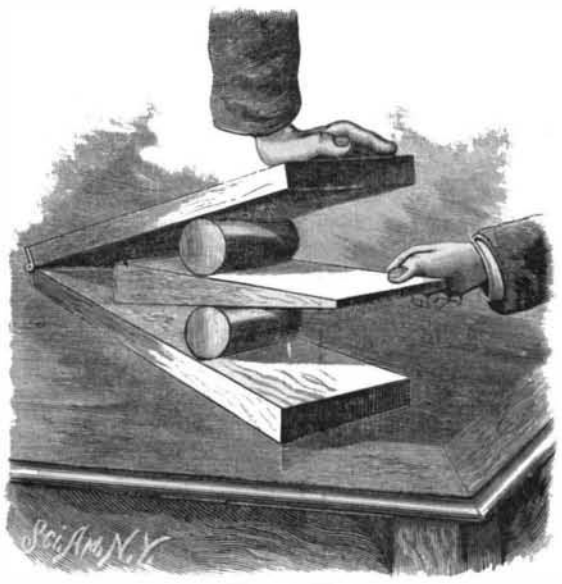
VOLCANIC ERUPTIONS IN NEW ZEALAND.

The details of the terrible eruption in New Zealand during the month of June, which have just been received, show it to have been one of the most disastrous on record. The volcanic disturbances were confined to North Island or New Ulster. This has an area of about 44,000 square miles, or almost equal to that of the State of New York. It is the second largest of the group. About one-tenth of the surface is covered by mountains, the highest peaks of which are either active or extinct volcanoes. The northern part of the island is noted for the extreme beauty of its scenery, the Auckland lake district being a favorite resort for tourists. The greatest volcanic activity seems to have



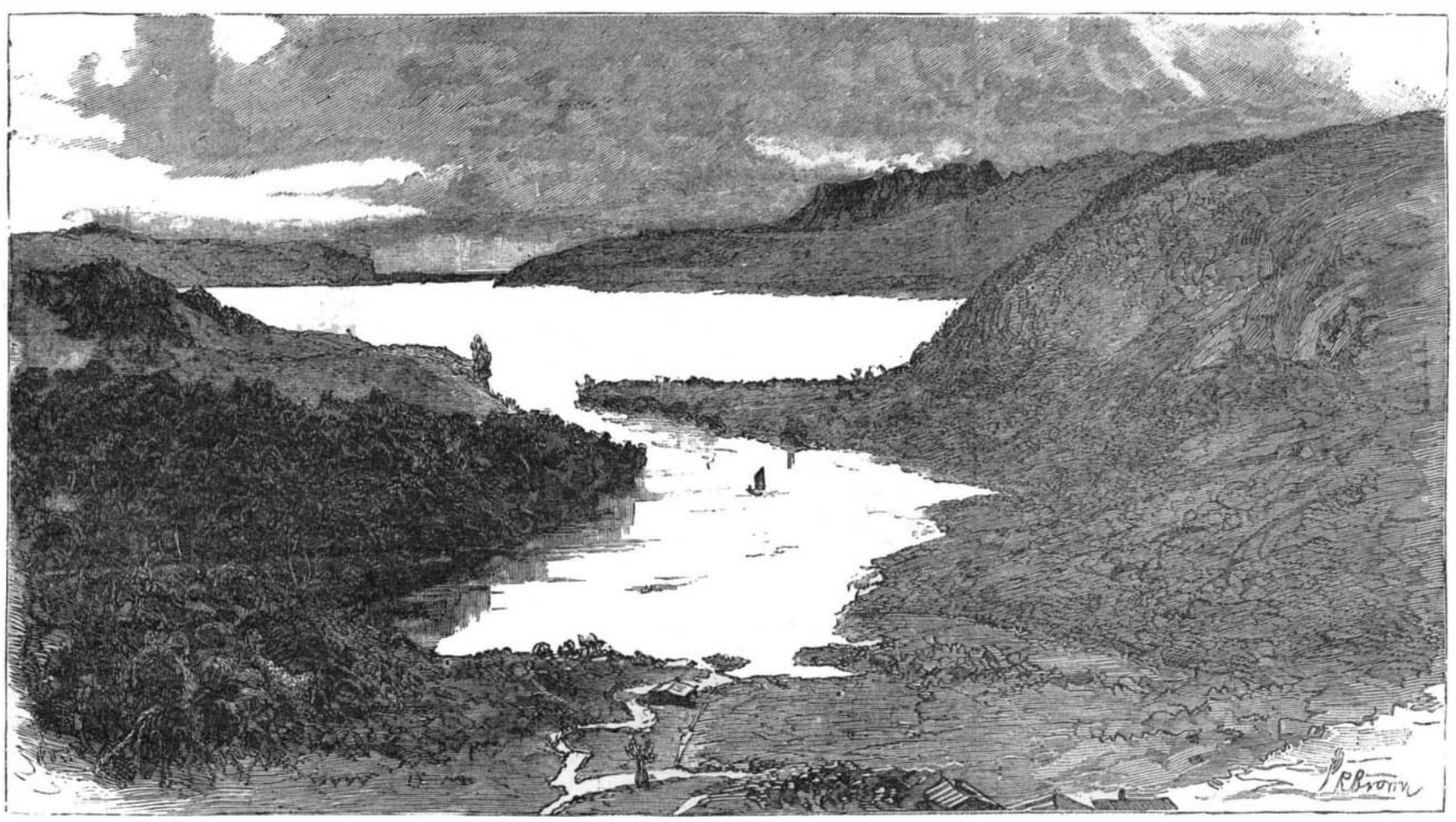
WEDGE PARADOX.

