trances and exits from every quarter of the grounds, but excursionists may be landed within the grounds. It will not even be necessary for visitors south of Twelfth street or west of the river to come east of the river, or for residents of the North side to come south of the river, by the usual routes, in order to visit the exposition. The existing railroad circuit will run trains every minute, from every division of the city, landing passengers for five cents at the center of the fair; and passenger boats from every landing on river or lake shore can reach the exposition water front in all weathers.

"It only remains to notice in this connection the really noblest feature associated with the fair, the magnificent bridge which is to span the Chicago river at an elevation of one hundred and thirty feet, joining the termini of the Lake Shore driveway and Michigan avenue. The bridge will begin at Michigan avenue, extending one thousand feet east on Monroe street, thence north, reaching the summit by a rise of one foot in sixteen. The bridge will consist of three arches, the central span being fifteen hundred feet. The main arch will spring from Lake to Ohio street. Curves are the most striking forms of structural beauty, and it is thought that this colossal bridge, representing the gateway of the imperial city, and surmounted by symbolical works of art, is one of the noblest conceptions of the many that have been suggested. The estimated cost of the structure is $3,000,000.

"The objection so frequently raised that there is insufficient time for the stupendous work of extending and filling in the lake front is negatived in the most direct and emphatic manner by the best engineering experts. President Ellsworth, of the South Park Board of Commissioners, unhesitatingly declares that the work can be accomplished in a satisfactory manner without retarding the fair. Indeed, investigation has demonstrated that the preparation of the Lake Front as proposed would be more economical and expeditious than any other site that has been urged upon the directors.

"One of the most important considerations in influencing the Lake Front selection is that the Illinois Central company surrender all riparian claims and right of way between Monroe Street and Park Row, and all right of way between Sixteenth and Twenty-second Streets. Then the Lake Front will be practically wedded to Jackson Park, completing Chicago's magnificent and unparalleled park system. The exposition overflow from the Lake Front will find all essential accommodation southward. The proposition to connect Jackson Park, and perhaps Garfield Park, and the Lake Front by a railroad operated by the fair association obviates every objection to the division of exhibits. This would afford ready and free transportation to all visitors and would largely enhance the fair receipts.

"The financial problem of the fair has been effectually solved by the selection of the Lake Front. It is a site which practically furnishes $25,000,000 for fair purposes. Any other selection would have left the directors to depend upon the meager subscription fund of $5,000,000 and such additional appropriation as might accrue from legislative authority."

A Boiling Lake in Nevada.

Recently an item has been going the rounds in regard to a boiling lake near Lassen's Peak, California. It is not generally known, but we have in Nevada a similar boiling lake. It is situated at the eastern base of the first large mountain range east of the Sink of the Carson. It lies on the edge of an immense desert—a desert so large and scorching that in summer the Indians never attempt to cross it except at night, and even then they always go provided with a large supply of water. On three sides of the lake are rocks two or three hundred feet high, which are perfectly bare and are burned to a deep brick red. The area of the lake is about two acres. Though steam is constantly rising from the water, the whole surface of the lake does not boil. The agitation—boiling—is confined to the great springs which burst up at several points. These springs force columns of water from a foot to two or three feet in diameter to a height of over twenty inches above the general surface of the lake, causing a loud rippling sound and considerable local commotion. The water of the whole lake is doubtless boiling hot, though not seen to boil, for a brook flowing from it down into the sands of the desert sends up a cloud of steam for a distance of several hundred yards. About a mile from the lake is a great deposit of sulphur, running through which are streaks of pure alum, from two to six inches wide.—*Virginia (Nev.) Enterprise.*

