POLYTECHNIC ASSOCIATION OF THE AMERICAN INSTITUTE.

[Reported expressly for the Scientific American.]

On Thursday evening, May 24th, the usual weekly meeting of the Polytechnic Association was held at its room in the Cooper Institute, this city. At this meeting the appointed subject — "Gas-burning" — was brought upon the *tapis*, and the following is the gist of the

DISCUSSION.

Mr. Seely—Illuminating gas is composed of hydrogen and carbon, in varying proportions. Hydrogen, of itself, in burning, gives little light but great heat; carbon, also, in the act of burning, gives little light, but, being a solid, it may become red-hot or white-hot by heat. In the gas flame, the elements are separated; the hydrogen, as a gas, enveloping the particles of solid carbon. The hydrogen burns first, and by the heat of its burning the suspended carbon becomes luminous. Now, it is found, by experiment, that hydrogen in burning, with the heat from the carbon burning, gives out heat enough to render luminous all the carbon it can combine with; and it hence appears that the value of gas depends upon the proportion of carbon it contains. But gas may be so burned that very little of this value shall appear. If a flame be very small, it burns with a blue color of little light; in this case, the flame has a large contact with the metal of the burner, so that its heat is conducted away, the carbon is not heated hot enough and the combustion is not complete. In complete combustion the products are water and carbonic acid; and otherwise, carbonic oxyd and compounds of oxygen, hydrogen and carbon may be produced. When a flame smokes, gas is not burned economically, for the smoke is the valuable element of the gas going away without giving out its light or heat. Smoking is remedied by securing greater access of air, by spreading the flame to a greater surface, by chimneys, or by diminishing the pressure of the issue. If gas issues at too great pressure, it burns with a roaring noise, and gives little light, for the reason that the air mingles with the gas and consumes the carbon before it can give out its light. This is the condition in which gas burns in the "Bunson burner," and in many other contrivances adapted for heating by gas. The color of a flame is a good practical test of economical burning. A flame just at the point of beginning to smoke yields its maximum light, and at this point it is of a yellowish hue. Upon these principles, it is a simple thing to construct a burner which shall burn gas economically. Ordinary burners consume gas wastefully, for the reason that the access of air to the flame is too great; the gas issues with too great a pressure for the size and form of the flame. And if you turn off the gas to diminish the pressure, the flame will not be large enough. The simple remedy, then, is to enlarge the orifices and change their direction so as properly to spread the flame with little tension. We then have an economical light, but flickering, unsteady and liable to smoke, which objections may be partially remedied by the use of a spreader and a chimney. The first burner especially adapted to check the flow of gas was stuffed with felt; the felt was replaced with wire gauze, and, lately, sawdust is preferred to either. Instead of the stuffing, various contrivances have been introduced in which the gas is checked by compelling it to go through tubes, bent or winding, within the burner; and, last, there is the "Johnson burner," which checks by breaking the flow against a conical surface. All of these burners have wide orifices, and in these lie their merit; for the stop-cock is the place to check the flow.

Mr. Bogart—If the stop-cock will regulate and check the flow, people do not know it, and they will not use it for that purpose. But it is my experience that the same effect cannot be produced by the stop-cock as we get by the improved burner.

Professor Hedrick. Although yellow light is the most economical, it is not the most available. Its liability to smoke and its unsteadiness will unfit it for many people and places. Yellow light is pleasant enough to see by, as we found in North Carolina, where pine knots are much used.

The subject of "Gas-burning" will be resumed at the next meeting.

After the close of the meeting, the president remarked, in reference to the subject of "Expansion" (discussed at the previous meeting), that he had called at the office of the Eric Railroad Company and learned, from the highest authority, that no rails had been laid in actual contact on that road.

HOW TO MAKE IMPROVEMENTS.

The *American Railway Times*, in discussing the prejudices which seem to possess the minds of those who strive to make improvements, says:—"We know of no class of men who seem more unwilling to depend on one another than the master-mechanics of our railways. Of course, independence is a good thing—that is, within bounds. We have seen many a locomotive superintendent who wanted to adopt the improvement of his neighbor on another road, but who wanted first to invent it himself; and who would thus copy, as near as he could, the contrivance so as to not have it precisely the same—so near as to gain all that was to be gained by it, but not so near as to be called a thief; he will take the smoke-stack of a neighbor, but paint the top of it red where his neighbor's is blue—then he is an originator, and not a copyist. Some men in our neighborhood come to the designer of a successful 'coaler,' and say:—'My friend, tell me all about your improvement, just what it is, just what your experience with it has been; lend us your foreman, that he may introduce your plan *in propria persona* upon our road; and whatever you say is right, we will pay you for its use.' Now this is doing the thing up in the proper shape; the man who proceeds thus is a man, and is seeking after the truth wherever it is to be found; and he is the man who will save thousands of dollars to the company for which he works. But there is a class of men who come to the inventor or the improver, and get all the information they can out of him, and go away and partially digest and throw up from a diseased stomach an abortion which comes out as '*our* patent locomotive, which *we* designed in *our* shop;' but, somehow or other, when the thing comes up to be tried, it don't work; so cut and patch and alter, and try again; but it don't work; and so it goes, try and fail, try and fail, until your employers are disgusted with improved locomotives, and coaling is a humbug. These men seek not after the truth, but after *themselves;* and generally succeed not only in finding themselves, but in discovering themselves pretty essentially to others, also. Particular cases, illustrative of both of these modes of proceeding, we can put our hand upon with very little trouble; but we do not intend, just now, to particularize. We should prefer the master-mechanics to correct their own errors, and not to require to have it done for them, as forced correction from the outside is apt to fail in the desired effect, while self-correction from within removes the cause of error."

