IMPROVED ICE MAKING MACHINERY.

Conveniently located under one of the arches of the Brooklyn Bridge is a working example of the Pontifex ice machine, which is being successfully manufactured by the Continental Iron Works, and is thus described by *Engineering:*

The principle applied is the property of liquid anhydrous ammonia to boil at a temperature of 30° below zero Fah., at atmospheric pressure, and to take up during the process an immense amount of heat from its surroundings. The absorbing power which water has for ammoniacal gas is taken advantage of, and the aqua ammonia thus formed is subjected to distillation, which drives off the ammoniacal gas which it holds in solution, and this by a pipe surface condenser is cooled with a view, aided by its own pressure, of hastening liquefaction.

The liquid ammonia is now allowed to expand into gas by releasing it from pressure, thus producing refrigeration. It is claimed that this system produces a perfectly anhydrous ammonia gas and liquid free from all traces of steam and water.

Referring, then, to the sectional drawing, and beginning with the generator, it will be seen that it consists of a horizontal cylinder, which is filled two-thirds full of aqua ammonia containing about 30 per cent by weight of ammonia gas in solution. This gas is driven off from the water by means of a steam coil (the steam being condensed in the coil and discharged by the steam trap), the gas passing upward through the analyzer, which contains a series of perforated trays that serve the purpose of holding back all traces of steam that may be carried along with the gas. The gas then passes into the upper coils of the condenser, where, under the combined influence of its own pressure and of the condensing water around the coils (which enters the condenser at the bottom), it is cooled and liquefied, and collects in the receiver. But should the apparatus be forced beyond its capacity, either by accident or design, provision is made to catch any steam that may have escaped the action of the analyzer. To this end there are three traps in the upper condenser coil, which collect this steam, condense it, and conduct it back to the analyzer.

The liquid anhydrous ammonia from the receiver then goes into the cooler, or refrigerator, where it is allowed to evaporate, producing intense cold; the heat necessary to enable it to flash into gas being supplied by non-congealable brine, which is pumped through a coil in the cooler. This brine then serves as a carrier of the cold to the chill rooms, cellars, or ice making tanks.

