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Scientific American Supplement, No. , October 11, by Various Part 1 out of 3. www.enganchecubano.com homepage; Index of Scientific American Supplement, No. , October 11,

It was in that the Portuguese government learned of the discovery of the diamond that had been made in the rivers of the environs of Diamantina by some adventurers who had entered this region in search of gold. Since that epoch the exploitation of this gem, pursued under varied regimes, and with diverse success, has never ceased. As soon as it heard of this discovery, the Portuguese government thought it would make as much profit out of it as possible, so it no longer authorized any other exploitation in the Diamantina regions than that of the diamond, and it imposed upon such exploitation a tax that was fixed at 28 francs per laborer in and in From to all operations were suspended, and a more lucrative organization for the treasury was sought for. In the era of contracts was inaugurated. At this epoch the government took the exploitation of the diamond in hand, and gave it in charge of a special administration, which was submitted to the direction of the treasury of Lisbon, and which had at its head a comptroller. This new regime lasted till In order to render the surveillance of the treasury agents efficient, and prevent smuggling which can be so easily done with an object like the diamond , it was necessary to impose a special regime over the entire region of Diamantina, and, in fact, the latter was, up to the independence of Brazil, submitted to Draconian regulations. It should be understood that what was taken by stealth does not enter into this total, and it must be stated that during the latter years, when the Extraccao existed only in name, smuggling must have been active. It is almost impossible to estimate what the territory has produced. The discovery of the Cape deposits has given it a terrible blow. Although the Brazilian diamond is much more beautiful, and for this reason is held at a much higher price, these new exploitations, by annually throwing large quantities of stones upon the market, have led to a great reduction in the price, and the Diamantina exploitations, which have become long, difficult, and costly, have received a serious set-back. So the annual production of this region, which was estimated for the years preceding at 3, oitavas about 52, carats , is now scarcely The rivers in the environs of Diamantina rim at the bottom of deep and narrow gorges that have been scooped out to depths of or meters through the denuded plateau in whose center stands the city of Diamantina. In the bed of these rivers, in places where they have not yet been worked, there may be found, underneath a stratum of modern sand, another of rocks, and finally a diamondiferous deposit of rounded pebbles, mixed with sand. It is the matrix of the diamond, and the latter is extracted from it by washing. It is arranged in roundish masses upon the beds of the rivers, and is met with at depths ranging from a few decimeters up to 25 and 30 meters. The same material, with the same name, is also found deposited at all heights upon small terraces at the sides of the valleys through which the rivers flow. It is coarser and less rolled, and has very likely been deposited by risings of the rivers during the period when the valleys were being formed. Finally, it is found in a still coarser state, mixed with red earth and deposited in horizontal strata upon the upper plateau. Of these different deposits, the most important are those of the river beds, the material here having undergone a true mechanical preparation and being richer. These are the deposits that have been the object of the most important exploitations. The year is divided into two distinct seasons--the dry, from May to September, during which rain is exceptional, and the rainy, from October to April. As water is necessary for all the operations, no work can be done upon the high plateaux except through rain water stored up in large reservoirs. These beds form what are called the "rainy season washings. Now in all this rocky and denuded region the water that falls runs immediately to the river, and causes terrible freshets therein; so operations capable of keeping the bed dry would be out of proportion to the probable results of the exploitation, whence it follows that the latter is only possible in dry weather, and these deposits are therefore called "dry season washings. In order to dry the bed a dam is constructed, and the river is either diverted into a plank flume supported by piles, or into a canal dug along the shore, or by means of tight walls, according to the lay of the place. The second process, which is preferable to the