thus shown twice in twenty-four hours. This improvement has been patented by Mr. William R. Dunham, of Stoneham, Mass.

Weight of Compact Bodies.

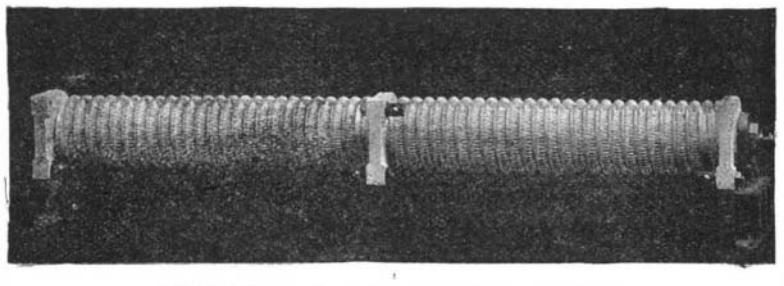
The load which is produced by a dense crowd of persons is generally taken at 80 to 100 pounds per square foot, and is considered to be the greatest uniformly distributed load for which a floor need be proportioned. That this value may be largely exceeded in an actual crowd was pointed out by Professor W. C. Kernot, of Melbourne University, Australia, in a recent paper before the Victorian Institute of Engineers, copied into *Engineering News*. In an actual trial, a class of students averaging 153·5 pounds each in weight were crowded in a lobby containing 18·23 square feet, making an average floor load of 134·7 pounds. There was still room to have placed another man, which would have brought up the loading to 143·1 pounds per square foot. Professor Kernot also quoted from Stoney, who placed 58 Irish laborers, averaging 145 pounds each in weight, in an empty ship deckhouse measuring 57 square feet floor area. This was a load of 147·4 pounds per square foot. In another test, with 73 laborers crowded into a hut, 9 feet by 8 feet 8 inches, Stoney produced a load of 142 pounds per square foot, and estimated that two or three more men could have been squeezed in. It appears from these experiments that while the figures ordinarily assumed of 80 to 100 pounds are sufficiently correct for spaces on which there is no cause to induce the collection of great crowds, larger figures, say 140 or 150 pounds per square foot, should be used for railway stations and platforms, entrances and exits to places of public assemblies or of office buildings, bridge sidewalks, pavements over vaults, and other places where dense crowds are likely to gather.

Stationary Electric Waves.

Before the Berlin Physical Society Professor Raoul Pictet recently gave an account of experiments made by Messrs. Sarasin and De la Rive, by which the rate of the electric waves discovered by Hertz had been measured, and their identity with waves of light in the ether determined. By using large metallic surfaces 16 m. in diameter as reflectors, and by allowing the discharge of the primary spark to take place under oil instead of in the air, it was found possible to obtain stationary electric waves in a long gallery and to determine their nodal points. In the discussion which ensued Professor Kundt stated that Dr. Zenker was the first person who had explained the photographing of colors by means of stationary waves, that stationary light waves were first experimentally determined by Dr. Wiener, and that Seebeck was the first to take photographs of colored objects. After Professor H. W. Vogel, pictures due to the action of light were first taken by a doctor named Schulz, in Halle. In 1727, *Nature* says, this observer treated a solution of nitrate of silver in a small box with calcium chloride and obtained a grayish precipitate. He then covered the box with a lid in which was a hole the shape of some letter, and on subsequently examining the precipitate he saw a dark image of the letter on it. The experiment was found to fail in the dark. Schulz hence concluded that the image of the letter was due to the action of light.

AN ELECTRIC HEATER FOR CARS.

The Consolidated Car Heating Company, of Albany, N. Y., is now producing heaters depending for their effect upon the heating of a conductor by an electric current. The resisting conductor of wire is divided into twelve equal parts, and a multiple switch is provided to throw them in or out of action. Six hundred and twenty-five feet of wire is used in one of their standard sizes. The principal use is for trolley cars, but for house and office use the same company manufactures other heaters, wound for any desired voltage, and for direct and alternating current supply. Our cut shows the neat appearance of the car heater.



INTERIOR C. C. H. CO. ELECTRIC HEATER.

