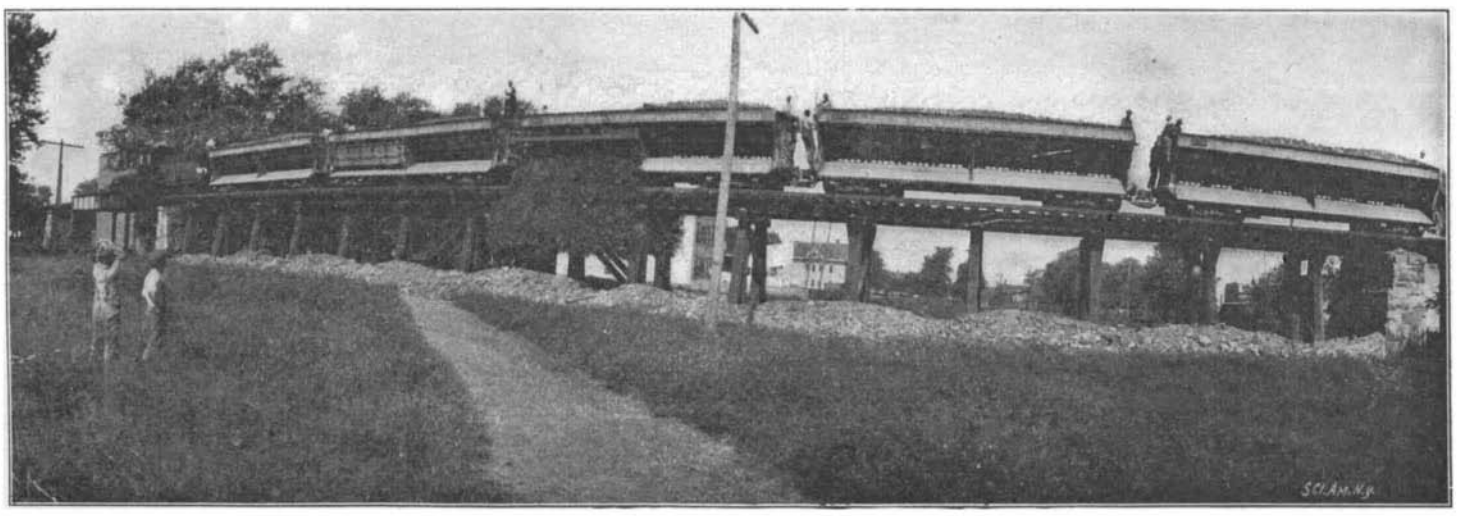
SELF-DUMPING CARS IN RAILROAD CONSTRUCTION.

BY DAY ALLEN WILLEY.

Some remarkably rapid work in the building of railroads in the West has recently been accomplished by the use of labor-saving machinery and appliances such as self-dumping cars, the track-laying machine and the bridge-building traveler. The country through which some of the lines have been constructed is of a very difficult character, and necessitated the filling of valleys or canyons with earth or stone in addition to the erection of many long and high bridges. Such an enormous quantity of material was required to fill around the false work placed across some of the valleys that the unloading of the cars in the usual way by shoveling was out of the question, as too much time would be lost in the work. In some places embankments ranging as high as 150 feet were required to carry the track across the valleys. In their construction a wooden trestle would be built from the side of the valley a distance of 50 to 100 feet, according to depth, and a temporary track laid on this support.



DISTRIBUTING MATERIAL FROM SELF-DUMPING CARS ON A TRESTLE.

From the nearest gravel pit or cut trains of construction cars would be run out on the trestle and contents dumped. From an engineering standpoint the work performed by some of the self-dumping cars was remarkable. What is known as the Goodwin was employed by a number of the contractors. This car is built of steel, with the lower half of a V-section. Each side is hinged, and may be swung in and fastened or released at the will of the operator. The movable framework holding the sides in place is connected with valves or "dump cylinders" operated by compressed air, the ordinary supply furnished for the air-brakes being usually sufficient to operate them.

The car can be arranged so as to open one side or the other or both. When it is loaded it is run out upon the trestle or false work, and by merely pulling the dumping lever, as it is called, the sides are opened and the contents of the dumper thrown in the center of the track or on either side as desired. Only one man is required to empty a train of five or six cars after the mechanism for directing the motion of the contents has once been adjusted. By coupling the air-hose to the dumping cylinder on the end car one man, by shifting a lever, can dump a train of half a dozen or more cars.

