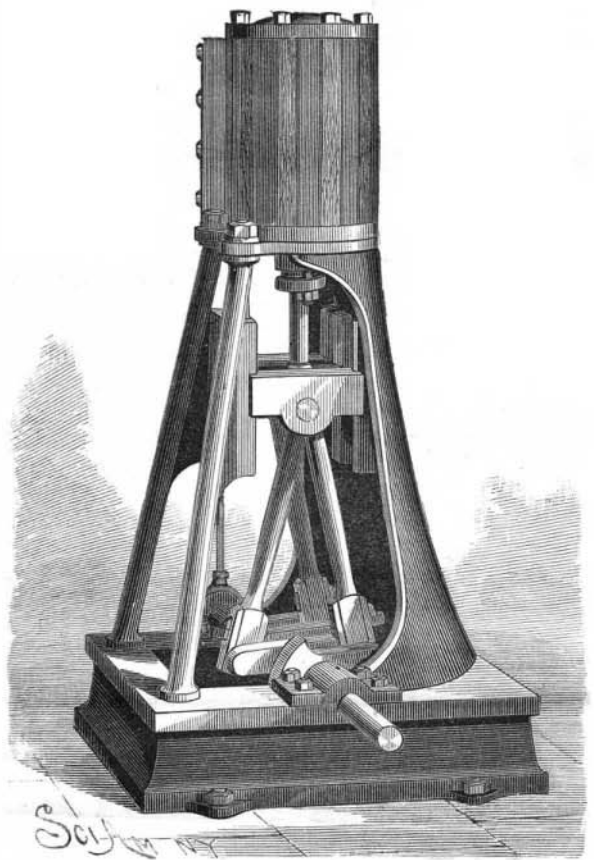


IMPROVED BALANCED STEAM ENGINE.

Of the moving parts of a steam engine, the piston, piston rod, and crosshead have only a reciprocating motion, while the connecting rod has both a reciprocating and rotary motion, the rotary motion being almost *nil* at the connection with the crosshead,



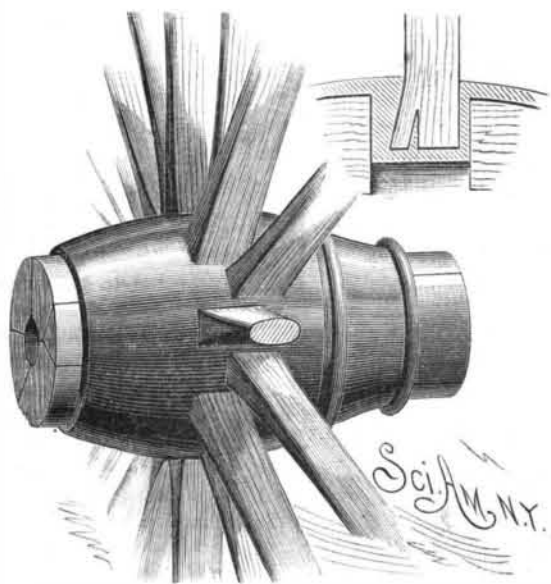
LOUQUE'S BALANCED RECIPROCATING COUNTER-WEIGHT ENGINE.

and being almost perfectly rotary at its connection with the crank, which has, of course, only a rotary movement. To perfectly balance these motions, it is necessary to counteract the effects of the one by the other. In the engine represented in the accompanying engraving, this end is reached by a simple and admirable arrangement of counterbalancing parts. The engine has a three-crank shaft. The connecting rod being weighed, its weight is divided in two equal parts, and a rod is connected to each of the crank pins opposite the main crank. These rods always move in opposition to the connecting rod. The piston, piston rod, and crosshead are also weighed and the weight divided in two equal parts, are placed at the end of the balanced rods, and are made to move in slides running parallel with the crosshead. The engine is thus perfectly balanced. The inventor did not deem it necessary or useful to counterbalance the slide valves. The effect of such counterbalancing has been so extraordinary in its practical results that these engines have been run without bolting to the floor and without flywheel, at either slow or high speed. The counterweights can be applied to any engine.

Further particulars can be obtained from the patentee, Mr. Charles Louque, 31 Carondelet Street, New Orleans, La., and from our Business and Personal column.

IMPROVED WHEEL HUB.

