PROGRESS OF THE WORLD'S FAIR BUILDINGS.

The site of the Columbian Exhibition at Chicago has been for some time a scene of the most stirring life and energy, and the grounds are rapidly taking on the appearance the architects and managers have designed they shall present before the opening of the great fair. The rate of progress being made cannot be fully appreciated on the mere understanding that some four thousand men are now regularly at work on the fair grounds, for, with the generous scale on which the expenditures are being made, and the careful elaboration of the plans before the work was commenced, it is apparent that another and a greater army of co-laborers is at work getting ready and forwarding to the site the materials to be used, such materials being furnished, as far as possible, in a state which calls for comparatively little work to fix in completed condition.

Our first page illustrations represent the present appearance of three of the important buildings of the fair which are now nearing completion, the work on these structures being further advanced than that on any of the others, although a great deal has been done on each of the main buildings. The Woman's Building is entirely inclosed and the oilers and painters are putting on the outside finish, while the plastering and completion of the inside is in progress. The roofing of the Mines Building is being rapidly completed, and that of the Transportation Building, although not quite so far advanced, is being energetically pushed forward. The mild weather through most of December afforded opportunities for pressing the outside work which had hardly been looked for, but which were taken advantage of to the fullest extent. This circumstance also permitted of almost continuous operations being carried on in the docking of the interior waterways, and the landscape gardener, Mr. Ulrich, has been able to keep about four hundred men employed in grading, filling, and tree planting.

At the same time the work in all the other departments is actively progressing under the direction of numerous mechanical, electrical, sanitary, railroad, and municipal engineers. The engines, boilers, and belting to form the power plant will be obtained mostly free of cost from exhibitors, by whom they will be installed as exhibits, and it is said that in this way the necessary plant for 16,000 horse power, of the 25,000 to be provided, is already secured. Negotiations have also been closed with Henry S. Worthington for a pumping plant free of cost for service on the grounds, with a capacity of 40,000,000 gallons per day. A triple expansion engine to be furnished by a Milwaukee firm has cylinders 30, 58, and 88 inches in diameter, with a 60 inch stroke. Another firm is to furnish six large engines developing an aggregate of 3,000 horse power, operating also compound air compressors, the feed pumps, heaters, condensers, and other appliances needed for the entire plant having been secured without cost as exhibits. So many of the belting manufacturers have offered to run belting as exhibits that it is not doubted all the supplies desired in this line will be obtained free of cost. A temporary power plant of 700 horse power is now in operation on the grounds, and a temporary pumping plant having a capacity of 3,000,000 gallons per day.

CLAY MODEL FOR SECTION OF ARCH OF DOOR IN MINES BUILDING.

About nine miles of sewer pipe have been already laid on the grounds, half of the entire work of pipe-laying being finished. Eighty hydrants for the permanent work have been set, and forty-eight ejectors are being made for discharging the sewerage of the principal buildings. Ample provision has been made to protect the buildings in progress from fire, and the laying of the permanent water pipes is well advanced.

The electrical engineer has completed the plans for the interior lighting of all the buildings. These plans are said to call for 7,000 arc lights of 2,000 candle power each and 120,000 incandescent lights of 16 candle power each. The plant for this lighting is to be put in position and operated by contractors during the time of the exhibition, and it is estimated that the amount of electric lighting will be ten times as much as was employed at the Paris Exposition. A temporary plant for electric lighting and power now supplies all the saw mills and hoisting machinery on the grounds.

The Woman's Building, now so nearly completed, was happily designed by a woman, Miss Sophia G. Hayden, of Boston, who received a prize of $1,000 for the best design furnished. It is 200 by 400 feet in size, and has corner and center pavilions connected in the first story by an open arcade, surmounted by classic vases. The first story is Doric and the second Ionic, the center pavilion containing the main entrance, and being treated as a triple open archway of the story above, with a row of free-standing Corinthian columns. The main gallery of the building will be 60 by 240 ft., and there will be one room 80 by 200 ft. in which will be shown matters connected with woman's work from the earliest ages of history to the present time.