first, is in fact impossible when the river runs, as is often the case, in a narrow, abrupt, walled channel. These works are sometimes very important. In , the Acaba Mundo flume was meters in length and 5. In the dry part of the river the extraction of the sand, stones, and cascalho is done solely by hand. Almost all of these men are negroes, who run with their load upon their head over the white sand, singing some song of their country. It, is very picturesque, but it is doubtful whether it is economical. Since the century and a half that these rivers have been dug and redug, it may be admitted that wherever the cascalho has been easy of access it has been removed; and that wherever it has not been, little attempt has been made to work it. How have these attempts, which have doubtless been made at several periods, come out? This would at present be very difficult to ascertain. The exploitations have been too numerous to allow us now to estimate the value of a bed from the data furnished by geology, and local tradition is too uncertain or exaggerated to allow us to place much confidence in it. We can, at the very most, say that if some points still remain intact it must be because the exploitation of them was too difficult with the processes that were employed, and this should be a reason, were it desired to attempt new operations, for having recourse to entirely different modes of work. It would seem rational, as regards this, to try to put to profit the hydraulic power that the flumes and canals render disposable for mechanically extracting the sand. The field to be worked being naturally long and narrow, it would be the proper thing to employ a series of inclined planes distributed along the banks, actuated by water wheels, and corresponding to so many small working points. The river often flows through a genuine canon with nearly vertical walls, where space would be absolutely wanting for installing wheels elsewhere than at the exit of the canal, and if may become necessary to distribute the power of these wheels along the works. In these regions of difficult access and few resources it is necessary to dispense with complicated apparatus, and one might in such a case, it would seem, try electric motors, whose installation would be easy. An exploitation in accordance with these ideas was begun for the first time in upon the Ribeirao de Inferno at Portao de Ferro. We shall describe it. Once established in the country, the first thing to do is to form roads so as to secure communications with the neighboring villages and forests, and afterward to cut down trees for building houses. These latter are usually constructed, for these works, of untrimmed wood and mud, with thatched roof. There were thus constructed at Portao de Ferro a few kilometers of roads, then some houses for the engineers and special workmen, barracks for laborers, stores, kitchens, etc. It was afterward necessary to repair the old lateral canal which had been dug out of the rock in the times of the Royal Extraction, but which had been torn open for a considerable length. This necessitated the erection of tight walls of dry stone, grass, and mud, for a length of meters, and with thicknesses of from 6 to 10 meters. In order to divert the water into this canal, it was necessary to raise its level 5 meters. The dam, then, had to support a strong pressure, and it could not be built upon sand. It therefore became necessary to build a temporary dam and to turn the river into a plank flume, so as to make it possible to dig at the location of the permanent dam in order to reach a solid bottom at a depth of nearly 4 meters. The permanent dam thus had a total height of 10 meters, with a thickness of 15 at the base and 7 at the top. It was constructed of dry stone, grass, and earth, with the addition of strong wood-work. The rocks upon which it had to be built were full of fissures, and when it was desired to close it great leakages of water occurred, which came near ruining it and necessitated the construction of a second wall behind it and a talus of earth in front. The dam as shown in Fig. It was closed on the second of July, and had a storage capacity of 55, cubic meters. The principal excavation was begun at the point where the bed was deepest, and which consequently the older miners must have had most trouble in reaching. Here were set up two Letestu pumps that were actuated by a four-horse wheel. These pumps lifted 50 cubic meters per hour. All except the pump chambers and pipes was made of wood on the spot. The water that was lifted was carried away from the works in a flume meters in length, which likewise removed the water from the motive wheels. For the service of the same excavation two simple acting inclined planes were installed that