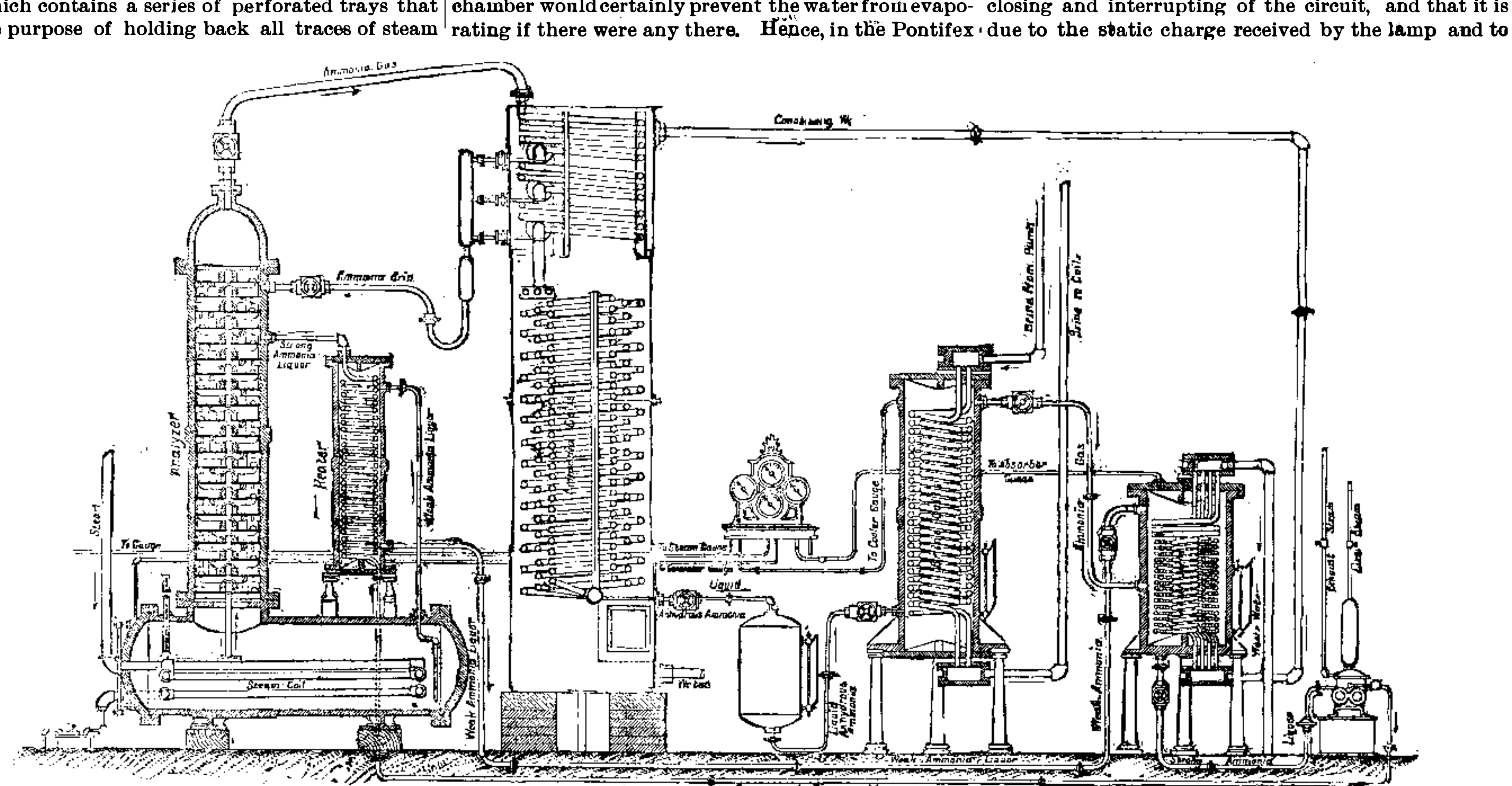
The anhydrous ammonia gas leaves the cooler at the top, and thence goes into the absorber; here it meets the mother liquor, or weak ammoniacal liquor, from the generator, which enters the absorber in the form of spray. This greedily absorbs the ammonia gas, forming strong ammoniacal liquor, which is pumped continuously from the absorber, by the ammonia pump, to the upper trays of the analyzer, where the greater part of the ammonia gas again leaves the liquor before reaching the generator, the ascending heat therefrom being sufficient to effect its distillation.

The process of absorption is facilitated by cooling the ammonia liquor, both weak and strong, by means of coils in the absorber, which are supplied by the overflow water from the condenser; hence it will be seen that the cooling of the absorber is obtained at no expenditure of water beyond what is necessary to supply the condenser of the machine. The Pontifex machine, therefore, uses no more condensing water than any of the machines of the compression type, for in these the water from the condenser simply runs to waste. This is an important advantage which the Pontifex possesses over other machines of its class.

The weak ammoniacal liquor from the generator, on its way to the absorber, passes through the heater and around a coil through which the strong ammoniacal liquor from the absorber is being pumped to the analyzer. Here an interchange of temperatures occurs, resulting in an economy of fuel, because the strong liquor is heated at the expense of the weak liquor, which is then enabled the more readily to perform its work of absorption.

The Pontifex machine is continuous and reliable in its operation, and thus solves the only problem in connection with the subject of ice making or refrigeration by the absorption process. If the liquid anhydrous ammonia in the cooler contains even a trace of water to say nothing of the 5 to 7 per cent which the advocates of rival systems claim must go over with the gas in an absorption machine, it would be simply a question of a few days or weeks before the cooler would be filled with water and the generator would be empty. From the relative location of the inlet and outlet pipes it will be seen that nothing can leave the cooler except in the form of ammonia gas, and the intense cold of the chamber would certainly prevent the water from evaporating if there were any there. Hence, in the Pontifex machine, this defect, so commonly urged against other machines of its class, would be especially fatal to its continuous operation for even a short time. The fact that it is continuous demonstrates amply the efficiency of the arrangement for securing perfectly anhydrous ammonia.