The Transportation Building, between the Horticultural and Mines Buildings, is very refined and simple architecturally. The main building is 960 ft. front and 256 ft. deep, and it will have a triangular annex of one story buildings covering nine acres. Its cupola will be reached by eight elevators, and from it a most beautiful view will be obtained of the entire exhibition. Its main entrance will be a magnificent single arch, enriched to an extraordinary degree with carvings, reliefs, and paintings. The display here of locomotives, cars, and everything belonging to the department of transportation will, without doubt, far surpass anything ever before planned anywhere.

The Mines and Mining Building is 700 by 350 ft. in size, and the height to the main cornice is 65 ft. The grand entrances are at the north and south ends, and are 110 ft. high and 32 ft. wide, each opening into a vestibule 88 ft. high and elaborately decorated. At each corner of the building is a pavilion 68 ft. square and 90 ft. high, surmounted by a dome. The roof is of glass, 100 ft. from the floor, and a balcony 60 ft. wide and 25 ft. high encircles the building, eight stairways leading to this balcony.

The appearance of the staff ornamentation, as well as the manner in which it is produced, is well brought out in our illustration of the clay model for a portion of the arch of one of the doors in the Mines Building. The section shown embraces five or six different pieces, all so nicely joined on board backing that it is impossible to tell where the pieces come together, and yet readily separable to make the gelatine moulds therefrom, in which the staff is cast in sections of convenient size to be easily handled. These gelatine moulds are about an inch thick in substance, and bring out all the fine lines of the model with great distinctness, the staff castings in them accurately representing all the details of the most delicate designs. The staff is a composition of plaster of Paris and tow or other fiber, with a varying amount of alumina, glycerine, dextrine, etc., according to the special casting to be made. Almost any color desired may be readily produced upon it by simple external washes. There are now three considerable establishments on the fair grounds, employing altogether about 400 hands in the manufacture of this style of exterior ornamentation for the Exposition Buildings.

PROF. DR. KOBERT has proved experimentally that hydrogen peroxide is a valuable antidote for hydrocyanic acid poisoning. It is to be given internally as well as subcutaneously until the odor of the acid can no longer be recognized in the exhalations and the symptoms subside. He found that lethal or even larger doses could be given to animals daily for several weeks, if hydrogen peroxide be injected in one cubic centimeter doses when the symptoms of poisoning appear. The antidote acts by changing hydrocyanic acid into oxamide.—*Pharm. Centralhalle*, 1891, 570.

Cotton Oil Soap.

In the Queen's Bench Division Mr. Justice Charles lately gave judgment in the case of Wilson *v.* Union Oil Mills Company and Pearson. The action was brought by Mr. John Hazelgrave Wilson, chemist and patentee of process for bleaching soap, against the Union Oil Mills Company, of South Sea House, Threadneedle Street, London, and Mr. Isaac Pearson, chairman of the company, and an oil refiner, carrying on business at the Rock Villa Oil Mills, Glasgow.

The plaintiff claimed a royalty of 2*l.* per ton on all soap manufactured by his process, or, alternatively, damages for alleged infringement of his patent, and an injunction to restrain the defendants' further infringing.

The defendants denied having agreed to pay a royalty, or having committed any infringement of the plaintiff's patent, and alleged that the patent was invalid.

