THE VAN BUREN STREET DRAWBRIDGE OF THE METROPOLITAN WEST SIDE ELEVATED RAILROAD OF CHICAGO.

(Continued from SCIENTIFIC AMERICAN of April 27, 1895.)

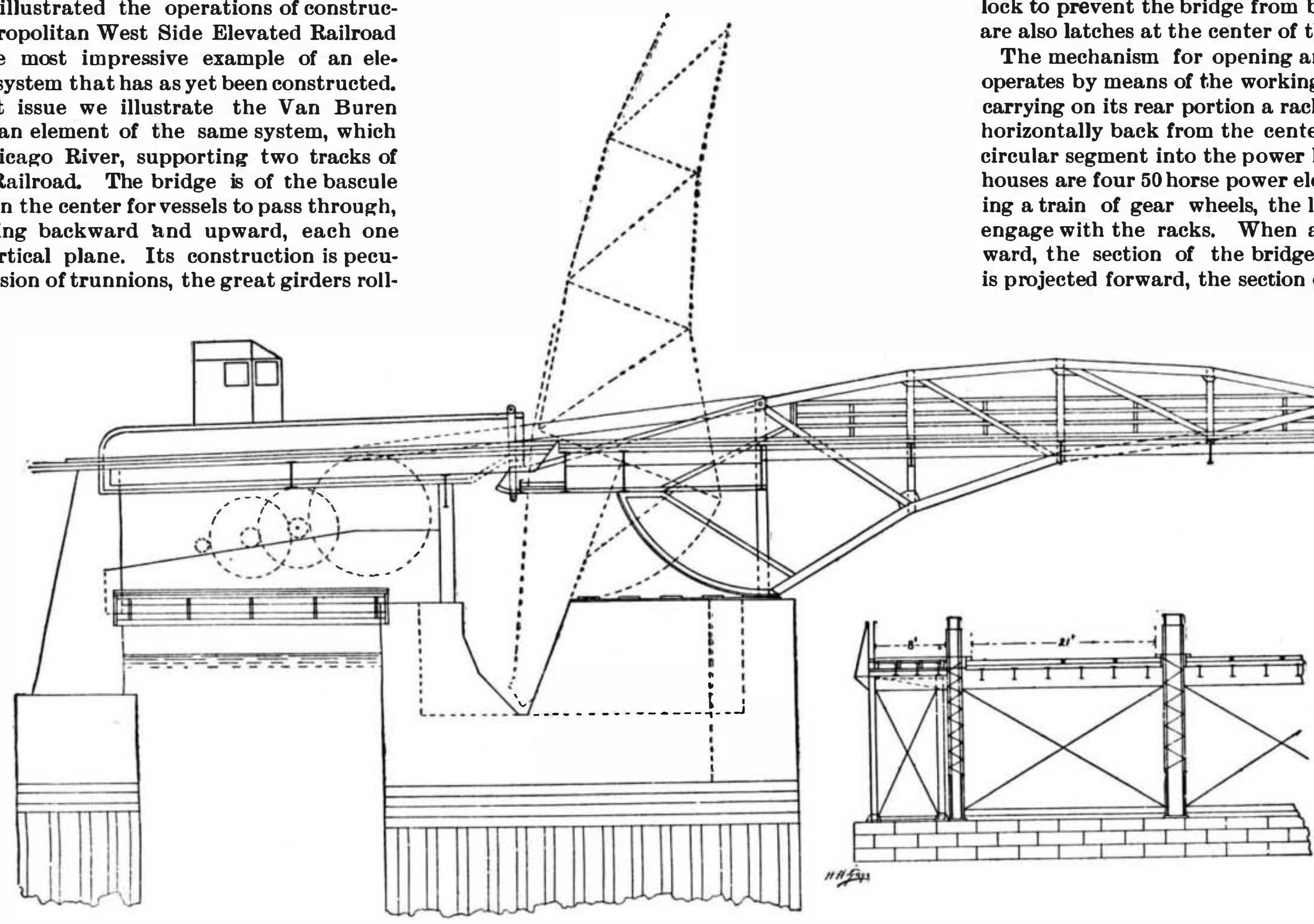
We recently illustrated the operations of construction of the Metropolitan West Side Elevated Railroad of Chicago, the most impressive example of an elevated railroad system that has as yet been constructed. In our present issue we illustrate the Van Buren Street bridge, an element of the same system, which crosses the Chicago River, supporting two tracks of the Elevated Railroad. The bridge is of the bascule type, opening in the center for vessels to pass through, the trusses rising backward and upward, each one moving in a vertical plane. Its construction is peculiar in the omission of trunnions, the great girders rolling on a segment of a circle, one of which is formed on the backward prolongation of each of them.