The capacity of these machines is from 5,000 lb. to 50,000 lb. of clear ice in twenty-four hours.



IMPROVED ICE MAKING MACHINERY.

Vest Button Photography.

The process of instantaneous photographing is rapidly becoming an evil. We hear talk already about specialists in photography for instantaneous pictures since the "Detective Camera," as it is called, was put upon the market. The box is so small that it can be carried anywhere without the slighest inconvenience, and, as the little lens at the bottom is always ready for use, an instantaneous picture can be taken at any desired moment. There was some misgiving at first entertained about the value of these cameras, but we have recently seen some wonderful work produced by them. In the camera is a gelatine plate which can be turned six times, so that six photographs can be taken one after the other, and these pictures are so sharply defined that they can be enlarged tenfold. The inventor, Mr. Stirn, of New York, is a German by birth, and his brother, Mr. R. Stirn, of Bremen, sells the apparatus for about seven dollars (thirty marks), with a complete outfit. No operator is required to fit the camera and lens correctly in position for the party to be photographed. All that is requisite is to pull a string and the photograph is at once taken. With another pull the plate is made ready for another picture. We are told that the most prominent artists carry this detective camera with them at all times—A. Von Werner, Gussow, Thumann, O. Lessing, and others. This they do from a strictly professional point of view, and not as amateurs or dilettanti. In Germany, Herr Stirn recently produced before a photographic society enlargements to a size of forty centimeters from such pictures, and all were remarkably distinct and well defined. These plates can also be taken at different distances and always sharply outlined. Young men take their lady friends on promenade to be unconsciously photographed. People, young and old, who have never entered an artist's studio or a photographic gallery will be astonished to see their pictures freely circulated. Most of all, it is to be feared that the legitimate business of the photographer will be injured by these cameras. Any possible mania or desire for photos. can soon be gratified at trifling expense and after a short term of practice by means of this invention. Photographs can soon be so multiplied as to become a positive nuisance, and from the various considerations that enter into the matter, it does not seem so very easy to answer our query—"What next?"—*American Lithographer.*

Improved Incandescent Lamps.

An incandescent electric lamp while in operation sets free or drives off from its filament more or less carbon in loose particles, which become deposited upon the inner surface of the globe and cloud it. The *Electrical World* says: Mr. Edward P. Thompson has found that such carbon is, for the most part, set free upon the closing and interrupting of the circuit, and that it is due to the static charge received by the lamp and to the discharge which takes place. In order to avoid this injurious action, Mr. Thompson has designed a lamp with means for discharging the high potential currents from the filament and preventing the free carbon from being thrown off, at the same time causing that which is thrown off to be deposited at points where it will not injure the light.

This is accomplished by inserting in the globe an independent conductor which is provided with points projected in opposite directions toward the respective arms of the filament, and connecting the same with the earth. A conductor extends into the globe between the two arms of the filament. This conductor is provided with sharp points of conducting material extending in opposite directions toward the respective arms of the filament, but not quite in contact therewith. The high potential currents or charges, especially such as are present upon the interruption of the circuit of the lamp, according to Mr. Thompson, tend to discharge across the arms of the filament to these points, and whatever loose carbon is thrown off at such time will tend to gather upon the inner conductor, rather than upon the surface of the globe.

A Horse Killed by an Electric Motor Wire.

MONTGOMERY, Ala., July 25.—Gov. Seay met with a peculiar accident this afternoon. He and his private secretary, J. K. Jackson, were driving down the main street of the city, when one of the guy wires which support the overhead cable of the electric street railway broke and fell to the ground, striking the governor's horse. The wire was heavily charged with electricity, and the horse, becoming entangled, was shocked and burned to death in a few minutes.