The plaintiff's patent was taken in 1883, and aimed to utilize, for the purpose of manufacturing a good commercial soap, the mucilage, or "cotton oil foots," which was a waste product in the preparation of refined cotton seed oil. The oil, when first expressed from the cotton seed, is of a dark port wine color, and contains suspended in it particles of the husk of the seed which had passed into it during the extraction of the oil by hydraulic pressure. The dark oil is treated with a solution of caustic soda, which partly saponifies the oil, and carries to the bottom of the vessel in which the oil is placed the coloring matter and the portions of the husk remaining in the liquid, leaving the oil of the color of an intermediate sherry. The mucilage or matter which falls to the bottom of the oil consists of partially saponified matter mixed with portions of free oil, caustic soda, and the resinous and albuminous compounds obtained from the husk of the cotton seed. Some thousands of tons of this mucilage are produced from the various factories every year, and the plaintiff claimed that his process not only produced a good commercial soap, which it was not difficult to do, but yielded this in a bleached condition, so that it could be used for washing materials without staining them. The bleaching was accomplished by means of hypochlorite of sodium, and he alleged that the defendants had adopted the main features of his patent.

The defendant Pearson and Mr. Tatlock, the public analyst of the city of Glasgow, proved that the process as described by the plaintiff in his specification was unworkable, and that it was impossible to separate the coloring matter from the soap by the use of hypochlorite of soda in the manner directed by the plaintiff by reason that the resinous and albuminous coloring matter absorbed any amount of the bleaching agent employed without any appreciable alteration in the color, and that the common salt produced by the decomposition of the hypochlorite of soda under the action of heat was detrimental to the process, as it threw up the coloring matter in a fine state of division and mixed it with the soap, so that the soap produced was useless. The witnesses further proved that in the process used by the defendant Pearson, which he had patented, and which was the result of a large number of experiments after the failure of the plaintiff's process, the defendant saponified the mucilage with an excess of very strong caustic soda, which not only produced soap but also dissolved out the coloring matter. The defendant then passed open steam into the boiling mass and produced a violent mechanical agitation of the liquid, and a complete separation of the soap from the colored solution took place, and the soap could be at once run or skimmed off, and after the soap had been washed with dilute alkali a good marketable soap was produced, which caused no discoloration in any fabric washed with it. The soap was somewhat dark in color, and as at first there was some prejudice in the trade, the defendant bleached the soap by boiling it with hypochlorite of soda, and this was the infringement complained of. The defendant had not, however, bleached more than about 400 tons of the soap, and was now producing a soap about the color of Pears' soap without the use of any bleaching agents.

A large body of evidence was called to prove the failure of the plaintiff's process, and several soap makers gave evidence of the use by them of hypochlorite of sodium for bleaching soap long prior to the date of the plaintiff's patent, and various specifications of Longmore, Watt, Briqueler, and others were put forward as anticipating the plaintiff's patent.

Judgment was given in favor of the defendant.

Purifying Carbon Bisulphide without Distillation.

One liter of the carbon bisulphide is treated with 0·5 c. c. of bromine and allowed to stand for three to four hours. The excess of bromine is removed by agitation with caustic potash or copper turnings. Any remaining cloudiness may then be removed by agitation with a little dry calcium chloride, with subsequent filtration. The carbon bisulphide treated in this way is colorless, of pleasant smell, and evaporates without residue.—*A. Chenevier.*

Luminous Paints.

FOR ORANGE LUMINOUS PAINT, 46 parts varnish are mixed with 17·5 parts prepared barium sulphate, 1 part prepared India yellow, 1·5 parts prepared madder lake, and 38 parts luminous calcium sulphide.

FOR YELLOW LUMINOUS PAINT, 48 parts varnish are mixed with 10 parts prepared barium sulphate, 8 parts barium chromate, and 34 parts luminous calcium sulphide.

FOR GREEN LUMINOUS PAINT, 48 parts varnish are mixed with 10 parts prepared barium sulphate, 8 parts chromium oxide green, and 34 parts luminous calcium sulphide.

A BLUE LUMINOUS PAINT is prepared from 42 parts varnish, 10·2 parts prepared barium sulphate, 6·4 parts ultramarine blue, 5·4 parts cobalt blue, and 46 parts luminous calcium sulphide.

A VIOLET LUMINOUS PAINT is made from 42 parts varnish, 10·2 parts prepared barium sulphate, 2·8 parts ultramarine violet, 9 parts cobalt arsenate, and 36 parts luminous calcium sulphide.