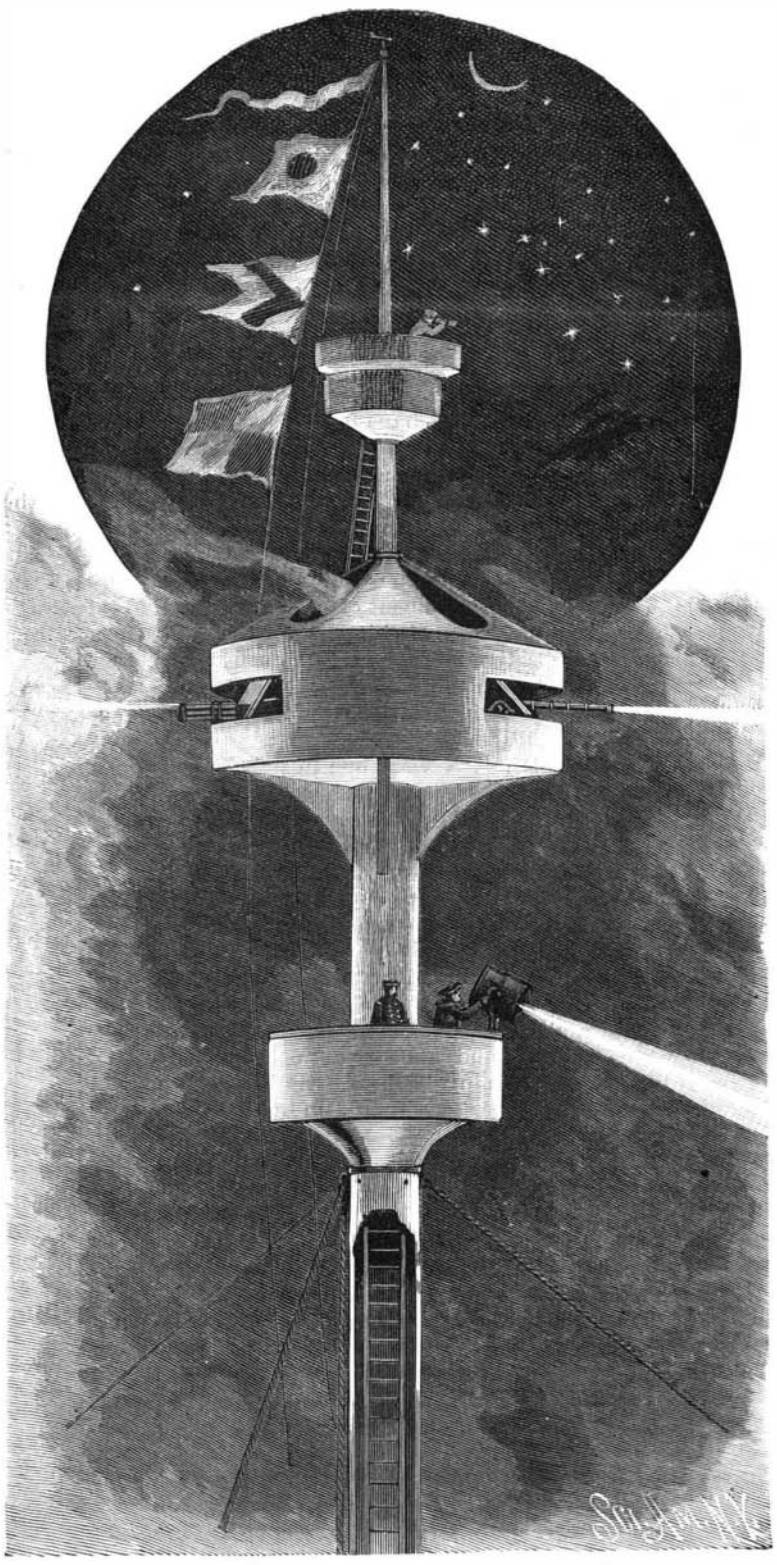
MAST OF A MODERN WAR VESSEL.

Although modern warfare is as different from that of the days of Greek fire, the catapult and the cross bow as is our mode of living from that of the ancients, still in some of our modern appliances there is a remarkable resemblance to some of the very ancient enginery. In early naval warfare the mast of a vessel was an important aggressive point, and from the mast head were thrown javelins, arrows, hot shot, Greek fire and other destructive missiles. The masthead was then, as now, the chief lookout, and as all naval battles were at short range, equivalent almost to actual contact of the vessels, the mast was perhaps even more important than the main armament of the vessel.

Among the vessels which Charles I. added to the English navy was one built by Pett, named The Sovereign of the Seas, launched at Woolwich in 1637. The length of her keel was 128 feet, the main breadth 48 feet, and the length from stem to stern 232 feet. The description of this vessel by Thomas Heywood, states that "she bore five lanthorns, the biggest of which would hold ten persons upright, had three flush decks, a forecastle, half deck, quarter deck, and round house. Her lower tier had thirty ports for cannon and demi-cannon; middle tier, thirty for culverins and demi-culverins; third tier, twenty-six for other ordnance; forecastle, twelve, and two half decks, thirteen or fourteen ports more within board, for murthering pieces, besides ten pieces of chace ordnance forward, and ten right aft, and many loopholes in the cabins for musquet shot. She had eleven anchors, one of 4,400 pounds weight. She was of the burden of 1,637 tons." On trial, this vessel was found to be too high for good service. She was therefore cut down to a deck less, and became an excellent ship.

