The Silver Mines of Arkansas.

A correspondent of the St. Louis *Globe-Democrat*, writing from Little Rock, describes the mining region of Montgomery county and its minerals as follows:

The district embraces townships 1 and 2 south, ranges 23, 24, 25 west, which includes a district of about 216 square miles.

The main water courses are the Wichita proper, and its south and north forks, besides a large number of small streams and rivulets, all more or less suitable for water power. The same tract of land is well timbered with yellow pine, white and black oak, ash, hickory, black walnut, gum, etc., well adapted for building and mining purposes.

The district forms a basin of small rolling hills, which are continuous throughout its entire length, and is surrounded by the Ozark Mountains on the north, the Mazerne Mountains on the south, the eastern spur of the Cassotal and Little Missouri Mountains on the west, and the Crystal Mountains on the east. These mountains are of secondary and primary formation, containing hornblende, granite, slate, and porphyry.

South of the Mazerne range is a younger formation of novaculate and limestone. The summits of the Crystal Mountains show ledges of metamorphic sandstone, underlaid by slate and sub-carboniferous limestone, which leads to the conclusion that this entire mineral belt is underlaid by sub-carboniferous limestone and porphyry.

The basin itself shows calcous shale and slate—the latter being generally exposed in the gulches and riverbanks—and is traversed by a belt of quartz veins which runs in an eastwardly and westwardly direction, and can be followed westwardly its entire length through the Cassotal range to the Indian Territory, thence through the Wichita Mountains, in the northwest part of Texas, striking the Rocky Mountains in New Mexico, the belt showing the same formation throughout its entire length, which has been conclusively proven by many of our most eminent geologists and mining engineers who have spent years of time and labor in determining this important fact, and who offer as an evidence of the correctness of this view the fact that the same minerals exist in the same character of quartz and spar throughout both entire districts.

The veins opened up to the present time have given evidence of walls and selonge, and are the quartz veins freely impregnated by gouche, which dip north, and have more or less strong overlap south, and have a general strike from 8° to 25° north of east.

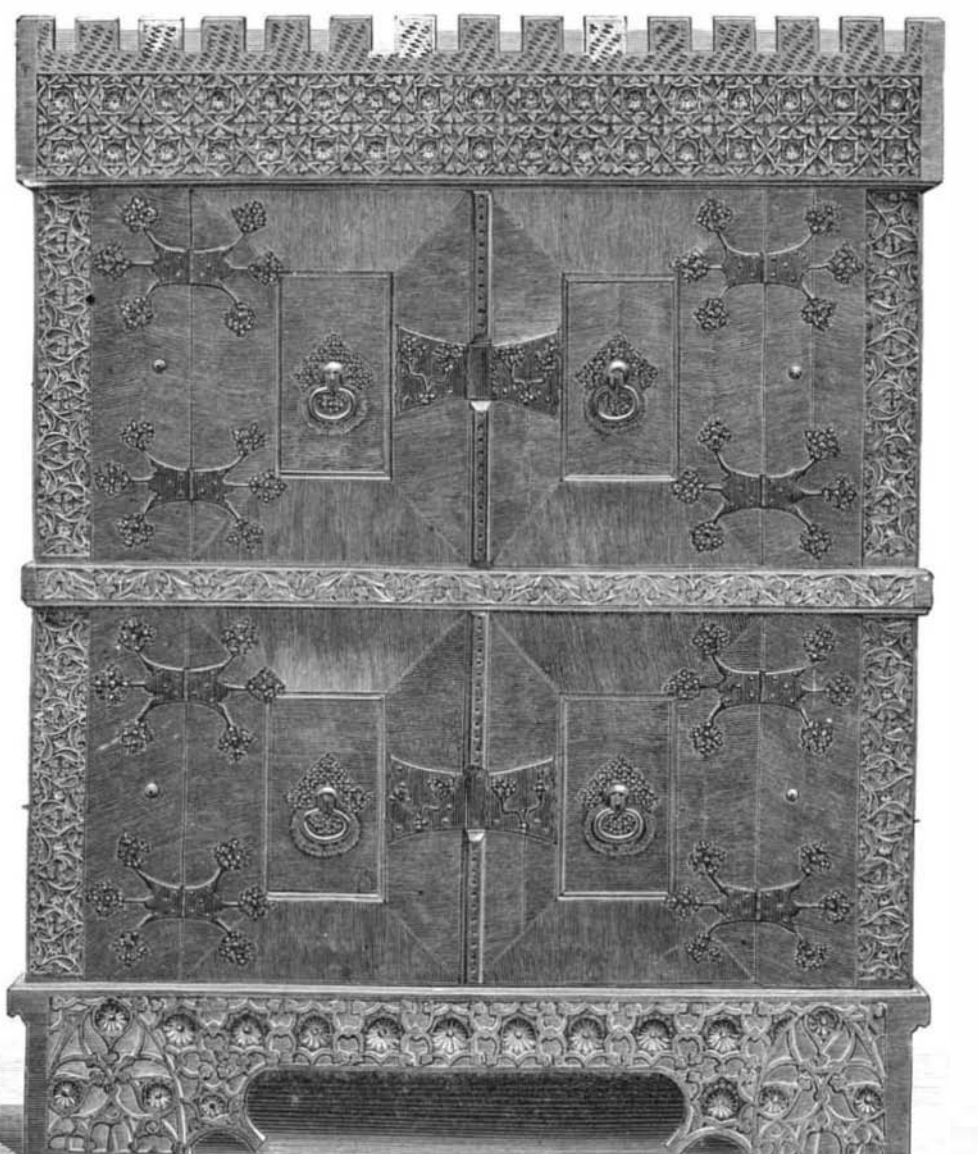
The eminent geologists, Professors Church and Phillips, during their stay in Silver City, made upward of thirty assays, with the most gratifying results, the quartz with two exceptions ranging from 200 to 600 ounces of silver to the ton, and this from specimens picked up indiscriminately from the surface, and in which not the slightest indication of ore was perceptible. These gentlemen were astonished to find such results from quartz that made no showing whatever, and was in no case taken from a greater depth than twenty feet, which was hardly sufficient to enable them to determine with any degree of accuracy the extent or value of the ores of greater depth, but gave it as their opinion that their greatest richness would be at a depth of one hundred and fifty feet.