FOR GRAY LUMINOUS PAINT, 45 parts of the varnish are mixed with 6 parts prepared barium sulphate, 6 parts prepared calcium carbonate, 0·5 part ultramarine blue, 6·5 parts gray zinc sulphide.

A YELLOWISH-BROWN LUMINOUS PAINT is obtained from 48 parts varnish, 10 parts precipitated barium sulphate, 8 parts auripigment, and 34 parts luminous calcium sulphide.

LUMINOUS COLORS FOR ARTISTS' use are prepared by using pure East India poppy oil in the same quantity instead of the varnish, and taking particular pains to grind the materials as fine as possible.

FOR LUMINOUS OIL COLOR PAINTS, equal quantities of pure linseed are used in the place of the varnish. The linseed oil must be cold-pressed and thickened by heat.

All the above luminous paints can be used in the manufacture of colored papers, etc., if the varnish is altogether omitted, and the dry mixtures are ground to a paste with water.

The luminous paints can also be used as WAX COLORS FOR PAINTING ON GLASS and similar objects, by adding, instead of the varnish, 10 per cent more of Japanese wax and one-fourth the quantity of the latter of olive oil. The wax colors prepared in this way may also be used for painting upon porcelain, and are then carefully burned without access of air. Paintings of this kind can also be treated with water glass. —*Ztschr. Oest. Ap. Ver.*

Magnetism.

In tools it is due to a combination of position and vibration.

It is well known that vibration greatly assists change in the magnetic state of a piece of iron placed in a magnetic field, and Ewing has shown this quantitatively by a series of curves derived from actual experiment.

The phenomenon of hysteresis, or the lagging of a magnetic effect behind its cause, which is existent in all qualities of iron and steel, in soft annealed iron least and in hardened steel the most, is almost entirely obliterated in the former, and greatly lessened in the latter, when the bar is subjected to vibration.

A simple experiment, within the reach of nearly every one, to show this effect, is the following:

If an ordinary wrought iron poker be held in a vertical north and south plane and one end be dealt a sharp blow, it will be found to have assumed polarity, which may be proved by presenting the ends in turn to the north-seeking end of a compass. One end of the poker will attract and the other repel. If now the poker be reversed in position and the other end tapped, the polarity will be changed, and the end which formerly attracted the north end of the needle will now be found to repel it.

The maximum effect is produced when the bar is held parallel with the dipping needle, and it gradually disappears as this angle is departed from, until, when held at right angles to the dipping needle, no polarity is developed by the blow, and if the bar already have polarity, it may be completely removed by striking the bar when in this latter position.

Since a dipping needle may not be accessible, this latter effect may be easily produced by striking the bar when held horizontally in an east and west position. It will then be at right angles to any vertical angle in a north and south plane. As before stated, the bar will acquire no polarity if struck when in this position. This is not strictly true, however, as it would be magnetized transversely, but its dimensions in this direction being so small compared with its length, the magnetism would be too slight to be detected in the ordinary way.

In the example given, the magnetic field is due to the earth's magnetism, whose lines of force take a nearly north and south direction and tend to thread an iron bar held parallel to them. The magnetic reluctance of the bar, or the resistance which its molecules or molecular magnets offers to an arrangement in conformity with these lines, is overcome or lessened by any means of molecular vibration. In some cases the mere tremor of the earth is sufficient in this magnetic field to permit of this rearrangement. In others it requires a more violent vibration, such as may be caused by heat, by friction, or by a blow, and it not infrequently happens that these agencies must be long continued to produce appreciable results.

The magnetic reluctance of different samples of iron or steel varies not only with their quality and temper, being least with soft annealed iron and greatest with hardened steel, but also with the past history of the bar in question.