Gunpowder was used as long ago as 1338, and it seems strange to read that at this early period of 1338 iron cannon having several chambers were used. In these early days, arms and ordnance bore such names as these: cannon, demi-cannon, culverins, demi-culverins, sakers, mynions, falcons, falconets, etc.; now we have rifles and howitzers, Gatling and Hotchkiss guns, the mitrailleuse, etc.

Our engraving represents the mast of a modern war ship, with its lookout and its turret. The mast is made hollow, and of sufficient diameter to allow the men to ascend. The lower tower is provided with a search light, which receives its current through wires extending up the hollow mast. The turret is armed upon one side with a single piece of ordnance, and upon the other with a Gatling gun. Above all is located the lookout or watch tower. With such an auxiliary as this, a war ship can seriously harass the enemy, besides doing a great deal of actual damage. By the aid of a strong electric light, aggressive movements may be carried on at night. Not only can these aggressive movements be carried forward, but by means of the light the entire vicinity of the vessel may be searched for torpedoes and torpedo boats, thus rendering practical at night the means of defense against the attacks of these wary enemies.



MAST OF A MODERN WAR VESSEL.

The Art of Living to a Great Age.

The enchanters of China promised the emperors of that country to find an elixir of long life that should efface the irreparable inroad of years. The astrologers and necromancers of the middle ages flattered themselves to have discovered the fountain of youth, in which a person had merely to bathe in order to recover his youth. All such dreams were long ago dispelled by the progress of science. Yet, in the heart of most men there is such a desire to prolong their stay upon the earth that the art of living for a long time has not ceased to impassion a large number of persons who would be willing to endure all the evils of an indefinitely prolonged old age.

One of the perpetual secretaries of the Paris Academy of Sciences has written a volume to prove that man should consider himself young up to eighty years of age. A noble Venetian named Cornaro spent twenty years in a scale pan in order to ascertain what alimentary regimen was best adapted to him. We have known old men who, having learned that M. Chevreul had never drank anything but water, took the resolution to abstain wholly from wine, hoping in this way to exceed a hundred years. Fortunately a rag gatherer, who reached the same age as the celebrated academician, spared them this sacrifice by informing his confrere in longevity that he had never drank anything but wine.

The Society of Hygiene, Vienna, has just started an extensive investigation in order to determine what it is necessary to do in order scientifically to prolong life beyond the ordinary limits and to rival the patriarchs of the Scriptures, as compared with whom M. Chevreul himself was but a child. The society has therefore drawn up a circular which it has sent to all the old men of Germany and Austria occupying a certain position in the world, and which contains a multitude of questions about their regimen, their habits, the duration of their intellectual work, the nature of their recreation, their manner of clothing themselves, etc. The good Viennese hope in this way to get up a practical manual designed for those who wish some day to double their formidable cape of eighty years.—*Iron.*

Cement for Iron Railings.

For the cementing of iron railing tops, iron grating to stoves, etc., the following mixture is recommended; in fact, with such effect has it been used as to resist the blows of a sledge hammer. The mixture is composed of equal parts of sulphur and white lead, with about one-sixth proportion of borax, the three being thoroughly incorporated together, so as to form one homogeneous mass. When the application is to be made of this composition it is wet with strong sulphuric acid, and a thin layer of it is placed between two pieces of iron, these being at once pressed together. In five days it will be perfectly dry, all traces of the cement having vanished, and the work having every appearance of welding.

THE manufacture of cotton goods in Ceylon has for the last few years made remarkable progress. The island promises to become as dangerous a rival to India in that industry as in the cultivation of tea.

Cause of the Constantly Decreasing Mileage of Freight Cars on Home Roads.*

BY W. G. WATTSON.

That it is true that the general average performance of freight cars is constantly decreasing there is scarcely any doubt, although there are no available statistics of a general character to prove the conclusion as an established fact. At the same time it is true that on a majority of the railroads the methods of handling cars, distribution, supervision at stations, records, train services, etc., have been greatly improved during the past ten years; but in spite of this fact the general average car performance has decreased. This leads to the apparently paradoxical state of things that upon the whole the efforts of our association to improve the administration of the car service office have been successful, but that the most important results, *i. e.*, increasing car movement, have not been accomplished.

In the year 1878 the White Line comprised 3,520 cars, the performance of which averaged 70 miles per day. In the same year the Union Line comprised 3,828 cars, and the average performance was 78·82 miles per car per day. At the present time the White Line comprises 13,000 cars, and the average mileage is 29·9 miles per car per day. The Union Line now comprises 9,015 cars, and the average mileage is 36 miles per car per day. Other fast freight lines and railroads show similar figures. This condition is not due to any decline in the method of handling cars, so far as the efficiency of the car service office is concerned.