Remarkable Armor Plates.

A test of a new nickel steel armor plate treated by the Harvey process was made Feb. 11 at the Indian Head proving grounds. The object was to determine the tests to be established for the 7,000 tons of armor for which contracts are soon to be let. The test was to include shots at low velocity to show whether the plate would break or crack, and at high velocity to test the resistance to penetration. The plate in this trial was 9 by 7 feet in size and 14 inches thick, and was the thickest plate yet submitted to test. The arrangement of the gun from which the shots were fired and of the backing were the same as in previous tests. The first shot was fired with a charge which gave a velocity at the point of impact of 1,472 feet per second. The projectile entered the plate 5 inches and broke in fragments; no crack could be found in the plate. The second shot, with a velocity at the point of impact of 1,860 feet, entered the plate about 6½ inches, and cracked it for a part of its length. The third shot had a velocity of impact of 1,960 feet, and the result was almost the same as with the second. The fourth projectile, with the high velocity of 2,060 feet, entered the plate about 10 inches, cracking it in several directions, and breaking the backing. The tests were considered very satisfactory.

THE TELAUTOGRAPH.

The telautograph, on which Prof. Elisha Gray has been working for several years, has now been so perfected that a public exhibition was recently made of it in New York and in Chicago, at which the representatives of the SCIENTIFIC AMERICAN were present.

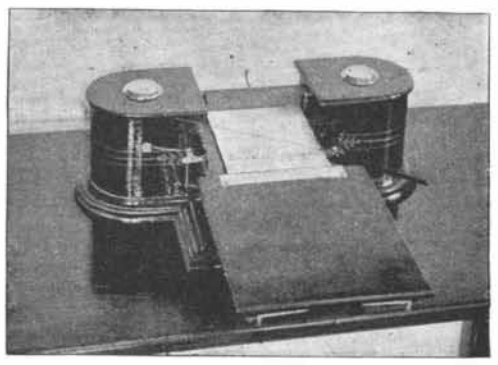


Fig. 1.—THE TELAUTOGRAPH TRANSMITTER.

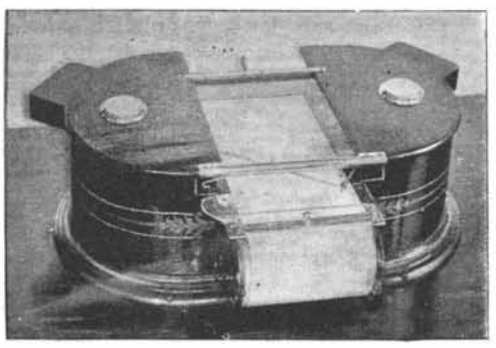


Fig. 2.—THE TELAUTOGRAPH RECEIVER.

Messages were sent over several miles of line. Two instruments, which are small in size and simple of construction, comprise the apparatus. They are the transmitter and the receiver as illustrated. The electrical energy required to operate this device is the same that would be required in a telegraph line of corresponding length, but the most efficient wire is copper instead of iron, and three number 18 wires are used. Two of the wires connect the transmitters with the receivers, while the third is used for such operations as lifting the pen and pencil from the paper, moving the paper along, and the like.

The operator of the telautograph holds the pencil firmly as he would any pencil, and writes naturally, and rapidly if need be, taking care that there be no jerky movements. The instrument has a convenient rest for the hand. The paper is in a roll and is five inches wide, and the operator writes on a plate to a depth of two and one-half to three inches before moving the paper along. Two small silken cords are attached to the pencil and are connected, one to the right, the other to the left, to a small drum inside the case of the instrument. Under this drum, and attached to the same shaft that it is on, is a steel wheel with forty teeth to the inch on its circumference. Every movement of the cords transmits its action to these wheels, and as each tooth of the wheels passes a given point it transmits an electric impulse to the receiver, which reproduces in facsimile whatever line made by the pencil on the transmitter induced the impulse. The receiver is constructed on practically the same principle as the transmitter, but the impulses it receives are transmitted by electrical instead of mechanical means. It has toothed wheels, one at the right and the other at the left, and also a drum inside each wheel. Instead of having cords, both drums have an aluminum arm attached to them. These arms are hollow and ink flows through them, reproducing on another roll of paper whatever mark the pencil has made.