The hub is adapted to give a staggering arrange-



GRASBERGER'S IMPROVED WHEEL HUB.

ment to the spokes, while it secures the greatest possible strength without destroying the symmetry and beauty of the plain wooden hub. The body of the hub is composed of two wooden end sections, which are bored to receive the axle, and are fitted within a metal shell, which is constructed with recesses form-

ing pockets for the spokes. In the construction here illustrated, the spokes are held in place by being made to spread out laterally by a locking wedge, as shown in the sectional view. The outer and inner wooden end blocks, which form the core of the hub, are turned to shape, then cut in five pieces, one of which is wedge shaped, to form a key for the whole; or they can be steamed and forced into the hub.

This hub receives the full size of the spokes the whole length of the tenon, and repairs are easily made, as the spokes are independent of each other. It is impossible for the grease to get in around the spokes, in case of a loose box.

This invention has been patented by Mr. Boniface A. Grasberger, of 1448 East Franklin Street, Richmond, Va.

How Plaster Casts are Made—Col. Pat. Gilmore's Plaster Cast.

The St. Louis *Globe* gives the following amusing account of Col. Pat. Gilmore's experience in the hands of a couple of youthful modelers: "I went to the studio at the hour fixed, and was to be met there by a well known sculptor, who had courteously undertaken to do the modeling himself. By some unfortunate mischance, he failed to put in an appearance. Two apprentices were vigorously stirring the liquid plaster of Paris or whatever villainous compound is used for the purpose. After about half an hour's waiting, it was decided to proceed in the great man's absence, and I was invited to disrobe. A much-beplastered white sheet was wrapped around my neck and shoulders tightly, and my face and hair were liberally greased to prevent the plaster sticking to the flesh. Pieces of paper were stuffed into my mouth, nose, and ears, and I was told to shut my eyes. No sooner had I done so than my persecutors commenced pouring the liquid on my head. One poured while the other pressed the rapidly hardening compound so as to fill every recess and get a cast of every feature. They poured a great deal too much on, and soon my head was incased in a mask as hard as iron. The heat was insufferable. I could not move my head, for the awful weight threatened to dislocate my neck if I did; my eyes seemed being pressed into my brain, and the paper circlelets not proving adequate for their purpose, I began to feel the first symptoms of suffocation. I could not call out, and believed myself to be dying. But my troubles had barely commenced. The apprentices had not fixed the centerboard, or slit, properly, and when they mercifully decided to release me, they found the cast would not come in half as it usually does. In a successful operation the two halves are joined together after removal, and a perfect reproduction of the face and head easily produced; but in my case both dividing board and grease had been overlooked, and the only course left was to smash the mask off. Mallet and chisel were used, producing an effect like concussion of the brain. Finally my face was freed, and I was able to breathe, and make a few remarks to the boys on their carelessness. Then it transpired that they had omitted to grease behind my ears, and the plaster adhered to the skin like glue. To remove the former, the latter had to be torn away, and when at last I got away I was a mass of blood and sores. After two weeks' medical attention I got about right, but the memory is still fresh."

How to Collect Mosses.

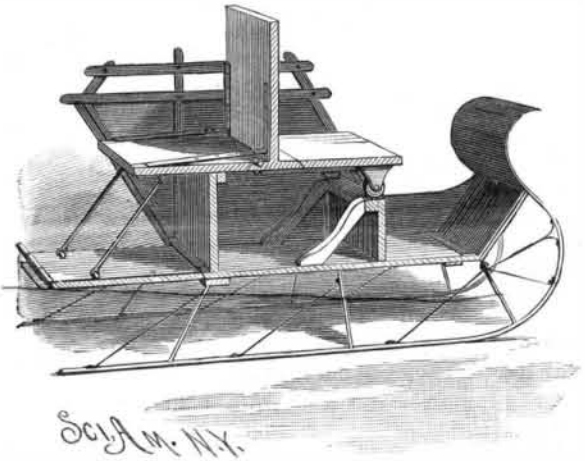
At the meeting of the Royal Society of Tasmania on July 13, Mr. R. A. Bastow, F.L.S., read a paper on the collection, observation, and identification of mosses, from which we take some practical hints. The collector should provide himself with a good pocket lens, a table knife, a piece of carpet 12 by 8 to kneel upon, very capacious pockets, two or three old newspapers, a small billy, and refreshment. The latter is an absolute requisite, for it is wonderful how voracious one becomes by the time that the furthest point of the collecting ground is reached.

