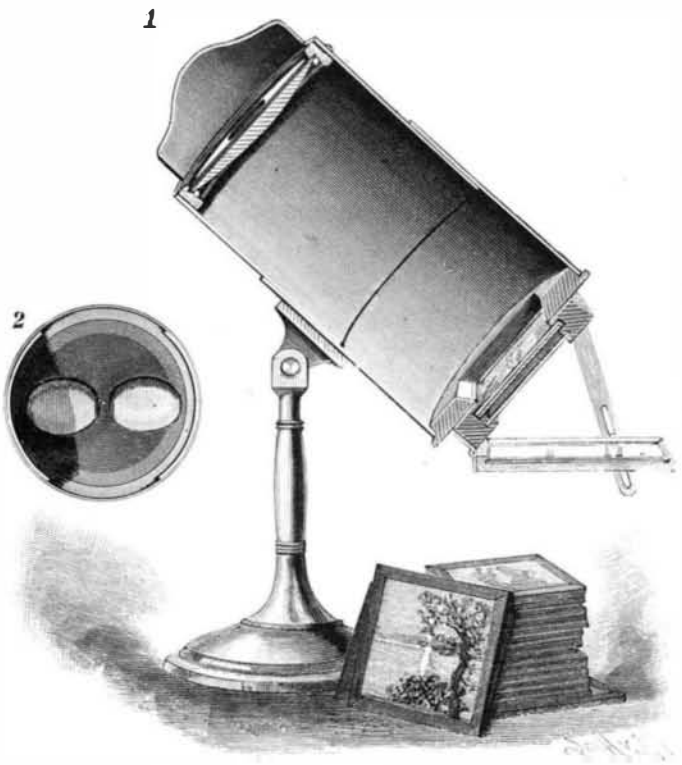
INSTRUMENT FOR VIEWING LANTERN SLIDES.

BY GEO. M. HOPKINS.

The photographer or lanternist who has a large accumulation of slides loses much of the pleasure and profit of his collection unless he is provided with an instrument of some kind for viewing the pictures directly, without the use of a lantern. Several instruments of this character have been devised, most of which admit of the use of only one eye, thus making the examination of the views tiresome and unsatisfactory.



INSTRUMENT FOR VIEWING LANTERN SLIDES.

The annexed engraving shows a very convenient instrument for this purpose, in which both eyes are used, giving an effect which is almost stereoscopic. The instrument, which is shown in section, consists of two tin tubes sliding one within the other telescopically, and mounted adjustably on a standard. The lower end of the tube is provided with two grooved guides similar to those used in the lantern for receiving slides. In the outer guide is placed a piece of fine ground glass, and the slides are inserted in the inner guide. Below the ground glass is hinged a reflector for throwing the light through the ground glass and slide. To the upper end of the telescopic tube is fitted a wooden ring in which is placed a plano-convex lens, with the plane side out. It is of sufficient diameter to admit of the use of both eyes in viewing the slide, and has a convenient focal length. Over the glass is placed a screen of black paper, with two apertures of about the size and shape of the lenses of an eyeglass, see Fig. 2, and around the opening in which the lens is placed is arranged a hood for screening off extraneous light. The diameter of the plano-convex lens is 4½ in. and its focal length is 15 in.; the telescopic tube is 5 in. in diameter, and when extended for use has a length of 10 to 12 in.

By thus placing the plane side of the lens out, and arranging the slide within the focus of the lens, the spherical aberration is almost overcome, and both eyes are enabled to view the picture. The effect is very satisfactory, and as the view is considerably enlarged, at the same time being seen with both eyes at short range, the picture appears practically stereoscopic. With daylight only the plane mirror is required for proper illumination when the light comes from the sky or some plain light colored surface, but for lamp or gas light the lamp should have a plain porcelain or ground glass globe, or a piece of smooth white paper should be laid over the mirror to furnish light of the character required.

NEARLY 2,000 electric cars are running in the United States. Boston alone has about 100 miles of electrically operated roads. Several systems have been developed to a perfection that insures smooth and regular service. Other systems are still in the experimental stage.

FIREWORKS IN MINIATURE.