By utilizing this form of car 10 to 25 cubic yards can be thrown on the embankment from each side in merely the time required for the material to pass out—usually a few seconds. As the lower portion of the false work is filled an addition to the trestle is constructed and more cars added to the dumping train. If more material accumulates on one side of the trestle than on the other it is only necessary to keep one side of the car closed and divert all of the filling to the lower, shallower part of the bank.

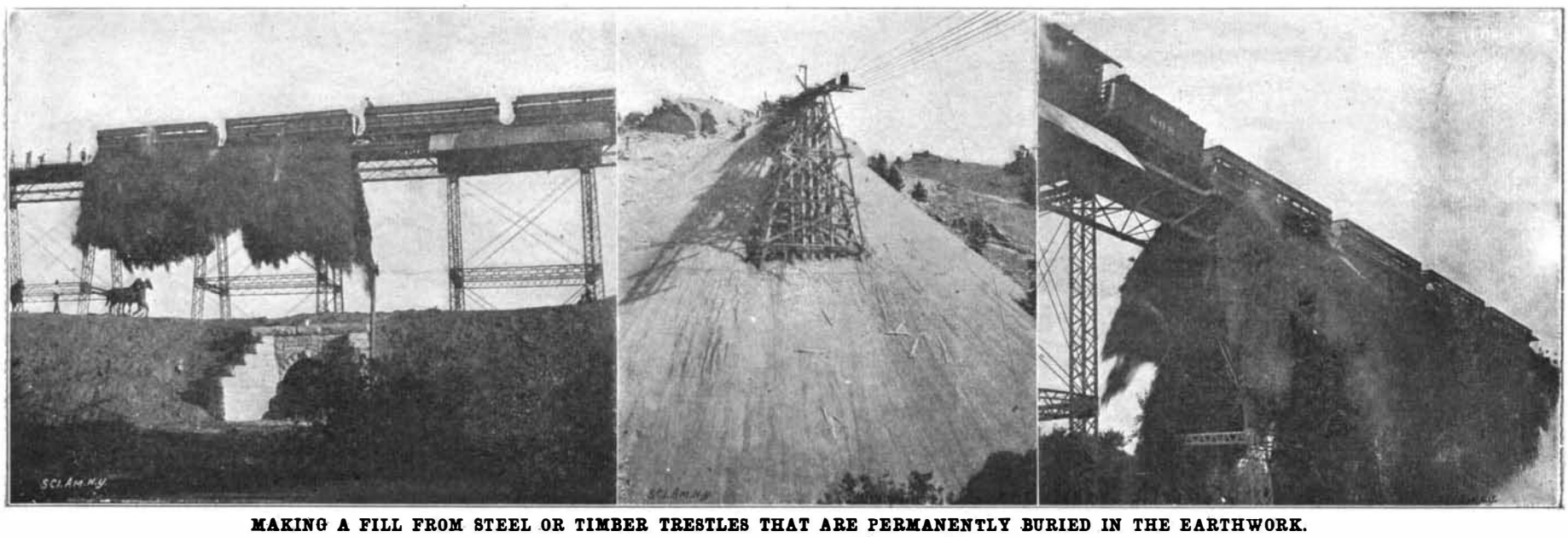
When the level of the road-bed is reached the track is laid with rails of the usual size, and the cars utilized to ballast it. Loaded with rock or gravel, they are hauled over the rails to the desired point, and by the single motion of the lever the material can be thrown, not only on one side of the rails to the required distance, but also between them so evenly that a few minutes' work with a shovel is sufficient to place the road-bed in condition for regular service. An interesting feature in connection with the ballasting is the rapidity with which the work is performed. In case time is precious it can be discharged from either or both sides while the locomotive is pulling the cars at a speed ranging from 5 to 12 miles an hour. For completing the surface of the road-bed it was found in the work above referred to that the distribution was very satisfactory even at the latter rate of speed.

To give an idea of the load which can be transferred in not only constructing railroads, but loading vessels with coal or other material, it has been found by actual test that five canal boats each 300 feet in length can be filled at a time, provided, of course, that they are lying along the same wharf. With the usual number of hatches to a boat about forty cars of ordinary size can be placed on the wharf, one to serve each hatch. As already stated, an indefinite number of cars can be unloaded by one man by merely connecting the hose which carries the compressed air to one of the dumping cylinders, consequently as soon as the cars are in position their contents can be emptied into the hold simultaneously. The sides of the unloaded car are replaced in position and locked, and the empty train drawn from the wharf, when another takes its place. Allowing for the movement of the cars to and from the wharf, and the unloading, a train load of from 1,500 to 2,000 tons can be transferred in less than ten minutes, or at a rate of fully 10,000 tons an hour. If the tracks connected with the shipping wharf are extensive enough to allow trains to be made up and hauled without delay this rate of unloading can be considerably increased.