Mr. Bastow makes it a rule never to collect anything on the journey outward, no matter how tempting a tuft of capsules may be. It is better just to mentally note them and pass them by in going; they may just as easily be secured on the return. Every tuft of moss that is gathered should be carefully folded in paper, so that the species may be kept separate. However beautiful a medley tuft of moss may be, it is better left behind; tufts of one species only should be looked for. Mosses thus gathered will keep a long time, but it is better to wash them and lay them tastefully between blotting paper under pressure for a few days. They are then both dry and rigid, and may be packeted and labeled at once, or placed in an album, or mounted on glass slips as slides for the microscope. The author has prepared a key to the study of Tasmanian mosses, which is a new feature in the introductory portion of bryology. The Tasmanian mosses are the first in the botanical world to be diagrammatically arranged, so that the student may have all the genera before him on one sheet, so bracketed and arranged that he can speedily find out the genus of the specimen in hand.

One species of each genus is represented, in its natural size and as it appears under the microscope with a $1\frac{1}{2}$ inch objective. The key also contains short generic descriptions; these, in conjunction with the list of Tasmanian genera, their authors, the English meanings of the generic names, and the habit of each genus, in the body of the paper, will afford great assistance.

IMPROVED VEHICLE SEAT.

The object of this invention, which has been patented by Mr. James Steele, of Guelph, Ontario, Canada, is to so construct a vehicle seat and body that it may be arranged as a single or double seated vehicle. The body of the vehicle is provided with a hinged back, to which is connected a tilting seat, by rods jointed to the seat and back of the body. An auxiliary seat is hinged to an extension of the back of the main seat, and provided with rollers running upon guides placed in the body below the main seat. When only a single seat is required, the back is raised to a vertical position, thereby bringing the main seat into a horizontal position, where it is supported by the frame of the vehicle. At

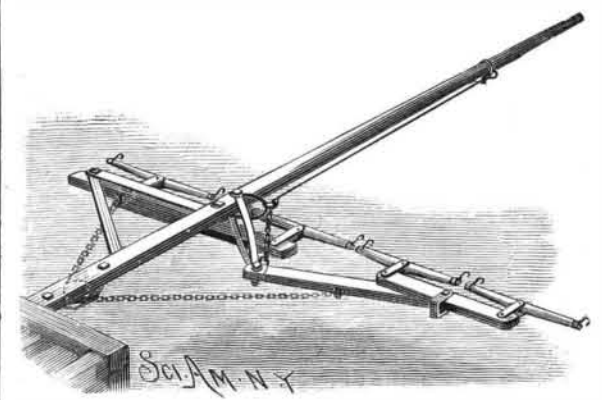


STEELE'S IMPROVED VEHICLE SEAT.

the same time the auxiliary seat is folded under the main seat, its rollers riding along the guides, and the end board is brought against the rear ends of the side pieces of the body. When two seats are desired, the back is lowered to a horizontal position, to form the rear seat, while the main seat is brought into a vertical position, so as to serve as a back to both seats. The auxiliary seat is carried upward, and forms the front seat. The end board is lowered, and becomes the foot board for the rear seat. The engraving represents the seat arranged in this manner.

DRAUGHT EQUALIZER.

The simple and efficient draught equalizer here illustrated is designed to be used with four horses abreast. To the tongue are secured two bars united at their outer ends, and one of which is at right angles to the tongue. Upon the bolt connecting the ends is pivoted one end of an equalizing bar extending beneath the tongue, and to the under surface of which, at the free end, is pivoted an equal armed evener, having single trees at each end. To the tongue, a short distance in front of the bar, placed at right angles, are pivotally connected two bars, between whose rear ends is pivoted one end of a second equalizing bar. The centers of the two equalizing bars are connected by a chain passing around a sheave in a frame secured to the under side of the tongue, near its rear end. To the outer end of the second equalizing bar is pivoted an evener, provided with two single trees. Upon each of the bolts holding the bars connected with the inner end of the second equalizer is placed a clevis. These are connected with a rod secured to a ring encircling the forward end of the tongue. This arrangement limits the rearward swing of the two bars, and fixes the inner end of the



HOLCK'S DRAUGHT EQUALIZER.

second equalizing bar. By means of this arrangement of equalizing bars and chains, a thorough equalization of the pull of the four horses is obtained, and, to a great extent, side draught is avoided.