To set off this piece of fireworks it is not necessary to be a pyrotechnist. Provide yourself simply with a blowpipe or even a clay tobacco pipe. Take a few sheets of thin tinfoil, such as is used as a wrapping for chocolate, and cut them into strips of a width of about an inch. Then present each slip to the flame of the blowpipe, when the metal will ignite and fall in incandescent globules, which will rebound and run over the table on which you operate and travel to a considerable distance. Sometimes they will divide and give rise to other globules that will run and leap in all directions.

When the flame is strong and the tinfoil burns briskly, the globules are very abundant and then present the aspect of a bouquet of fireworks in miniature.

There is absolutely no danger attending this experiment. The globules, surrounded with oxide formed during the combustion, leave only a small whitish track that may be quickly removed, even from oil cloth.

This combustion, which produces a curious effect, is at the same time a demonstration of the combination of a metal with the oxygen of the air. By such combination, the tinfoil is converted into a white oxide. It was by studying the increase in weight exhibited by tin heated in contact with the air that John Rey, a chemist of the seventeenth century, succeeded in understanding the fixation of the air upon metals.—*La Nature.*

COMBUSTION OF TINFOIL IN THE FLAME OF A BLOWPIPE.

A NEW ELEVATED ELECTRIC RAILWAY SYSTEM.

BY HENRY S. PRUYN.

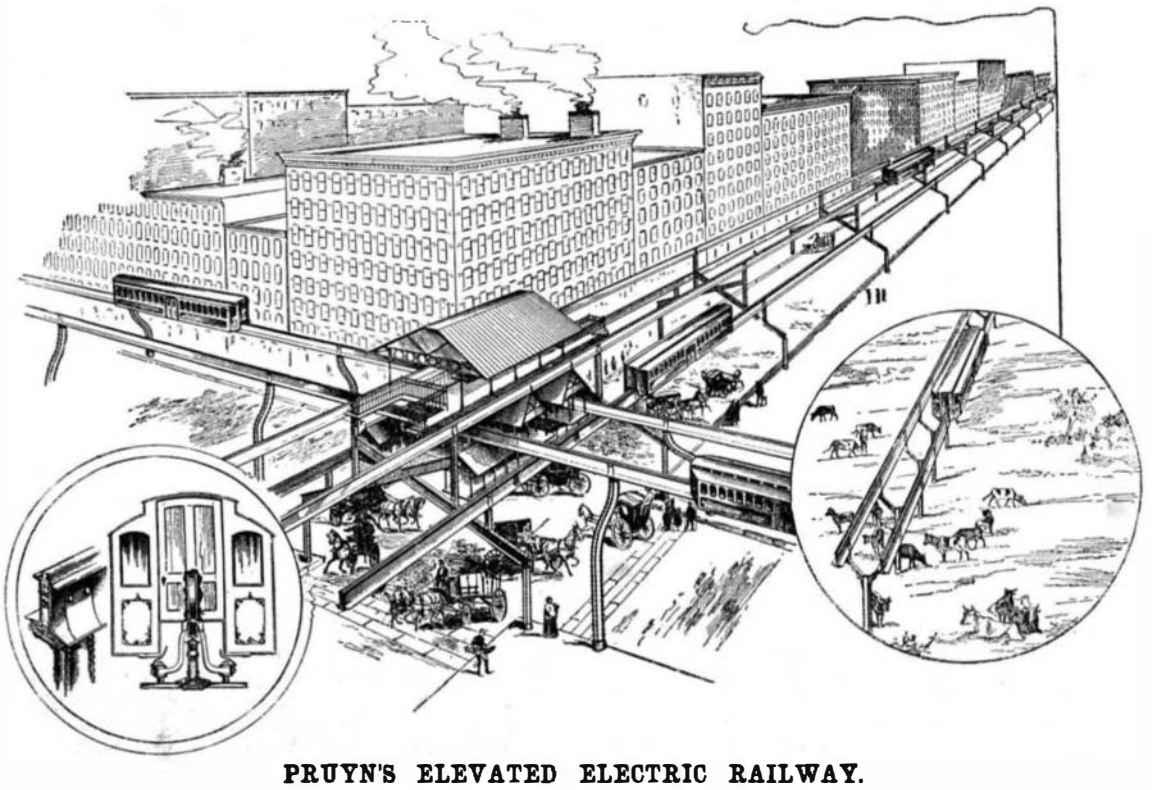
A new elevated electric railway system, known as the Pruynway, is shown in the accompanying illustrations. The picture at the left gives a perspective view of the structure of the girder and of the rail which it carries on top of it and the two current conductors carried under the lower flanges, where they are not only insulated, but protected from damage by the weather or any other cause. Slightly below the level of these power current conductors, and between them and below the structure, is a space for telegraph, telephone, light or any other electric lines, which are also protected from interruption by snow, ice or other causes. As these conductors are firmly fastened and completely protected, there is no danger of short circuiting or leakage of any of the current.

