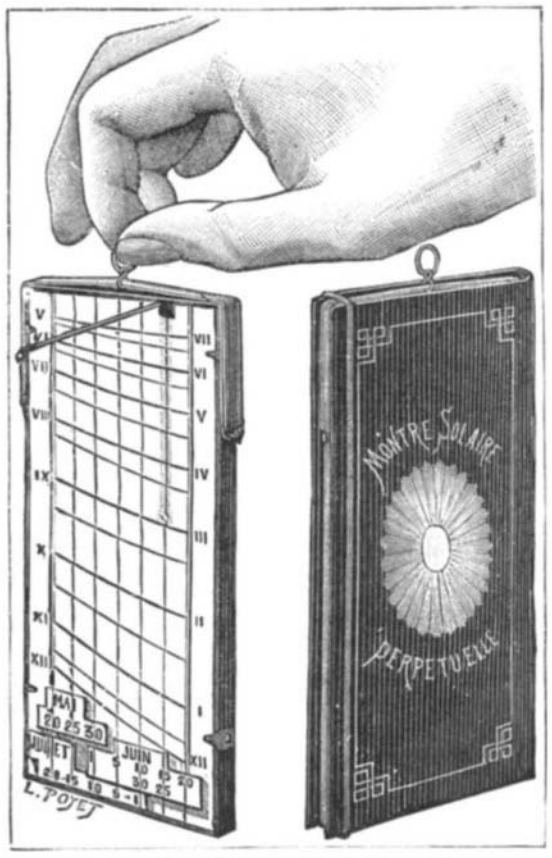
heave in the center—some mighty beast lifting up that floor! Now a wave runs round the incrusted marge, and there is an outburst, a blood-red fount, gushing and bubbling from one of earth's arteries. The broad disk of the lake heaves and trembles. Fitful gaseous flashes flit across. The moving floor cracks. A serrated fissure, like the suture of a skull, runs from marge to marge, and quick, darting streaks, sudden cracks of the crust, shoot across in all directions. These serrated streaks are at first rosy lines on the gray surface, then they widen like crimson ribbons, broadening to the view. They undulate with the billowy motion of the whole upheaving surface. Another crimson fount springs up along the now fretting and roaring rim of the lake, and another and another of the wildly up-leaping fountains of fire toss high their gory crests, even casting gouts and clots of the red spray that fall and harden near the observer's feet. By this time the spirit of our inferno is aroused. The fierce red lake is all boil and leap and roar. It is more than the roar of sea surfs. The surging tide of the molten earth sounds a deeper bass than any note of the sea; and the heaved-up crust, broken into fragments, is churned and dissolved in the boiling flood. The roaring gulf is now, indeed, a vortex of indescribable glories and terrors.

DE COMBETTE'S SOLAR WATCH.

Sun dials are of two kinds: in one the hour is indicated by the inclination of the shadow, and in the other it is shown by its length. The inventor of the very simple little apparatus represented herewith has chosen the latter mode.

The arrangement of the "watch" is as follows: To the sides of a block of mahogany are affixed four clasps, which serve for holding in place the cards upon which are inscribed the different months. In the engraving, we have the card for the months of May, June, and July. Over the top of the block extends a rubber band which is fixed to the sides by means of rings. A third ring, through which the band passes, serves for holding the apparatus. A steel needle having an aperture at one extremity serves for projecting the shadow on the card.

To use the apparatus, the unperforated end of the needle is placed between the wood and the rubber, on the line of the day of the month. Thus, in the cut it is on the line of the 15th and 20th of June. The apparatus is then held by the ring, and turned to the right or to the left until the shadow exactly coincides with the line. The luminous point projected by the eye of the needle indicates at the right the hour for the morning, and to the left that for the afternoon. It will be



DE COMBETTE'S SOLAR WATCH.

at once seen, on reading the card, that on the 20th of June the sun is at its greatest elevation, and that on the 25th it is at the same height as on the 15th; and that on the 1st of July it is at the same height as on the 10th and 30th of June, etc.