The car service office has not reached a state of perfection, of course, but it is not less efficient than it was ten years ago. There are, however, forces at work influencing the decrease in the service of cars which are not affected by the most thorough office system. If these forces have any effect at all, it is to reduce and not increase the average car performance, as the more thorough and efficient the office work (from a mileage standpoint, which is the controlling factor at present) the less will be the movement of cars empty, the loaded movement being controlled by the quantity of traffic. . . . The trouble is that new cars are being built faster than new tonnage is developed, and consequently a decrease in car movement is inevitable. In the year 1888, according to Poor's Manual, there were 70,423 millions of tons of freight moved one mile by all of the railroads in the United States, and the number of freight cars owned by them was 1,005,116. Estimating 15 tons per car, the tonnage was moved with a car performance of 4,695 million miles. At 20 miles per car per day, 1,005,116 cars would in one year run 7.337½ million miles, which, after moving the tonnage of 1888, left 2,642½ million miles, or about 36 per cent. to spare. Certainly an allowance of 36 per cent. for the empty movement is sufficient. There can, therefore, be no increase in the average car movement so long as the increase of equipment keeps pace with the growth of traffic.

If there are sufficient cars for the legitimate wants of traffic, why are more being built? There can be but one explanation, and that will show that the freight car has become so great a factor in the competition for traffic that the *number* of available cars, instead of their performance, is the desideratum. Railroads have been so multiplied that nearly all traffic is competitive, and while the rate and time in transit are the controlling factors, neither can avail without the support of a full supply *of the most improved kind* of cars. I emphasize the words "of the most improved kind," because the car of 20 tons capacity has not more than forced the 15 ton car from through service, when its owe usefulness is threatened by the appearance of the 25 ton car. Not only this, but special cars are being built for different classes of traffic; for instance, furniture cars (the larger, the more favored by shippers), ostensibly intended especially for furniture, but which are an active factor in the competition for all bulky shipments, of light weight, such as carriages, household goods, hay, baskets, empty crates, etc. Special horse and cattle cars, refrigerator cars and ventilated fruit cars are also playing well their parts as missionary agents for competitive traffic. A new road is open and puts on a line of new cars, built after the most approved patterns, and begins to compete for business, and the older lines must have cars equally good or lose their traffic. When the crops are harvested, an immense quantity of freight is at once offered for shipment, and the road which has the most cars generally secures the most tonnage. The great delay to the foreign car (the car away from home), both under load and empty, breeds a fictitious demand for more cars, and they are built, when the real, practical need is more movement of the cars already built. Under these conditions the equipments of the railroads are rapidly increasing, and the situation is further aggravated by the great influx of cars belonging to private car companies and shippers of special commodities. Many of the former are turned loose to earn what mileage they can, and, being exceptionally good cars, have an advantage over many cars belonging to railroads. Shippers' cars find their way into service by reason of the traffic that they bring to the line hauling them, and it is fast becoming the rule that every shipper of considerable traffic has his own cars. These cars do not increase the aggregate tonnage, but decrease the service of the cars of the railroads. Competitive passenger traffic has already reached a most expensive state—gilt edged service with vestibuled cars or no business—and to the observing mind it must be plain that competition for freight traffic is fast tending in the same extravagant direction, and that feature which incites the overbuilding of freight cars is the principal factor.

There are, however, other minor causes influencing the over-production of freight cars, and consequently the decreased general average performance, which are directly attributable to the car service office. I refer to the general indifference with which foreign cars and the requests of their owners for their return are treated. We devote almost all our entire energy to following up our own cars away from home. We know that this is mostly wasted energy. When we remember that our own car is the foreign car when it gets away from home, the effect of this principle in the service may be appreciated. It is well enough to talk about delays by reason of billing "to order," overcrowded yards, etc., but the principal cause of delay to the foreign car is that car service officers are dividing their energy among all the other railroads of the country, instead of concentrating it for the movement of cars on the home line. My company has now a number of cars on one of the important lines, and they have been there since last February, notwithstanding our repeated efforts to get them home. The cars have been empty for at least two months. During this time we have received quite a number of cars belonging to the road in question, and tracers have followed them thick and fast. It is a great mistake to allow cars to stand around loaded or empty unnecessarily, as the cost of the standing room and the retarding of traffic in transit far transcends the mileage consideration. The mileage system of settlement for service of cars interchanged is also a fruitful cause for the building of new cars and the consequent curtailment of the service of the old ones, as the preference of shippers for the new, strong cars so swells the mileage as to return a handsome rate of interest on the money invested, to say nothing about the earnings from the increased tonnage secured.