The track and its structure stand on posts high enough to permit free passage for the public below, and to prevent all interference. Freedom from obstruction by snow is secured, even in the most snowy regions; and the drifting of snow and cleaning it away from tracks on city streets is a serious nuisance which this system entirely escapes. In fact, no obstructions of any kind, intentional or accidental, are liable to occur.

In the Pruyn method of operating the electric power and current, the system does not depend upon the ordinary ground circuit. Instead of the return current being allowed to pass through the structure to the ground, it is passed from generators stationed at suitable intervals along or under the railway line, out through the conductor at one side of the structure, and picked up and carried by a suitable truck conductor to the car motor, and after having performed its allotted labor in driving the carrying wheel which rests on the top of the main rail, passes down on the other side of the car through a suitable conductor into the opposite guide wheel below, which delivers it to the current conductor on that side and returns it to the original generating dynamo.

Each car is self-propelling and the cars may be run singly or in trains. The weight of the car and its load is carried low on either side of the track rail, and largely below.

Doors for the use of passengers are provided in the sides of the car. Passengers sit comfortably, back to back, separated by a narrow aisle or passageway for the use of the motorneer, and facing the sides of the car.



PRUYN'S ELEVATED ELECTRIC RAILWAY.

The view in the right hand panel will give an idea of the Pruyn method of construction for a cross-country, double track road. A right of way one rod wide is sufficient for it. There are no grade crossings for wagon roads, footpaths or railways, and thus no liability of damage to persons or property from passing trains, smoke or accidental fires from locomotive sparks. The Pruynway needs no grading, ballasting, draining, culverts, fencing, telegraph posts, cattle guards or small bridges; no bridges are required except over large streams and ravines. The Pruyn road passes over bridges without obstructing footpaths and roadways; and as the electric current which propels the car is broken on drawbridges by the opening of the draw, the cars cannot run upon a drawbridge or approach it while the draw is open. The line can run through agricultural lands with no more interference with tillage and grazing than would be occasioned by a series of trees standing several rods apart. Cars and trains can be run at a speed limited only by the rate at which the driving wheels can be rotated by the heavy electrical current, without the necessity of stopping for supplies of water and fuel, for re-oiling journals or changing engines, and can be run without danger or inconvenience within or without, at full speed, through the most densely populated towns as well as anywhere else.

The central view shows the system as applied in cities, with a three-story station at the intersection of two streets, for the accommodation of passengers on either of the three lines of railway shown. Through express cars run on the two highest tracks of the main line; local accommodation cars run on the lowest pair of tracks, nearly over the curbs on each side of the street.

The structure is a *permanent way*. Once made, it is there for years. It does not require the expenditure necessary in ordinary railroads to keep in repair their 2,500 ties and 350 rail joints to the mile on a track bed exposed to the action of rain, frost and other effects of the weather.