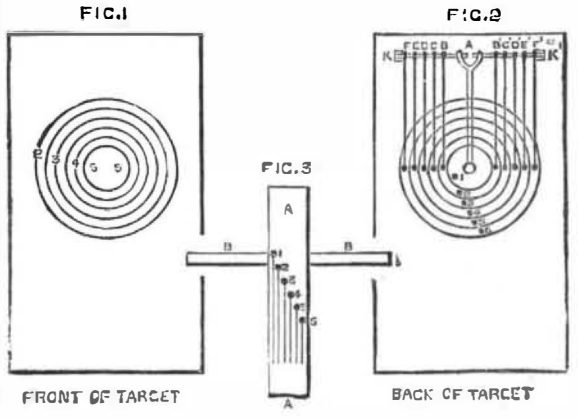
The figure to the right shows the apparatus inclosed in its case.—*La Nature.*

Scientific Exploration of the Northwest.

It is said on good authority that the Northern Pacific Railroad Company and the Oregon Railway and Navigation Company have united in putting a scientific exploring expedition into the field, for the purpose of examining into the mineral, agricultural, and other resources of the territory tributary to the two companies between Lake Superior and the Pacific coast. Prof. Raphael Pumpelly, until now in charge of the coal and iron department of the late national census, has been appointed chief of the expedition, and he has already started for Montana to examine the principal mining districts in that Territory. The work of the expedition will extend through several years.

SELF-REGISTERING TARGET.

The target here illustrated is the invention of Dr. Wilson, of Hawkhurst, Eng. It consists of a sufficiently thick plate of iron, out of which six circular disks or concentric flat faced rings of necessary breadth are made, as seen at Fig. 1. The rings must be of such diameters that there shall be a clear opening all round between each of them of about three-sixteenths of an inch or a quarter of an inch, so that the disk rings—see Fig. 2, back of target—hang by hooks of sufficient length on the cross rod, K K, and work on it, as an easy joint, may move backwards and forwards without



touching each other. They support in pairs—with the exception of No. 5—one of the disk rings, which form the face of the target, F F support ring 2; D E, D^1 E^1, support rings marked 3; B C, B^1 C^1, rings marked 4; and A supports 5, the bullseye. When the bullet hits the face of one of the disk rings, it swings back, but, by the ring's own natural weight, it immediately rights itself, and falls back into its original position. The spots, 1 2 3 4 5 6, are nipples or tongues. One is fixed in the back of each of the disk rings; and when the ring is suddenly forced back, its nipple plunges into a small hole—see Fig. 3—opposite, to correspond in the strong plank, A A, faced with iron, behind the target, and to which the target is fixed. The holes in A A, Fig. 3, are also marked 1 to 6; into these the nipple plunges deep enough to touch the sensitive needle, and through this medium sets a signaling apparatus in motion. The sensitive needle must be sufficiently deep in each hole to be entirely protected against any accidental breaking and flying about of pieces of the bullet. The electric apparatus can be made safe behind the broad plank, A A. On the inside of the crossbar, B B, Fig. 3, a short distance behind the target disk, there are pads or buffers, to deafen the harsh sound of the iron disk in dashing against an iron surface, and also to prevent the disk ring being thrown back too far by the impact of the bullet. In Fig. 1, 5 represents the bullseye; then 4 and 3 are each divided into two rings. If the bullet strikes on the opening between 5 and the inner ring 4, forcing both back, it would not be a bullseye, but the best position on 4; if on the inner ring of 4 only, it would be a more valuable position than if it struck on the opening between the two rings marked 4, forcing both back, but this position of the shot again would be still more valuable than if the bullet hit the outer 4 ring only. These hits would point out a relative value, say equal to 4¾, 4½, 4¼, 4, yet all equal to 4, but showing a difference, and they can be recorded with unfailing accuracy in the firing point at the moment the bullet hits the target. The rings marked 3 may be divided in the same manner. Thus eleven different values of hits may be recorded by this target. The hooks by which the disk rings hang require to be considerably bent outwards, all except F F, to allow the rings to swing sufficiently far back, and not touch any of the other's hooks.