LOADING A TRAIN OF GOODWIN CARS BY BUCKET DREDGE.

At rear of last car is shown the air-cylinder by which sides of car are released.

The mechanism operating the sides of the self-dumping car is graduated so that the opening can be varied and the flow of material diminished or increased at the will of the operator. This is especially desirable in reballasting track. When but a small quantity of gravel or rock is required to properly level the road-bed in such work the ballasting train can be moved as rapidly as 16 miles an hour. This rate of speed has been maintained and the work done successfully in improvements upon the Great Northern Railway, where rock as well as stone was discharged at the same time. As six men require about thirty minutes to unload the average-sized car, an idea of the time and labor



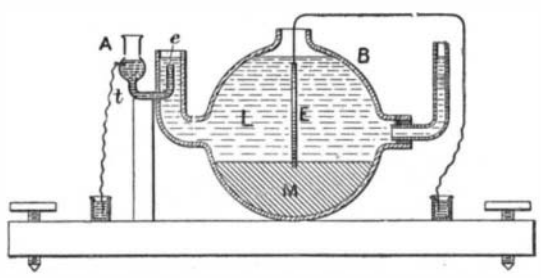
MAKING A FILL FROM STEEL OR TIMBER TRESTLES THAT ARE PERMANENTLY BURIED IN THE EARTHWORK.

The above snapshots were taken as the material was dumped from the cars.

saved by the automatic process can be gained. The accompanying photographs showing the work of making some high fills on the Union Pacific and other railroads are particularly interesting in view of the excellent "snap-shot" effects secured.

NEW FORM OF LIPPMANN ELECTROMETER.

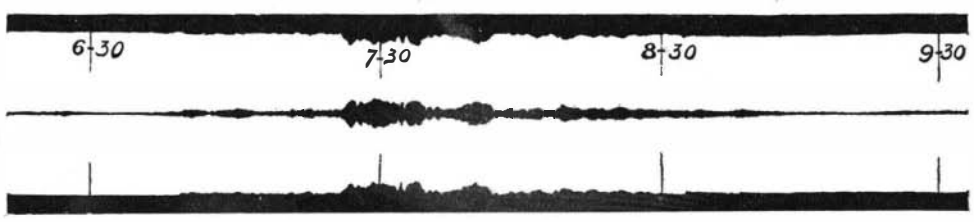
A new form of Lippmann capillary electrometer has been devised by M. Pierre Boley, of Paris. It has the advantage of being easy to construct and is at the same time very sensitive, as it will indicate differences of potential as low as 1-3000th of a volt. As the diagram shows, the mercury is contained in a pipette, *A*, whose lower tube, *t*, is bent twice at right angles. The tube has a diameter of one millimeter at the open end, *e*, and here the meniscus is formed. The end of the tube is surrounded by the electrolyte, *L*, contained in a spherical vessel, *B*, which has a tubulure at each end; that on the left brings the liquid above the meniscus, and enables the latter to be observed by the microscope eyepiece, while the right-hand tube, which turns in the stopper, renders it easy to empty the vessel. The electrode, *E*, is fixed upright in a base of putty, *M*; it has a diameter of 4 inches, and on this account it is not easily polarized. The meniscus is lighted from above so as to produce in the microscope two or three black fringes parallel to the image at its summit. The cross wire is brought upon the fringe nearest the mercury, which is the most sharply defined. To measure the electromotive force a Latimer Clark standard cell is used with a compensator which brings the reading back to zero. The image of the meniscus is seen to depress with a change in the electromotive force of only 1-3000th of a volt. For instance with a meniscus of one millimeter diameter, the apparent depression is about ⅛ of a millimeter for an image which is magnified 100 diameters. The instrument obeys a simple law for increasing electromotive forces, as up to 1-100th of a volt the depression is exactly proportional to the electromotive force. The zero of the instrument remains always fixed when it is mounted, so as to be free from vibration.



LIPPMANN'S ELECTROMETER.

EARTHQUAKE RECORDERS IN AMERICA.