were moved by a four-horse wheel. The tracks of these planes were made of wood. Steel rails, however, had been brought for the cars, along with the cables and the metallic parts of the windlass; but all else was made upon the spot, including all the wooden pulleys for transmitting motion from the wheel to the windlasses. This excavation reached bottom at a depth of 16 meters. The second touched bottom at about 10 meters, and gave access to a subterranean canal, which was followed for about 20 meters. The extraction of sand was effected here by an inclined plane moved by a Gramme machine. The generatrix had to make 1, revolutions, and be set in motion by an overshot wheel. As time was wanting, it became necessary to diminish to as great a degree as possible the number of parts to be employed in the transmission of motion, and since there was an abundance of water, a velocity of 15 revolutions was accepted for the wheel, which, with a total fall of 4. A three meter pulley was placed upon the shaft of the wheel. This was made of freshly cut wood that had been exposed to the sun. This rendered it necessary to give up the idea of using a belt, since it was not possible to prevent its getting wet. Cords could not be found in the country, and so it was necessary to make use of a too heavy chain, which was in no wise intended for such a purpose, and which at a velocity of 15 revolutions began to swing and necessarily absorbed much power. The large pulley drove one of 0. Upon this latter a 2. The motor, by means of a belt, actuated a windlass provided with suitable checking gearings. The distance of the two machines was meters. Save the transmission by chain, the whole worked in a satisfactory manner. The performance could only be estimated in a lump, by comparing on the one hand the theoretical work of the fall of water, and, on the other, that of the vertical elevation of the car; and, further, one was obliged to estimate the weight of the latter. If we allow 1, kilogrammes for the weight of a car that received liters of dry sand or of wet, the performance was 19 per cent. This experiment was at all events of such a nature as to indicate the use of these machines in cases where the arrangement of the locality absolutely necessitates a transmission of power. The first workmen reached Portao de Ferro December 15, , and the material shipped from France did not arrive until April 25, Operations were suspended about the 25th of September, since, for a fortnight already, there had no longer been any doubt as to the manner in which the river bed had been cleaned by former operators. As a result of this first experiment, the proof remained that it would be easy in future exploitations to introduce into the country methods of work that are quicker and more economical than those now in use. In fact, all the operations were performed with natives of the country, with the exception of a carpenter and blacksmith from Rio Janeiro. I have been exceedingly interested in Dr. But a sufficient number of well-established facts are known to account for all the peculiarities and vagaries of cholera. Cholera has existed in Hindostan for centuries. It was found there by Vasco da Gama in , and there is a perfectly authentic history of it from that time down to the present. It is never absent from India, from whence it has been conveyed innumerable times to other countries. It has never become domiciled in any other land, not even in China, parts of which lie in the same latitude; nor in Arabia, to which country pilgrims go every year from India; nor in Egypt, nor Persia, with which communication is so frequent; much less in any other part of the world. Canton in China, Muscat and Mecca in Arabia, lie nearly in the same degree of latitude as Calcutta, in which cholera is always existent; yet these places only have cholera occasionally, and then only after arrivals of it from Hindostan. The arrival of cholera in other countries is often involved in some easily removable obscurity, which is deepened only by the ignorance and want of veracity of quarantine and other officials. Cholera is almost always preceded by a premonitory diarrhoea, which lasts from one or two to three or four or more days before urgent and characteristic symptoms show themselves. Of 6, cases, no less than 5, had preceding diarrhoea. The sufferers from this sow the germs of the disease in numerous, often distant and obscure, places, to which no choleraic person is supposed to have come. The disease has been reproduced in men and some few animals by their swallowing the discharges. The discharges, according to the experiments of Thiersch, Burdon-Sanderson, and Macnamara, are not virulent and poisonous for the first twenty-four hours; on the second day eleven per cent.