On reference to the cut, two small diagrams will be seen illustrating the bridge, open and closed. The rocking operation of the bridge is made clear in these cuts. They indicate two additional features. The working struts, as they are called, by which the bridge is opened and shut, constitute one of these features. One such strut for each half of the bridge is connected to the point representing the center, from which the circular segments are struck, and runs back horizontally or nearly so to the machine for opening. In the two diagrams this working strut is indicated by a single line extending from such center back along the fixed roadbed. The cuts also show how part of the deck carried by the trusses, as they rock backward, descends beneath the level of the fixed decks on either side of the river.

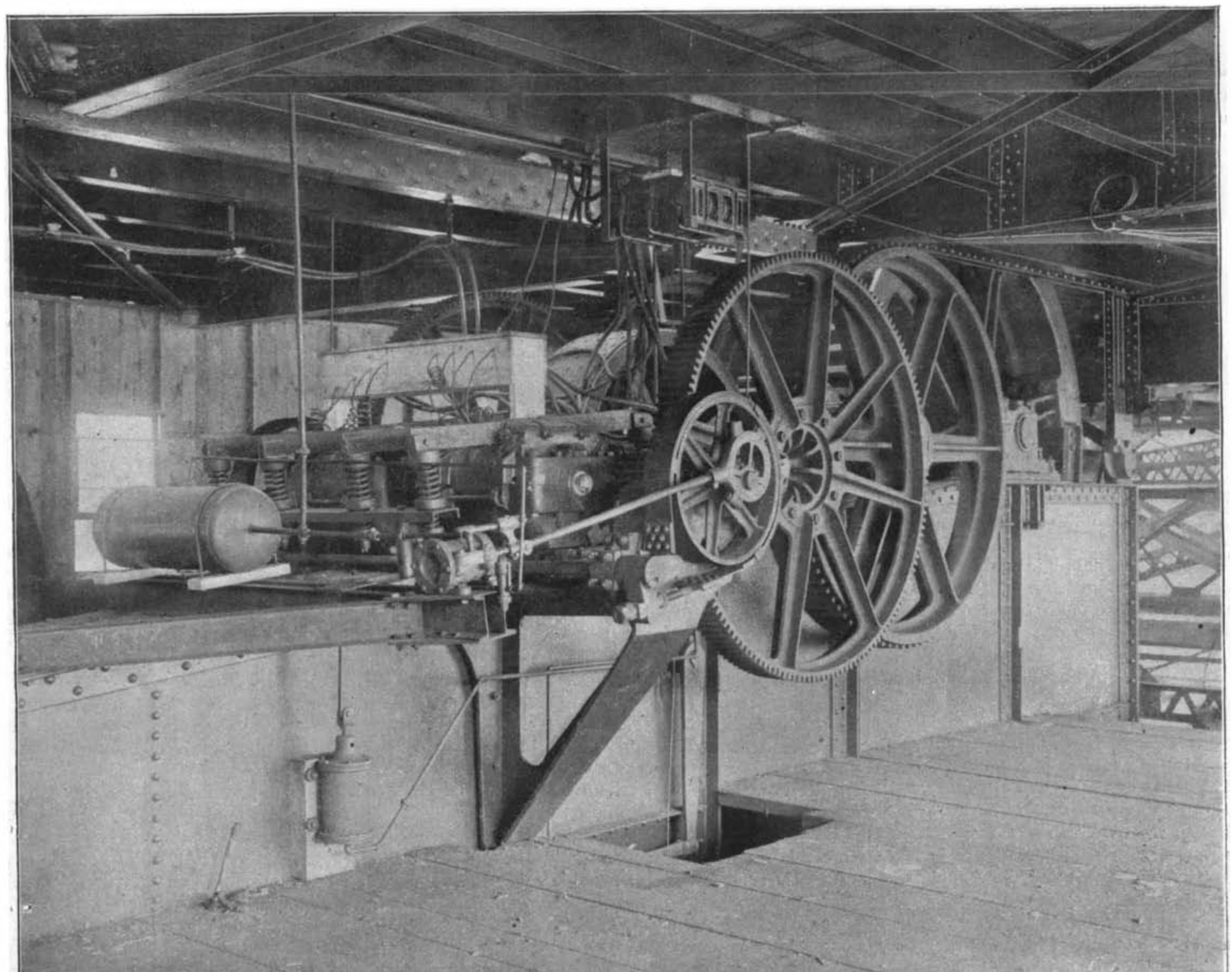
Referring to the general view of the bridge, it will be seen that each section of the bridge comprises three parallel trusses, each with a circular segment. For the circular segments to roll on, there are provided steel ways on which are projections or teeth of steel, which enter pockets in the faces of the segments. This insures alignment of the three trusses in their operation. On the right hand of the picture is seen the portion of roadway extending back of the center of curvature, which portion goes down when the bridge rises; it is cut off obliquely at its rear end, and a latch or link swings over this end, operating as a lock to prevent the bridge from being opened. There are also latches at the center of the bridge.