been felt in this part of the island. At Tauranga, on the Bay of Plenty, violent earthquakes followed each other in rapid succession on the morning of the 9th of June, and were accompanied by showers of fine dust. In the neighborhood of Rotona, the severity of the shocks was such that many believed the island would sink into the sea.

The sensation experienced is said to have been fearful beyond description. After the first shock, the inhabitants rushed frantically about in all directions. With the second shock the entire country was illuminated by the volcanic fires. Mount Terrawerra, on the shore of the beautiful lake of that name, was the first crater to break forth, but in a short time the entire Paersa range was in a state of active eruption, hurling lava and stones over the surrounding country. The extinct volcano of Ruapehn, which rises to a height of 9,100 feet near the center of the island, resumed its activity for the first time in tradition. The scene was one of awful grandeur. The land for an extent of 120 miles in length by 20 in breadth was one mass of flame and hot crumbling soil. Dense volumes of smoke made luminous by the reflection from the fiery craters hung heavily in the air. Showers of dust, having a strong sulphurous odor, continued to fall for nearly two days, turning day into night and totally destroying a large number of native villages. Wairoa was covered to a depth of ten feet with dust and ashes.

The loss of life was considerable, and included a number of English residents. Those of the natives who escaped were driven frantic with terror. Many were burned alive by the volcanic dust and scoriæ. An old Maori chief had a remarkable escape. He is stated to have been dug out alive after an imprisonment of 104 hours. The destruction of the pasture by the dust and mud was so extensive that many cattle have been starved, and great distress exists throughout the entire lake district. Nearly all vegetation has been blasted by the poisonous vapors, dust, and the mud of blue clay ejected from the volcanoes. The aspect of the country has been changed, and several of the lakes been transformed into mud baths. Many of the buildings which escaped being buried have been crushed by the weight of the falling mud.

The effects of the eruption were felt for some distance at sea. The steamship Southern Cross, bound for Auckland, experienced an almost fatal downfall of dust on the morning of June 10, the day following the earthquakes. From 5 to 10 o'clock there was complete darkness, and balls of fire constantly played around the mastheads. The men being unable to stand the blinding showers of dust, the vessel was put about and stood away to the north, but it was not until 11 o'clock on the following morning that the dust was left behind.