In connection with the recent volcanic eruptions in the West Indies and the disastrous earthquake in Guatemala, it is interesting to know that several instruments for observing and recording earthquakes are in service in various parts of North America. One is located in Baltimore, one at Toronto, three at Bayonne, New Jersey, and one at Victoria, British Columbia. Although the seismograph at Baltimore has been in operation only since April, 1901, it has noted a number of disturbances of the earth, the last being that which so seriously affected Central America. The instrument is of the form designed by Prof. John Milne, the noted geologist, and consists of a so-called horizontal pendulum, that is, a beam supported by a vertical column as a door is hung by its two hinges. The line between the two points of support of the beam is nearly, but not exactly, vertical; the more nearly vertical it is the more sensitive is the beam to slight tremors. A small tilting of the column at right angles to the beam will cause the latter to swing in that direction. The adjustment is usually made so that a tilting of the column of ½ sec. of arc (i. e., a movement of the top of the column, which is about one foot high, of 1-35,000th of an inch beyond the base) will cause the end of the beam to swing a distance of 1-25th inch. The beam is 37 inches long, and on its end is fastened a plate of thin brass in which is a narrow slit parallel to the length of the beam; this plate moves over a fixed brass plate with a similar slit, but at right angles to the former. A ray of light is reflected through the two slits, which simply serve to narrow it, and moves to and fro as the beam swings. The light falls on a strip of bromide paper which is steadily moved by clock work under the slits at the rate of 1-25th of an inch a minute. When the beam is at rest the movement of the paper causes the light to trace a straight line upon it, but when the beam swings back and forth the straight line is changed into a sinuous curve. The period of vibration of the beam is about fifteen seconds, during which time the paper has only moved about 1-100th of an inch, consequently the curved line is very much compressed, and its back and forth tracing on the paper appears like the widening and paling of an original straight line. The instrument is mounted on a solid brick pier. built about twenty-five years ago, and consequently rests upon a very solid foundation, as the pier stands on the clays and gravels of the Potomac Formation, which rest on crystalline rocks seventy or eighty feet below the surface. The beam points about S. 30 deg. W. This direction was chosen so that the beam might be parallel to the Appalachian mountain system and to the coast line, and thus be most sensitive to disturbances propagated at right angles to these continental features. It is in charge of Prof. Harry Fielding Reid, of the faculty of the Johns Hopkins University, and by a strange coincidence made its first record on the same day it was completed and placed in operation. This was an earthquake which was very perceptibly felt upon the Pacific Coast as well as at various points on the Pacific Ocean, and the record of the instrument shows more or less movement of the earth for a period of nearly four hours. Reproductions of this disturbance upon the photographic paper correspond almost exactly to that noted when the disaster in Guatemala occurred, although the Central American fluctuations were somewhat more violent, as indicated by the wave lines indicating the vibration of the instrument. Although many trains pass through the Baltimore & Ohio Railroad tunnel within 150 feet of the instrument, the vibrations caused by the service are so rapid that the seismograph is not affected. Scientists who have confidence in the construction of the instrument believe that the eruptions at Martinique and St. Vincent have been confined to a small area, as the record at Baltimore has given no trace whatever of disturbance since these eruptions.



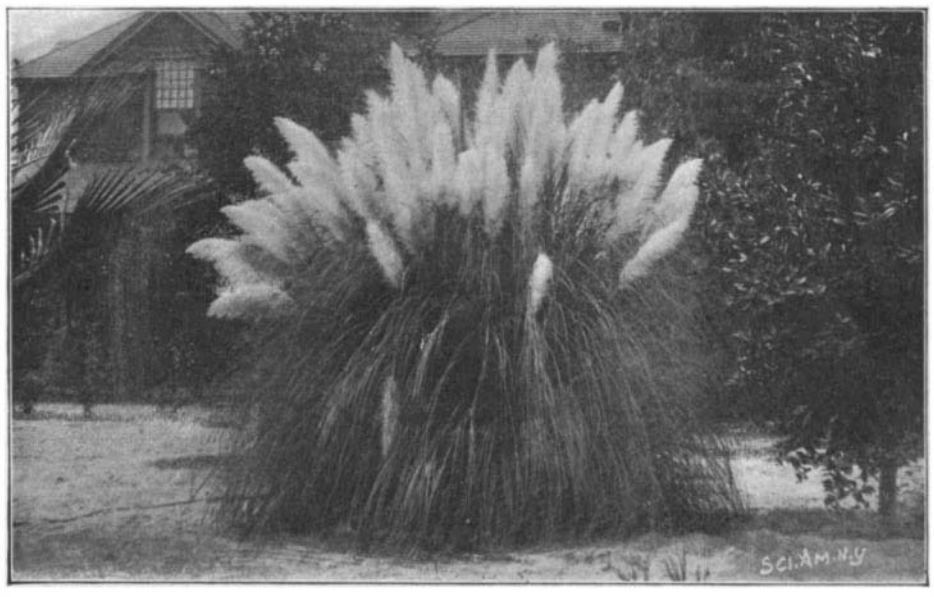
PHOTOGRAPHIC RECORD OF AN EARTHQUAKE MADE BY SEISMOGRAPH AT JOHNS HOPKINS UNIVERSITY

This instrument gave no indication of the West Indian disturbances.