This invention has been patented by Mr. Charles F. Holck, of Laporte City, Iowa.

Seth Wilmarth.

Seth Wilmarth, one of the greatest of American machinists, died at his home in Malden, Mass., Nov. 5, aged 76, of heart disease. In navy yard circles, for the past quarter of a century, Mr. Wilmarth occupied a distinguished place, and made many and important mechanical improvements. His advice was sought by the most prominent machinists of the world. Over twenty patents were taken out by him, among them the hydraulic lift for revolving turrets, for which alone the United States Government paid him \$50,000. He invented a planer and the great lathe at the Charlestown Navy Yard, at the time of their construction the largest machines of their kind in the world. He was a farmer's son, and was born in Brattleborough, Vt., in 1810. Evincing a predilection for mechanical work, he was apprenticed at a machine shop in Pawtucket, R. I. He rose rapidly until he was recognized as a master of every branch of mechanical knowledge, and in 1855 he was appointed Master Mechanic and Superintendent of the Charlestown Navy Yard by Rear-Admiral Joseph Smith. Every building of importance in the yard was erected under his supervision, and he was the guiding mind in every mechanical improvement projected.

Dangers of Sewer Gas.

The amount of sickness caused by sewer gas, the world over, is little known. Defective plumbing is one form of murder. Death is almost sure to result unless the victim has a strong constitution to withstand the shock he receives from this source. It was defective plumbing, the *American Builder* claims, which caused the late severe illness of Secretary Manning. Workmen engaged in tearing the plumbing out of Secretary Manning's private office found in a little closet in the corner a pipe four inches in diameter, besides several smaller pipes, leading directly to the sewer without any trap or contrivance to prevent sewer gas from coming into the room. These pipes strike the sewer just at its head, where the greatest amount of gas is formed. In the winter, when the doors and windows were shut, the air was most oppressive, and sometimes in the coldest weather Mr. Manning was forced to open the windows. His physicians pronounce his disease blood poison from sewer gas, and say that it was brought on, beyond doubt, by his sitting in that little room.

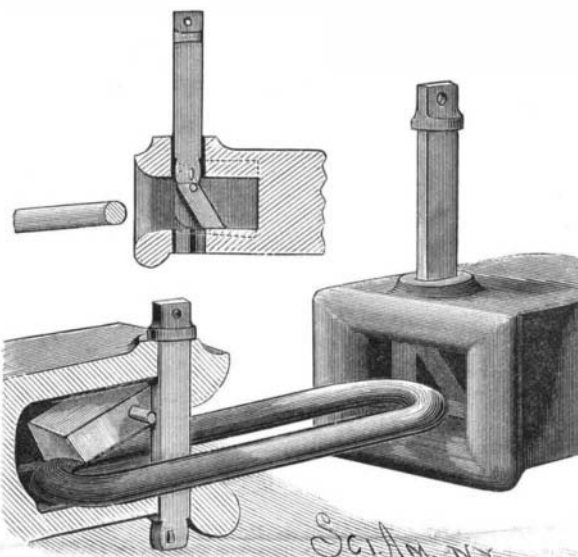
THE AFRICAN DIAMOND INDUSTRY.

At the diamond mines, South Africa, an immense amount of machinery is now employed in the work of elevating the earth containing the diamonds, crushing and separating the same. The earth is raised from the mine pits by means of tubs that run on wire cables, the loads being carried and dumped on inclined boxes, thence distributed into small cars, to be distributed upon the depositing floors.

Our illustration, which is from *Engineering*, shows one of the Compagnie Generale's depositing boxes, with blue ground in the box and trucks loaded therefrom ready to be drawn away to the depositing floor. An empty tipping tub is shown on the standing wires over the box ready to be lowered down again into the claims. The Kafir sitting on the box has to hook an anchored wire on to the hanging bar of the tub as it passes over him, by which means the tipping of the tub is effected, the tub itself being so balanced that it quickly rights itself again after tipping. The bottom of the depositing box is formed of iron grating, whereby the coarse lumps of blue ground are sifted from the finer ground, which passes into the lower receptacle of the depositing box and is trucked away separately, thus facilitating the process of pulverization.