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This has been effected by employing heaters respectively 10 inches and 20 inches in diameter. Agreeably to the dimensions already specified, the area of the inch heater acted upon by the reflected solar rays is The section of the annular sunbeam whose direct rays act upon the polygonal reflector is 3, square inches, as before stated. Regarding the diffusion of the solar rays during the investigation, the following demonstration will be readily understood. Hence, as the inch heater presents an area of The atmospheric conditions having proved unfavorable during the investigation, maximum solar temperature was not recorded. Accordingly, the heaters of the solar pyrometer did not reach maximum temperature, the highest indication by the thermometer of the small heater being No compensation will, however, be introduced on account of deficient solar heat, the intention being to base the computation of solar temperature solely on the result of observations conducted at New York during the summer solstice of It will be noticed that the temperature of the large heater is proportionally higher than that of the small heater, a fact showing that the latter, owing to its higher temperature, loses more heat by radiation and convection than the former. Besides, the rate of cooling of heated bodies increases more rapidly than the augmentation of temperature. The loss occasioned by the imperfect reflection of the mirrors, as before stated, is 0. The result of the experimental investigation carried out during the summer solstice of may be thus briefly stated. The diffusion of the solar rays acting on the 20 inch heater being in the ratio of 1 to 10,, the temperature of the solar surface cannot be less than This underrated computation must be accepted unless it can be shown that the temperature produced by radiant heat is not inversely as the diffusion of the rays. It scarcely needs demonstration to prove that extreme tenuity can alone account for the extraordinary velocities recorded by observers of solar phenomena. These facts warrant the conclusion that the high temperature established by our investigation is requisite to prevent undue density of the solar atmosphere. Nageli, and the amidulin of Nasse are the same or different substances. A single experiment will serve to show that under certain conditions a soluble substance maybe obtained from starch grains. If dried starch grains are rubbed between two glass plates, the grains will be seen under the microscope to be fissured, and if then wetted and filtered, the filtrate will be a perfectly clear liquid showing a strong starch reaction with iodine. Since no solution is obtained from uninjured grains, even after soaking for weeks in water, Brukner concludes that the outer layers of the starch grains form a membrane protecting the interior soluble layers from the action of the water. The soluble filtrate from starch paste also contains a substance identical with granulose. Between the two kinds of starch, the granular and that contained in paste, there is no chemical but only a physical difference, depending on the condition of aggregation of their micellae. Nageli maintains that granulose, or soluble starch, differs from amylodextrin in the former being precipitated by tannic acid and acetate of lead, while the latter is not. Brukner fails to confirm this difference, obtaining a voluminous precipitate with tannic acid and acetate of lead in the case of both substances. Another difference maintained by Nageli, that freshly precipitated starch is insoluble, amylodextrin soluble in water, is also contested; the author finding that granulose is soluble to a considerable extent in water, not only immediately after precipitation, but when it has remained for twenty-four hours under absolute alcohol. Other differences pointed out by W. Nageli, Brukner also maintains to be non-existent, and he regards amidulin and amylodextrin as identical. Brucke gave the name erythrogranulose to a substance nearly related to granulose, but with a stronger affinity for iodine, and receiving from it not a blue but a red color. Brukner regards the red color as resulting from a mixture of erythrodextrin, and the greater solubility of this substance in water. If a mixture of filtered potato starch paste and erythrodextrin is dried in a watch glass covered with a thin pellicle of collodion, and a drop of iodine solution placed on the latter, it penetrates very slowly through the pellicle, the dextrin becoming first tinctured with red, and the granulose afterward with blue. If, on the other hand, no erythrodextrin is used, the diffusion of the iodine causes at once simply a blue coloring. He shows that the iodide may resist heat, and that the loss of color depends on the greater attraction of water for iodine as compared with starch, and the greater solubility of iodine in water at high temperatures. The different kinds of starch do not take the same tint with the same quantity of solid iodine. Paper read before the Institution of Mechanical Engineers at the Cardiff meeting. In the year , while on a visit to some of the great silver mines in Bolivia, an opportunity was afforded the writer of inspecting a new and successful process for the