This question is a vital one in dollars and cents. Placing the low water mark of acceptable service at 40 miles per car per day, a surplus of 500,000 cars above the requirements of the service is shown. This represents a needless investment of about $250,000,000. Instead of a return upon this enormous investment there is a further outlay for maintenance of $40 per car, amounting to $20,000,000 per annum. The surplus cars must also have standing room, which means 3,310 miles of side tracks, representing an additional investment of about $49,650,000. This side track must always be maintained, and another annual expenditure of about $3,310,000 is involved. Altogether a permanent investment of $299,656,000 and an additional yearly expenditure of about $23,310,000. But this is not all. More locomotives are required and the whole operating service assumes greater proportions than would otherwise be necessary. The question therefore involves the consideration of an interest of vast magnitude, and its solution is to be had only through a complete change of practice in supplying and moving cars.

The improvement of car service is not, in its most important sense, a question of operating details, but one of administrative policy. What, therefore, will be the outcome? The tendency of the time is toward consolidation. Will the car service evil reach such proportions as to render the consolidation of individual equipments under independent co-operative companies for various geographical districts the only means of survival? Or can such a move be forestalled by the determined and united efforts of this association to reduce the detention of the foreign car both under load and empty?

*A paper read before the International Association of Car Accountants, at New York, June 26, 1890, by W. G. Wattson.

Improved Arrangement of Marine Engines.

The steamship City of Vienna, which was built by Messrs. Workman, Clark & Co., Belfast, and engined by Messrs. John & James Thomson, Finnieston Engine Works, Glasgow, to the order of Messrs. George Smith & Sons, Glasgow, went out on her official trial on the Firth of Clyde recently. The City of Vienna is a vessel of 5,000 tons register, 412 ft. long, 46 ft. 4 in. beam, by 29 ft. 3 in. depth of hold, and is a splendid addition to the fine fleet of City Line steamers trading between the Clyde and India. She has three decks, the upper and main being steel, covered with teak. She is fitted throughout with all the latest improvements, and is of the highest class, every modern requisite for the comfort of passengers and the expeditious handling of the cargo having been adopted. The propelling machinery of the City of Vienna is of special interest, and particularly the main engines, which are a complete departure from the previous arrangements of marine engines of high power.

Howden's system of forced draught, of which the owners had previously acquired a very satisfactory experience, has been adopted, also Weir's patent feed pumps and evaporating apparatus; and to the engines has been fitted Morton's patent valve gear, Toms' patent slide valve being fitted to the low pressure cylinder. The engines of the City of Vienna are the largest to which this system of valve gear has been hitherto applied. They are of the triple expansion type, on three cranks, having cylinders 32 in., 53 in. and 87½ in. diameter respectively, and 5 ft. stroke, working at a boiler pressure of 160 lb. per square inch, and a piston speed of 700 ft. per minute. The difference in the longitudinal engine room space occupied by the new engines, as compared with that which would have been occupied by engines of the ordinary type, with the same diameter of cylinders and ordinary link motion, designed to occupy the shortest space consistent with having the crank shaft interchangeable, as in the present case, is over 4 ft., which in a ship of the dimensions of the City of Vienna represents a large and valuable increased cargo space, while with the new engines there is also the additional advantage of increased longitudinal main bearing surface, although there are fewer bearings, consequent upon the reduced length of the sole plate, every working part of the engines is open and free of access, the valves being on the cross center line of each engine, thus leaving a clear space from back to front between the engines.

Special attention has been given by the engineers to the design and finish of the whole engines, ample bearing surface having been provided in the working parts, with the means of easy and efficient lubrication available for the engineers in charge. The performance of the engines on the preliminary and official trials was in every respect highly satisfactory, a speed of fifteen knots per hour being attained, the engines working smoothly and no heating. At the conclusion of the trial the Messrs. Thomson were cordially congratulated on the success which had attended this new departure from their usual design and practice. Messrs. Thomson have in course of construction four sets of triple expansion engines, which are also to be fitted with Morton's patent valve gear.

Water Power and Electric Motors.

The census of 1880 placed the number of water wheels operating as motive power in the United States at 54,404. This tally represented a total of 1,225,379 horse power. The later association of water power with electric motors has developed a source of force that is destined to be of eminent service in industrial life. The distribution of this new energy by means of wires and motors over areas tributary to our water courses will add a new chapter to the story of industrial development. It has been computed on the best data obtainable that the rivers and streams of this country averaged throughout the year over 200,000,000 horse power. The electric utilization of this power opens a field of magnificent opportunities.

The Niagara project is in correspondence with the possibilities of this new energy in motive power. In Rochester, Kearney and Spokane Falls we have practical examples of its use.