IMPROVED CAR COUPLING.

This coupling may be used on any form of car, but is especially applicable for use on freight cars. It may be used in connection with the ordinary pin and link coupling. The drawhead is formed with the usual opening, and in the upper portion are two recesses, within which are pivotally mounted tumblers, whose forward faces are recessed. The tumblers are connected

**REQUA'S IMPROVED CAR COUPLING.**

by a cross rod so located that, when in the position shown in the upper sectional view, the rod will be beneath the coupling-pin hole, the pin being provided at its lower end with a cotter which prevents it from being entirely withdrawn. The tumblers serve to hold the extended end of the coupling link elevated when arranged as shown in the left of the lower figure, the lower wall of the main opening being inclined so that the link will be raised to a position to couple automatically with the adjacent car. In the drawhead into which the link enters, the pin is supported by the cross rod uniting the tumblers, which are swung down. The entering link strikes and throws the tumblers back, so as to permit the pin to drop into the link.

This invention has been patented by Mr. Mark M. Requa; particulars can be obtained from Mr. B. A. Mann, of Lanesborough, Minn.

Electrical Resistance of Carbon.

The principle of the carbon telephonic transmitters

the better contact of the carbon and the metal caused by thus squeezing them together. This view has been opposed by Mendenhall (*American Journal of Science and Arts*), and his later experiments make good his position. He finds, using soft carbon or compressed lampblack, that the resistance of this material varies greatly with pressure, and that the greater part of this change is due to a real change in the resistance of the carbon itself, and only a small portion of the variation is due to the surface contact. He found that a comparatively great pressure would sometimes result in a permanent reduction of the resistance of the carbon; and that this resistance is so uncertain and fluctuating, that it is extremely doubtful whether this phenomenon could be applied so as to give a measure of the pressure exerted.

Chinese Straw Shoes.

We understand that Dr. Macgowan has sent to the Agricultural Bureau, through Consul-General Kennedy, of Shanghai, a collection of shoes made of rice straw, and worn by laboring people in the south of China. Dr. Macgowan sends them, suggesting the introduction of rice-straw shoe making into the rice-producing regions of the South. They are made by women and others who are too feeble for more active employment, which circumstance, and the abundance of the material, render them very cheap—from one to twelve cents per pair!