Our Future Timber Supply.

Prof. Charles S. Sargent, one of the special agents of the tenth census, in his report on the forests of North America, gives it as his opinion that the forests of the United States, notwithstanding the great and increasing drains upon them, are capable of yielding annually, for many years longer, a larger amount of material than has yet been drawn from them, even with our present reckless methods of forest management. It is true that the great pine forest of the North has already suffered fatal inroads, that the pine that once covered New England and New York has disappeared, and that Pennsylvania is nearly stripped of what once appeared to be a nearly inexhaustible supply of the same wood. But the great northwestern pineries are not yet exhausted, and, with the newly introduced methods by which logs once supposed inaccessible are now profitably brought to the mills, they may be expected to increase the volume of their annual product for a few years longer in response to the growing demands of the great agricultural population which is fast covering the treeless mid-continental plateau.

The area of the pine forest, however, remaining in the great pine-producing States of Michigan, Wisconsin, and Minnesota is dangerously small in proportion to the country's consumption of white pine lumber, and the entire exhaustion of these forests in a comparatively short time is certain. The wide area now covered in New England by a vigorous second growth of white pine, although insignificant in growth and productiveness in comparison with the forests that it replaces, must not be overlooked in considering the pine supply of the country. These new forests, which are already yielding between two and three hundred million feet of timber annually, are capable of great future development.

The pine belt of the south Atlantic region still contains immense quantities of timber unequaled for all purposes of construction, although unsuited to take the place of the white pine of the North. The Southern pine forests, although stripped from the banks of streams flowing into the Atlantic, are practically untouched in the Gulf States, especially in those bordering the Mississippi River. These forests contain sufficient material to supply all possible demands that can be made upon them for a long time.

The hardwood forests of the Mississippi basin are still, in certain regions at least, important, although the best walnut, ash, cherry, and yellow poplar have been largely culled. Two great bodies of hardwood timber, however, remain, and upon these comparatively slight inroads have been made as yet. The most important of these forests covers the region occupied by the southern Alleghany mountain system, embracing southwestern Virginia, West Virginia, western North and South Carolina, and eastern Kentucky and Tennessee. Here oak unequaled in quality abounds, walnut is still not rare, although not found in any very large continuous bodies, and cherry, yellow poplar, and other woods of commercial importance are common. The second great body of hardwood, largely oak, is found west of the Mississippi River, extending from central Missouri to western Louisiana.

The forests of Michigan, especially those of the northern peninsula, still abound in considerable bodies of hardwood, principally maple. Throughout the remainder of the Atlantic region the hardwood forests, although often covering considerable areas, have everywhere lost their best timber, and are either entirely insufficient to supply the local demand of the present population, or must soon become so.

In the Pacific region, the great forests of fir which extend along the coast region of Washington Territory and Oregon are still practically intact. Fire and the ax have scarcely made a perceptible impression upon this magnificent accumulation of timber. Great forests of pine still cover the California Sierras through nearly their entire extent. The redwood forest of the coast, however, once, all things considered, the most important and valuable body of timber in the United States, has already suffered seriously, and many of its best and most accessible trees have been removed. This forest still contains a large amount of timber, although its extent and productive capacity have been generally exaggerated. The demand for redwood, the only real substitute for white pine produced in the forests of the United States, is rapidly increasing, and, even at the present rate of consumption, the commercial importance of this forest must soon disappear.

The pine forests that cover the western slopes of the northern Rocky Mountains and those occupying the high plateau and inaccessible mountain ranges of central Arizona and southwestern New Mexico have not yet suffered serious damage at the hands of man. The remaining forests of the Pacific region, of little beyond local importance, are fast disappearing. The area of these interior forests is diminished every year by fire and by the demands of a careless and indifferent population, and their complete extermination is probably inevitable.