The lower falls of the Genesee River are utilized by the Rochester Brush Electric Light Company, and it has 500 motors already in active service. It furnishes power to 108 tailor shops, charging at the rate of $18 per annum for one-eighth horse power. Fan motors are kept in continual motion from June 1 to October 1 for $15. For 25 cents a day a small manufacturer or storekeeper has one horse power at his service, with no trouble or care of his own. Its work is steady and continuous, and its easy command in small units at a nominal cost will make its use general and probably work some important changes in our industrial facilities.

The rate for two horse power is $120 per annum, $250 for five, $300 for six, $400 for eight, $475 for ten and $700 for fifteen. The power applied at these rates is economical and steady, and involves no attention beyond the closing of a switch, and that the work of a second. It can be carried any distance in large or small quantities.

The Ordnance Department of the national government is constructing a dam at Rock Island, Ill., in which some forty-one wheels, connected with dynamos, will carry the electric current to motors distributed in its various departments. The Des Moines rapids at Keokuk will furnish 60,000 horse power with the necessary machinery and appliances. There is practically no computable limit to the possibilities of this motive power, and its development will in time change many of the old and cumbersome conditions of our varied industries.—*The Age of Steel.*

THE new Croton Aqueduct, New York, was opened on the 15th July, and water from the Croton Lake, after running 30 miles, was admitted to the reservoir in Central Park. The opening of the new aqueduct is the cause of much rejoicing among the people. The supply of pure water will be much more abundant than it has been for ten years past.

A Electric Lawn Party.

Mr. Edward H. Johnson, the president of the Interior Conduit and Insulation Co., has a fine country residence, "Alta Crest," at Greenwich, Conn. His house is situated about four miles from the Sound, in the center of a plot of ground of 33 acres, which, according to the United States geographical survey, occupies the highest point of land between Maine and Florida, a like distance from the coast. On account of the electric light and the electrical proclivities of its owner, the place has been very appropriately named "Electric Hill." The house itself is of the colonial style, and from its spacious porticoes a magnificent view on all sides is spread before the observer. The lighthouse off Bridgeport shoals is plainly visible 33 miles distant—such is the vista. The house stands on the apex of the hill, and the broad winding driveway which leads up to it by a circuitous route is lighted by numerous incandescent lamps on ornamental poles. An Edison plant supplies the light and power for the house as well as for the spacious stables and lawns.

Within the house itself Mr. Johnson has carried out many novel ideas in regard to lighting as applied to decorative effects, as well as in regard to the useful application of electric power for household work.

In the groined, oaken hall a large handsomely finished organ pours forth melodious music by the hour, by the simple manipulation of an ordinary electric switch. An apartment over the *porte cochere*, known as Mr. Johnson's "Den," contains trophies from all parts of the civilized and uncivilized world. An electric cigar lighter lies handy to an open box of cigars on a table. Two electric cooking stoves keep the late supper warm, while an electric teapot simmers on the sideboard and has been found convenient in supplying other warm decoctions besides the five o'clock cup. A huge horned owl blinks electrically, with large yellow eyes, from his perch in one corner across the room at a hideous bearded Chinese mask, which emits the red fire of passion from its open eyes, mouth, and nostrils. Between the two is suspended in midair a large specimen of porcupine fish, within whose transparent and bristling skin is concealed an incandescent lamp sufficient by itself to light the room. Electric fan motors cool the air when necessary. On one side of the room stands what may now be termed a relic—one of the first phonographs ever made, a monument to tinfoil, lung power, and muscle; while on the other stands the very last instrument, especially constructed for Mr. Johnson, at the phonograph works. The drawers of the cabinet contain a choice selection of musical cylinders, which prove an endless source of entertainment to every one.

Lately Mr. and Mrs. Johnson received some 300 guests at their annual lawn party, given in honor of the birthday of their daughter. For this occasion a large dancing platform, 40 by 25 feet, was erected on the lawn in front of the house, covered with crash, and illuminated by strings of Chinese lanterns, each with an incandescent lamp within, suspended in festoons from decorated poles at the corners. Outside the house, the decorations consisted principally of artistic effects produced by an elaborate arrangement of incandescent lamps of all colors. Between each post of both the upper and lower porticoes encircling three sides of the house were suspended flexible pendants bearing alternate colored lamps of red, white, and blue, while from each of the third story windows hung lamps of like colors, and, surmounting it all, making one huge pyramid of light, was a varicolored cluster of lamps in the cupola.

From beneath the ivy which climbs thickly round about the stone tower containing the gun room and telephone room, peeped forth also many red and blue lamps. The flag poles, 75 feet in height, floated the stars and stripes, surmounted, not by the conventional eagle, but by a pin-wheel five feet in diameter, containing oven a dozen red, white, and blue lamps, and rapidly revolved by an eight horse power motor.