Prof. Phillips, who was in Mexico in the months of September, October, and November, examined a large number of old silver mines in Chihuahua and Durango, and who has been four months in Arkansas examining its silver resources, states that the two fields, in their general geology, are almost identical in character, and feels convinced that these high grade ores from the quartz veins of Montgomery county will run to wire and other forms of native silver at a depth of 100 to 200 feet, as similar surface ores were found in the same character of quartz incased in slates as were mined by the old Spaniards at Parral, Santa Barbara, and Inde, in the State of Durango, and all of which veins carried more or less native silver at a depth not exceeding 100 feet from the surface.

PAPER is worth six cents a pound in Peru until it is made into money, then it depreciates, adds a wicked editor next door, about fifty per cent.

GOTHIC OAK PRESS.

The carved oak press, with metal work after the style of the close of the 15th century, is an admirable specimen of its class. It is now in the possession of the Art Industry School of Vienna, and is preserved as a good example of fine Gothic carved work.



CARVED OAK PRESS.—AFTER THE STYLE OF THE 15TH CENTURY.

RECENT AGRICULTURAL INVENTIONS.

Mr. William H. Sterns, of Humboldt, Neb., has patented a simply constructed and easily operated churn, in which the agitation of the cream is produced by the rapid movement of the apparatus in a horizontal plane, so that the cream is thrown violently from side to side of the receptacle, a circular or rotary movement being prevented by cream breakers in the sides of the receptacle.

An improvement in corn planters has been patented by Mr. Allen F. Hall, of Onarga, Ill. The object of this invention is to improve the construction of the corn planter for which letters patent No. 197,549 were granted to the same inventor, November 27, 1877, so as to make it simpler in construction, more easily operated, and more readily thrown into and out of gear.

An economical and powerful press for cotton, hay, rags, etc., that may be worked by hand, horse, or steam power, in field, farm, or factory, has been patented by Mr. John Rossell, of Galveston, Texas. The invention consists in combining worm gearing with an eccentric cam for working the movable head of the press, and in a novel arrangement of pins and an endless rope for retracting the movable head.

Mr. Thomas T. Harrison, of Aubrey, Kan., has invented an improved attachment for breaking and cultivating plows, by which the plow can be easily and fully controlled. The invention consists in a novel arrangement of vertical and horizontal bars for supporting and guiding the plow.

The General Wool Monument.

