POLYTECHNIC ASSOCIATION OF THE AMERICAN INSTITUTE.

The Association held its regular weekly meeting at its room at the Cooper Institute, on Thursday evening, April, 5, 1866, the President, Prof. S. D. Tillman, in the chair.

THERMOMETERS AS STEAM GAGES.

Dr. Rowell remarked that some time since he proposed the use of thermometers as steam gages, the relation of the temperature to the pressure of steam having been accurately determined ; the pressure could be ascertained with great precision by observing the temperature. Several engineers of his acquaintance had, accordingly, caused thermometers to be fixed in their boilers, but the bulbs very soon cracked to pieces, and the plan was therefore abandoned.

Dr. Parmelee said that the failure of the thermometers was due to the use of American glass in their manufacture. He had used thermometers a great deal, both in the laboratory and in vulcanizing rubber, and he had found that while tubes of American glass would crumble to pieces after use two or three times, bulbs blown from French or Bohemian glass would last seven months.

Professor Everett observed that our glass makers were doubtless able to produce good chemical glass, but they did not make the effort on account of the limited demand.

Dr. Feutchtwanger assented to this, and said that in the production of glass for achromatic lenses the American glass makers beat the world.

Dr. Rowell then proposed to reverse his plan; where difficulty is found in using thermometers for measuring temperatures, he would substitute a steam gage, and ascertain the temperature by measuring the pressure. He exhibited a small gage prepared for this purpose, intended especially for use in vulcanizing rubber, and remarked that the index moved over about an inch in ten degrees, while in the small thermometers in general use in vulcanizing, the movement of the mercury is through only one-tenth of an inch in ten degrees.

[It must be remembered that the measurement of the pressure by the temperature, or the measurement of temperature by pressure gage, is only to be trusted in the case of saturated steam. When the steam is superheated the temperature is higher with a given pressure than is given in Regnault's tables for saturated steam.—EDS. SCIENTIFIC AMERICAN.]

THE LOCALITIES OF PETROLEUM.

Professor C. H. Hitchcock, formerly of Amherst College, read a long paper on the geology of petroleum. He followed pretty nearly the same ground which has been repeatedly gone over at the Polytechnic by Dr. Stevens, whose remarks have been very fully reported in our columns A few of his statements, however, may be new to a portion of our readers. He agreed with Dr. Stevens in saying that pretroleum has been found in all the fossiliferous rocks, and that the principal oil-bearing formation in this country is the Devonian. He, however, seemed to regard some of the other formations more promising of a profitable yield than have generally been considered. Among them he mentioned the Triassic, in which petroleum has been found at Simsbury in Connecticut, and the silurian, which has been yielding oil in Cumberland county, Ky., since 1829. Between twenty and thiry years ago a great many wells were sunk in the Western States in search of salt water, and it was in this search that oil was struck in Cumberland county. As the mode of purifying the oil was not then known, it was allowed to run to waste. Since the great value of petroleum has become known, the sinking of wells in this district has been renewed, and some 25 or 30 of these wells are now yielding oil. Professor Hitchcock estimated that at least 75,000 barrels of petroleum has been raised in Cumberland county.

In regard to the disputed point of petroleum being found in California, the speaker said that at least 60,000 gallons have been sent to market in that State.

The formation of petroleum has been much discussed ; it is the result mainly of vegetable decomposition, though some of the Canadian and other deposits contain a small quantity of animal matter, as is shown by the presence of sulphur, and by their extremely offensive odors. Except in one case all the water he had found associated with petroleum was salt, and he would suggest that the submergence of vegetation beneath salt water may have been an essential condition of the formation of petroleum.

The yield of petroleum in the United States, for the last five years has been as follows,

1861	24,000,000 gallons.
1862	40,000,000 gallons.
1863	70,000,000 gallons.
1864	87,000,000 gallons.
1865	91,160,000 gallons.

At the present time the product is not less than 14,000 barrels per day.

THE USES OF PEAT.

The President announced peat as the regular subject for the evening. From the long discussion that followed we select for our columns only a portion of the remarks of Mr. Josiah B. Hyde. This gentleman has devoted several years to the examination of peat, and has written some very able papers upon it. He said there are two kinds of peat, the fibrous and the non-fibrous—the fibrous is fit for fuel only, but the non-fibrous has many valuable uses. It is as good for clarifying sugar as bone charcoal.

"Peat cannot be dried by natural means. In this vial is an ounce of it reduced to an impalpable powder. I pour a little into my hand, and blow a cloud of it across this room. I have spread this on porcelain plates and exposed it to the bright sun for hours, and on weighing it, found it to be still just an ounce ; but after two hours exposure to a temperature of 212°, it weighed three-fourths of an ounce. On again being exposed to the atmosphere it absorbed moisture and was restored to its original weight."

The subject of peat was continued for the next evening.

THE LENOIR GAS ENGINE.

BY FRED. J. SLADE.

Having had considerable opportunities for observing the practical working of this machine, the writer has thought some of the phenomena of its operation of sufficient interest to be made public. The principle of its action is as follows:—The piston moving at the beginning of its stroke by the momentum previously imparted to the fly-wheel, draws into the cylinder, through a suitable slide valve, a mixture of common illuminating gas and air. When the piston has moved through a little less than half the stroke the valve closes, and an electric spark is introduced into the cylinder and ignites the gases. The expansion caused by the heat of combustion drives the piston during the remainder of the stroke.