The mechanism for opening and closing the bridge operates by means of the working strut. This is a bar carrying on its rear portion a rack and running nearly horizontally back from the center of curvature of the circular segment into the power houses. In the power houses are four 50 horse power electric motors, operating a train of gear wheels, the last of which wheels engage with the racks. When a rack is drawn backward, the section of the bridge rises; when a rack is projected forward, the section descends. Within the backward extension of the roadway just alluded to ballast is placed to bring the center of gravity into proper position. The effect of this is that the bridge naturally rests partly open, and if it is stirred from this position, tends to rock back and forth. The working struts are attached by pin connections to the central trusses; one strut operates each half of the bridge.

Assuming the bridge now to be closed, if it is desired to open it, the machinery is started so as to draw the racks backward. As each rack moves, its first effect is



THE VAN BUREN STREET BRIDGE, CHICAGO—DIAGRAM OF CONSTRUCTION.



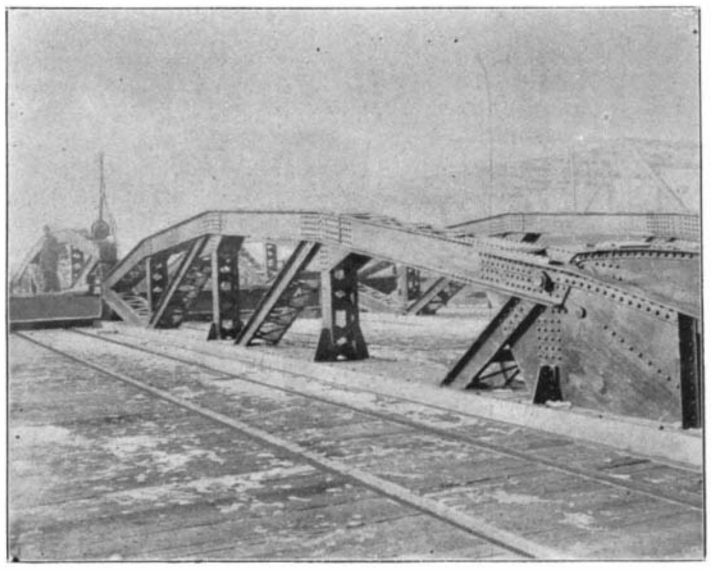
THE VAN BUREN STREET BRIDGE, CHICAGO—OPENING AND CLOSING MECHANISM.