The largest monolith ever transported any distance in this country is the granite shaft to be set up in honor of Major-General John Ellis Wool, at Troy, N. Y. It is of gray granite, measures 3,784 cubic feet, and weighs 254 tons. In the rough it measured 4,763 cubic feet, and weighed 398 tons. The entire monument will stand 73 feet 7 inches high, the shaft alone measuring 58 feet. The stone was cut and finished at the quarry of the Bardwell Granite Company, Fox Island, Maine. This monolith is considerably smaller than the obelisk known as Cleopatra's Needle, lately transported from Egypt to London. The great Lateran obelisk in Rome, originally from the Temple of the Sun, in Egypt, is 150 feet high and weighs 440 tons.

The Swiftest Ship in the World.

A new British war steamer, called the Mercury, built of steel, has just been completed and successfully tried at Portsmouth, England. The vessel is 300 feet long, 46 feet beam, 16 feet 3 inches hold. Displacement, 3,750 tons. On her late trial trip the engines developed 7,595 horse power, and the speed attained was within a trifle of 22 miles an hour. These are remarkable results for a vessel of the dimensions given. The Mercury has twin screws, driven by separate engines arranged in separate engine rooms. Her machinery nearly fills the hull. There are twelve boilers, four high pressure cylinders, each 41 inches diameter, and four low pressure cylinders, 75 inches diameter. Stroke, 3 feet; boiler pressure, 60 to 65 lb.; coal consumption, 2·35 lb. per hour per horse power. One man governs the rudder, which is worked by steam. The vessel's armament will consist of ten 64-pounders.

Two More New Metals.

The discovery of two new metals is announced, named samarium and norwegium. Paradoxical as it may sound to speak of the finding and christening of a hitherto unknown metal before it has been either seen or handled, yet such is the case with samarium. As happened in the instance of the metal gallium, mentioned in the SCIENTIFIC AMERICAN a few numbers back, it has first become known to science by means of the spectrum analysis alone; nor can it be doubted, predicts one of our foreign exchanges, that in the verification of its existence by the senses it will, in due time, follow the same precedent. It is well known that by means of the characteristic rays which are seen in the luminous spectrum, produced by the combustion of any substance, it is possible to single out the known or unknown bodies which enter into the combination. As are the rays, such are the elements producing them. When rays are found answering to no substance already catalogued, the existence of some new body is naturally inferred from the fact. That was how gallium was first brought to light, and now we have a like history for samarium. M. Lecoq de Boisbaudran, who has greatly distinguished himself by his researches in this branch of science, found, as he was examining a mineral known under the name of samarkite, an emission of unfamiliar rays. He has inferred thence the existence in this mineral of a new metal, which he has accordingly named samarium, and all he has now to do is to isolate it from the other elements with which it is as yet combined. This has already been done for another new metal, norwegium, patriotically so named after his fatherland by its discoverer, Professor Tellef-Dahll, of the University of Norway, who detected it in a metallic compound of arsenic and nickel. The professor has even determined the principal properties of this new metal, which he describes as being white, slightly malleable, of about the hardness of copper, and fusible at a dull red heat. Its density is represented by 9·44, and its chemical equivalent is 145.

Heating Metals in Vacuo by the Electric Current.

A very interesting paper, by Mr. T. A. Edison, was read before the American Association at Saratoga the other day:

"In the course of my experiments on electric lighting," says the author, "I have developed some striking phenomena arising from the heating of metals by flames and by the electric current, especially wires of platinum and platinum alloyed with iridium. These experiments are still in progress.

"The first fact observed was that platinum lost weight when heated in a flame of hydrogen, that the metal colored the flame green, and that these two results continued until the whole of the platinum in contact with the flame had disappeared.

