unless the furnace in which said coal is burned is so built or equipped that at least 75 per cent of the smoke is consumed or otherwise prevented from entering the atmosphere." The penalty was fixed at not less than $10 nor more than $100 for each week during which the violation of the law should continue.

It is to be hoped that other States will enact similar laws. It is an easy matter to prevent the smoking of furnace fires, and there is also economy in burning the smoke, which, as everybody knows, is composed of fine coal, which is allowed to escape before it has been properly acted upon by the oxygen of the air.

Cultivation of the Chocolate Tree.

Mr. J. H. Hart, the superintendent of the Royal Botanic Gardens, Trinidad, has recently been successful in transporting to Nicaragua a selection of the best varieties of Trinidad "cacao." Cacao seed soon loses its vitality, and can only be safely transported long distances by placing it in a suitable position to germinate and grow on the voyage. On April 25 of this year, Mr. Hart left Trinidad with a number of specially prepared cases containing plants, and seeds planted on the day of departure. The boxes in which the seeds were sown had not glass roofs, but were strongly latticed and covered with a movable sailcloth cover which could be easily and rapidly fastened or unfastened, to give light, or to protect from wind, rain and sun. A frame covered with wire netting was fastened inside each case, so as to press upon the surface of the soil, to prevent it shifting and causing the seeds to be disturbed. The seeds germinated ten days after planting, and on June 10 Mr. Hart reached his destination with more than 26,000 healthy plants, which were successfully put out in nurseries. A number of cacao seeds were sown at Nicaragua to develop during the return voyage, and, upon arriving at Trinidad, good healthy plants were obtained from ninety-eight per cent of the seeds planted. These plants included two species entirely new to Trinidad, and their introduction may eventually prove of great benefit to the colony.

The Mammoth in Alaska.

At a recent meeting of the Geological Society, London, reported in *Nature*, a paper was read consisting of notes on the occurrence of mammoth remains in the Yukon district of Canada and in Alaska, by Dr. George M. Dawson, C.M.G., F.R.S. In this paper various recorded occurrences of mammoth remains were noted and discussed. The remains are abundant in, if not strictly confined to, the limits of a great unglaciated area in the northwestern part of the North American continent, while within the area which was covered by the great ice mass which the author has described as the Cordilleran glacier, remains of the mammoth are either entirely wanting or are very scarce. At the time of the existence of the mammoth the North American and Asiatic land was continuous, for an elevation of the land sufficient to enable the mammoth to reach those islands of the Bering Sea where these bones have been found would result in the obliteration of Bering Straits. The bones occur, along the northern coast of Alaska, in a layer of clay resting on the somewhat impure "ground ice formation" which gives indications of stratification, and above the clay is a peaty layer.

The author considered this "ground ice" was formed as a deposit when more continental conditions prevailed, by snow fall on a region without the slopes necessary to produce moving glaciers. The mammoth may be supposed to have passed between Asia and America at this time. At a later date, when Bering Straits were opened and the perennial accumulation of snow ceased on the lowlands, the clay was probably carried down from the highlands and deposited during the overflow of rivers. Over this land the mammoth roamed, and wherever local areas of decay of ice arose, bogs would be produced which served as veritable sink traps. The author considered it probable that the accumulation of "ground ice" was coincident with the second (and latest) epoch of maximum glaciation, which was followed by an important subsidence in British Columbia. In the discussion of the paper, Sir Henry Howorth remarked upon the long and careful survey of Northwest America which has been made by the author, and upon the value of the conclusions which he has come to; first, in regard to the absence of ancient glaciation in Alaska and its borders; secondly, in regard to the existence of a great glacier in the Cordilleras, whose products are quite independent of and have nothing to do with the Laurentian drift; and thirdly, in regard to the distribution of the mammoth.

It was a new fact to him, and one of great importance, that mammoth remains had occurred in Unalaska and the Pribylov Islands in Bering Straits, proving that in the mammoth age there was a land bridge here, as many inquirers had argued. It would be very interesting to have the western frontier defined where the mammoth remains cease to be found. It would be very interesting to know how far south on the west of the Cordilleras the true mammoth, as distinguished from *Elephas Columbi*, has occurred. Regarding one conclusion of Dr. Dawson's, Sir Henry could not agree with him, namely, about the age of the strata of ice sometimes found under the mammoth beds in Alaska, as they have been found in Siberia. The speaker was of opinion that this ice had accumulated since the beds were laid down, and was not there when the mammoth roamed about in the forests where he and his companions lived.