THE UTILIZATION OF PAMPAS GRASS.

BY CHARLES F. HOLDER.

Thirty years ago the pampas grass was a curiosity. Many New England homes had treasured specimens which were brought across the seas as souvenirs from the vast pampas lands of South America. Now the pampas plume has been introduced into America, and in California forms one of the standard crops. The vast fields of grass in its light gray tints present a beautiful scene, rippling in the wind, the soft colors and graceful shapes being particularly pleasing to the eye, and when seen in long stretches, as on the Rancho del Fuerte near Whittier, a more attractive sight can hardly be imagined. Yet the full beauty of a pampas field in perfection is never or rarely seen in California, as the plumes are gathered before they are perfectly ripe and white.



PAMPAS GRASS, SHOWING THE HIGHLY DECORATIVE EFFECT OF THE PLUMES.

Santa Barbara county is the region most famous for this grass, and here the first experiments were made with it, the roots having been brought, it is said, in the early sixties, from South America by a Spanish gentleman. It was soon seen that the pampas plume in the United States would be a profitable venture, and when it was found that the plants would live, roots were imported and many acres planted in various parts of California, resulting in the pampas ranches of to-day. One of these is found south of Pasadena, over the Mission hills, owned by Mrs. Strong, the pioneer of plume raising on a large scale, the first to introduce the plumes as part of the regalia of political clubs. Their use by tens of thousands in the Blaine campaign gave significance and novelty to the ranks of the followers of the Plumed Knight, each of whom bore one of the attractive plumes.

The plumes have no special economic value aside from their use as ornaments. They are dyed all colors of the rainbow, jet black and silver, and bring a good financial return in the large cities and in the localities where they are not known. Thousands of plumes are thus employed all over this country and Europe, Germany especially being an important field for the plume. Of all the enterprises in California, this is one of the most æsthetic. The orange picking and packing is interesting to the average tourist, the great groves with their golden fruit being always a fascinating sight, but the pampas plume is so dainty that it appeals particularly to the artistic.

The ranches or plume orchards are planted from roots often obtained direct from South America to renew the stock in its full vigor, but the roots are easily obtainable in California. These are planted a third farther apart than ordinary fruit trees, as the plants grow to enormous size. Like the tobacco, it is exhausting to the earth, sapping it of its moisture and richness, and taking so firm a hold upon the soil with its mass of roots that only dynamite will blow it out. The pampas plume farmer plants them in hills ten by sixteen feet apart, each hill representing five or six individual plants which appear to the casual observer to be one enormous bunch. The first year a few plumes will be seen; the second and third each hill may be counted on producing from 50 to 200, and the fourth and fifth and sixth years see a fine crop, the plant now being, if the conditions are perfectly favorable, nineteen or twenty feet high and twelve or more across. The ground is kept weeded, and after the fifth year old stock is weeded out, the best results coming from plants between four and five years of age. In the high lands, where the plants are exposed to the warm rays of the sun and evaporation is rapid, the plants are irrigated once a month. In September the picking begins about the time of the vintage, and on the large pampas plume ranches, troops of Mexicans or white laborers can be seen trimming the grass. As soon as the tips of the grass begin to appear, they are cut and carried to the tables where women pull off the sheaves, skilled hands making $1.50 per day at the work. Children now take the plumes and lay them in long rows in the sun to dry and bleach. When the industry was in its incipiency, it was doubtful if it could be made a success, as the plumules dropped off and it was impossible to transport the plumes, but someone discovered that if the plume was picked when it was not quite ripe it would hold together, which solved the entire problem.

In sunny localities a day or so suffices to dry the plumes, and at such times the ground appears, from the hills, to be covered with snow. After the drying the plumes are taken to the curing house and then finally sorted into various grades by expert hands. The finest and most beautiful plumes are about thirty-six inches long, and they are packed for shipment either in packages of 2,000 or in large cases, the prices ranging from $200 to $50 per thousand, according to the demand.

There are numerous pampas orchards in California ranging in their productive quality from 5,000 hills, which produce 250,000 plumes, down to small ranches where but a few are raised. In all, California produces about 2,500,000 plumes per annum, which are sent all over this country and Europe.

The pampas grass is the *Gynerium argenteum* of botanists, and is indigenous to the La Plata region of South America, covering large portions of the pampas and forming a characteristic plant of the country. In Southern California the pampas is a common garden plant, being very effective against the rich green foliage. During the yearly fiestas of Los Angeles, Pasa-