"A platinum wire, twenty-thousandths of an inch in diameter, was wound in the form of a spiral one eighth of an inch in diameter and half an inch in length. The two ends of the spiral were secured to clamping posts, and the whole apparatus was covered with a glass shade. Upon bringing the spiral to incandescence for twenty minutes that part of the globe in line with the sides of the spiral became slightly darkened; in five hours the deposit became so thick that the incandescent spiral could not be seen through the deposit. This film, which was most perfect, consisted of platinum, and I have no doubt but that large plates of glass might be coated economically by placing them on each side of a large sheet of platinum, kept incandescent by the electric current. This loss in weight, together with the deposit upon the glass, presented a very serious obstacle to the use of metallic wires for giving light by incandescence, but this was easily surmounted after the cause was ascertained. I coated the wire forming the spiral with the oxide of magnesium by dusting upon it finely powdered acetate of magnesium. While incandescent the salt was decomposed by the heat, and there remained a strongly adherent coating of the oxide. This spiral so coated was covered with a glass shade and brought to incandescence for several minutes; but instead of a deposit of platinum upon the glass there was a deposit of the oxide of magnesia. From this and other experiments I became convinced that this effect was due to the washing action of the air upon the spiral; that the loss of weight in and the coloration of the hydrogen flame was also due to the wearing away of the surface of the platina, by the attrition produced by the impact of the stream of gases upon the highly incandescent surface, and not to volatilization, as commonly understood.

"I will now describe other and far more important phenomena observed in my experiments.

"If a short length of platinum wire, one thousandth of an inch in diameter, be held in the flame of a Bunsen burner, at some part it will fuse and a piece of the wire will be bent at an angle by the action of the globule of melted platinum; in some cases there are several globules formed simultaneously, and the wire assumes a zigzag shape.

"With a wire four thousandths of an inch in diameter this effect does not take place, as the temperature cannot be raised to equal that of the smaller wire owing to the increased radiating surface and mass. After heating, if the wire be examined under a microscope, that part of the surface which has been incandescent will be found covered with innumerable cracks. If the wire be placed between clamping posts, and heated to incandescence for twenty minutes by the passage of an electric current the cracks will be so enlarged as to be seen with the naked eye, the wire under the microscope presents a shrunken appearance, and is full of deep cracks. If the current is continued for several hours these effects will so increase that the wire will fall to pieces.

"This disintegration has been noticed in platina long subjected to the action of a flame, by Prof. John W. Draper. The failure of the process of lighting invented by the French chemist, Tessié-du-Motay, who raised sheets of platinum to incandescence by introducing them into a hydrogen flame, was due to the rapid disintegration of the metal. I have ascertained the cause of this phenomenon, and have succeeded in eliminating that which produces it, and in doing so have produced a metal in a state hitherto unknown, and which is absolutely stable at a temperature where nearly all substances melt or are consumed; a metal which, although originally soft and pliable, becomes as homogeneous as glass and as rigid as steel. When wound in the form of a spiral it is as springy and elastic when at the most dazzling incandescence as when cold, and cannot be annealed by any process now commonly known.

"For the cause of this shrinking and cracking of the wire is due entirely to the expansion of the air in the mechanical and physical pores of the platinum, and the contraction upon the escape of the air. Platinum as sold in commerce may be compared to sandstone in which the whole is made of a great number of particles with many air spaces. The sandstone upon melting becomes homogeneous and no air spaces exist. With platinum or any metal the air spaces may be eliminated and the metal made homogeneous by a very simple process. This process I will now describe. I had made a large number of platinum spirals, all of the same size and from the same quality of wire; each spiral presented to the air a radiating surface of three and one sixteenths of an inch; five of these were brought by the electric current up to the melting point, the light was measured by a photometer, and the average light was equal to four standard candles for each spiral just at the melting point. One of the same kind of spirals was placed in the receiver of an air pump and the air exhausted to two millimeters; a weak current was then passed through the wire to warm it slightly for the purpose of assisting the passage of the air from the pores of the metal into the vacuum. The temperature of the wire was gradually augmented at intervals of ten minutes until it became red. The object of slowly increasing the temperature was to allow the air to pass out gradually and not explosively. Afterward the current was increased at intervals of fifteen minutes. Before each increase in the current the wire was allowed to cool, and the contraction and expansion at these high temperatures caused the wire to weld together at the points previously containing air. In one hour and forty minutes this spiral had reached such a temperature without melting that it was giving a light of twenty-five standard candles, whereas it would undoubtedly have melted before it gave a light of five candles had it not been put through the above process. Several more spirals were afterward tried, with the same result. One spiral which had been brought to these high temperatures more slowly gave a light equal to thirty standard candles. In the open air this spiral gave nearly the same light, although it required more current to keep it at the same temperature.

"Upon examination of these spirals, which had passed through the vacuum process, by the aid of a microscope, no cracks were visible; the wire had become as white as silver, and had a polish which could not be given it by any other means. The wire had a smaller diameter than before treatment, and it was exceedingly difficult to melt in the oxyhydrogen flame, as compared with untreated platinum; it was found that it was as hard as the steel wire used in pianos, and that it could not be annealed at any temperature.