It is found that a bar which has once been magnetized in a given direction and demagnetized will more readily again take magnetism in the original direction than in the opposite one, and although two bars may be of identically the same composition and hardness, they will vary in their susceptibility as the stages through which they have passed in the course of manufacture have varied. So that it has been well said that the susceptibility to magnetism of a given bar is the resultant of all the influences to which it has been exposed in and since its manufacture.—*Electricity.*

Improved Storage Cells.

This is the storage battery of the Société Anonyme pour le Travail Electrique des Métaux, the output of whose works at Saint-Ouen, Paris, is at the rate of five tons a day, with a capacity for ten tons. Cells with a total storage capacity for 70,000 lamps are now in use at Paris. The working capacity and durability of these accumulators are sought to be increased without increase of weight or cost. For this purpose the plates are made of grid pattern, with square holes filled in with reduced lead of great porosity. Chloride of lead and chloride of zinc are melted together and the fused salts moulded in cakes of 2 inches square, of desired thickness. The cakes are formed with cross grooves on both sides and a small hole through the center. When cool they are removed from the mould, laid in batches between perforated iron plates and placed in a bath of hydrochloric acid for 15 days. The chloride of zinc is thus dissolved out. The cakes are afterward dried, placed in moulds, and molten lead poured in, forming a framing, the lead also running into grooves on the faces of the blocks and into the small hole—a self-supporting plate of good conductivity being thus produced. The plates are trimmed up and placed with zinc plates between them in a solution of chloride of zinc, which reduces the chloride of lead squares to pure porous metallic lead, the last traces of chloride of zinc being removed by a bath of dilute hydrochloric acid. They are afterward washed several times in alternate pure and acidulated water. The processes of reduction and cleansing are now complete, an examination of the interior of the squares showing the pores of regular structure at right angles to the surface of the plate. The plates are then formed in the usual way by passing currents of electricity, the efficiency of the resultant cells being remarkably high. The ordinary plates made by the Société have a capacity of 10 ampere-hours per kilo. (4·5 per pound). Cells of special type for traction purposes possess the high rate of 19 ampere-hours per kilo. (8 per pound). A remarkable feature is the high rates of charge and discharge. An installation at the Hotel Continental having 55 half-ton cells has an ordinary output of 600 amperes, and on an emergency of 1,200 amperes, at 110 volts, without noticeable fall in voltage, and without detriment to the plates. The largest installation where they are used is that of M. Popp, where 25,000 16-candle power lamps are supplied. There are no less than sixteen sub-stations, all charged from one central generating station. The engines cease running at 4 P. M., the batteries carrying the entire load till next morning. These accumulators have been adopted by the French government after severe tests, and, it would seem, constitute a most important advance in this department of electrical practice.

The Meat Diet.

The attention of the French Society for the Advancement of Science has recently been directed by certain physicians to the evil effects of an excessive meat diet, or of raw, overkept, or bad meat. The ptomaines thus produced introduce poisonous principles in the system, which the kidneys cannot throw off. Inhabitants of cities indulge far too freely in meat, often badly cooked and kept too long; the poor and country population do not often get their meat fresh. Professor Verneuil considers something should be done to remedy this state of things. He points out that Reclus, the French geographer, has proved that cancer is most frequent among those branches of the human race where carnivorous habits prevail.

Cocoanut Butter.

This comparatively new product was at first said to be prepared from the milk of the cocoanuts, but as a matter of fact it is produced from the cocoanut oil, by treatment with alcohol and animal charcoal, which removes the rancid flavor and makes the butter white.

An Edison Patent for Connecting "Tension Reducing" Devices in Multiple Arc.

On Dec. 8, 1891, a patent was issued to Mr. T. A. Edison, entitled "Sytem of Distribution," No. 464,822, which will attract considerable attention, owing to the broadness of the claims embodied in it. The patent was filed June 26, 1882, and describes the method of employing a high tension main circuit extending to a distant point and "tension reducers" located at a distance from the point of supply and connected with the high tension circuit in multiple arc so as to be independent of one another, the lamps or motors on the derived low tension circuit also being connected in multiple arc.