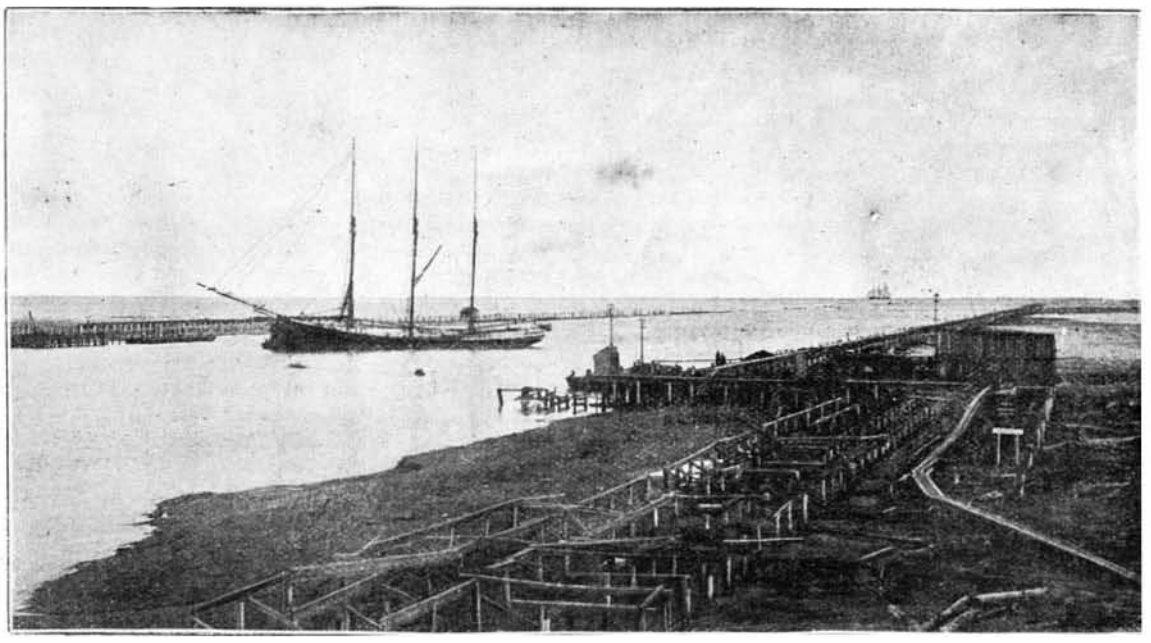
The cars are lighted and can be heated by electricity under instant control, without danger from fire or steam under any circumstances; from the breakage of

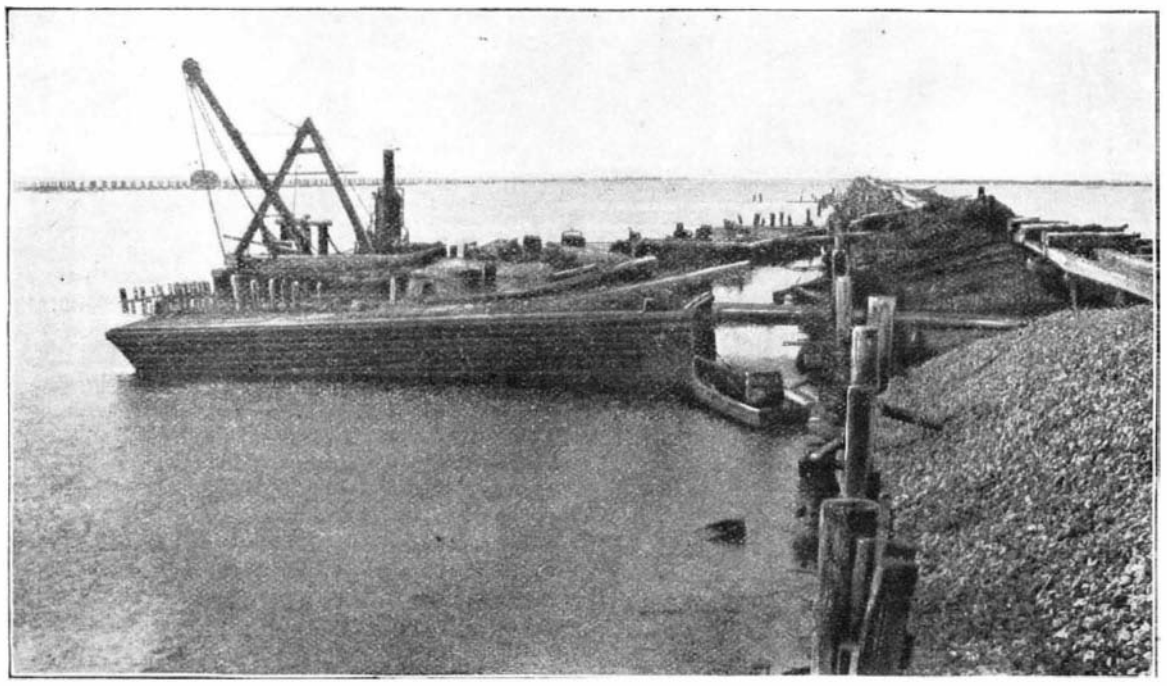
trucks, should such a thing be possible, as the remaining truck suffices to retain the car locked on the track until it stops, and then continues to hold it there. At each truck safety rollers are provided which would take its place in such an emergency in sustaining and guiding the car at that end and keeping it in position.—*Electrical Review.*

THE GREAT JETTIES AT THE MOUTH OF THE BRAZOS RIVER.

