POLYTECHNIC ASSOCIATION OF THE AMERICAN INSTITUTE.

The Association held its regular weekly meeting at its room at the Cooper Institute, on Thursday evening, April 14th; the President, S. D. Tillman, Esq., in the chair.

ROPER'S AIR ENGINE.

The President announced that the first portion of the meeting would be devoted to the examination of new inventions, and invited Mr. S. H. Roper, of Boston, to explain his air engine, which he did by means of an elaborate drawing that he had previously made upon the blackboard. This engine is the same that was illustrated on page 97, Vol. VIII. of the SCIENTIFIC AMERICAN. The products of combustion are used. The fire is in an air-tight vessel equivalent to the boiler of a steam engine, and the air is forced in by an air-pump both above and below the grate, about one-tenth of the air passing through the fire. The heated air and the gases resulting from combus, tion pass by a circuitous passage into the cylinder-driving up the piston, which is carried down by the fly-wheel, the engine being single-acting. The piston is prolonged downward by a hollow drum not quite fitting to the cylinder, and giving an annular space around it filled with cool air which keeps the hot air away from contact with the lubricating material of the piston. The average working pressure is about 8 lbs. to the inch, The description of this engine called forth a brief discussion.

The President:—What is the weight and price of your two-horse-power engine?

Mr. Roper:—The weight is 3,500 lbs., and we sell them for $600. And by a two-horse-power engine, I mean one that in its ordinary working will actually raise 66,000 lbs. one foot high per minute.

Mr. Stetson:—What is the cost of fuel?

Mr. Roper:—In an experiment that I made with my own engine, which was doing a regular duty of 57,000 lbs. per minute, 2½ tuns of coal lasted 41 days.

Mr. Stetson:—Do you consider your engine more economical than a steam engine?

Mr. Roper:—Yes, more economical than any small steam engine. We get a horse-power from 5 lbs. of coal per hour, and some large steam engines do a great deal better than that, but in small engines the saving in coal is not the main thing. The saving in engineering is twice as much as the whole cost of the coal. And more important still, is the constant running of the engine. The first of my engines was put up 15 months ago in a shop where 206 hands are employed, and the stopping of that engine half a day would result in a loss more than equal to the whole cost of the engine. It is in a shoemaker's shop, and if any repairs have been made on it, they have been made by the shoemakers.

Mr. Garvey:—Do you find any difficulty from the sulphur in the anthracite coal?

Mr. Roper:—We have not had any yet.

After the exhibition of some other newly invented articles, the President proceeded to read his usual summary of news. We select the following items :—

STEEL BOILERS.

An account was read of the experiment with steel and iron boilers described on page 73 of our current volume. This was followed by a brief discussion.

Capt. Maynard:—I would ask what is meant by steel. We hear a great deal about a very mild steel. If steel is mild enough it is iron, and costs about the same as other iron. If a boiler were made of genuine steel, I should apprehend great danger of its breaking to pieces. I have seen a claret bottle filled with water and subjected to a gradually increasing pressure up to 120 lbs. to the inch without breaking, but when the pressure was reduced to 20 lbs. and made percussive, the bottle flew to pieces.

Mr. Miller:—I was at Mr. Krupp's works while this experiment was in progress, and saw the boilers. The steel is made by Mr. Krupp, by a process somewhat similar to Bessemer's. The most interesting thing to me was the method recently adopted by Mr. Krupp for rolling boiler plate in complete rings from a single ingot in the same way that he rolls the tires for locomotive wheels, so that no longitudinal riveting is required. He makes the rings about three feet long.

RESIDUAL MAGNETISM.

Dr. A. Van Waltenhofen asserts that the amount of magnetism remaining in the soft iron of an electro-magnet, after the cessation of the electric current, is dependent on the manner in which the current is interrupted. The amount is greater after a gradual interruption. The residual magnetism in very soft iron is often of an opposite nature to that previously existing, after the very sudden interruption of a strong current. This seems to him to furnish strong proof that magnetism is not caused by the separation of two fluids, but by the motion of magnetic molecules to which is opposed a certain amount of frictional resistance. He compared each magnetic molecule to a spring which is bent back. If suddenly released it will return to its original position or go beyond it, but if gradually released it will not go quite to its primitive place.

THE SPECTRUM OF CARBON.

M. Morin, of Versailles, finding that coal, charcoal, and the diamond cannot be vaporized by heat when isolated, yet the same spectrum produced by the common gas flame, cyanogen, carbonic oxide, carbonic acid, acelytine, and the hydro-carbons generally, he concluded this result must be due to the only element common to all these compounds, carbon, and in a state of vapor. It follows that the theory of the candle flame must be somewhat modified. The base of the flame being blue is the vapor of carbon preserved from combustion but kept at a very high temperature by the envelope of hydrogen, which being the more combustible element alone unites with the oxygen of the air. Above the blue part comes the luminous part produced by the passage of the carbon from the gaseous to the solid state, giving out in the passage a considerable amount of heat. The black cone surrounding the wick of the candle is formed of gaseous carburets of hydrogen which burn only in the upper part of the flame where they come in contact with oxygen. Hydrogen being not very combustible, but very subtle, diffusive, and penetrating, its combustion takes place under conditions in which it would be impossible for other gaseous vapors or bodies to burn. If a candle be gently moved so that the flame may be inclined, and the air allowed to come in contact with the vapor of the hydro-carbons which surround the wick, we see the hydrogen take fire and above the wick appears the blue vapor of the carbon. The latter can exist alone and give its luminous reactions, only when it has near it the high temperature produced by the combustion of hydrogen. When cyanogen is burned in a current of oxygen, the high temperature produced by the interior of the flame makes the vapor of carbon intensely hot, and hence very luminous; consequently its spectrum is very luminous also.