treatment of silver ores, the invention of Herr Francke, a German gentleman long resident in Bolivia, whose acquaintance the writer had also the pleasure of making. After many years of tedious working devoted to experiments bearing on the metallurgical treatment of rich but refractory silver ores, the inventor has successfully introduced the process of which it is proposed in this paper to give a description, and which has, by its satisfactory working, entirely eclipsed all other plans hitherto tried in Bolivia, Peru, and Chili. The Francke "tina" process is based on the same metallurgical principles as the system described by Alonzo Barba in , and also on those introduced into the States in more recent times under the name of the Washoe process. Transactions of the American Institute of Mining Engineers, vol. In this description of the process the writer will endeavor to enter into every possible detail having a practical bearing on the final results; and with this view he commences with the actual separation of the ores at the mines. The object of this separation is twofold: The reason for this separation not being effected by those mechanical appliances so common in most ore dressing establishments, such as stone breakers or crushing rolls, is simply because the ores are so rich in silver, and frequently of such a brittle nature, that any undue pulverization would certainly result in a great loss of silver, as a large amount would be carried away in the form of fine dust. So much attention is indeed required in this department that it is found requisite to institute strict superintendence in the sorting or cobbing sheds, in order to prevent as far as practicable any improper diminution of the ores. According to the above method, the ores coming from the mine are classified into the four following divisions: Very rich ore, averaging about six per cent. Rich ore, averaging about one per cent. Gangue, or waste rock, thrown on the dump heaps. The first of these qualities--the very rich ore--is so valuable as to render advantageous its direct export in the raw state to the coast for shipment to Europe. The cost of fuel in Bolivia forms so considerable a charge in smelting operations, that the cost of freight to Europe on very rich silver ores works out at a relatively insignificant figure, when compared with the cost of smelting operations in that country. This rich ore is consequently selected very carefully, and packed up in tough rawhide bags, so as to make small compact parcels some 18 in. The second and third qualities of ore are taken direct to the smelting works; and where these are situated at some distance from the mines, as at Huanchaca and Guadalupe, the transport is effected by means of strong but lightly built iron carts, specially constructed to meet the heavy wear and tear consequent upon the rough mountain roads. These two classes of ores are either treated separately, or mixed together in such proportion as is found by experience to be most suitable for the smelting process. On its arrival at the reduction works the ore is taken direct to the stamp mill. At the Huanchaca works there are sixty-five heads of stamps, each head weighing about lb. As fast as the ore is stamped, it is shoveled out by hand, and thrown upon inclined sieves of forty holes per lineal inch; the stuff which will not pass through the mesh is returned to the stamps. Dry stamping may be said to be almost a necessity in dealing with these rich silver ores, as with the employment of water there is a great loss of silver, owing to the finer particles being carried away in suspension, and thus getting mixed with the slimes, from which it is exceedingly difficult to recover them, especially in those remote regions where the cost of maintaining large ore-dressing establishments is very heavy. Dry stamping, however, presents many serious drawbacks, some of which could probably be eliminated if they received proper attention. For instance, the very fine dust, which rises in a dense cloud during the operation of stamping, not only settles down on all parts of the machinery, interfering with its proper working, so that some part of the battery is nearly always stopped for repairs, but is also the cause of serious inconvenience to the workmen. At the Huanchaca mines, owing to the presence of galena or sulphide of lead in the ores, this fine dust is of such an injurious character as not unfrequently to cause the death of the workmen; as a precautionary measure they are accustomed to stuff cotton wool into their nostrils. This, however, is only a partial preventive; and the men find the best method of overcoming the evil effect is to return to their homes at intervals of a few weeks, their places being taken by others for the same periods. In dry stamping there is also a considerable loss of silver in the fine particles of rich ore which are carried away as dust and irrevocably lost. To prevent this loss, the writer proposed while at Huanchaca that a chamber should be constructed, into which all the fine dust might be exhausted or blown by a powerful fan or ventilator. This type of furnace has proved, after various trials, to be that best suited for the treatment of the Bolivian silver ores, and is stated to have been found the