"My experiments with many metals treated by this process have proved to my satisfaction, and I have no hesitation in stating, that what is known as annealing of metals to make them soft and pliable is nothing more than the cracking of the metal. In every case where a hard drawn wire had been annealed a powerful microscope revealed myriads of cracks in the metal.

"Since the experiments of which I have just spoken, I have, by the aid of Sprengel mercury pumps, produced higher exhaustions, and have, by consuming five hours in excluding the air from the wire and intermitting the current a great number of times, succeeded in obtaining a light of eight standard candles from a spiral of wire with a total radiating surface of 1-32 of an inch, or a surface about equal to a grain of buckwheat.

"With spirals of this small size which have not passed through the process the average amount of light given out before melting is less than one standard candle. Thus I am enabled by the increased capacity of platinum to withstand high temperatures, to employ small radiating surfaces, and thus reduce the energy required for candle-light. I can now obtain eight separate jets, each giving out an absolutely steady light, and each equal to sixteen standard candles, or a total of one hundred and twenty-eight candles, by the expenditure of thirty thousand foot pounds of energy, or less than one horse power.

"As a matter of curiosity I have made spirals of other metals, and excluded the air from them in the manner stated. Common iron wire may be made to give a light greater than platinum not heated. The iron becomes as hard as steel and just as elastic. Nickel is far more refractory than iron. Steel wire used in pianos becomes decarbonized, but remains hard and assumes the color of silver. Aluminum melts only at a white heat."

Economy of the Electric Light.

Further experiments with the electric light on the Thames Embankment, London, indicate that the light may be produced at less cost than appeared possible at the time when only 20 lights were in circuit. It will be remembered, says the *Electrician*, that the engine employed is of 20 horse power nominal, manufactured by Messrs. Ransomes, Sims & Head, and that the Jablochkoff lights are used. Operations were commenced at the end of last year, the engine driving 20 lights, indicating about 23 horse power, and consuming 3·8 lb. of coal per indicated horse power per hour. Six months afterward a second Gramme exciter and divider were added for lighting 40 lights, when the engine indicated about 38 horse power, and the consumption of fuel was about 3·2 lb.

Last month a lengthened experiment was made, in order to test whether the engine was capable of driving three exciters and three dividers for supplying light to 60 candles through a circuit of nearly a mile and a half, and it was found that with an indicated power of about 60 horses, and making 140 revolutions per minute, the engine was completely master of the work, and the 60 lights burned more steadily than when the smaller number were driven. As the consumption of fuel will not probably exceed 3 lb. per indicated horse power when working 60 lights, and the working charges will be about the same as when the experiments were made upon which Mr. Keates founded his report respecting the cost of 20 lights, it seems evident that the cost of electric lighting may be reduced by existing machinery and appliances to something not greatly in excess of that of gas.

The Fourth of July under the Midnight Sun.

A party of Americans celebrated the 102d anniversary of our national independence at North Cape, Norway, latitude 71° 15′, longitude 25° 50′. They arrived there at 11 o'clock on the night of July 3d, and at one minute after midnight guns were fired and the shrill sounds of the engine's whistle were made to respond to the number of stars on our flag, and loud cheers given to usher in our great national holiday. The party then ascended the almost perpendicular cliff (900 feet high) and raised the American flag, the flag being made for the occasion by the ladies of the party out of materials purchased at one of the Norwegian towns. When the flag was raised cheers and guns again resounded over the waters. It was certainly a most extraordinary place for such a celebration—probably the first time that a party of Americans ever celebrated the Fourth of July at such an hour and at such a latitude and longitude. The midnight sun shone upon them all the time with dazzling brightness. Far to the north they gazed out on the Atlantic Ocean dashing against the great cliff on which they stood. Behind them were the snow-clad mountains, along which they had been coasting, and not a living creature was near them but the sea birds that arose screaming from the water as the silence of their home was broken. The North Cape is beyond seventy-one degrees of north latitude and about 100 miles north of Hammerfest, the most northerly town in the world. It is five degrees further north than the most northern part of Iceland.

Invisible Spines of the Cactus.

I landed one day on one of the small outliers of St. Thomas, Little Saba Island, about a mile and a half distant from the main island.