The composition of coal gas is not the same in all cases, but varies with the kind of coal used in its manufacture, and the extent to which the distillation is carried. A constitution probably not far from the average in our cities would be expressed by

Olefiant gas	7
Light corburetted hydrogen	56
Hydrogen	21
Carbonic oxide	11
Nitrogen	5
	190

Now, in combustion 1 cubic foot of olefiant gas unites with 3 cubic feet of oxygen and gives 2 cubic feet of carbonic acid and 2 of vapor water. One cubic foot of light carburetted hydrogen unites with 2 cubic feet of oxygen and gives 1 cubic foot of carbonic acid and 2 of vapor of water. One cubic foot of hydrogen unites with one-half a cubic foot of oxygen, and gives 1 cubic foot of vapor of water. One cubic foot of carbonic oxide unites with one-half a cubic foot of oxygen, and gives one cubic foot of carbonic acid.

The result of the combustion of 100 cubic feet of coal gas, therefore, will be represented as follows:—

		Oxygen			Vapor of Water.	Carbonic Acid.
Olefiant gas	7 and	21	yields		14	14
Light carburetted hydrogen	56 and	112	"		56	112
Hydrogen	21 and	10½	"			21
Carbonic oxide	11 and	5½	"		11	
Nitrogen	5		"	Nitrogen	5	
	100	149			86	147
Nit. associated with oxy. in air,		560			560	

Original gases.......... 809 yield products of combn , 793

We see from this that for the perfect combustion of gas of ordinary quality we must supply seven volumes of air for each volume of gas, and that for gases containing a greater proportion of hydro-carbons a greater quantity of air will be required, and, at the same time, the bulk of the products of combustion will be greater.

By applying a Richard's indicator of unusually delicate workmanship the writer obtained from an engine of 8⅔ inches diameter of cylinder, and 16¼ inches stroke, diagrams of which the accompanying is a fair specimen.

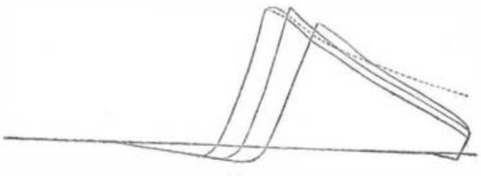

DIAGRAM A—50 REVOLUTIONS,

In this case as the explosion did not occur immediately on the closing of the valve, the tension of the gases falls to 11 lbs, per square inch (above a vacuum). After combustion it rises to 48 lbs, The temperature necessary to produce this pressure is found by the formula,

$$t_2=\frac{P_2(1+k\ (t_1-32^\circ)\ )-P_1}{P_1k}+32^\circ,$$

in which t_1=temperature of the gases before combustion, taken at 200° on account of the warmth of the cylinder.

P_2 is 48 augmented in the proportion $\frac{809}{763}$ and the mean co-efficient of expansion k of the gases under constant volume is ·00204. This gives us as the temperature of the gases at the moment of combustion, 2474°. The dotted line represents the theoretical curve of expansion, taking into account the loss of heat and consequent fall of pressure due to the work done (which is the proper theoretical curve for an indicator diagram). The temperature at the end of the stroke indicated by this line would be 2156°. The actual final temperature shown by the diagram, supposing there to be no leakage, is 1438°. and the difference, 718°, is the quantity of heat absorbed by the water jacket with which the cylinder is surrounded. It will be observed from this card, that the explosion takes place so late in the stroke that there is a considerable available pressure in the cylinder at the end of the stroke, which, of course, is not utilized. To prevent this waste, the manufacturer of these engines in this country, Mr. Miers Coryell, sets the admission valve so as to close earlier; and this has the further advantage, that at the middle of the stroke a given quantity of work is performed in less time than at the ends, and consequently there is less loss of heat.

The diagrams give information which may be of interest to some as to the time required for the explosion of such a mixture of gases. In this case it appears to be about $\frac{1}{27}$ of a second.

Diagram B was obtained on one occasion when the electrical points in the cylinder were wet, and owing to the uncertain passage of the spark the explosions were very irregular. It is introduced here to show the difference between explosions occuring at the middle of the stroke and those nearer the ends. It will be observed that the pressure attained in the latter explosions rises somewhat higher than the true expansion curve drawn from the point attained by explosion near the middle of the stroke (which, as for this purpose, there is no work to be taken into consideration, would stand at the end of the stroke 4 2 lbs. higher than that shown).

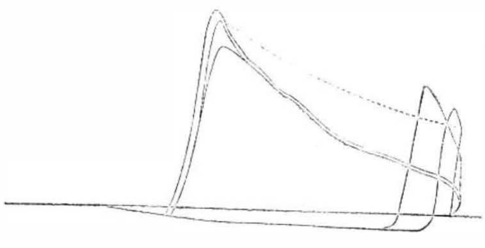

DIAGRAM B—45 REVOLUTIONS. 1 INCH=32lbs.

This is probably due to the greater heat acquired by the gases before explosion. It will also be noticed that the time of acquiring the maximum pressure is considerably greater in the later explosions, being $\frac{1}{30}$ of a second in the earlier and $\frac{1}{20}$ or more in the later.

Lastly, the great loss of pressure by cooling is