Humus and soil cannot accumulate upon ice except as a moraine, and there are no traces of moraines or of great surface glaciation in Alaska and Siberia. Nor could either the flora or fauna of the mammoth age have survived conditions consistent with the accumulation of these beds of ice almost immediately below the surface, or consistent with their presence there. The speaker considered that these beds were due to the filtration of water in the summer down to the point where there is a stratum of frozen soil, through which it cannot pass and where it consequently accumulates, freezes, raises the ground, and in the next season grows by the same process until a thick bed of ice has been formed. The evidence goes to show that the present is the coldest period known in recent geological times in Siberia and Alaska, and that the period of the mammoth and its companions was followed and not preceded by an Arctic climate where its remains occur. Dr. H. Woodward remarked that the most interesting point in Dr. Dawson's paper was the mention of the remains of mammoths on the Aleutian Islands, proving that this was the old high road for this and other mammals from Asia into North America in Pleistocene times.

The Aluminum Flashlight.

In a communication to the London and Provincial Photographic Association, T. Bolas says: Aluminum has a much higher kindling point than magnesium, and, consequently, when aluminum filings are blown or dusted through an ordinary flame, they do not ignite, as they are not in the flame sufficiently long to become heated through. Again, aluminum, if heated in a crucible to a white heat, scarcely oxidizes, as the metal does not boil at this temperature, and a very thin film of oxide protects the surface. Magnesium would boil and blaze in a white hot crucible, as the vapor would burn.

If, however, we take the fine powder of aluminum, now so largely sold as a "silver" bronze, and blow or dust this through a flame, it becomes heated to the igniting point, and, weight for weight, yields a more powerful light than magnesium.

The commercial aluminum bronze powders contain, however, a trace of greasy material, which prevents the grains readily separating, and, if the powder contaminated with grease is blown through a flame, or used in an ordinary flash lamp, it tends to blow through in clots, and a large proportion escapes combustion.

This grease may be driven off or destroyed by heating the bronze powder to about the melting point of zinc; and, for operating on a small scale, it is sufficient to heat it in a test tube over a spirit lamp. The powder which I bring before you to-night has been thus heated, and it is readily blown about by the slightest breath. It ignites readily, and burns completely when used in an ordinary flash lamp; indeed, it burns more completely than does magnesium dust, as it is impracticable to use magnesium in an extremely fine state of division, owing to its tendency to oxidize spontaneously. Aluminum, on the other hand, can be stored in a minutely fine state of division without fear of deterioration by oxidation.

One incidental advantage of aluminum over magnesium is the non-irritating character of the fumes of oxide; magnesia, on the other hand, being an irritating alkaline earth.

New Use of Oxygen.

If there is one point more strongly impressed than any other upon the tyro in the use of oxygen and hydrogen, it is that he must be most careful to prevent any possible admixture of the two. The advice is most desirable, although it is well known that for explosion to take place the proportion of the mixed gases to each other must be within certain well-known limits. Outside those limits no explosion will take place. The knowledge of this fact underlies the novel application we refer to. At Huddersfield, Brin's Oxygen Company have erected oxygen plant for the purpose of supplying that gas to mix with the illuminating gas to be issued to the public. About six per cent is added just before it enters the station meter, and is then stored in special holders. The corporation gas is enriched to the extent of five and a half candle power by this addition, a fact which is most singular when it is remembered that atmospheric air is looked upon as a deleterious adulterant of ordinary coal gas.—*Br. Jour. of Photo.*

Vanadiferous Oil.

This oil, of slight density, varying between 1·15 and 1·20, is of a fatty appearance and contains 51·52 per cent of volatile matter. The percentage of hydrogen is much lower than that of the vanadiferous oil recently discovered in Argentina by Mr. Kyle, and carbon and nitrogen show a larger percentage. The most interesting feature of this oil is the presence, in the ashes, of a large proportion of vanadic acid in the shape of alkaline and metallic vanadates. It also occurs free in this oil, and may be extracted by washing with ammoniacal water. A quantitative analysis gave a percentage of 0·24 of vanadic acid in the oil and 38·5 per cent in the ashes. As the oil is abundant, some important applications of vanadium may be looked for if the properties of the metal are found to be commercially valuable.—*M. A. Mourlot.*

The Porosity of Glass.