The writing done by the receiver is in fact a series of dashes, but these dashes are so infinitesimal as not to be apparent. Straight lines, curves, in fact any line, can be reproduced, whether it be part of a letter, a flower, or a face. Peculiar characteristics in a person's writing are reproduced to just the marked extent which they are apparent in the original copy. Dotting the I's and crossing the T's are easily done, as by the use of the third wire the pencil and pen are lifted from the paper in the operation. When the operator turns the switch to move the paper along another section, the paper in the receiver is moved automatically the same distance.

This, the latest and one of the most remarkable of Prof. Gray's inventions, bids fair to become a formidable rival of the telephone and the Morse and printing telegraphs.

The Care of Tops and Dashes of Carriages.

When a top carriage comes into the carriage painter's care for repainting, it should be his aim to not only give the leather of the top and dash a good appearance, comparably with a newly finished job, but the refinish upon the leather should be done with the object of preserving it, so that it will retain as good an appearance as the other parts of the carriage as long as possible.

All the so-called "leather dressings" in the market give to the leather a fresh and good appearance for a short time, but they do not wear as long as the finishing varnish used upon the carriage; consequently, a top and dash soon begin to look rusty, and long before the wood and iron work of the carriage needs to be revarnished, they have become so dull and unsightly that the owner of the carriage really has cause to be ashamed of them.

The leather upon carriages seems to have no one who is willing to assume responsibility for its shortcomings. The trimmer repudiates the care of it. The patent nostrum man appears periodically, screaming his dope up to the realms above everything; but practical use shows just what the truck is worth.

The harness maker, the blacksmith, the livery man, and the neighbors, all have a smear to suggest to undo the shabbiness of an old top. The painter is usually asked the leading question, when a carriage comes into his care: "Can you do anything with that top?" And reference is made to the dash in a similar way, and it falls to the painter's lot to do something for the top and dash. He generally buys a "leather dressing," for which he is not responsible in any way, and thus the care of the leather upon a carriage is taken by proxy, as it were, for which no one appears responsible.

All the "top dressings" in the market are only a kind or quality of asphaltum varnish. They give a nice appearance to a top, but they do not keep out water, and they thicken the leather, and, what is equally bad, are not durable.

When a top is old and pretty well gone, leather varnish is as good if not better than anything else for it, because the leather is past being spoiled. For a carriage top on its first reappearance in the paint shop we recommend the following treatment, a method that has been tried on livery buggies, etc., during four years, and has proved itself an excellent one:

The top should be cleaned thoroughly, inside and out, and the rail and joints made ready to be blacked; then take boiled oil and put into it some thinned drop-black, and coat the leather all over with it, brushing it out well. When this has stood half an hour, the places where the top has been folded, and which are more or less cracked, will have absorbed the oil. Go over these spots again; then take some soft rags and rub all the oil and black off so clean that it won't dirty a clean piece of rag.

This treatment thoroughly cleans and polishes the leather, and it fills all the cracks so that they resist water. This oil and black does not dry as hard in a year as the enamel on the leather. It freshens the enamel and gives it a new lease of life. This oil also keeps the straps soft better than neat's-foot oil.

Sometimes a top which has been abused will take in the oil and look dead at the badly folded places the next day or so. These spots should be reoiled and rubbed dry. This does not thicken the leather, and as this oil dries it does not take dirt. Tops that have been done up four years in succession by this method look better than those treated in any other way.

Dashes can be treated with a thin coat of flat drop-black, and rubbed off clean with a rag. This cleans the leather, touches up the scratches, and blackens the seams. When this is dry, give them with the most scrupulous care a flowing coat of wearing body varnish. After four years of this treatment the dashes of common ungrained leather looked almost as good as new. —*The Hub.*

PATENT 492,789, issued March 7, 1893, for a speaking telegraph or telephone, was applied for by T. A. Edison Sept. 5, 1877, nearly sixteen years ago. It has been held back by some concerted action between the Patent Office and Edison until the present time; and if the patent is held to be valid, it will not expire until nearly thirty-three years from the date of application.