TERRAWERRA LAKE AND MOUNTAIN, THE SCENE OF THE RECENT VOLCANIC ERUPTION IN NEW ZEALAND.

WEDGE PARADOX AND FALLING AND PROJECTED BALL.

T. O'CONOR SLOANE, PH.D.

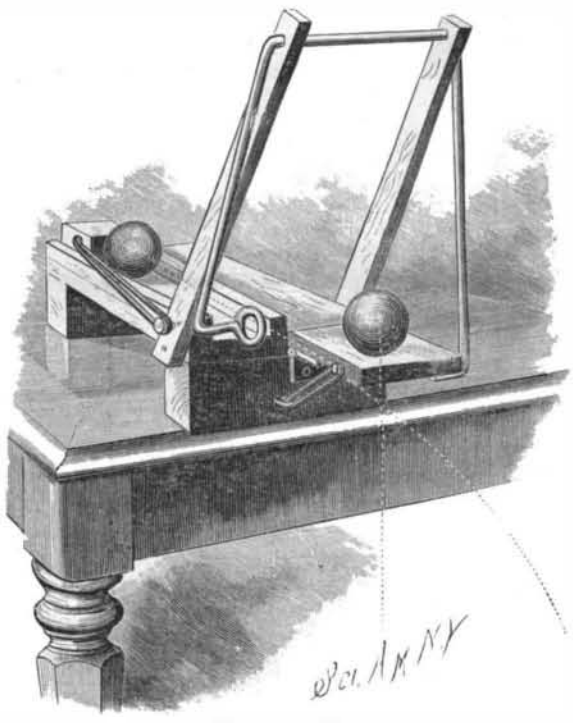
The general action of a wedge is well known. It forces apart surfaces between which it is driven. If, on the other hand, it has smooth sides, the reciprocal action may take place. When placed between two opposing faces that are pressed together by a constant force, and left to itself, it may, by their action, be violently expelled. The schoolboy's trick of shooting an orange seed from between his finger and thumb by compressing it violently, so that it flies out, is a good, though not very refined, illustration of this principle. The slippery sides of the seed help the action. Holmes also alludes to it in describing the toughness of the "settler's elm:"

"The wedges flew from between its lips,
Their blunt ends frizzled like celery tips."

The reciprocal has come to be as well recognized as its original.

If, however, a wedge is placed between two surfaces that constantly tend to approach each other, and the conditions are so arranged that when the wedge moves apparently the wrong way the surfaces will come closer together, then the wedge will act in this paradoxical manner.

The conditions may be obtained by the arrangement shown in the cut. Two pieces of wood are hinged together, so as to open and shut like a book. A strip of leather answers as well as a hinge. These are to represent the surfaces that tend to approach each other. A wedge of about the proportions of the one in the drawing must be provided, and also two cylinders or rollers. Cotton spools, or even two pencils, may be used as rollers. The apparatus is now put together as shown in the illustration. The wedge is introduced between the hinged boards, a roller being placed above and below it. It is placed so far within their opening that the angle that the boards make with each other is greater, or of more degrees, than is the angle of the



FALLING AND PROJECTED BALL.

wedge. The thin end of the wedge, supported in one hand, projects outward from the opened boards, and pressure is applied to the uppermost one. In accordance with general rules, this, it would seem, should draw the wedge inward. But, on the contrary, it will be found that it drives it outward, in opposition to the normal movement. The latter is forced outward, so that its thicker parts are brought between the rollers.

The ordinary action of the wedge is complicated by the inclination of the boards to each other, and by the rollers. If the angle included between the boards is greater than that between the sides of the wedge, then the boards will approach more by the rollers moving outward, than the wedge in corresponding movement can drive them apart. The consequence is that the rollers move outward, carrying with them the wedge, and, until the angles become equal, the motion continues, the algebraic sum of the wedge and roller action indicating an approach of the opposing faces. When the angles become equal, the conditions of repose are reached.

This action of the wedge when seen appears most curious. It is a good illustration of the short road to truth that is often afforded by experiments.