Some interesting experiments going to show that glass is more porous, under some conditions, than it has hitherto been considered, have been carried out by Messrs. E. Warburg and F. Tegetmeier. These experiments are described by Professor W. Chandler Roberts-Austen as demonstrating the possibility of producing eventually a degree of porosity in vitreous bodies which will admit of the passage of elements having comparatively small atomic volumes; while other elements having larger atomic volumes are strained off; thus occasioning a mechanical sifting of the elements. A receptacle was divided into two compartments by a sheet of glass, which could be several millimeters thick. Sodium amalgam was placed on one side and pure mercury on the other; the whole was then heated to the moderate temperature of 200° C, at which the glass becomes slightly conducting. The positive and negative wires from a Plante battery were then respectively placed in connection with the contents of the two compartments; and it was found at the end of 30 hours that a considerable quantity of sodium had passed into the mercury through the glass, which had nevertheless preserved its original weight and transparency.

A CARBONIC ACID MOTOR.

BY GUSTAVE MICHAUD, SC.D., COSTA RICA.

This little apparatus derives its power from self-compressed carbonic acid. I devised it to illustrate Pascal's principle as well as many other chemical and physical phenomena. It is easily made; some of my pupils constructed it in less than an hour with materials obtained from the apothecary. If made of the dimensions I give below, it will oscillate for three or four hours without being reloaded. Its various parts are as follows: Two 9 or 10 oz. bottles, B, with wide mouth. One glass tube, T, about 26 in. long and ¼ in. bore (cost about three cents). Two glass tubes, E, 6 in. long each; ¼ in. bore (cost about two cents). Two rubber stoppers, K, each with two holes (cost about fifteen cents each). If cork stoppers are used the expense is much reduced, but a set of round files (rat tails) or a cork borer will be necessary to bore holes in the cork. Two rubber tubes, I, about 4 in. long, ¼ in. diameter (cost about ten cents). One rubber tube, R, about 19 in. long, ⅛ in. diameter (cost about ten cents). A piece of wood, A, shaped in the form of a quadratic prism; size 1 × 1 × 2 in. Two pieces of sheet iron, S; size 1½ × 2 in. Two pieces of marble the size of a nut, each wrapped in a piece of linen.

To make the apparatus, take the glass tube, T, introduce each of its extremities through the holes of the two rubber stoppers, K, place the rubber tubes, I, on each of the ends of the tube, T; take a needle with common thread and sew the piece of marble wrapped in its linen to the free end of the rubber tubes, I. Take the piece of wood, A, nail on each side of it a piece of sheet iron, S. Out of the central part of the piece, A, saw a cleft perpendicular to the metallic sheets, S. Press the center of the tube, T, in this cleft, and keep it in place by means of two pieces of wood screwed on the top of the piece. A.

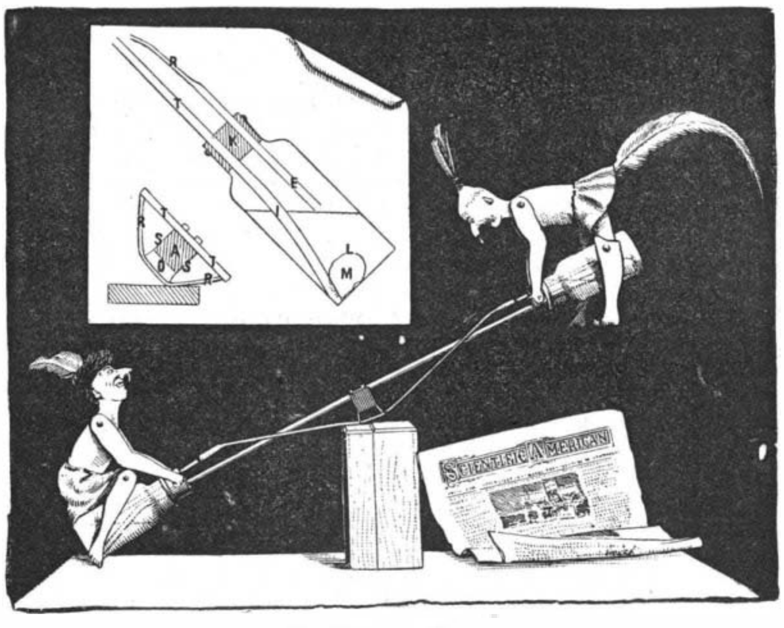
Pass the tubes, E E, through the holes left empty in the stoppers, so that the length of the part to be contained in the bottle be equal to half of the height of the bottle. Connect the tubes, E E, by means of the rubber tube, R. After putting it in place, cut a small hole in its central part, O. Last, stop one bottle with either of the two stoppers.