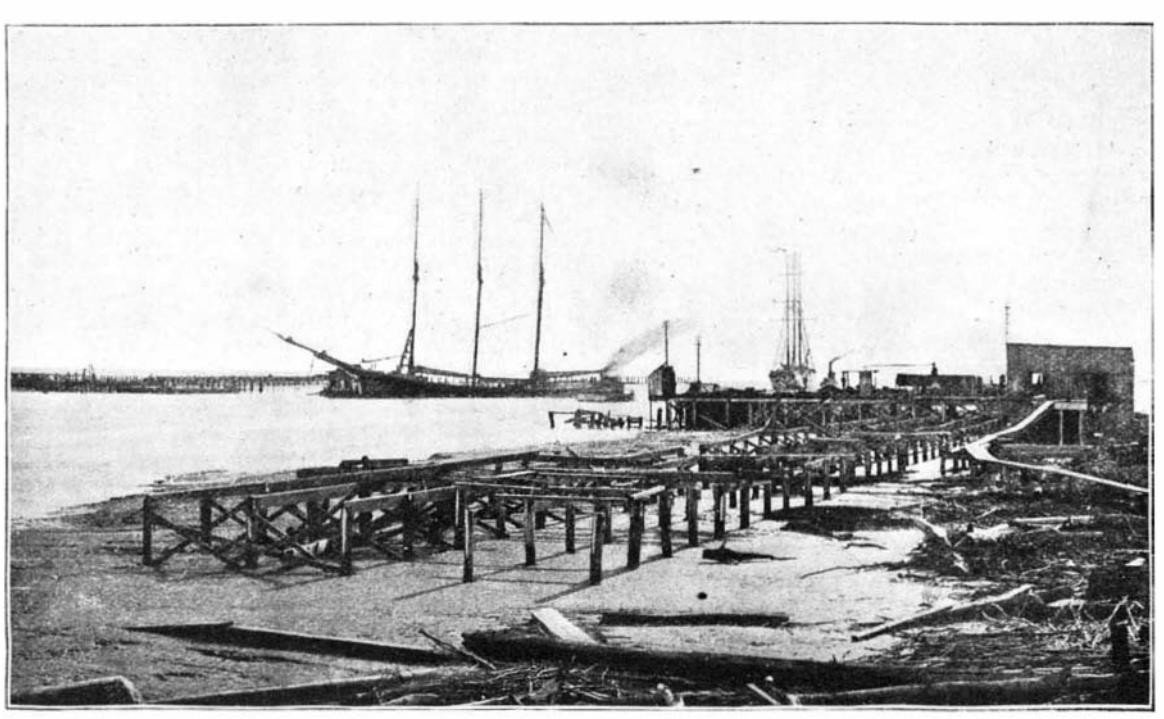
WALFRED W. WILSON.

There are being built at the mouth of the Brazos River, on the gulf coast of Texas, two massive jetties, the object of which is to scour out and maintain a depth of 20 feet of water over the bar. This work is being carried on by a private corporation, at a cost of $850,000, and is now almost finished. The jetties are 5,400 feet in length and 560 feet apart. They start from the shore line and extend out to and end upon the outer slope or over the bar. The mode of construction is as follows: Wharves are first built at the shore end of the jetties. Brush mattresses are then placed between the piles of these wharves and loaded with stone so as to form substantial headings from which to build the jetties seaward. The mattress work is constructed from a trestle of four rows of piling for each jetty. The mattress strips are made continuous by splicing, and the lower mattresses are supported by timbers suspended from the trestles. Brush is first piled crosswise, then lengthwise, and then crosswise again, sufficient that when compressed the mattress is from two to three feet thick and 250 feet in length. The strips are placed five feet apart and are connected by galvanized wire rope. A compression strain of one ton is given the binders at each connection. The upper strips of the lower mattress are used for the lower strips of the upper mattress, and