A puffin (*Puffinus sp.*) was nesting in holes among the grass, laying a single large white egg. The birds allowed themselves to be caught in the nest with the hand. Our spaniels kept bringing them to us, retrieving them with great delight.

The island was covered with thorny cactuses. It was impossible to avoid their prickles, and I got covered with them when in pursuit of wild goats and pigeons. There were four kinds of cactuses: a prickly pear (*Opuntia*), with spines ¾ of an inch long; a quadrangular stemmed cactus, like the most familiar one in greenhouses; a cactus with rounded ribbed stem, growing in candelabrum-like form (*Cereus*); and a large dome-shaped cactus, a foot and a half high, and bearing a crown of small red flowers (*Melocactus*).

The spines must be a most efficient protection to the cactus from being devoured by large animals. I have often noticed that if one approaches one's hand slowly toward some of the forms with closely set long spines, doing it with especial care, to try and touch the end of one of the spines lightly without getting pricked, one's hand always does receive a sharp prick before such is expected, the distance having been miscalculated.

There seems to be a special arrangement in the color of the spines in some cases, possibly intended directly to bring about an illusion, and cause animals likely to injure the plant to get pricked severely before they expect it, and thus to learn to shun the plant.

While the greater length of the spines next the surface of the plant is white, the tips are dark colored or black. The black tips are almost invisible, as viewed at a good many angles against the general mass as a background. The spines look as if they ended where the white coloring ends, and the hand is advanced as if the prickles began there and is pricked suddenly by some unseen black tip. The experiment is easily tried in any cactus house at home.—*Notes by a Naturalist—Moseley.*

Fusible Metals.

Of mixtures of metals which become liquid at temperatures at or below the boiling point of water, there are several known, some of which are placed in convenient order as follows:

1. D'Arcet's: Bismuth, 8; lead, 5; tin, 3 parts. This melts below 212° Fah.

2. Walker's: Bismuth, 8; tin, 4; lead, 5 parts; antimony, 1 part. The metals should be repeatedly melted and poured into drops, until they can be well mixed previous to fusing them together.

3. Onion's: Lead, 3; tin, 2; bismuth, 5 parts. Melts at 197° Fah.

4. If, to the latter, after removing it from the fire, one part of warm quicksilver be added, it will remain liquid at 170° Fah., and become a firm solid only at 140° Fah.

5. Another: Bismuth, 2; lead, 5; tin. 3 parts. Melts in boiling water.

Nos. 1, 2, 3, and 5 are used to make toy spoons to surprise children by their melting in hot liquors. A little mercury (as in 4) may be added to lower their melting points.

Nos. 1 and 2 are specially adapted for making electrotype moulds. French cliché moulds are made with the alloy No. 2. These alloys are also used to form pencils for writing, also as metal baths in the laboratory, or for soft soldering joints.

Direct Determination of Silver in Galena on Volhard's Principle.

From two to five grammes of the galena, according to its supposed richness in silver, are very finely ground and intimately mixed in a porcelain mortar with from three to four times its weight of a flux composed of equal parts of soda and saltpeter, placed in a porcelain crucible, covered, and heated over a burner to thorough fusion, when the mixture is well stirred with a glass rod. It is then let cool and placed in an evaporating dish partly filled with water, in which the melted matter is softened, dissolved out of the crucible into the dish, which is then heated, and the watery solution is filtered into a flask. The residue on the filter, after being well washed, is rinsed back into the dish, very dilute nitric acid is added, and the whole evaporated to dryness. The dry residue is taken up in water acidulated with nitric acid, heated, and filtered into the same flask in which is the aqueous solution. The residue is washed with hot water, the filtrate is allowed to cool in the flask, ferric sulphate or iron alum is added, and the liquid is titrated.—*C. A. M. Balling, in Oest. Zeitschrift Berg. u. Hütten.*

THE Royal Kew Gardens were recently devastated by a severe hail storm, which broke glass in the conservatory to the estimated number of 16,000 panes. The hailstones were found to average one and a half inches in diameter, and to weigh three quarters of an ounce. They came down with sufficient force to bury themselves in the bare earth of the flower borders, and even penetrate the turf to the depth of an inch. In some cases perfectly circular holes were cut out of the glass panes, while the hailstones went through the succulent leaves of the Echeverias planted out in the beds with as clean an outline as if it had been made with a punch.