The other cut shows a simple apparatus for exhibiting

one of the laws of projected bodies. If a body is projected or thrown in a horizontal direction, it will take no longer to reach the ground than one that is dropped at the same moment. Thus, if two marbles are simultaneously released over a level floor, and if to one of them a strong horizontal impulse is given, so as to throw it a considerable distance, both will reach the ground at the same instant, although one travels a much greater distance than does the other, and they will make but one sound as they strike, provided all the adjustments are correct.

A board about ten inches long and five inches wide is mounted on two pieces, one at each end. On its forward end, at one side, a little platform or trap door, two inches square, is hinged. An India rubber band extends diagonally from the outer corner of this trap door downward to the main piece. Thus the door is drawn strongly downward. With a center bit a hole is made partly through the platform. The end of the board at its other side is free. On its upper surface, running back from this plate, two strips are secured, making a groove about an inch wide. Within this a block of wood, two inches long, slides, fitting closely, but moving with little friction. A band of India rubber is fastened to and extends forward from its front end, and is secured to the board near its front.

These two parts are intended to receive two marbles. One rests on the trap door. The hole gives it a good resting place. The other runs in the groove in front of the movable block, and can be discharged by it a distance of ten feet or more. A wire catch is arranged so as to hold up the trap door, but is released when a ball is thrown from the groove. Its arrangement is clear from the cut.

The catch is set so as to hold up the trap door, and a marble is placed thereon. Another marble is placed in the groove, the block being previously drawn back. The marble rests in front of and in contact with the sliding block. It is well to have a trigger arrangement for holding the block in place, and for releasing it when all is ready. Such can easily be devised by any one. The apparatus being firmly secured and perfectly horizontal, the block is released. It shoots the marble in front of it across the room. As the marble leaves the groove it touches the catch and releases the trap door. The elastic band jerks this down, so that the other ball falls vertically and perfectly freely from the platform. If no elastic were used to pull the trap down, the ball would be retarded in its pulling. If the adjustments are correct, both balls will strike the floor together, making only one report.

This is more than an illustration of a law of projection. It also illustrates the fact that different forces act on a body irrespective of each other. Thus the action of gravity is exerted to an equal extent on both balls, though one is perfectly free and the other is acted on by a strong horizontal force. It may be used as an example of a broad principle of nature which is enunciated in one of Newton's laws of forces.

In the last issue of this paper, collision balls of easy construction were described. No attempt was made to give all the phenomena that they could be made to present. One very pretty experiment may be noted here. Three balls are hung about half an inch apart. The center one is then started into oscillation. This must be done carefully. As soon as it begins to strike the side balls, it is left to itself, when a most curious sound, almost musical in its time, is produced by the click of the balls. Many other variations will suggest themselves to any one experimenting with them. As an improvement in the method of suspension, the substitution of circular pieces of leather for the straps has been suggested. Before pasting the disks on the balls, they may be pierced with a needle in and out near the center, and the thread so carried through. Then they may be put in place, and a better attachment than the one described will be the result.

Andrew Carnegie.

David Brooks was manager of a Pittsburg railroad office when a boy named Andrew Carnegie was a messenger in it at a salary of $3 a week. The boy had just arrived with his father and mother from Scotland, the land of his birth. That was a very little more than 36 years ago, yet to-day he is the famous millionaire ironmonger of Pittsburg. Andrew Carnegie has said: "I owe my rise in life to a game of checkers." I will explain to you what that remark means.