The forest wealth of the country is still undoubtedly enormous. Great as it is, however, it is not inexhaustible, and the forests of the United States, in spite of their extent, variety, and richness, in spite of the fact that the climatic conditions of a large portion of the country are peculiarly favorable to the development of forest growth, cannot always continue productive if the simplest laws of nature governing their growth are totally disregarded.

The judicious cutting of a forest in a climate like that of the Atlantic or Pacific coast regions entails no serious or permanent loss. A crop ready for the harvest is gathered for the benefit of the community; trees that have reached their prime are cut instead of being allowed to perish naturally, and others take their place. The permanence of the forests in regions better suited for the growth of trees than for general agriculture may thus be insured. Two causes, however, are constantly at work destroying the permanence of the forests of the country and threatening their total extermination as sources of national prosperity—fire and browsing animals inflict greater permanent injury upon the forests of the country than the ax, recklessly and wastefully as it is generally used against them.

The Electrical Lighthouse Lamp.

The third illuminant, electricity, has been known in England for about thirty-five years. As generated in the magneto-machines of Prof. Holmes, between 1853 and 1862, and as tried experimentally in the lighthouses of Dungeness and South Foreland, it was very small in dimension and very uncertain in character. Several forms of the light were suggested during this period, such as the voltaic arc of Watson and the mercurial electric lamp of Way. With the more effective alternating current machines, and with the larger carbons, of later years, the arc grew in power and dimension. At the present time carbons of from 25 to 40 millimeters are available, with an intensity in the focus of a light of ten times that of the most powerful gas or oil burner. The arc is thus become a most valuable resource, not merely for its unsurpassable power, but also for its focal adaptability to the usual dioptric apparatus, and to special optical combinations dictated by nautical circumstances. It is most flexible in its application. It radiates no harmful heat. It has the high merit of not exacting any abnormal dimensions of apparatus, lantern, or tower. Lastly, being the most powerful in all its gradations relatively to other illuminants, it is the cheapest of all lights if the cost of establishment and maintenance be computed in terms of the units of the beam transmitted, which is the only strictly logical and practical way of treating it. For these reasons it has been chosen in France as the best illuminant for a large number of coast lights, and it is making rapid way in Europe and America. It may therefore be safely asserted that the electric light, when it shall have been freed from its last disabilities and shall have attained its utmost development, will, in the not distant future, be the prevailing illuminant of our own lighthouses and of the other chief lighthouses of the world.

In illustration of the power of the electric arc with suitable optical treatment, I may mention that the direct beams of the Tino light, near Spezia, were observed on April 20, 1885, by Prof. Noceti, from the hill S. Giorgio, behind Savona, at an elevation of 2,733 feet and a distance of 73 statute miles, the atmosphere being clear and under moonlight. The beams of the arc were notably brighter than those of the *lanterna* at Genoa, at one-third of the distance. Frequent observations are reported of the Macquarie light in New South Wales, at ranges of 60, 65, and 70 nautical miles, by means of reflections on the sky while the light itself is below the horizon.—*J. Kennard, in Nature.*

The Infant Rapidly Becoming a Giant.

The public expect much of improvements in which electricity is employed. Millions may be spent in digging a canal where the channel fills up from the slow movement of the soil as fast as it is removed by the dredging machines; failure after failure may be recorded in the annals of mining developments until success seems to be the exception; but let there be a failure of an electrical piece of mechanism, and every one wonders. In the early days of the development of the systems of electric lighting, storage, and transmission of power there were few failures, and those were instructive.

The first devices for automatically lighting and extinguishing gas were somewhat crude. Now, however, with careful installation, failure is unknown; yet ten years ago the great systems of lighting by electricity had only been dreamed of. It required thirty years to perfect the system of telegraphy. The methods used in gas making were not improved for a long period. And it is possible that the old process would have been in use for half a century longer if the competition of electric lighting had not necessitated improvements. So much has been accomplished that still more is expected of our electricians. The inventor or experimenter was once called a crank. Now large sums of money are expended yearly in systematic experimenting, the highest skill, education, and ability is employed, and the professors in the universities and technical schools are retained as consulting electricians.—*Elec. Review.*

Enameled Letters.