One method of accomplishing this object is described, consisting of secondary batteries or condensers which are charged in series from the high tension circuit and discharged in multiple into the low tension circuit, this being accomplished by means of a revolving commutator.

The patent was the subject of prolonged interference proceedings. Its claims are as follows:

1. In a system of electrical distribution, the combination of a main circuit extending to a distance from the source of electrical energy and having a current of high tension, a constantly acting tension reducer connected with such main circuit by a multiple arc or cross circuit, so as to be independent of other similarly connected tension reducers, and a translation circuit supplied by such tension reducer with a current of lower tension, substantially as set forth.

2. In a system of electrical distribution, the combination of a main circuit extending to a distance from the source of electrical energy and having a current of high tension, a translation circuit, translating devices arranged in multiple arc in such translation circuit, and a constantly acting tension reducer connected with such main circuit by a multiple arc or cross circuit and also connected with said translation circuit, said tension reducer being charged from such main circuit and discharging a current of lower tension in said translation circuit substantially as set forth.

3. In a system of electrical distribution, the combination of a main circuit extending to a distance from the source of electrical energy and having a current of high tension and a translation circuit with an intermediate secondary battery or condenser, and a continuously working commutator throwing all the elements of such secondary battery or condenser together and at the same time rapidly forming a series connection with the main circuit to multiple arc connection with the translation circuit, and back again, substantially as set forth.

4. In a system of electrical distribution, the combination of a main circuit extending to a distance from the source of electrical energy and having a current of high tension, and a translation circuit with an intermediate secondary battery or condenser, a commutator throwing all the elements of such secondary battery or condenser together and at the same time rapidly forming a series connection with the main circuit to a multiple arc connection with the translation circuit, and an electric motor working such commutator, substantially as set forth.

The *Electrical Engineer* adds, the Edison Company claims that the patent covers the placing of converters or transformers in multiple arc.

Small Wire Manufacture.

Says the Providence *Journal:* In Providence diamond dies are made and used at the American Electrical Works. Until means for drilling holes through diamonds were devised, wire was drawn through steel plates, which, however, failed to give satisfactory results. The slightest wear in the hole spoiled the wire, which was made larger at one end of the coil than the other. The steel dies, therefore, had to be handled with great care, and whenever the slightest wear was detected, it was necessary to pound the die and ream the hole out to the size required.

The wire makers of Europe discarded steel dies when they learned how to drill rubies and sapphires. These dies were superior to steel dies, but they lacked the hardness necessary to the most perfect dies. Then diamonds were drilled, and better results were obtained, but the production of perfect wire was not possible until after the imported diamond dies were reamed out. The wire as drawn through them was rough, the inside of the hole not being smooth.

The American Electrical Works enjoys the distinction of having manufactured the only perfect diamond dies used in the United States. About twelve years ago, W. H. Sawyer, who has been connected with the company since 1878, made a number of experiments in drilling the jewels. Trial after trial was made, but the diamond was too hard to be pierced by any of the ordinary methods. It was a long time before he succeeded in drilling the diamond, and it is believed that he is the only man in the country who has been able to produce a perfect diamond die for drawing wire finer than a hair pulled from one's head.

These fine wires are used in making the receiving instruments of ocean cables, the galvanometers used in testing cables, etc. The finest wires in the world are made at the factory, at the corner of Stewart and Conduit streets. The smallest size is two-thousandths of an inch in diameter, but the diameter mostly called for is three-thousandths of an inch. An idea of the fineness of the two-thousandths wire is afforded by the number of miles there are in a pound. One pound of this size if unwound would reach from Providence to Woonsocket nearly sixteen miles, and a pound of the three-thousandths would stretch from the City Hall to the chimney of one of the mills at Lonsdale.

The magnet wires are covered with silk thread, which is even finer than the wire, and is wound with two layers, a process requiring the greatest delicacy, as frequently the tendency is to cover the thread with wire instead of wire with thread. The wires are made of copper and German silver, and are unsurpassed for uniformity of diameter and regularity of size.