to revolve a cam by which pin latches at the center of the span are withdrawn and the latches at the heels of the trusses, one of which is shown in the general view of the bridge, are swung backward, leaving the trusses free to move. As the motion continues, the bridge opens, twenty seconds sufficing for the entire operation. In closing, the reverse succession of operations takes place. The pin latches at the center are designed to prevent lateral movement and to insure the ends of the rails abutting in line; the other latches hold the trusses closed. Each truss may be treated as a cantilever, the tail girder representing the anchoring span.

We have referred to the counterpoise weights. They are placed within the tail girders and between them, beneath the railway floor. As these weights are sufficient to prevent the bridge from naturally coming to a horizontal position, in the closing operation force has to be applied to bring the end down. To work each half of the draw span, two of the fifty horse power electric motors are provided, which are wired to operate together or alone. If by any accident the current is cut off, compressed air brakes are automatically applied, which instantly bring the bridge to rest.

In the closing process, before the ends come together the sections are automatically brought to a full stop, so that the final closing has to be performed with special care. A powerful emergency brake is supplied to guard against accidents, which brake can be made instantly to act upon the structure. It is believed that all these precautions and structural features make an accident impossible. Owing to the height of the bridge, it will have to be raised for comparatively few vessels, as most can freely pass under it.

One of the cuts shows the lifting mechanism placed beneath the roadway, the under surface of the roadway or deck forming the ceiling. The general relation of the trusses to the abutments is shown in the larger diagram, giving a view partly in section of the structure, the open position being indicated by dotted lines. The small illustration gives a view of the deck of the bridge. The distant section in this cut is shown partly raised, a further descent of about three feet being required to complete the closing.



DECK VIEW OF THE VAN BUREN STREET BRIDGE, CHICAGO.

The "Blow Hole," Kiama, N. S. W.

One of the most pleasant as well as famous tourist resorts in New South Wales is situated on the coast some 70 miles south of Sydney. The center of this district is Kiama, a picturesque and thriving town surrounded by rich agricultural country, and which has been built upon an old igneous flow of basalt that has solidified and crystallized into huge columns of what is popularly called "bluestone." This formation is seen to perfection on the west coast of Scotland and north of Ireland at St. Fingal's Cave and other places; and those who are acquainted with the rugged appearance of the coast in these places can form a good idea of the appearance of the New South Wales coast at this point. Kiama, unlike other tourist resorts, can be thoroughly enjoyed in either fair or stormy weather, and those who visit the town when a good gale is blowing have an opportunity of witnessing a sight the like of which does not exist elsewhere on our globe. The famous "Blow Hole" here situated, in the middle of a rocky headland running out into the sea, forms a truly wondrous sight. With each successive breaker the ocean spray is sent shooting up into the air sometimes as high as from 300 feet to 400 feet, descending in a drenching shower and accompanied by a rumbling noise as of distant thunder, which can be heard for many miles around.

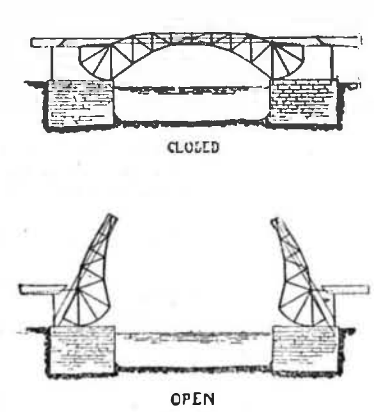
This "Blow Hole" is a singular natural phenomenon, and consists of a perpendicular hole, nearly circular, with a diameter of about 10 yards across, and has the appearance of being the crater of an extinct volcano. This is connected with the ocean by a cave about a hundred yards in length, the seaward opening of which is in all respects similar to St. Fingal's Cave on the west coast of Scotland, the same perpendicular basaltic columns forming the side walls of each. Into this cave towering waves rush during stormy weather, and as the cave extends some distance further into the rock than the "Blow Hole," on the entrance of each wave this cavity becomes full of compressed air, which, when the tension becomes too great, blows the water with stupendous force up the perpendicular opening.—Aust. Photo. Jour.