most economical as regards consumption of fuel, and to give the least trouble in labor. Bolivian dollars at 3s. Tola a kind of shrub , 3 cwt. One man can attend to two furnaces, and earns 3s. Probably no revolving mechanical furnace is suited to the roasting of these ores, as the operation requires to be carefully and intelligently watched, for it is essential to the success of the Francke process that the ores should not be completely or "dead" roasted, inasmuch as certain salts, prejudicial to the ultimate proper working of the process, are liable to be formed if the roasting be too protracted. These salts are mainly due to the presence of antimony, zinc, lead, and arsenic, all of which are unfavorable to amalgamation. The ores are roasted with 8 per cent. So roasted the ores are only partially chlorinized, and their complete chlorination is effected subsequently, during the process of amalgamation; the chlorides are thus formed progressively as required, and, in fact, it would almost appear that the success of the process virtually consists in obviating the formation of injurious salts. All the sulphide ores in Bolivia contain sufficient copper to form the quantity of cuprous chloride requisite for the first stages of roasting, in order to render the silver contained in the ore thoroughly amenable to subsequent amalgamation. The tinas or amalgamating vats constitute the prominent feature of the Francke process; they are large wooden vats, shown in Figs. Each vat is very strongly constructed, being bound with thick iron hoops. At the bottom it is fitted with copper plates about 3 in. It is considered essential to the success of the process that the bottom plates should present a clear rubbing surface of at least 10 square feet. At Huanchaca this stirrer has been made with four projecting radial arms, D D, Figs. The stirrer can be lifted or depressed in the vat at will by means of a worm and screw at the top of the driving shaft, Fig. The bevel gearing is revolved by shafting connected with pulley wheels and belting, the wheels being 3 ft. The driving engine is placed at one end of the building. At the bottom of the vat, and in front of it, a large wooden stop-cock is fitted, through which the liquid amalgam is drawn off at the end of the process into another shallow-bottomed and smaller vat, Figs. Directly above this last vat there is a water hose, supplied with a flexible spout, through which a strong stream of water is directed upon the amalgam as it issues from the grinding vat, in order to wash off all impurities. The following is the mode of working usually employed. The grinding vat or tina is first charged to about one-fifth of its depth with water and from 6 cwt. The amount of salt required in the process depends naturally on the character of the ore to be treated, as ascertained by actual experiment, and averages from lb. Into this brine a jet of steam is then directed, and the stirrer is set to work for about half an hour, until the liquid is in a thoroughly boiling condition, in which state it must be kept until the end of the process. As soon as the liquid reaches boiling point, the stamped and roasted ore is run into the vat, and at the end of another half-hour about 1 cwt. The stirring is kept up continuously for eight to twelve hours, according to the character and richness of the ores. At the end of this time the amalgam is run out through the stop-cock at bottom of the vat, is washed, and is put into hydraulic presses, by means of which the mercury is squeezed out, leaving behind a thick, pulpy mass, composed mainly of silver, and locally termed a "pina," from its resembling in shape the cone of a pine tree. These pinas are then carefully weighed and put into a subliming furnace, Figs. About four ounces of mercury are lost for every pound of silver made. The actual quantities of mercury to be added in the grinding vat, and the times of its addition, are based entirely on practical experience of the process. With ore assaying oz. When treating "pacos," or earthy chlorides of silver, assaying only 20 oz. The furnace top is closed by a cast-iron lid, which is lifted off for charging the fuel. Round the top of the furnace is a tier of radial outlet holes for the fuel smoke to escape through; and round the bottom is a corresponding tier of inlet air-holes, through which the fuel is continually rabbled with poles by hand. The fuel used is llama dung, costing 80 cents, or 2s. Beneath the furnace is a vault containing a wrought-iron water-tank, B, into which the open mouth of the retort, C, projects downward and is submerged below the water. For charging the retort, the water-tank is placed on a trolly; and standing upright on a stool inside the tank is placed the pina, or conical mass of silver amalgam, which is held together by being built up on a core-bar fitted with a series of horizontal disks. The trolly is then run into the vault, and the water-tank containing the pina is lifted by screw-jacks, so as to raise the pina into the retort, in which position the tank is then supported by a cross-beam. The sublimed mercury is condensed and collected in the water; and on the completion of the process the tank is lowered, and the spongy or porous cone of silver is withdrawn from the retort.