Trade Schools in New York.

In the fall of 1880, under a joint arrangement between Richard T. Auchmuty, of this city, and the trustees of the Metropolitan Museum of Art, a technical school for the industrial education of artisans in the elements of mechanics and of design was established in a building specially erected and presented by Mr. Auchmuty for the purpose, and situated in First Avenue, near Sixty-eighth street. The school at once drew a large attendance. Classes were formed for practical instruction in drawing and design, decoration in distemper, modeling and carving, carriage draughting and plumbing, and no less than 143 pupils were enrolled. The school was open day and evening. Lectures were given by specialists in the trades and arts, but a prime feature was made of shop instruction by foremen and journeymen from factories in this city.

Since the schools were closed last spring a wealthy gentleman of this city has given $50,000 to the Metropolitan Museum of Art, to be devoted to the advancement of art education. It has, therefore, been deemed best to withdraw the art classes from the building at Sixty-eighth street and to establish them on an independent basis at Glass Hall, in Thirty-fourth street. The artisan classes will remain in the Sixty-eighth street building, and be known as the New York Trade Schools. The school for the decorative arts will be under charge of Mr. John Buckingham, former manager of the schools, and the trade schools will be under the supervision of Mr. Charles F. Wingate, sanitary engineer, who had charge last winter of the classes in plumbing and sanitary engineering.

The course of instruction for the coming year will embrace many new features. There is a large and well appointed workshop, where instruction will be given in the manual branches of the trades. Attached to this workshop will be a collection of the articles and materials used in plumbing. It is proposed to make this collection as complete as possible. Dr. Chandler, president of the Board of Health, and Professor Egleston, of the School of Mines of Columbia College, will take part in the series of lectures to be given to the class.

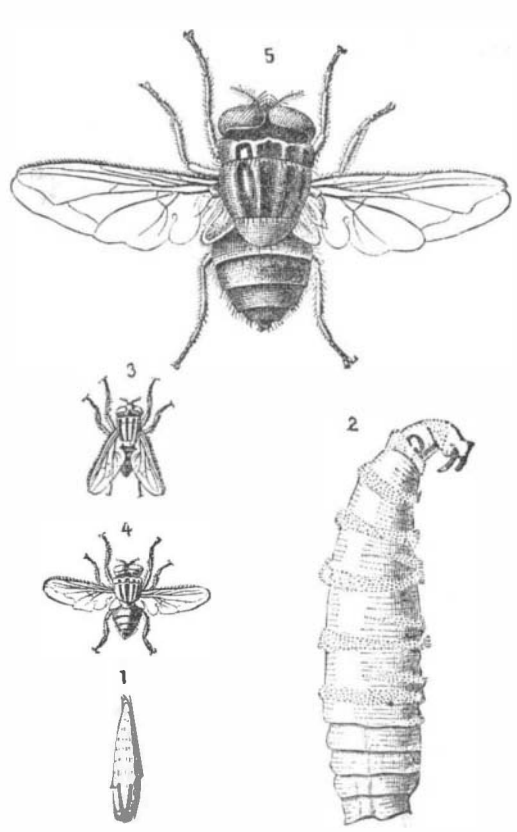
These trade schools are not intended to be either a charitable or a money making institution, the charges being based on the actual cost of the instruction given.

A DEADLY FLY.—NEW CASE OF MYIASIS OBSERVED IN THE ARGENTINE REPUBLIC.