The elder Carnegie was a moulder in a pottery. Like many Scotchmen, he was exceedingly fond of playing checkers. In Pittsburg, at that time, was a well known ale house, in one room of which those who loved to play checkers were wont to assemble. Among them were Carnegie and Brooks, and in this way the two men became acquainted. Carnegie's son also came there at times with his father, and he, too, tested David Brooks' powers at draughts. One day the elder Carnegie remarked that he did not know what to do with his son. "Send him down to my office, and I will make a messenger boy of him," said Mr. Brooks. The next day he began his new employment. The lad was intelligent and industrious. Manager Brooks had an old telegraph instrument fitted up in the office, and when the messenger boys were not engaged he showed them on this how to tick out the Morse alphabet. With this instruction young Carnegie soon became a skillful operator. Thomas A. Scott was at that time Superintendent of the Pennsylvania Railroad in Pittsburg. He had a telegraph instrument rigged up in his office and wanted some one to manipulate the key. Manager Brooks recommended young Carnegie, and he was employed. He showed such aptitude in managing the movement of trains by telegraph that he was transferred to the superintendent's office in Altoona. There he continued to attract the attention of Thomas A. Scott, and was rapidly pushed along. He was given opportunities to engage in some coal and oil speculations that were successful, and afterward made money from the first sleeping cars that were built. —*Philadelphia News.*

A Sacrificial Stone near St. Paul.

BY H. C. HOVEY.

The ancient altar about to be described has not been hitherto mentioned in any published account, so far as I know, although it can hardly have altogether escaped notice in the local papers. Yet it gives its name, "Red Rock," to one of the landing places where the Mississippi steamboats have touched ever since they began to run on the upper portion of that longest of rivers. Formerly there was a flourishing mission here, sustained by the Methodists; and with that fact in mind I made inquiry for the veteran who had it in charge, Rev. Chauncey Hobart, from whom the facts now given were principally obtained.

This pioneer came on the field before the settlement of either St. Paul or Minneapolis, and retains a vivid recollection of many interesting events, which it is to be hoped he may yet publish in some permanent form before his useful career is ended. According to him, it was the custom among the Sioux to worship the bowlders that lie scattered among the hills and valleys and here and there on the prairies of this region. When a Dakota was in perplexity or distress, and desired deliverance from some impending danger, it was his custom to clear a spot from grass and brush, roll a bowlder upon it, streak it with red paint, deck it with feathers and flowers, and then pray to it for needed help.

Usually, when a stone had thus served its purpose, it was no longer regarded as a sacred object, but might be disposed of in any way that suited the savage whim. But the peculiarity of the sacrificial stone now described is that from generation to generation it was a shrine to which pilgrimages were made and where offerings were laid. Its Indian name was "Eyah Shah," which simply means Red Rock, and is the same term by which they designate catlinite, or the red pipe clay. The stone itself is not naturally red, as I found on examination, being merely an extremely hard specimen of hornblende-biotite-granite, quite symmetrical in shape, about five feet long and three feet in its greatest width.

The Indians also called it "Waukan," or a mystery, and had strange speculations as to its origin. It lies on a weathered ledge of limestone, and evidently has not been moved since left there by the ancient forces that brought it as a trophy from some granite range. But the Dakotas looked no farther than to an adjacent hill, about two miles distant, down whose sides, as they said, they could trace the path along which, self-impelled, it had rolled to the river bank. The particular clan of the Dakotas that claimed this rude altar was known as the Mendewacantons, although, being but two miles below the village of the Kaposia band, it was to some extent resorted to by them likewise.

The hunting ground of the clan was up the St. Croix River, and invariably before starting on an expedition they would visit Eyah Shah and leave an offering of gayly painted feathers, or a duck, or goose, or a slice of venison, and after a few simple ceremonies they would go on their way. But twice a year the clan would meet more formally, in order to paint the stone, which they did with vermilion, or, as some say, occasionally with the blood of their enemies, which had been saved up for that purpose. When the painting was done, they would trim the bowlder with flowers and feathers and other ornaments, and dance around it before sunrise, with chants and prayers for success from the spirit of the mysterious rock.