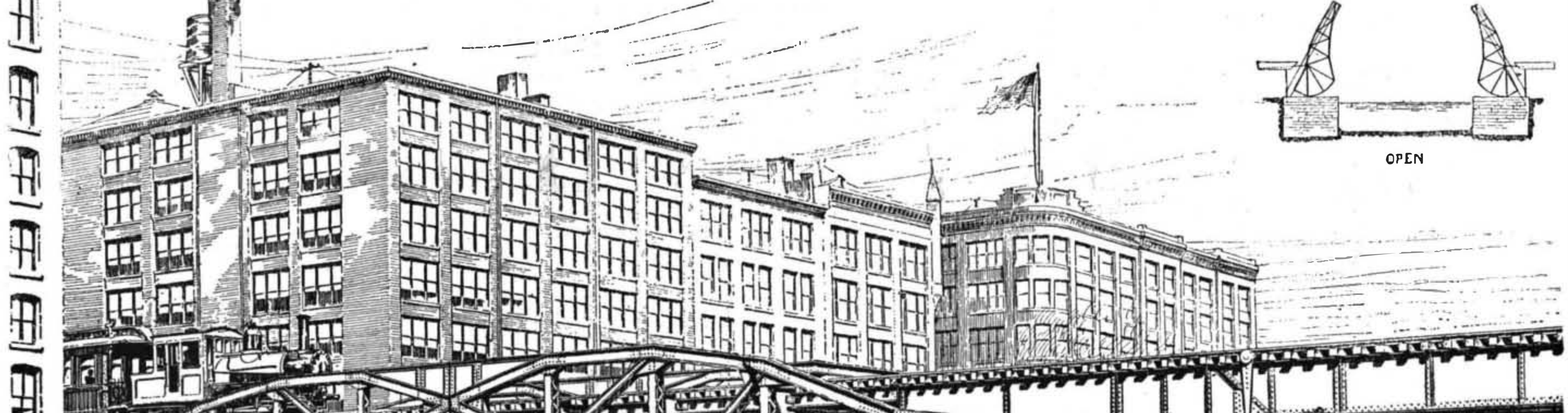
The Palais de l'Elysee, Paris.

The Elysée Palace, where the President of the French republic lives, was built in 1718 by a banker. In 1748 Madam de Pompadour purchased it, and in 1768 Louis XV bought it from her heirs; later, he sold it to the financier Meaujou, the only proprietor that died in it. Louis XVI bought it for $260,000 and gave it to the Duchess of Bourbon, who, in 1790, presented it to the French nation. In 1803 Murat acquired it and gave it to Napoleon I, who was very fond of the garden. In 1814 Emperor Alexander I, of Russia, resided here. Then the Duke of Berry, the Dauphin, lived in it, and, after his death, the baby Duke of Bordeaux. In 1848 it was assigned to Louis Napoleon. Since 1873 Presidents McMahon, Grevy, Carnot, and Casimir-Perier have dwelt in it. Now M. Faure is the master.—Cincinnati Commercial-Gazette.

RAW silk waste machine wipers, instead of the cotton waste wipers heretofore almost universally used, are said to be entirely free from danger by spontaneous combustion, and this one fact should be sufficient to highly commend them to all who have charge of running machinery. These wipers are manufactured by the American Silk Manufacturing Company, of Philadelphia, and their cost in use is lessened, where used in considerable quantity, by means of a special washing compound, enabling the washers to be employed over again as many as eight to twelve times. These wipers are also said to more thoroughly clean the machinery on which they are used, leaving no small detached fibers or shreds on parts wiped.