Mr. P. Auguste Conil has recently described, in the *Annales des Sciences Naturelles*, some new cases of myiasis observed by him in the province of Cordoba (Argentine Republic). This affection, which is nearly always fatal, is brought about by a fly, *Calliphora anthropophaga*, Conil, represented herewith, and which, depositing its eggs in the nostrils of an individual, lays the germs of a horrible malady. We will allow Mr. Conil to describe in his own words one of the cases that he witnessed:

"The house situated alongside of mine is occupied by Mr. Auguste Ortiz, whose family lives at Totoral, a village lying sixty miles to the north of Cordoba, very near the line of railway connecting the latter with Tucuman. One of his sisters, Josefa Ortiz, aged 18, was taken sick, and experienced so acute pains that she decided to consult a physician, who, after questioning and examining her, said that she had an attack of angina and treated her for that affection. In spite of all the remedies administered, the pains, far from ceasing, increased in intensity, and the mother, justly alarmed, wrote to her son to consult another practitioner at Cordoba.

"He went at once to Dr. Lesbini, and gave him all the details that he had just received in regard to his sister's case. On Sunday, January 5, 1879, Josefa began to complain of insupportable itching in the right nostril, and, on the same day, had several attacks of bleeding at the nose. The days following she experienced violent pains in her face, nape of the neck, and throat. The physician in attendance, finding that he had made a wrong diagnosis, advised that the patient should be sent to Cordoba in order that she might be within reach of remedies and medical skill



CALLIPHORA ANTHROPOPHAGA.

1. Larva, natural size.—2. The same enlarged, side view.—3. The perfect insect, natural size.—4. The same, wings extended.—5. The same, enlarged.

"On the 14th of January her palate was perforated, and two larvæ, accompanied by matter, came out of her mouth. Having smelled a branch of basil, eighty larvæ, pretty well developed, escaped from her right nostril. The pains becoming more and more violent, Auguste Ortiz was notified and at once left for Totoral. Having arrived at home his sister's state seemed to him to be so grave that he resolved to take her with him to the city. He narrated in all its details the consultation that he had had with Dr. Lesbini, and said that, according to the opinion of the latter, Josefa's trouble was produced by larvæ, which, in the egg state, had been deposited in her nostrils by a fly. The relatives of the patient, notwithstanding the eighty-two larvæ expelled, could not believe such an assertion, as it appeared impossible that the *worms* that they had seen could come from a fly. They doubted it all the more, too, because the patient asserted that no fly had entered her nose.

"Struck by what she had heard, one of the sisters of the

sick girl, and younger than she, stated that on the evening preceding a fly had entered *her* left nostril, and, since in the evening she had begun to experience the same symptoms as those exhibited at first by Josefa, the family began to think that Dr. Lesbini might be right. The trip was therefore resolved upon, and it was decided that Eliza should be one of the party, a decision to which she undoubtedly owes her life. On Saturday, January 18, at ten minutes past twelve the patient took the train. At the station Jesus-Maria she got out and walked around for a moment; this was at about half past one. When the train reached the station General Paz, at ten minutes before three, the patient's state was so much worse that her family was thrown into the greatest inquietude lest she should not arrive alive at her destination. At three o'clock, when the train started, the patient became senseless, and, shortly after leaving the station, she expired in her mother's arms. The corpse, having been taken to the brother's house, was examined by Dr. Lesbini and two of his confreres, who had been at once summoned. The former desired to make an autopsy, but the family was formally opposed to it.

"Dr. Lesbini's diagnosis was fully confirmed by the larvæ which came from the mouth and nasal fossæ of the patient, as well as by the perforation of the palate. There is no doubt, then, that Josefa died from the malady under consideration, *myiasis*, and that it was caused by the larvæ of *Callipho'a anthropophaga*, which probably penetrated the brain and lungs."

After citing a large number of similar cases, Mr. Conil gives a careful study of the larva and perfect state of the dangerous insect.

"Resuming the data which precede," says Mr. Conil, it results that: an egg of the fly deposited on the 15th of January in the nasal fossa of Eliza Ortiz, hatched and had already, four and a half days afterward, attained a length of one-fifth of an inch; the larva had attained its entire growth and had transformed into a pupa eight and a half days after the egg was laid; and, finally, eleven days were sufficient for the pupa to perfect its forms and become transformed into a perfect insect. This makes in all nineteen days and a half for the cycle of its different metamorphoses.