The diamonds are set in brass dies without cutting. The foreign wire makers wasted their time and money in cutting the corners off the diamond chips in order that the jewels might be set in a socket; but at the American Electrical Works the fragment is placed in the center of the die, and held in position by an alloy melted and poured around the diamond. This saves time and expense in preparing the diamond for use in wire drawing, and the die is as neat in appearance as if the stone had been cut into ornamental shape.

It is difficult to secure the diamond chips of which the dies are made. The pieces in demand are knocked off the large jewels by the lapidaries and are often used for rose diamonds, that is, diamonds with flat surfaces. A few years ago the supply was abundant, but since the discovery of the process of drilling holes so small that they can scarcely be seen without a microscope, the quantity in the market has been limited.

Electric Lights for Rome, Italy.

A notable example in Europe of water power utilization in connection with electric lighting is afforded by the new electric station now being established at Tivoli, near Rome. There is at this place a large and valuable water power, a portion of which has recently been utilized in the establishment of a large alternating current station of a capacity of 2,000 h. p., intended to supply a portion of the city of Rome with electric light. Water is taken from the Falls of Tivoli by an aqueduct from which there is a pipe line 62 inches in diameter to the wheel station. The entire fall is 156 feet, and the water supply 106 cubic feet per second. The power station consists of three 100 h. p. Pelton wheels which operate direct current dynamos used as exciters. Also six Pelton wheels couple direct to the same number of 350 h. p. alternators which run at 170 revolutions per minute. Each alternator is designed to furnish current at 5,000 volts pressure and 45 amperes. The wheels are governed by hydraulic inlet valves, are worked by a sensitive hydraulic relay which is set in operation by a centrifugal governor. By this means the speed is automatically kept constant, independent of the working of the machine.

The alternating current so generated is to be transmitted to Rome, a distance of 15½ miles, by means of four stranded copper cables, each being 0·05 square inch in cross section, and capable of carrying 120 amperes carried overhead on iron poles placed 114 feet apart, and about 30 feet high, insulated by means of double-shed oil insulators, specially designed for this work by Prof. Mengarini.

A drop of 1,000 volts, or 20 per cent, is to be allowed in these lines. At the far end of the trunk mains the pressure will be reduced by step-down transformers to 2,000 volts, and distributed underground by Siemens cables to secondary centers, at which it will be again reduced to 1,000 volts.

The six machines are all capable of being worked together in parallel, the maximum number of five being used together, and one machine being always in reserve. Two of the exciters are sufficient to supply exciting current to the whole of the dynamos, the third being a reserve.

The Deadly Cold Bed.

If trustworthy statistics could be had of the number of persons who die every year or become permanently diseased from sleeping in damp or cold beds, they would probably be astonishing and appalling. It is a peril that constantly besets traveling men, and if they are wise they will invariably insist on having their beds aired and dried, even at the risk of causing much trouble to their landlords. But, according to *Good Housekeeping*, it is a peril that resides also in the home, and the cold "spare room" has slain its thousands of hapless guests, and will go on with its slaughter till people learn wisdom. Not only the guest, but the family, often suffer the penalty of sleeping in cold rooms and chilling their bodies, at a time when they need all their bodily heat, by getting between cold sheets. Even in warm summer weather a cold, damp bed will get in its deadly work. It is a needless peril, and the neglect to provide dry rooms and beds has in it the elements of murder and suicide.

Chignecto Ship Railway.