To set the apparatus in motion, fill half of the unstoppered bottle with a mixture of one volume of hydrochloric acid with one of water. Stop it, keeping meanwhile the whole apparatus in a vertical position, and place it at once on a box or any other stand, five to eight inches high.

The occlusion of the rubber tube, R, by the pressure of one of the pieces of sheet iron, S, will prevent the escaping of the carbonic acid, and the pressure of this gas will drive the liquid from the lower to the upper bottle through the glass tube, T. Meanwhile, the gas contained in the upper bottle will escape through the hole, O, made in the center of the rubber tube, R. If the center of gravity of the apparatus is not much above its oscillating axis, the upper bottle will fall after receiving little more than half of the liquid contained in the lower one. Then the change that takes place in the occlusion of the rubber tube, R, by the pieces, S S, will cause a repetition of the same phenomena in opposite direction.

If you wish the apparatus to cease its motion for a while, without waste of chemicals, place any heavy body on the lower bottle, which will then completely empty itself into the upper bottle and all chemical action will cease, as the marble is never in contact with the liquid in the upper bottle.

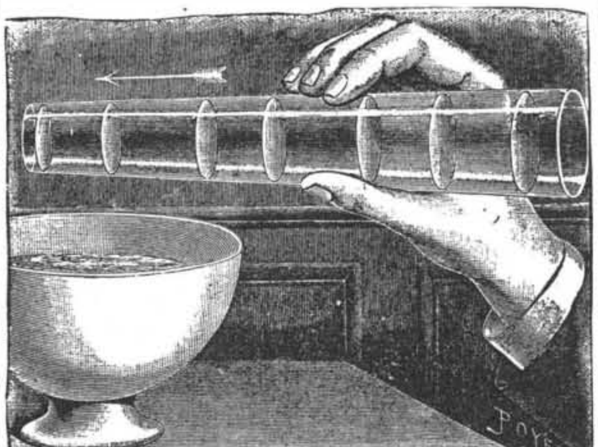
When made of the dimensions which we give above, its working expenses will be about one-eighth of a cent per hour, cost of the hydrochloric acid consumed.



A CARBONIC ACID MOTOR.

EXPERIMENT ON THE TENSION OF LIQUID FILMS.

Take a lamp chimney of conical form, that is to say, wider at the bottom than at the top, wet the interior with soapsuds, and then drain in order to get rid of the liquid in excess. Then, holding the chimney upright, dip the wide end in the soapsuds. Upon removing it, it will be found that, toward this extremity, a film of soapsuds has formed in the interior. Now place the chimney horizontally, and the liquid film will be observed to set itself in motion, and in a moment reach the narrow extremity of the glass. This phenomenon is due to the elastic tension of the film, which might be compared to a distended membrane



EXPERIMENT ON THE TENSION OF LIQUID FILMS.

of rubber, which contracts as soon as the traction upon its edges diminishes. Now here the traction becomes feebler and feebler in proportion as the diameter of the glass diminishes. Instead of a single film, a second may be formed as soon as the first has moved a slight distance from the wide end of the chimney. and then, successively as many films as may be desired. All will be observed to set themselves in motion and travel toward the narrow end, as if they were chasing one another.—*L'Illustration.*

Blackening of Incandescent Lamp Bulbs.

I have repeatedly noticed (writes Mr. W. Stuart-Smith in the *Electrical World*) discussions as to the cause of blackening of incandescent lamp bulbs. The latest theory seems to come from France, and is to the effect that residual oxygen in the bulb, together with that which was occluded in the filament, attacks the carbon and forms carbonic oxide, which undergoes dissociation by coming in contact with the comparatively cold glass, depositing the carbon and leaving the oxygen free for a repetition of the process. It has been some years since I have paid attention to chemical matters, but, unless I am mistaken, cooling as above would *not* cause dissociation, and the above explanation cannot be the correct one. It seems to me that a portion of the action at least *must* be due to the following cause: It is well known that all substances in the solid or liquid form give off vapor, in fact, are surrounded by an atmosphere of their own vapor.