"If we consider the quantity of eggs that each female of the diptera under consideration is capable of laying at one time, we shall be astonished at the relatively small number of cases of myiasis that occur, even taking into account that many cases cannot be ascertained by science and consequently are ignored. That the fly does not multiply to a greater extent, seeing its wonderful fecundity, must be due to the fact that some enemy holds it in check and prevents a multiplication which would be so pernicious to our species. What the enemy is the future will probably tell us; I hope so, at least, and if it is possible, I propose, next summer, to pursue my observations on the diptera, and to apply myself specially to biological observations."

Michigan Frogs and Frog Hunting.

The marshes between Detroit and Lake St. Clair are the resort of millions of frogs; and it is asserted that more frogs are sold in Detroit than in any other city of its size. During the frog season heavy shipments are made to New York, Boston, and other Eastern cities. The *Free Press*, which pronounces the commercial frog as suspicious as a wolf, as wild as a deer, and as shrewd as a fox, describes the work of frog hunting as follows:

"Most of the frogs are caught for this market by men. One or two boys have some fame as successful frog catchers, but it has been demonstrated that the average boy lacks the necessary qualificatious to make the business of any profit to him. We know of one old fisherman and hunter who has followed the frog catching business for the last twelve years, and he has sometimes made it pay as high as $15 per week. While there is only one way of killing a goose there are several ways of killing a frog. Frog hunting would be a great financial success if the jumpers would take a seat on a log and permit a man to walk up and crack 'em over the head with a club, but the frog is utterly opposed to any such proceeding. His eagle eye detects the enemy afar off, and the approach must be cautious. The outfit consists of a frog spear, a hook and line, a fish pole with a pointed iron in the end, and sometimes a small shotgun is taken along. First discover your frog. He may be sitting on a log ten feet from shore. He feels quite safe at that distance and will probably wait for developments. The hook and line can be used here. The line is stout and the hook big enough to hold a twenty pound bass. The idea is to fish for the frog without bait. A careful hand will maneuver the line until the hook is under the frog's throat, and then a sudden jerk takes him off his meditative roost and gives him into the power of his enemy. The spear, which is provided with a long handle, can sometimes be used, though a frog will dodge a sudden thrust as quick as a pickerel. If the shot gun is used it is with a light charge of powder and very fine shot, and the head is the point aimed at. Some of the froggers work the banks and are provided with boats, but success depends a good deal on circumstances. A good hunter has been known to bag 200 frogs per day, but three or four dozen legs are called a fair day's catch. A frog will probably live ten or fifteen years if steering clear of accidents. They are not worth catching until they are two years old, and are not "prime" until they reach the age of five. A frog sees his palmy days from five to ten. Before reaching five he is giddy and thoughtless. After that he settles down to a life of ease and contentment, and the days come and go and leave him no sorrow. Frogs have been caught in the St. Clair marshes weighing as high as seven pounds and having legs almost like drumsticks. One was caught at the head of Belle Isle two years ago which kicked the beam at nine, and one weighing only half a pound less was on exhibition at the Central Market last spring. Frog hunters say that the game they pursue is a weather bureau in himself. Before a storm he can be found only in certain localities. When there is to be a dry spell he seeks certain other localities. If the day is to be cool and cloudy his altitude betrays it. If it is to be hot and sultry the frog remains below. During a thunderstorm he is "on deck" to witness the display, and is then off his guard to such a degree that he is often killed with a club. His natural enemies are man, several species of birds, three or four species of fish, and one or two kinds of animals, and the fact that he manages to dodge all for years is proof enough that his lack of brains has been more than made good by his supple legs."

REMOVAL OF FLOOD ROCK, NEW YORK CITY.