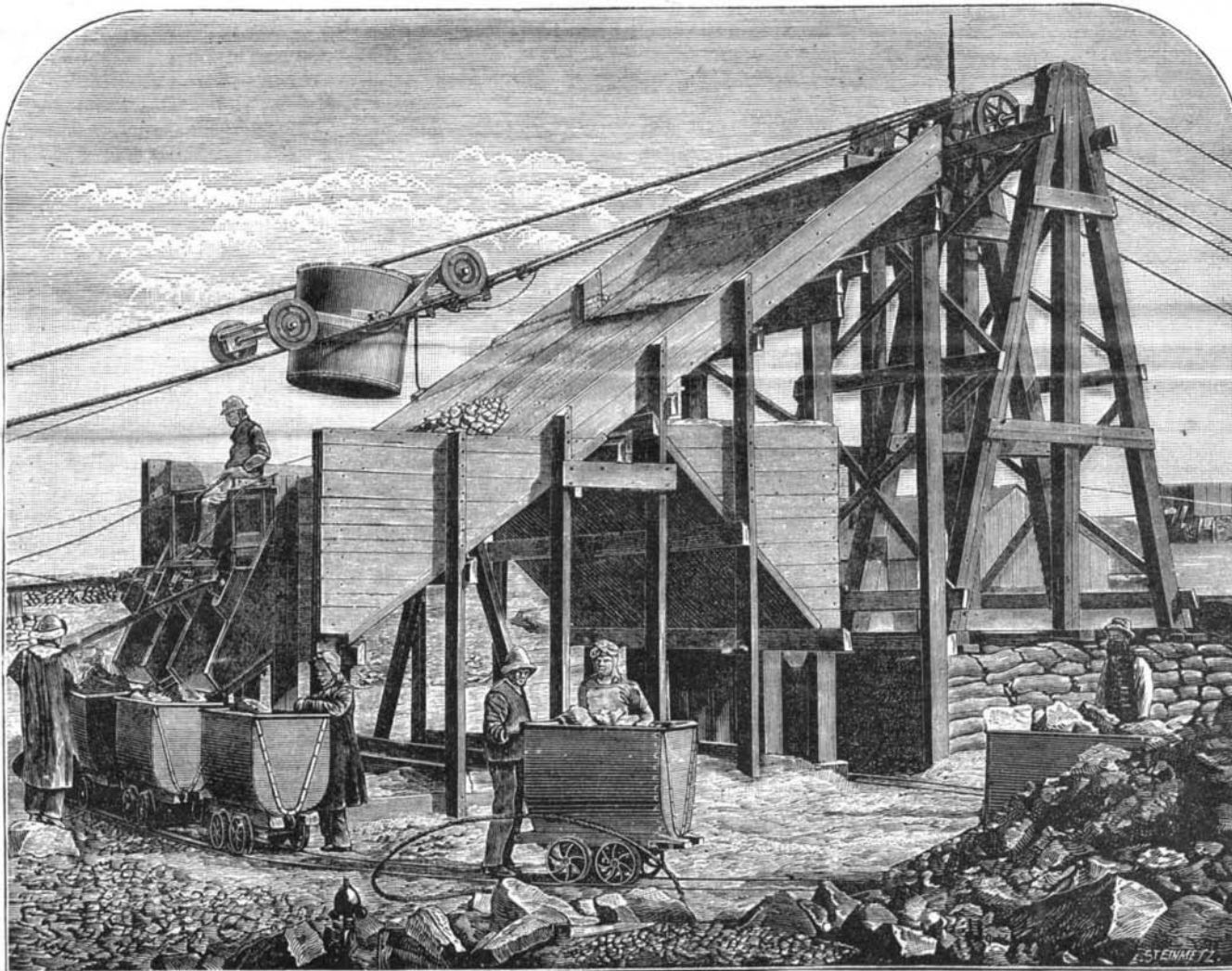
Dr. Macgowan suggests also the introduction into nurseries for children's wear of these straw shoes, that more freedom be allowed to the feet of our children.

The highest priced shoes—12 cents—are made of mat grass (*Arundo mites*), which Dr. Macgowan says should be acclimated in the South, and that mat making would prove a profitable industry.

The Electrical Railway in Minneapolis.

The *Electrical Review* contains an interesting account of the successful operation of the electrical railway in Minneapolis, in which it says: "The trains consist of three or four passenger cars, each weighing 11 tons empty. The number of passengers carried is often as high as 600 at one time, so that the weight of the train is as follows: Four cars, each 11 tons, 44 tons; 600 passengers, at 130 pounds, 39 tons; motor car, 8 tons; total, 91 tons. The steam dummy now brings the train to as far as the steam is allowed, and then the electric motor relieves it and takes the train down town with its passengers. The distance over which the electric motor travels is at present somewhat near a mile, the speed

being about seven miles an hour, this being the regulation speed within the city limits. Considering the constant stopping and starting at each block, the grades in the road, and the heavy trains, the electric motor must be given the credit of doing at least as good work as could be expected or obtained from any steam engine. During the seventeen or eighteen hours of service, not a single minute of stoppage is made except to let off and take on passengers. This electric road has been in operation for several weeks without a hitch or a breakage. The motor, which is about 40 horsepower, works as perfectly under a heavy as under a light load. From the permanency and the character of the work done by this electric railway, it will be

**THE AFRICAN DIAMOND INDUSTRY.—A DEPOSITING STAND.**

is briefly this: A button of carbon is placed between two metal conductors, one of which, being in contact with the vibrating membrane, is made, when the telephone is used, to bear with varying pressure on the button of carbon, thus changing the resistance of the circuit, and so varying the current flowing therein. Previously, the diminution of resistance corresponding to the increased pressure has been held to be due to

seen that electric railways on elevated as well as on ordinary roads must become facts in the immediate future. They are indeed now with us, and there is no more trouble to build 200 or 300 horse-power generators than to build machines of fifty horse-power. The public is losing its skepticism, and what was proclaimed as an impossibility yesterday has become a fact to-day."