so on until sufficient thickness is obtained, that when firmly forced on the gulf bottom the top of the jetty will be about two feet above the flow of the average flood tide. The jetty is then loaded with stone and concrete to thoroughly consolidate it. The interstices of the brush work are filled with sufficient rock to give the jetty a weight of 75 pounds per cubic foot displacement. The jetties are parallel to each other, so that the forces at command are applied uniformly throughout the whole length of the channel. The axis of the jetties are at right angles to the deep water curves in the gulf, and the end of the east jetty extends beyond the end of the west jetty, thus protecting it and the channel entrance from heavy seas and drifting sands. The work is carried on by means of a double railroad track extending seaward as the jetties progress, and the brush mattresses are hauled upon tilting ways placed upon a platform car, while the piles are driven by an overhanging driver. The mattresses are launched between the piles and loaded with sufficient stone to hold them in place. A platform is arranged under the tilting ways, on which the necessary amount of stone is carried, and from which it is thrown on the mattress as soon as it is afloat and made fast to the piles. When the sea will permit foundation mattresses are floated ahead, anchored in position by anchors or temporary guide piles and loaded with stone from flat boats. The sea end of the jetties will be provided with solid pier heads built of heavy blocks of stone and concrete to withstand the terrific wave force which at times nothing but the heaviest construction, with suitable slopes, can stand. Mr. E. L. Corthell, of Chicago, Ill., is the chief engineer and Mr. George Y. Wisner, of Velasco, Texas, is the resident engineer. The Brazos River is 800 miles long and drains an area of 36,000 square miles. It debouches boldly into the Gulf of Mexico in one solid stream, there being no delta formation at its mouth. The current of this great river will rush through the channel made by the jetties, scour away the sand and mud, and thus carry out the design of the engineer by acquiring and maintaining a depth of 20 feet of water over the bar.



JETTY WORKS, BRAZOS RIVER, TEXAS.

The Eye and the Telescope.

The following careful statement by Prof. E. S. Holden on the power of the eye and the telescope, as they are contrasted in actual experience, is of special and permanent interest:

If the brightness of a star seen with the eye alone is one, with a two inch telescope it is one hundred times as bright; with a four inch telescope it is four hundred times as bright; eight inch telescope it is sixteen hundred times as bright; sixteen inch telescope it is 6,400 times as bright; thirty-two inch telescope it is 25,600 times as bright; thirty-six inch telescope it is 32,400 times as bright. That is, stars can be seen with the thirty-six inch telescope which are 30,000 times fainter than the faintest stars visible to the naked eye. While the magnifying power which can be successfully used on a five inch telescope is not above four hundred, the thirty-six inch telescope will permit a magnifying power of more than two thousand diameters on suitable objects, stars, for example. This power cannot be used on the moon and planets with real advantage for many reasons, but probably a power of one thousand or fifteen hundred will be the maximum. The moon will thus appear under the same conditions as if it were to be viewed by the naked eye at a distance of say two hundred miles. This is the same as saying that objects about three hundred feet square can be recognized. So that no village or great canal or even large edifices can be built on the moon without our knowledge. Highly organized life on the moon will make itself known in this indirect way, if it exists. If one were looking at the earth under the same conditions, the great works of hydraulic mining or the great operations on Dakota farms or California ranches would be obvious.—*Worthington's Magazine.*

Defects in Tin-lined Tubes.

Some brass condenser tubes in the United States cruiser Baltimore, after being in service for a yearor more, were found to have experienced a peculiar change. In many places the metal was changed to almost pure copper, of a spongy texture, the zinc having completely disappeared. An investigation showed the probable cause of the failure to have been an electrolytic action between the tin lining of the tubes and the brass, the sea water circulating through the condenser forming the electrolyte. Had the tin coating remained perfect, no corrosion would have resulted; but the mud and grit carried in suspension through the condenser cut away the tin coating in spots, and it was at these spots that the change of the metal occurred. It was concluded that if the tubes had not been tinned at all, they would have remained intact.