The work of mining the seven acres of Hell Gate, known as Flood Rock, which is illustrated on our first page, was planned and barely commenced by Gen. Newton, U. S. Engineers, before his successful explosion of the extensive mine under Hallet's Point Reef, which took place Sept. 24, 1876, a full illustrated account of which appeared in the SCIENTIFIC AMERICAN of October 14, 1876, preceded by an illustrated history of the inception and progress of the work in current numbers of earlier dates. By this important operation there has been secured a clear navigable channel of 26 feet depth at low water, in place of the dangerous and dreaded whirlpool, called by the early Dutch settlers of New York "Horl Gatt," meaning whirl passage, which has become Hell Gate by modern usage. The name is now applied to the area including Flood Rock and other neighboring reefs.

The present work, begun in 1876, was suspended for want of appropriations during the whole of the fiscal year ending June 30, 1878.

Flood Rock is a ledge of gneiss, of about the same composition as Hallet's Point Reef, located about 1,000 feet northwesterly from Hallet's Point, at Astoria, L. I., where the machinery plant for mining that reef was located.

The summit of Flood Rock, as seen in the engraving, formerly appeared at all times above water. Its form was such that, by building upon it suitable retaining walls and cribs, an area of about a quarter of an acre was prepared for the necessary buildings and a hoisting tower at the opening of the shaft, which has been sunk from the apex of the ledge to a depth of about 75 feet, as shown in the section of the mine in our engraving.

The rock, as it was removed, was at first deposited by dumping scows in a deep hole off Ninety-second street, till it was filled to a desirable level. It is now being deposited between Little and Great Mill Rocks, an interval of about 800 feet, which with the rocks will form the western side or breakwater to the new channel formed by the removal of Flood Rock. This was included in Gen. Newton's original project for the improvement of Hell Gate.

A network of galleries, to plan of which is shown in the engraving, now extends under nearly five acres of Flood Rock. When the excavation is completed, piers only of sufficient size and in ample number to support the roof will remain.

The piers are then to be drilled, charged with sufficient explosives to break them down, and then fired simultaneously, when the whole mined area of the river bottom, shown by the fine cross lines now known as Flood Rock, is expected to sink into the mine, and after dredging, form a new channel of 26 feet depth at mean low water.

The amount of explosive to be employed was originally estimated at an equivalent of 100,000 pounds of nitro-glycerine.

The amount used at the former explosion at Hallet's Point was 52,000 pounds of explosive placed in 172 piers. The mine was fired by the touch of a child's hand, and Hallet's Reef was no more. There have since been dredged from this demolished reef a total of 72,084,078 gross tons of refuse, and only a few shoal points now remain, mostly near the shore.

The galleries thus far completed at Flood Rock have a total length of 13,528·08 lineal feet, from which 39,608·38 cubic feet of rock, measured in the original solid form, have been removed.

At the present rate of progress the mining will be completed about the close of 1883.

The machinery by means of which this important work is carried on is of the most approved types of modern mining appliances, and as much as possible of the labor is performed by steam, the prime motive agent. There are four large boilers, three of the horizontal two-flue type, 6 feet diameter by 24 feet long, set in brick, and externally fired, and one of the fire-box tubular or locomotive type. They have an aggregate of 140 square feet of fire grates, equal, at maximum rate of combustion with natural draught, to about 400 horse power.

The steam is maintained at 60 pounds constantly, but in a part only of this system of boilers, one or more being at all times available for cleaning and repairs. They furnish steam to the following engines and heating pipes: Five upright air compressors, steam cylinders, 9" by 18", which supply air to the small drilling engines (30 in all, a part only in use all the time), air pressure of 55 pounds per square inch; one double winding engine, having two cylinders 16"x24" geared to a 7-foot winding drum by spur gearing about 1 to 7, which raises and dumps automatically into scows all the mined rock; one upright ventilating engine cylinder, 12"x18", driving a fan 12 feet diameter; one small upright shop engine driving the machine shop and four smiths' fires; and one small double-cylinder freight hoister.