DIAGRAMS of BRIDGE





THE VAN BUREN STREET BRIDGE CHICAGO—GENERAL VIEW.

Collodio-Chloride for Transparencies.

Pyroxyline (Hopkins & Williams ordinary)	32 gr.
Ether (725)	3¼ oz.
Alcohol (805)	2½ "
Chloride of zinc	40 gr.
Nitrate of silver	92 "

Dissolve the chloride of zinc in the alcohol (and this is a valuable quality of chloride of zinc, that it will dissolve in the alcohol without the addition of water), put in the pyroxyline when soaked, add the ether, and shake. Now put the silver into a test tube, add 40 minims of distilled water. At this stage I prefer to use a non-actinic light. A single thickness of amber glass will do. There is no necessity for working in a dull light. We now dissolve the silver by heat over a spirit lamp flame, and at the same time heat 6 drachms of alcohol in a small flask; when the silver is dissolved, add about a drachm of hot alcohol to it by degrees. Then add to your collodion, a drop or two at a time, and shake well between, rinse out the tube with the remaining alcohol. If the operations have been carried out properly, a few drops of the emulsion put upon a plate will show an orange tinge; a fairly thick film, a full orange, inclined to ruby when held up to a light. The emulsion must be kept for not less than twenty-four hours.

This emulsion may be washed in the ordinary way. I use it without washing as a rule, as washing entails the consumption of twice the quantity of solvents. To filter, place a plug of wool or good sponge in a glass funnel, and run the emulsion through. Moisten sponge or wool wit ha few drops of alcohol first.

Coat the plates, and place them in a dish of water until the water runs smoothly over the surface, then rinse with two changes of water. Wipe the backs, and drain on blotting paper; or, when plates are wanted quickly, a piece of blotting paper may be placed on face of the plates, and gently pass a finger over to absorb all surface water. After this, they dry in five to ten minutes by the use of such a piece of apparatus as I show you. The usual drying cupboard will do, of course.

With this emulsion no preservative is at all necessary. I have found no difference in the results. One thing I have forgotten to mention in the proper place, that is, the use of a substratum to prevent the film slipping off the plate during washing. I strongly recommend edging the plates with India rubber solution. This is quickly done with a small camel hair brush cut to about a quarter of an inch long in the hair. A dozen of lantern plates can be done in five minutes easily.

The results which I show you have been developed with Abney's—

Ferrous citro-oxalate	1 part.
Ten per cent bromide potassium solution	1 "

Glycin I have only tried one formula given by the makers, that for hard development; and hydroquinone, as follows:

Hydroquinone	4 gr.
Bromide potassium	24 "
Sulphite of soda	48 "
Water	1 oz.

Three minims of a ten per cent solution of carbonate of soda.

Development was from five to twelve minutes. All these developers may be used repeatedly. Hypo must be used for fixing; 2 ounces to the pint is strong enough. Washing in the hand for about a minute is enough to remove the fixing salt.

The light used by me was magnesium, 6 to 36 inches. The colors are black, claret, and most beautiful purples to purple black.—J. S. Teape.

Fog Signals.

The subject of fog signals was discussed recently before the M. P. Club at its meeting in the Institute of Technology, Boston, the speaker being Maj. W. R. Livermore, of the United States army, who has charge of the lighthouses and signals in this district.

The Boston Commonwealth says the paper was a most interesting one, embodying, as it did, the experiments undertaken by Maj. Livermore along our New England coast, experiments which shed much light on several vexed questions.

The lights of the lighthouses in clear weather, said the speaker, are obscured only by the curvature of the earth, but in fogs, since even the sun is hidden, they become invisible. Sound, however, travels well under some conditions of storm, and a century or two ago the use of bells was begun as a warning in times when the light could not be seen. At Boston Light a cannon was once used as a signal, and many other devices have been invented to warn mariners as they approach the shore.