Mr. Ketchum, chief promoter of the Chignecto Marine Railway, has notified the Dominion government that an application will shortly be made to the government for some of the subsidy to be payable as interest on the bonds which are to be issued. This, Mr. Ketchum says, would be practically a guarantee that the interest on the bonds will be paid, and would not involve any more expenditure on the behalf of the government than if the work had been completed last year according to contract and the subsidy paid agreed upon. The subsidy to be given by the government is $170,000 a year, payable after the completion of the work in half yearly installments of $85,000 each for 20 years. The work of building the ship railway commenced in October, 1888, and another season's work would finish it. The most difficult and risky part of the work is accomplished, according to Mr. Ketchum. He says that nearly all the earthwork has been completed, the roadbed has been graded, the embankments and foundations made solid, the harbors and approaches constructed, the masonry built firm and solid, and 12 miles of single track laid. About $3,500,000 has already been expended and about $1,500,000 is needed to finish the work. This is an interesting and important project. It is to be hoped the necessary money for its completion will be soon provided.

Treatment of Locomotive Boiler Waters.

At a recent meeting of the Western Railway Club, the subject of discussion was the treatment of locomotive boiler water. The purge which seems to be the most successfully used to remove and prevent scale is composed of caustic soda and soda ash. About one quart, costing one cent, is used in the locomotive boiler for every twelve miles of distance traveled. Mr. Lewis said he had for the last year or more made a practice of using coal oil. When a boiler is washed out, and before it is filled with water, I have a gallon of coal oil poured into it, and as the water rises in the boiler, the coal oil floating on the surface deposits itself on the surface of the iron. There is no chemical action; we know that coal oil is very penetrating; that you can take a block of cast iron of reasonable size and pour a little coal oil on it and it will permeate through that block. My idea about the coal oil is that it will permeate the scale, or go between the scale and the iron, lifting it from the iron, and then the expansion of the boiler, due to heat, will crack off the scale, and it can be removed when the boiler is washed.

Mr. Quayle said he had recently used potatoes. We are using one peck of potatoes, and we find that the impurities of the water seem to come out every time the boiler is washed, in the form of a mushy substance, about the consistency of cream and about that color, only a little dirtier. I have learnt that sorghum is successfully used in stationary boilers as a water purifier. Mr. Gibbs said: Any vegetable substance can be used in a boiler and it will break up the scale, owing to the decomposition of the vegetable matter. The action of every vegetable substance is the same.

Life Saving at Sea.

The recent heavy gales, and some of the catastrophes that have resulted from them at various points along our coasts, should again direct public attention to the curious inefficiency of the appliances which are at present in common use for saving the lives of the crews of vessels that are cast ashore in storms. It need scarcely be pointed out that, where a wind blows violently off the shore, ships, though they may suffer in other ways, do not often come to grief by running aground. That danger is, of course, most threatening when the wind blows strongly from the sea. Yet great part of our arrangements for saving the lives of wrecked crews seem to be based upon the assumption that the dangerous gales come from the land and not from the sea. If not, why do we provide the coast brigade service with the rocket apparatus, and omit to insist that ships shall carry something similar? Even better than the rocket apparatus for this service is a small line-throwing gun. An ordinary brass signal gun, which can be adapted at very small cost for the purpose, will throw a line with considerable precision for a quarter of a mile.—*London Graphic.*

The 100 Puzzle.

We have received a number of ingenious solutions to the above—to so place the ten digits that their sum shall be 100. We submit a number of the same.

(1) $0 \div 1 - \frac{2}{3} + \frac{3}{6} + 4 + 5 \div 87 = 100.$

(2) $10 \div \frac{3}{2} \div \frac{3}{6} \div 4 + 5 + 78 = 100.$

(3) $0 + 1 + 34 \div 5 + 6^2 + 7 + 8 + 9 = 100.$

(4) $1 \div 3 + 4^2 \div 50 + 6 \div 7 \div 8 + 9 = 100.$

—*By C. F. Erhard.*

(5) $5 + 10 + 36 \div 47 = 98 + 2 = 100.$

—*By W. Donaghy.*

(6) $0 + 97 + 1 + \frac{2}{3} + \frac{3}{6} + \frac{4}{8} = 100.$ — *By H. S.*

It is to be said, however, that the use of fractions involving division, or of exponents involving multiplication and virtually repetition of the same number, is hardly fair.