The engine room, with its two Edison dynamos, storage batteries, engines, and various regulating apparatus, proved to be a place of endless entertainment and instruction. The pumps operated automatically by Sprague motors, and forcing water from wells 1,200 feet distant, as well as the electrical dampers and other heat-regulating apparatus, automatically and electrically operated, were thoroughly inspected. The electric organ in the hall entertained great numbers, while the phonograph in the "Den," with its popular vocal and instrumental music, was the center of a delighted audience. The idea of lighting carriages by electricity, recently mentioned as new and just accomplished in England, has been in operation on Mr. Johnson's several carriages for a number of years, and was also illustrated. The feature of the evening, however, was a grand display of Pain's Manhattan Beach fireworks, which were ignited by electricity direct from the lighting circuit, a suggestion from Mr. Johnson, and something, we believe, never attempted before.

The fireworks, some one hundred and fifty yards from the house, were ignited from the piazza by the turning of a small electric switch in the hands of a lady. A tiny electric bell at her side gave the signal that all was ready; the switch was then pressed and the rockets and bombs exploded.

The *modus operandi*, as conceived and carried out by Mr. Johnson, was as follows: For skyrockets a battery (not electric) was constructed of six pieces of one inch tubing of the Interior Conduit Insulation Co.'s underground tube—another new application for this useful article. Upon the upper ends of each tube, which were cut squarely, were driven two French nails about one inch apart, one side of each set of nails connecting with copper wire to one pole of the circuit (taken from an adjacent lamp post) and the other side of each set to the other pole. Each pair of nails were connected by the simple winding about with a piece of fuse wire of small capacity immediately under the touchpiece of each tubed rocket. Accordingly each fuse was thrown directly across the line and all in multiple on the moment the switch on the piazza was made to close the circuit through a flexible cord across the lawn, thus effecting the simultaneous explosion of the rockets. The bombs and other pieces were touched off in a like manner, to the delight of an admiring audience. As the evening drew to a close all seemed reluctant to depart from this veritable fairy land.—*Electrical Engineer.*

CRYSTALLIZED ORNAMENTS.

A beautiful ornament, which is very easily made, consists of a wooden cross covered with Canton flannel,

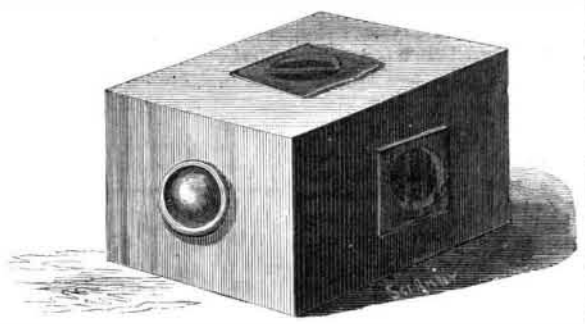


Fig. 1.—GROTTO.

with the nap side out, and crystallized by immersion in a solution of alum. The nap retains the crystals so that they are not readily loosened or detached. The flannel should be attached to the wood by means of brass wire nails, and the cross should be suspended in a solution formed by dissolving a pound of alum in a gallon of warm water. The cross should be suspended in the solution while it is still warm and allowed to remain in until the solution cools, when it will be found covered with bright crystals.

Fig. 1 is a perspective view, and Fig. 2 a longitudinal section of a grotto formed by crystallizing alum in a box containing jagged points covered with Canton flannel or wrapped about in various directions with

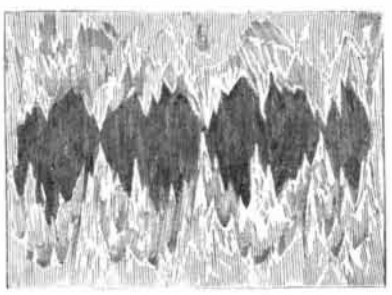


Fig. 2.—INTERIOR OF GROTTO.

coarse thread or twine. The box may be of wood or metal. It should have apertures in the top, ends, and sides. These apertures are stopped with corks, while the box is filled with the solution. After the crystallization the corks are removed, and the holes in the top, sides, and one end are covered with colored glass, and over the front aperture is secured a convex spectacle lens, having a focus about equal to the length of the box. When the interior of the box is illuminated by a strong light passing through the colored windows, the effect is fine.

The solution used in this case is the same as that given for the cross. After the crystals are formed and the liquid is poured from the box, the interior should be allowed to dry thoroughly before closing the apertures.

Celluloid Litigation.