There are two ten-inch Worthington duplex mining pumps, one of which at about 75 to 80 strokes per minute, serves to drain the mines in the present condition of the leaks.

There are also three boiler feed-pumps and a special Knowles circulating pump, 8-inch water piston.

The drying chamber in the main gallery is also supplied with steam for the purpose of drying the clothing of the workmen.

The exhaust steam from all these engines is condensed in a large Lighthall surface condenser, and about two-thirds of the original feed water is returned in a purified condition and at about 100° F. to the boilers; when new and unusual leaks are developed by the blasts the second pump is used till they can be plugged by the miners, the parts thus plugged must be then approached from another direction.

The water is all taken to the pump well below the central gallery, through drains cut below the general floor level of the mine, thus leaving the gallery floors comfortably dry for the workmen.

There are now about 200 men, comprising miners, mechanics, and laborers, engaged on this work, in three shifts or watches of eight hours each, using from 20 to 30 drilling engines, which are driven by compressed air distributed from the five compressing engines through a large main, and smaller branch air pipes to the headings where each air-drilling engine has its separate flexible pipe.

Holes something over two inches diameter are now being made, each about four feet deep, at the rate of 31·72 feet per shift, by each active drill.

The blasting is done at night; the explosive used is No. 2 extra giant powder; as many as 300 holes have been fired (charges about one pound weight) in a single night, and then the ventilating fan, located at the top of the shaft, is run at its maximum rate, displacing about 50,000 cubic feet of air per minute.

Careful and experienced pioneers explore the galleries after each blast and test the walls and roof, and remove all loose rocks before the drillers and mining laborers return to work where blasting has been going on.

The detached rock is loaded upon small cars on 2½-foot gauge tracks and drawn to the shaft by mules, a number of which are stabled permanently in a chamber set apart for their use.

The cars are run upon a tilting cradle, which is pivoted upon the sill of the hoisting cage, and firmly secured to the cradles so that they may be safely dumped into the iron-clad chute at the top of the hoist-way, whence the rocks slide into the dumping scow alongside. The descending empty car counterbalances an equivalent weight of the ascending load in the adjoining lift, thus practically eliminating the cost of hoisting the cars as dead weight. The loaded scows are taken by a powerful tugboat to the dumping ground, the present state of which requires unloading upon dump cars upon the dike, as it is shown, nearly filling the space between Little and Great Mill Rocks, indicated in the engraving.

The history of the Hallet's Point mine, which may be found fully illustrated in the SCIENTIFIC AMERICAN of August 21, 1875, Sept. 30 and Oct. 14, 1876, shows the comparative cost of hand and machine drilling by compressed air to be 95 cents per foot for the former, and 36 to 37 cents for the latter.

The distribution of the whole cost of mining was then as follows:

Drilling and blasting	46·00	per centum.
Transporting in the mine	17·00	"
Hoisting	3·28	"
Dumping	2·03	"
Pumping	10·37	"
Incidentals, including costs of superintendence	21·32	"
	100·00	

The disposal of the rock from the new mine, which involves the use of a tugboat and dumping scows, modifies the distribution of the cost, making the item of dumping 7·17 per cent., while the incidental item which includes cost of superintendence is reduced to 10·4, or less than half that in the old work.

The works at Flood Rock are in charge of Gen. John Newton, U. S. A.

Imitation Amber.

Considerable quantities of beautiful objects of artificial amber are now being produced in Vienna. The substance employed in its manufacture is chiefly colophony or resin, obtained by decomposition of turpentine, though several other ingredients are used to give it the requisite qualities. The imitation is said to be perfect, and the production has even the electric properties of amber. Ingenious manufacturers have even introduced into the substance foreign bodies, insects, etc., to make the similarity more striking. Natural amber requires a temperature of 285 to 287 degrees C. to fuse it, while the imitation becomes liquid at a much lower temperature.