INK PLANT.

Prof. Jameson, of the University of Quito, states that the expressed juice of the berries of the *coriaria thymifolia* is used by him in preference to the ordinary ink, because it does not corrode the steel pen.

PRODUCTION OF OXYGEN WITHOUT HEAT.

Mr. J. Robins has explained before the London Chemical Society the process used by him for obtaining pure oxygen. The combinations made by him are not original, yet they may not be generally known among those who separate and use the gas. The compound used is the peroxyde of barium and bichromate of potash. It is placed in a glass flask or bottle provided with an exit tube, and a mixture of dilute sulphuric acid and hydro-chloric acid is poured on, when the oxygen is rapidly evolved. Peroxyds of potassium, sodium, strontium, and calcium may be severally substituted for the peroxyd of barium. And manganate or permanganate of potash, binoxyd of manganese, and binoxyd of lead may be used in the place of bichromate of potash, but the cost of these articles render the latter most available. The chemical changes, not readily explained, in this process are the formation of the sulphate of baryta and peroxyd of hydrogen, or oxygenated water. This in contact with chromic acid is reduced to water, and the sesqui-oxyd of chromium is formed; oxygen gas being disengaged from both substances quite pure and fit to be used for medicinal purposes.

UTILIZATION OF WASTE PRODUCTS.

The regular subject of the evening was taken up, and Dr. Parmelee was called upon to open it.

Dr. Parmelee:—If this subject includes the employment of spent products illegitimately used for adulteration as well as the re-working and useful application of refuse articles, it opens a very wide field; none the less interesting and perhaps valuable for such an extension. In this case facts might be presented which would lead us to attend to a personal examination of our diet, clothing, and various articles of domestic consumption.

Mr. Mayhew, of London, tells us that, according to information which he received, about 78,000 lbs. of exhausted tea-leaves, dried and blended with cheap genuine tea, are sold annually by inferior shop-keepers to the poor Irish and others.

Beet and turnip leaves are largely employed in the manufacture of segars.

The waste made by the sawyer and turner has several economic uses. Mahogany dust is valuable for smoking fish; box-dust for cleaning jewelry; the shavings of cedar for making the otto of cedar wood, a hundred pounds producing 28 ounces.

It may not be uninteresting to know that there are woolen rags too poor for shoddy, and these may be used as manure; 2½ lbs. of woolen rags are considered equal to 100 lbs of farm-yard manure.

The following estimate has been made of the carcass of a dead horse, the average weight of which is from 12 to 13 cwt.:—

Hair of main and tail, 1½ lbs., used for hair-cloth, stuffing mattresses, and for making bags for crushing seed in oil-mills, and other purposes. Fat, 20 lbs., used for lamps after distilling and other purposes. Intestines, 80 lbs., for gut-strings. Heart and tongue a mystery. Bones, 160 lbs., for knife-handles, phosphorus, super-phosphate of lime. Hoofs, gelatine, prussiate, fancy snuff-boxes. Shoes, 5 lbs., used for shoes again, sold for old iron.

A correspondent of Mr. Simonds, editor of the *Technologist*, London, states that a foreman of the bindery department of Messrs. Harper & Brothers came in one morning with a bar of gold valued at $307½, the proceeds of the gold dust swept from the floor and wiped off on rags used by binders during three months. This was a few years ago. He further states that the gold sweepings were worth $1,500 a year; shavings from paper, $5,000; shavings from pasteboard $700; scraps from leather $150; making in the aggregate $7,850.

The speaker then gave a brief account of Prof. Everett's invention for utilizing waste tin scraps, a full description of which will be found in another part of this paper.

The same subject was continued for the next evening.

Curious if Credible.

From a business letter we make the following extract:—

"Before I close, allow me to ask the explanation of the following phenomenon:—A tin ladle, last winter, was left in a tub containing water enough to reach nearly to the top of the dipper, that is to say it was immersed nearly to its rim; within the dipper was water about one-fourth filling it. There came a cold night, and the water in the tub froze solid to the bottom, but the water in the dipper was not frozen at all. For three days the weather was cold, the ice in the tub gave no sign of thawing, and the water in the dipper gave no sign of freezing. But, by-and-by, the ice thawed; then the water in the dipper froze. Could the heat given out by the freezing of the water in the tub be sufficient to keep the water above the freezing point? If so, in the first instance, where did the heat come from, to prevent it from freezing during the three days that the water in the tub remained a solid mass of ice? Water froze quickly everywhere else in the room any time during the three days; but in the dipper it was limpid as in summer.

"C. G. D."

[It seems to us that there must have been some error in the observations.—EDS.

A CONVENIENT substitute for a cork-screw, when the latter is not at hand, may be found in the use of a common screw, with an attached string to pull the cork.

THE paper having the largest circulation in the world, is now said to be that issued by Secretary Chase. It is an extremely loyal publication, too. It supports both the Administration and the Union.