The last occasion on which they were known to have thus visited Eyah Shah was in 1862, prior to the terrible massacre that occurred in August of that year, and which is a matter of history. Since that date, however, the stripes of red paint have been renewed, the last coat having been applied as recently as three years ago—although my suspicions are that the work was done by white men desirous of perpetuating the interesting features of this ancient object of worship. Others with a different spirit have drilled a hole in one side, for the purpose of putting in a blast, by which it should be destroyed. I counted the painted stripes encircling the rugged rock, and found them twelve in number; each being about two inches wide, and the spaces between being from two to six inches wide. By the compass Eyah Shah lies exactly north and south. It is located just twelve paces from the present river bank. The north end is ornamented by a design representing the sun, and a rudely drawn face surrounded by fifteen rays. While mentioning these latter particulars, I do not attach much importance to them, because there is no proof that these existing markings were made by the Indians. Eyah Shah is about six miles below St. Paul, and is easily reached by boat or by rail.

Greek Quarrying.

You well know, writes W. L. Granville in the *Architect*, London, of the predilection of the Greeks for constructing with large sized blocks of marble or stone. They were extracted from the λατομια, or quarries, in the following manner:

In order to procure the square stones—after the top and front faces of a given mass of the rock in the quarry had been brought to a plain surface—incisions, usually from 4 to 5 inches wide, were made on the top surface, marking out the boundaries of the intended size of the block. These incisions being continued down to the required depth of the block, there remained nothing more to be done than to separate it from its lower bed, which operation was performed, as there is every reason to think, by the expansion of wooden wedges saturated with water. The cylindrical courses for the shafts of the columns were extracted (as may be observed at the quarries of Selinus, in Sicily) by means of a circular passageway, 2 ft. 8 in. in width, being hewn out of the rock, and taking the entasis of the intended column, thus leaving an insulated mass of stone in the center the exact shape and size of the required shaft. I should here add that the stone columns of every temple occupy almost invariably the same relative position in the building which they occupied in the quarry.

This circular mass of stone has now, like the square blocks, only to be lifted from its lower bed; and the method employed, which, from the examination of the quarries at Selinus, can be no longer doubted, bears me out in a conjecture I had previously made on the square blocks. A hole or deep incision, wedge-shaped, was made in the lowest part of the insulated cylinder, in the direction of its center, but considerably to one side, for reasons which will be obvious to you. Into this hole, I presume, a wooden wedge was inserted, which was saturated with water, and which being suffered to expand while in that position would, at no great distance of time, heave up the mass, on the same principle applied to the splitting of slate and millstones in France, and so separate it in the direction of its bed. Nothing, I think, appears more likely, from the consideration of the facts observed at Selinus, than that such was the method employed; and since I see from my memoranda that I observed the branch of a shrub, not one inch in diameter, which by its growth in a crevice of the rock had split a mass of stone weighing about fifty tons, I can readily conceive that the small orifice with its wooden wedge would have been sufficient to loosen the required mass.

Lightning Stroke in the Rocky Mountains.

The curious case of G. S. Edwards, who was struck by lightning while crossing Iron Hill, at Leadville, Colorado, on July 4, is attracting considerable interest among scientific men. After the flash, Mr. Edwards remained unconscious for fifteen minutes before receiving assistance. The lightning struck him on the left cheek, and after knocking out a number of his teeth passed diagonally across the breast to the right side. It then descended the body to the foot, emerging from the right boot. It passed entirely through the foot, leaving a hole similar to that made by a bullet. The clothing was torn into fragments, particles being found a distance of two hundred feet. Both of the boots were entirely destroyed, and one of them carried sixty feet away. The ground where the man was standing was torn up for a considerable distance. The course of the electric current along the body was marked by a black and red streak one and a half inches wide. The worst effect of the streak seems to have been on the lungs. A severe hemorrhage was produced, by which a quart of blood was lost. In addition to these injuries, the surface of the body was almost covered with blisters, the result of ugly burns. This, we believe, is the first authentic record of a person being injured by lightning at an elevation of 10,500 feet. It is remarkable such severe internal injuries were not followed by death.

A Magnesium Torch.

At a recent meeting of the Pharmaceutical Society, a cylinder of magnesium 10 in. long was shown by Messrs. Hopkins & Williams. When produced in a dense and massive form, such as this, there is less tendency to rapid combustion when burning. Magnesium torches are now used in Germany for the illumination of mines. The cost of the metal in London is now about $7.50 per pound.