The United States is the only nation in the world which makes an attempt to line its entire shores with signals, the theory here being to place such signals sufficiently close to permit of shore navigation in any weather; but practically the system is not quite complete. In 1851 the transmission of signals through the air was investigated by Gen. Duane; afterward it was taken up by Henry and continued by him with more or less activity up to the time of his death. During the past year a systematic series of experiments was undertaken by the Lighthouse Department, and Maj. Livermore, who had this investigation in charge, had been able to secure quite a number of observations which throw light on matters which have been puzzles to all previous experimenters.

The signals which are in common use are the siren, devised in 1870 by Brown, which can be heard ten or twelve miles; whistles, which will carry eight or ten miles; trumpets, with a range of six miles; and bells, which can be heard not more than three-quarters of a mile. In addition, there are floating bells, which can be heard for slight distances only, and whistling buoys, which are nearly as powerful as the trumpet.

The experiments of the last season had to consider the efficiency of the signals and their expense. The sirens can be heard for long distances, but they are very expensive. On the other hand, bells are not costly to operate, but they are audible for short distances only. A portion of the experiments dealt with larger bells and with the giving of the present bells a harder stroke with the hammer, both of which give the bell signals a higher efficiency.

With reference to the transmission of the signals through the air, previous experiments or comparisons have been uneven. For example, no trumpet has ever been constructed large enough to be properly compared with the siren. Maj. Livermore's experiments concerned themselves with the efficiency of the signals, the details of their construction and position, the reflections and the refractions of the "sound rays," and the effect of obstacles near to and distant from the source of the sound.

For this purpose one of the lighthouse steamers was fitted for the work, and observations in all kinds of weather and under differing conditions were secured. With reference to obstacles, it was found that intervening obstacles tend to diminish the intensity of the sound, irregular surfaces near and in front of the signals effectively lessen their efficiency, obstacles behind the signal cut off the sound in that direction, and obstacles at a distance from the signal cut off the sound in their immediate shadows.

As to the effect of weather conditions, these facts appear: Rain and snow do not of themselves modify the transmission of sound, but in affecting the temperature of the atmosphere they do influence the refraction of the sound and may, indeed, under certain conditions, cause it to be lost to objects on the surface of the water. This is a most important discovery, for it accounts beautifully for the so-called "ghosts," which are areas within which no sound from the signals can be heard. These silent areas have been accounted for in different ways, Tyndall having given a "flocculent material" solution, which, while within the limits of laboratory experiment, seems hardly possible on so large a scale as it must be in nature. Maj. Livermore finds that under certain conditions of wind relative to the position of the signal, the sound rays become refracted upward in certain places, reaching the surface of the water at more distant points in precisely the same line.

A curious example of this was once observed in experimenting near Boston Light. At a distance of about a mile from the light, no sound whatever was heard from the signals at the light, and it was thought that they had been stopped. Suddenly, however, they were heard in full intensity, and the steamer was stopped and backed again into the silent area. A man was sent up the mast, and he reported that he could hear the signals, although no sound could be heard on deck.

This experiment was repeated several times, and a position was found where the noises could be heard at the bow of the steamer but not at the stern. The signals employed on this occasion included a bell, a fog horn, a whistle and a gun; and although the smoke of the gun and the steam of the whistle could be seen from the steamer, no sound reached its deck while in the silent area. The sound rays, refracted through the conditions of the atmosphere, formed an arch over the silent area.

As the outcome of these experiments and investigations, there are many matters of interest and importance. Scientifically, the explanation of the atmospheric conditions which cause the silent area and the underlying principles of refraction of "sound rays" are of great importance; while, practically, there are many matters closely related thereto. The location for signals so that their efficiency may be to seaward, and not, as now, oftentimes to landward, where, as the speaker said, "the inhabitants of the cottages do not seem to appreciate their value," the placing of them so that the silent area may be overcome, and other matters of this nature, are of the greatest practical advantage.

The lecture was throughout of the greatest interest, being fully illustrated with graphic drawings, photographs of the fog signals and of the prominent lighthouses along our northern coast. The most striking of the graphic drawings was a series representing the intensity of the signals throughout the course of the experimental trips, the relation of the silent area to the direction of the wind in its upper and lower currents being indicated.