A NEW STEAM PASSENGER CAR.—A single car, called the *Novelty*, and propelled by an engine instead of horses, has been successfully tried on one of the Philadelphia surburban railroads. The engine has power for a speed of 30 miles an hour; the boiler occupies a vertical position on the front end of the car; the gearing, which in most of its parts is similar to a locomotive, is under the floor, and the water-tank (an iron pipe) is within the seats, which extend lengthwise alongthe sides of the car. The weight of car and engine, ready for service, is only 15,000 lbs. The engine has two horizontal cylinders, 5-inch diameter, 12-inch stroke; the car stands upon a pair of drivers, 3½ feet diameter, and a truck. The machinery occupies but 2½ feet of the body of the car, additional to the space occupied on the platform of horse-power cars by the driver. The car was built by Kimball & Gorton, and the engine by Baldwin & Co., of Philadelphia. For short lines, such a class of railroad carriages may yet supersede heavy engines drawing large trains. Being light, they will not require such heavy tracks, and a great number of them may be employed so as to run by steam, singly, at short intervals apart, as city railroad cars are now managed.

QUITE a quarrel is going on in the Paris Academy of Sciences with Leverrier, the discoverer of the planet Neptune. In the official almanac (*Connaissance des Temps*) which has just been published, there is no data concerning Neptune, and so Leverrier has brought up the subject in the Academy. Some of the members have indulged in what we would call "congressional personalities"—that is, their opinions of one another have been more pungent than complimentary.

A COLUMN OF VARIETIES.

A body falling only one foot strikes with a force eight times that of its weight.

The necropolis of Thebes, in Egypt (according to the calculations of Stevens), still contains millions of mummies.

Iron ships are now painted internally with gray oxyd of zinc, which affords better protection from rust than red lead.

A good baking powder is composed of 9 oz. bi-carbonate of soda, 8 oz. of tartaric acid and 10 oz. of rice or fine wheat flour.

There are 7,700 veins in an inch of mother-of-pearl. These decompose the rays of light and produce the prismatic colors.

Light comes from the sun at the rate of 200,000 miles per second; but sound travels at the rate of only 1,142 feet per second.

Fraunhoffer, the celebrated German optician, made a machine with which he could draw 32,900 lines in the breadth of one inch!

The "pitch" of a screw is the distance between two threads. In one revolution it will advance the exact distance of the pitch.

One pair of millstones, 4 feet in diameter and making 120 revolutions per minute, can grind five bushels of wheat to flour in one hour.

In the city of Pittsburgh, Pa., and vicinity, there are 25 rolling mills, which produce 100,000 tuns of bar, sheet and nail iron annually.

The shortest method of calculating the horse-power of engines is to use the unit of 550 lbs. moved one foot per second, instead of 33,000 lbs., one foot per minute.

Chloric ether is made by mixing one part of chloroform with six parts of rectified alcholic spirits. It is excellent for outward applications in neuralgia and toothache.

A circular saw, 2½ feet in diameter and making 270 revolutions per minute, will saw 40 square feet of oak and 70 square feet of spruce per hour per horse-power.

In a vacuum water boils at 88°. At the boiling point the vapor of water has the same density as the atmosphere; it is the same with all other vapors produced by boiling liquids.

Cast iron has been silvered, occasionally, by employing an excess of the chloride of silver in a cyanide solution of the metal, and otherwise pursuing the usual battery process.

An active man in the prime of life can raise 100 lbs. one foot per second, working 10 hours per day; a horse can raise 550 lbs. in the same space of time. These are units of horse and man-powers.

One gallon of water converted into steam will raise 5½ gallons of water at 50° up to 212°, which is the sensible heat of the steam; there are, therefore, 944 degrees of latent heat in the steam.

In man the temperature of the blood is 98°, in sheep, 102°. in ducks, 107°. During the chills of ague the heat of man's blood falls to 96° and 94°, while at the hight of fever it rises to 102°, and even to 105°.

The beautiful gloss of marble and alabaster is produced by rubbing it with a moist linen cloth and the powder of calcined tin. The finishing touch is given by rubbing with dry soft leather, or what is better—soft silk.

Baron Liebig has recently succeeded in forming artificial tartaric acid. It is said to be identical with the tartaric acid of nature, and that he has prepared the tartrates of soda and potash, and even tartar emetic, with it. This is a most important discovery in organic chemistry.

In America we have springs of salt water; in Cheshire (England) there are beds of red salt, 30 feet thick; in Poland there are salt mines extending for several miles in caverns, at a depth of 600 feet beneath the surface; at Cordova, in Spain, there is a mountain of salt 300 feet high; and in Peru there are salt mines 10,000 feet above the level of the sea.

The sheets of copper for sheathing ships are 4 feet long and 14 inches broad. The lower edges of the upper sheets lap over those beneath like clapboards on houses. The thicknesses of the several sheets used in the British navy are such that a superficial foot weighs 32, 28, 18 or 16 ounces. The thickest sheets are put on round a ship at the hight of the load water-line, and for about four strakes below; they are also put on the bows, down to the keel.