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Scientific American Supplement, No. March 22, [EBook] Language: English Character set encoding: The Amalgamation of Silver Ores. Interesting Facts about Platinum. New Screw Steam Collier, Frostburg. Destruction of the Tardes Viaduct by Wind. The Steam Bell for Locomotives. Diamond Mining in Brazil. Possibilities of the Telephone. Le Plongeon on June 1, Koch on the Cholera. Greely before the British Association. The electric railway recently set in operation between Frankfort and Offenbach furnishes an occasion for studying the question of such roads anew and from a practical standpoint. For elevated railways Messrs. Siemens and Halske a long time ago chose rails as current conductors. The electric railway from Berlin to Lichterfelde and the one at Vienna are in reality only elevated roads established upon the surface. Although it is possible to insulate the rails in a satisfactory manner in the case of an elevated road, the conditions of insulation are not very favorable where the railway is to be constructed on a level with the surface. In this case it becomes necessary to dispense with the simple and cheap arrangement of rails as conductors, and to set up, instead, a number of poles to support the electric conductors. It is from these latter that certain devices of peculiar construction take up the current. The simplest arrangement to be adopted under these circumstances would evidently be to stretch a wire upon which a traveler would slideâ€"this last named piece being connected with the locomotive by means of a flexible cord. This general idea, moreover, has been put in practice by several constructors. This is the mode of construction that Messrs. Siemens and Halske have adopted in the railway from Frankfort to Offenbach. While the Paris road was of an entirely temporary character, that of Frankfort has been built according to extremely well studied plans, and after much light having been thrown upon the question of electric traction by three years of new experiments. The two grooved tubes are suspended from insulators fixed upon external cast iron supports. As for the conductors, which have their resting points upon ordinary insulators mounted at the top of the same supports, these are cables composed of copper and steel. They serve both for leading the current and carrying the tubes. The same arrangement was used by Messrs. Siemens and Halske at Vienna in The motors, which are of H. The one shaft in common runs with a velocity of 60 revolutions per minute. Its motion is transmitted by means of ten hempen cables, 3. The flywheel, which is 4 m. As the pulley mounted upon the transmitting shaft is only one meter in diameter, it follows that the shafting has a velocity of revolutions per minute. The steam generators are of the Ten Brink type, and are seven in number. The normal pressure in them is four atmospheres. There are at present four dynamo-electric machines, but sufficient room was provided for four more. The shafts of the dynamos have a velocity of revolutions per minute. The pulleys are 60 cm. The dynamos are mounted upon rails so as to permit the tension of the belting to be regulated when necessity requires it. This arrangement, which possesses great advantages, had already been adopted in many other installations. The electric machines are 2 meters in height. The diameter of the rings is about 45 cm. The electric tension of the dynamos measures volts. The duty varies between 80 and 50 per cent. The total length of the road is 6, meters. Usually, there are four carsen route, and two dynamos serve to create the current. When the cars are coupled in pairs, three dynamos are usedâ€"one of the machines being always held in reserve. All the dynamos are grouped for quantity. The company at present owns six closed and five open cars. In the former there is room for twenty-two persons. The weight of these cars varies between 3, and 4, kilos. By the addition of ten parts of collodion to fifteen of creasote says the Revue de Therap. The meeting of the American Association was one of unusual interest and importance to the members of Section B. This is to be attributed not only to the unusually large attendance of American physicists, but also to the presence of a number of distinguished members of the British Association, who have contributed to the success of the meetings not only by presenting papers, but by entering freely into the discussions. In particular the section was fortunate in having the presence of Sir William Thomson, to whom more than to any one else we owe the successful operation of the great ocean cables, and who stands with Helmholtz first among living physicists. Whenever he entered any of the discussions, all were benefited by the clearness and suggestiveness of his remarks. Graham Bell, the inventor of the telephone, read a paper giving a possible method of communication between ships at sea. The simple experiment that illustrates the method which he proposed is as follows: Take a basin of water, introduce into it, at two widely separated points, the two terminals of a battery circuit which contains an interrupter, making and breaking the circuit very rapidly. Now at two other points touch the water with the terminals of a circuit containing a telephone. A sound will be heard, except when the two telephone terminals touch the water at points where the potential is the same. In this way the equipotential lines can easily be picked out. Now to apply this to the case of a ship at sea: Suppose one ship to be provided with a dynamo machine generating a powerful current, and let one terminal