If the substance is confined in an airtight space the vapor density is definite for every substance and for every temperature, but varies greatly with the temperature, being much greater for high temperatures. For a given substance and a given temperature the vapor density will be the same, no matter what other gases may be present; but if other gases are present in considerable quantities, considerably more time will be required for the density to reach its maximum value. In a vacuum, on the contrary, the action is comparatively rapid. Carbon, when cold, is a very stable substance, and its vapor density very low; but at the high temperature of the white-hot filament vaporization must be comparatively rapid and the vapor density relatively great. As the hot vapor comes in contact with the cooler glass it will deposit, and thus vaporization, instead of stopping, as would be the case if the glass were the same temperature as the filament, continues while the lamp is burning. When the lamp is extinguished the vapor in the globe must deposit on the glass until the definite density of the vapor of the cold carbon is attained. The more rapid blackening when the lamp is new may be due in part to the better condensing action of the clean glass, and it may be due in a greater part to the fact that some portions of the filament are more easily volatilized than others, and the action consequently more rapid while these are being thrown off.

A New Fertilizer.

In tallow melting establishments—and there are a score of them in the city of New York—a large amount of refuse, so-called "tank water," is thrown away. It contains a valuable element, gelatine. A patent has lately been granted to Michael A. Golseieff, of this city, for a method of utilizing the above waste product. It consists in partially evaporating the tank water and then combining it with quicklime in the proportion of one and one-half parts of lime to each part of water remaining in the refuse after the evaporation. The mixture is then allowed to expand and dry, when it is reduced to a powdered state, and is useful as a fertilizer, containing, as the patentee claims, from seven to twelve per cent of ammonia and from forty to sixty per cent of lime. If the new process should be found practicable for adoption by the various tallow melting manufactories, then a waste refuse of to-day will be made useful, and what is now a nuisance to public health will be abated.

Colors of Ancient Egypt.

The pigments used by the ancient Egyptians 4,000 to 6,000 years ago were few and almost all represented what have been called primary colors. Red seems to have been most used in the outside decoration of buildings. Giving results of an investigation of Mr. Flinders Petrie's specimens, Mr. W. J. Russell states that the red pigment was a ferric oxide, an oolitic hematite, with a little clay, the proportion of ferric oxide varying from 70 to 80 per cent. It was a natural pigment, unaffected by sunlight, heat or acids. Another color was a dull yellow, and this also consisted of oxide of iron, combined with alumina, lime and some water—being essentially a kind of colored clay. A reproduction of the mixture was fadeless in light, but was changed by heat. An orange about 4,000 B. C., by one of the first pyramid builders, was a mixture of the red and yellow. The maker mixed his colors with gum. A very bright yellow contained arsenic, and was in fact orpiment, which is now produced artificially. Beaten gold was the mineral called chrysolite; but in later times a kind of glass or frit colored with oxide of copper was used, and gave various shades. It could be rubbed down in a mortar, and was probably applied with gum. The white pigment used was sulphate of lime, known also as gypsum and alabaster. A pale pink color contained 99 per cent of sulphate of lime, the rest being an organic compound believed to be madder.

Transportation of Liquid Air.

In connection with the forthcoming lectures at the Royal Institution on "Air, Gaseous and Liquid," it may be mentioned that Prof. Dewar has successfully conveyed a considerable quantity of liquid air from London to Cambridge. The liquid air was carried in one of the double glass, vacuum jacketed flasks, the space between the inner and outer flask containing nothing but extremely attenuated mercurial vapor, together with a little liquid mercury. On pouring liquid air into the inner flask its outer surface is rapidly covered with a mercurial film of extreme thinness, forming a reflecting surface highly impervious to radiant heat. As soon as this is formed the whole apparatus is packed in solid carbonic acid, which at once freezes the liquid mercury, arrests the deposit upon the mirror, reduces the mercurial vapor to an infinitesimal quantity, forms an almost perfect vacuum, and supplies an envelope 80 degrees below zero. Thus protected, the liquid air reached Cambridge. The protective power of the high vacuum and the mercurial mirror will be better appreciated if it be borne in mind that the difference of temperature between liquid air and solid carbonic acid is the same as between ice and boiling water.

THREE routes for a cable line to the Sandwich Islands have been surveyed, and each is said to be practicable.