The Boiling Point of Milk.

Dr. Edmunds, writing in the British Medical Journal, makes the following observations on this subject: Referring to the temperature at which typhoid bacilli are killed, a correspondent assumes that milk boils at 180° to 190° F. This is a mistake which needs correction. Milk boils at a temperature higher than that of water, and it is well known that boiling milk inflicts a much more serious scald then boiling water. The point at which milk boils will vary half a degree or more, according to the amount of its saline and other non-aqueous constituents, but I find that a fair sample of milk, taken from my own kitchen, boils at 213·5° F. when tested with a standard chemical thermometer. I have always advised that milk boiled for one minute is made safe by the killing of any infective germs which it might have contained. The butter contained in the milk does not seem to raise its boiling point, but it is well known that butter and other fats and fixed oils boil at a very much higher temperature, and that boiling fixed oils destroys the skin as effectually as melted lead. In the manufacture of tin plate—that is, sheet iron plated with tin—the tin is kept melted under melted tallow, and the clean sheet iron is tinned by being passed through this bath of molten tin. Fixed oils may be heated to about 500° F. without undergoing material change, but at about 600° F. they begin to boil, owing to the evolution of gases, which are set free as a process of destructive distillation. It is generally held that the typhoid infection of milk is due to contaminated water used for washing the milk vessels or for augmenting the bulk of the milk by fraudulent additions. My own opinion is that an escape of fecal matter from the cow while being milked often falls into the milk pail, and that this is generally the real cause of typhoid infection in milk. I have actually seen this to occur when inspecting dairies and examining suspected cows, and I am perfectly sure that it often takes place. The polluted water theory seems to me to be far-fetched and inadequate.

An Exposition of California Products to be Held in Berlin.

An interesting exhibition of California food products is about to be opened in Berlin. The exhibition has been prepared by private enterprise in the effort to educate the people of Germany and of other foreign countries in the use of American products and to open, if possible, a new field for their consumption. A large building situated in the Thiergarten is being fitted up for the purpose, and the exhibition, it is announced, will be open to the public from the 5th of May to the 5th of July. The building is to be divided into octagonal courts, in each of which there will be a separate exhibition.

In one court, for example, will be shown bitter beers and cordials, another will be devoted to the orange products, and in other courts will be found dried fruits, vegetables, fish, canned fruits, oysters, etc. A novel feature will be a cafe for women, in which all kinds of breakfast foods will be served by colored attendants. The redwood industries of California have combined to build a redwood cottage, in which a unique exhibition will be made. The cottage will contain, besides other products, redwood shingles and burl, and experiments will be made to demonstrate the adaptability of redwood for the manufacture of lead pencils. Scattered about the building there will be some twenty booths attended by young women in Quaker costume, who will distribute prepared dried fruits, mushes, and baking powder products. There will also be glass-inclosed corn poppers, with the idea of introducing this delicacy into Berlin. A model American business office is also to be on exhibition, and it is believed that the many labor-saving devices and conveniences common in this country may be introduced in Germany.

The exhibition, it may be seen, is to be carried out on a very ambitious scale. Some three hundred business firms in California are enlisted in the enterprise, and these represent a capital of nearly $100,000,000. The exposition is not competitive, but purely of a commercial character, and, it is confidently believed, will prove a very effective advertisement for the Pacific coast.

Moving a Masonry House.

The Sage house, Brooklyn and St. Mark's Avenues, Brooklyn, N. Y., has been successfully moved by B. C. Miller & Son, the house movers of that city. The building is of stone, weighing about 1,300 tons, and was built by a son of Mr. Russell Sage, of New York. The contract for removal called for its being moved 30 feet toward St. Mark's Avenue and 20½ feet toward Brooklyn Avenue, and that it should be raised 2½ feet on its foundations. This to be done without break or crack in the walls.