The various methods of attracting attention by advertising have become one of the many indications of American enterprise, and it is a wide field, well calculated for the display of native ingenuity. Signs and placards are to be seen in every available place, forcing upon public notice the wonderful cures effected by a patent medicine or the merits of a new magic shoe blacking; and every conspicuous board, fence, or brick wall is sure to command a high price for the purpose. Paint and posters have been the principal agents in sign advertising, but they have faults in common, for if exposed to the weather for any length of time they soon become worn and unsightly; and so when a means of advertising at once durable and attractive was invented, it found the "long felt want" awaiting it. This was the invention of the white enameled letters, which have since become so popular and are to be seen on show windows in every city of the United States. These make the most attractive and neat letters possible to put on a window, for no one can pass by without noticing them.

The art of enameling was known before the Christian era, when its principal use was in the ornamentation of pottery, etc. For some years enameled clock dials have been in use, and in some instances a coating has been applied to the inside of pipes and baths. The enamel in these cases is made of soda and borax mixed with glass, the whole being reduced to a fine powder. The metal to be enameled is first cleaned by a weak solution of sulphuric acid, and gum water is then applied; the enamel is sifted on, the gum causing it to stick. It is next placed in a furnace kept at a very high temperature, and the vitreous enamel is fused and flows equally over the whole surface of the metal. When cool, if properly done, the enamel will have a peculiar glassy surface. The black figures of the clock dial are made of what is known as thin enamel, which somewhat resembles paint. It is applied by a camel's hair pencil and the whole is again placed in the furnace and baked, and the black figures are thus fastened on and become a part of the white foundation enamel, without losing their shape or color.

The process of making the letters is much the same, oxide of tin being mixed with the glass to give the opaque white appearance. The base is stamped out of copper in the required shape, and upon this the enamel is built up. It is found necessary to apply two coatings to obtain the smooth glaze, and a rough coating of enamel is also applied to the under side of the letter.

Another method of making enamel is by mixing 30 parts saltpeter, 90 of silica, and 250 of litharge. White is the color in general use, but when others are required they are obtained from the metallic oxides, blue from oxide of cobalt, green from oxide of chromium, etc.

The most difficult thing about the manufacture is to apply just the right amount of heat, for, if left in the furnace a little too long, the letters will crack; but if the heat is not quite strong enough, the glaze will be lacking. Before the letters are yet ready for the market, they must be filed around the edges to render them smooth.

Enameled letters were first made some twenty years ago in Germany, but the invention was not pushed, and it was introduced in this country about 1879, by a large firm engaged in the manufacture of metal and glass letters and other kinds of signs. The manufacture of the letters is for the most part confined to the city of New York, where six or seven firms are engaged in the business. The field is naturally limited, as a sign once put up is likely to last as long as it is needed; but as yet the demand is increasing, and large orders come in from Canada and South America, as well as from the Western States.

The making of these letters cannot, of course, be patented, but the skill required both in the baking and in making the enamel confines the business to a few.

There is a patent, however, on one kind of letter, which is concave or hollow, and it is claimed that this possesses advantages over the ordinary flat letter, but there is little doubt that either style will, if properly put up, prove satisfactory and serviceable. It is not to be denied that the letters do sometimes drop off, but in such cases the fault rests with the person by whom they are put up. A good cement for the purpose is made of four parts of white lead and one part of Indian red, mixed with copal varnish thoroughly until it attains the consistency of soft putty.

Enameled iron signs, such as are used on the platform railings of the elevated railways in New York for station names and advertisements, are made on the general principle of clock dials. They are all manufactured in Birmingham, England, where there is a large factory for the purpose. Various colors are used, but white lettering on a foundation of blue enamel is most popular.

Enameling of late has been applied to the manufacture of street names, park notices, numbers, "push" and "pull" plates, labels, and in all cases where a neat, attractive, and durable sign is desirable.—*American Stationer.*