Judge Lacombe of the United States Circuit Court for this district has lately rendered a decision adverse to the validity of the Hyatt patents, which cover the manufactures of celluloid. The substance known as celluloid consists usually of dissolved paper, although cotton or other vegetable fibers may be used. In the manufacture tissue paper is treated with nitric and sulphuric acids, the product is then washed and camphor added. The mass is then ground. Coloring matter is now added and the mass is made into a paste with alcohol, it is then pressed and broken between rolls. The finished mass is very plastic and may be moulded and pressed into any desired shapes, drawn into tubes, etc.

Patent—Corn Cob Pipe.

Judge Wallace, of the United States Circuit Court, sitting at Syracuse, N. Y., rendered an interesting decision in the case of H. Tibbe & Sons Manufacturing Company vs. Heineken. The suit was for the infringement of a patent on a corn cob pipe, and the court held that the defendant had infringed the plaintiff's patent by filling the cells which hold the corn on the exterior of the cob with cement from the outside. Judge Wallace said in giving judgment: "The claim of the plaintiff, Tibbe, is a new article of manufacture, a smoking pipe made of corn cob, in which the interstices are filled with a plastic, self-hardening cement. Upon first impression it would seem that the old 'Jackson pipe' is substantially the same thing as the pipe of the present patent. But that was a corn cob pipe in which the inside of the bowl was lined with a plastic cement to fireproof it, whereas the pipe of the patent is one in which the interstices of the cob are filled with cement. These interstices, or cells, which hold the corn are on the exterior of the cob, and although in some instances they could be filled from the inside of the bowl, that would not be a practical way of filling them, and when cobs of large or medium size are used for the bowl, as they generally are, the interstices can only be filled from the outside. The specification is addressed to those skilled in the art, and the claim is to be interpreted, as its language naturally imports, as one for a pipe in which the exterior interstices of the cob are filled with a plastic cement. Such a pipe supplies a sweet and porous receptacle for tobacco, having characteristics which are well understood by smokers to be desirable, and is a very different thing from one with a cement-lined bowl. It did not involve invention of any high order to make such a pipe, but there was enough to convert a poor article into a good one, and supply something to the trade which was new and the merits of which were immediately and generally recognized. If the defendant chooses to sell the old 'Jackson pipe,' he is at liberty to do so, but he has appropriated the rights of the complainant by selling the pipe of the patent and must take the consequences."—*Bradstreet's.*

New Route across the Atlantic.

An Ottawa, Can., dispatch states that a company of Boston, Mass., capitalists has been quietly developing the foundations of a seaport at the east end of the Straits of Canso, N. S., and if expectations are realized it will have an important bearing upon future communication between Europe and America. The place, which is to be called Terminal City, is five miles east of Port Mulgrave, on the Intercolonial Railway, and the government has consented to an extension of the railway to the place, and agreed to operate the extension as part of the Intercolonial system. Terminal City is situated on one of the finest harbors on the Atlantic coast, having sufficient depth of water for the largest vessel afloat, being completely land-locked, absolutely free from ice, comparatively free from fog, and open to navigation at all times. A straight line on the map of the world from Chicago to Liverpool passes through this point, and the distance between them is 400 miles shorter than by Portland, Boston, or New York. It will take four days from Terminal City to Liverpool by the new steamers proposed to be put on the route. When the railroad is completed and wharves are built, all passengers and mails from Europe will be delivered in New York or Montreal one day sooner than by any other route. It is the most easterly port, open all the year round, and appears to be a natural shipping port for the products of the Dominion to Europe.

High Rates of Speed.

One of our correspondents not long ago asserted that a speed of 100 miles an hour by steam locomotives was entirely practicable, and thought it would be attained. In a recent lecture before a scientific club, Professor Elihu Thomson declared that much higher speeds than can now be obtained with steam locomotives are to be expected by means of electricity, and he considered from 100 to even 150 miles an hour possible. While in the steam locomotive there are reciprocating parts that must be put in motion, stopped, and reversed continually, in the electric locomotive we have simply a rotary motion, which makes it possible to run with economy at much higher rates of speed. He believed that if we could come back after another hundred years, we would find 150 miles an hour to be the speed of traveling, adding, "It simply depends upon finding the necessary method of applying sufficient power, and building the locomotives to suit, arrangements being adopted to keep the cars on the track." One hundred and fifty miles an hour may be among the possibilities, but probably most people nowadays would rather leave to coming generations the enjoyment of whirling through space at that frightful velocity. To leave Chicago at night and be in New York next morning would be a wonderful achievement, involving great increase of business facilities, but the safety of such a speed under present conditions may well be questioned.—*Railway Age.*