enter the water at the prow of the ship, and the other to be carefully insulated, except at its end, and be trailed behind the ship, making connection with the sea at a considerable distance from the vessel; and suppose the current be rapidly made and broken by an interrupter; then the observer on a second vessel provided with similar terminal conductors to the first, but having a telephone instead of a dynamo, will be able to detect the presence of the other vessel even at a considerable distance; and by suitable modifications the direction of the other vessel may be found. This conception Professor Bell has actually tried on the Potomac River with two small boats, and found that at a mile and a quarter, the furthest distance experimented upon, the sound due to the action of the interrupter in one boat was distinctly audible in the other. The experiment did not succeed quite so well in salt water. Professor Trowbridge then mentioned a method which he had suggested some years ago for telegraphing across the ocean without a cable, the method having been suggested more for its interest than with any idea of its ever being put in practice. A conductor is supposed to be laid from Labrador to Patagonia, ending in the ocean at those points, and passing through New York, where a dynamo machine is supposed to be included in the circuit. In Europe a line is to extend from the north of Scotland to the south of Spain, making connections with the ocean at those points, and in this circuit is to be included a telephone. Then any change in the strength of the current in the American line would produce a corresponding change in current in the European line; and thus signals could be transmitted. Preece, of the English postal telegraph, then gave an account of how such a system had actually been put into practice in telegraphing between the Isle of Wight and Southampton during a suspension in the action of the regular cable communication. The instruments used were a telephone in one circuit, and in the other about twenty-five Leclanche cells and an interrupter. The sound could then be heard distinctly; and so communication was kept up until the cable was again in working order. Of the two lines used in this case, one extended from the sea at the end of the island near Hurst Castle, through the length of the island, and entered the sea again at Rye; while the line on the mainland ran from Hurst Castle, where it was connected with the sea, through Southampton to Portsmouth, where it again entered the sea. The distance between the two terminals at Hurst Castle was about one mile, while that between the terminals at Portsmouth and Rye amounted to six miles. The accurate measurement of very high temperatures is a matter of great importance, especially with regard to metallurgical operations; but it is also one of great difficulty. Until recent years the only methods suggested were to measure the expansion of a given fluid or gas, as in the air pyrometer; or to measure the contraction of a cone of hard, burnt clay, as in the Wedgwood pyrometer. Neither of these systems was at all reliable or satisfactory. Lately, however, other principles have been introduced with considerable success, and the matter is of so much interest, not only to the practical manufacturer but also to the physicist, that a sketch of the chief systems now in use will probably be acceptable. He will thus be enabled to select the instrument best suited for the particular purpose he may have in view. The first real improvement in this direction, as in so many others, is due to the genius of Sir William Siemens. His first attempt was a calorimetric pyrometer, in which a mass of copper at the temperature required to be known is thrown into the water of a calorimeter, and the heat it has absorbed thus determined. This method, however, is not very reliable, and was superseded by his well-known electric pyrometer. This rests on the principle that the electric resistance of metal conductors increases with the temperature. The principle is applied in the following manner: A cylinder of fireclay slides in a metal tube, and has two platinum wires one one-hundredth of an inch in diameter wound round it in separate grooves. Their ends are connected at the top to two conductors, which pass down inside the tube and end in a fireclay plug at the bottom. The other ends of the wires are connected with a small platinum coil, which is kept at a constant resistance. A third conductor starting from the top of the tube passes down through it, and comes out at the face of the metal plug. The tube is inserted in the medium whose temperature is to be found, and the electric resistance of the coil is measured by a differential voltameter. From this it is easy to deduce the temperature to which the platinum has been raised. This pyrometer is probably the most widely used at the present time. The exact arrangements are difficult to describe without the aid of drawings, but the result is to measure the difference of temperature between the medium to be tested and the atmosphere at the position of the instrument. The Trampler pyrometer is based upon the difference in the coefficients of dilatation for iron and graphite, that of the latter being about two-thirds that of the former. There is an iron tube containing a stick of hard graphite. This is placed in the medium to be examined, and both lengthen under the heat, but the iron the most of the two. At the top of the stick of graphite is a metal cap carrying a knife-edge, on which rests a bent lever pressed down upon it by a light spring.

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