roads, plain fare, hard beds, and extravagant charges. Such is Petrolia.

UTILIZATION OF THE GAS.

Of *economy*, as usually practised in older countries, Petrolia has as yet known little. Until wood commanded from $10 to $12 per cord, and coal more than $20 per ton (it is now about $28), no attempt was made to convert the columns of gas escaping from the wells into an agent for driving the engines. This has, however, at last been accomplished with the most complete success on the Watson flats, below Titusville, where half a dozen pumps are driven by gas. The writer has heard no complaints about the capturing of this (hitherto) fugitive slave interfering with the productiveness of any of the wells. All visitors, as well as the men concerned about these works, expressed their admiration at this beautiful arrangement, so simple and economical in itself. Of the still superfluous carbureted hydrogen, one well manager, or proprietor, took sufficient from it to heat up his premises, by letting it into the stove and using it for culinary purposes.

On the other hand, the same experiment made last winter at one of the wells ("the Yankee"), on Cherry Run, is said to have resulted in reducing its productive power nearly two-thirds, or from about 60 to 25 barrels per day, by checking the escape of gas from the tube, and thus weakening its power to expel the oil. So seriously was this felt that the attempt was abandoned, and the flow of oil returned to its former amount. The owners of that well have leased a large number of lots to other interests, and since that trial they have made it a point to insert a clause in every lease, prohibiting the lessees from thus appropriating the gas on the premises.

Other discoveries, and recent changes made in the oil regions, the writer proposes to point out in another article.

## FACTS ABOUT PEAT.

We have received from Messrs. Leavitt & Hunnewell, of 49 Congress street, Boston, Mass., a large pamphlet of 120 pages, which is a compilation of facts in relation to peat as an article of fuel. The following selections will give a good idea of the contents, and may interest some of our readers:—

FORMATION OF PEAT BOGS.

It is found, on examination, to be composed of vegetal matters; generally mosses, and species of aquatic plants in different stages of decomposition: and from this circumstance, as well as from the general appearance of the localities where peat abounds, its formation is generally accounted for somewhat as follows:—

Where pools of water collect, the soil under which is retentive, the water, not being absorbed, stagnates, and, provided the surface evaporation is not great, forms a pond. Around the borders of this pond various kinds of aquatic plants—sedges, rushes, &c. —soon make their appearance, and, by reproduction, gradually creep in towards the center, until the whole surface becomes covered. In process of time, when several races of these have succeeded one another, and mud and slime have accumulated at the roots and around the decaying stems, a spongy mass results, which is well calculated for the propagation of mosses.

Under a constant supply of moisture, these various species thrive, continue to luxuriate, and, by progressive growth, ultimately give rise to a composition in every respect similar to that constituting the various peat-bogs.

That some such natural process has been the cause of the production of heat, appears from its composition, and the localities in which it is found. These are chiefly in the temperate zones, where evaporation is slow. and the atmosphere is generally more or less saturated with humidity.

It may be conceived, that, in the origin of these formations, the retention of the water, whether from rain or springs, in extensive basins, led at first to the development of vegetal growth in the manner above indicated; and that, the necessary moisture being supplied in abundance, the accumulation became so rapid, that ultimately the surface assumed the appearance of land; and, as decomposition proceeded, a degree of solidity was given to the mass, equal to the support of denser bodies, such as shrubby plants.

It would appear that this organic growth was rarely restricted to the original basin, but that, as it accumulated, it spread over adjacent land, which in time became a morass.

Evidence conclusive of this exists in the fact, that whole forests of almost every description, such as oaks, firs, ash, birch, yew, willow, &c., have been overwhelmed in its gradual but steady advancement, and are found in all positions at the bottom of peat-bogs.

Generally this formation is met with in climates of a moist nature, in level countries, where imperfect natural drainage exists; although it is found in considerable beds in upland districts.

In mountainous districts, in addition to the imperviousness of the rock to the moisture, the constant formation of clouds upon those elevated regions favors the growth of the mosses and plants, the decomposition of which contributes to the increase annually of these deposits.

In America, peat is rarely found in these elevated positions, and then only in small quantities: but in Great Britain, and on the Continent, the deposits are numerous and extensive; and, as a general thing, they are esteemed of superior quality for fuel. Instances of this kind are frequent in Ireland, Scotland, Northern Germany and Holland, while others are found high up the Alps, in the Vosges and in the Jura.

METHODS OF PREPARATION FOR FUEL.

Where peat-bogs abound, and the inhabitants make use of it as fuel for domestic purposes, the process of preparation is very simple, and has varied little, if any, for ages.

The surface layer, or turf, which contains the living plants and their roots in the natural state, is stripped off to the depth of six, nine, or twelve inches.

The material is then cut with a kind of spade known as the slane, which has a blade about eighteen inches long by six inches broad, with a wing on the side, bent upwards at right angles to the blade, so as to form, with the latter, two sides of a square.

With this the peat is cut in long square masses, and laid upon the sward, where it spontaneously loses its water, partly by infiltration into the soil, and partly by evaporation.

After these blocks are partially dried, having been turned at intervals so as to expose the different sides to the sun and air, they are found to be reduced very materially both in size and weight, and to have acquired a good degree of consistency. They are then piled or cobbled up in heaps on the sward, care being taken to dispose them in such manner as will admit of a free circulation of air through the mass; and, after remaining exposed in this manner for some weeks, they are generally removed to some airy place of shelter, where the process of drying may continue, and the fuel be convenient of access when the season arrives for its consumption.

Such is the mode generally adopted, both in this and other countries, when the peat is of sufficient density and elasticity to bear being so handled without breaking.

When, however, the material is brittle, and will not admit of being used in this way, it is dug out with ordinary spades and shovels, and all roots, sticks, stones, and such like bodies, picked out. It is then spread upon the greensward, or, in some cases, upon suitable ground covered with a layer of straw or hay, in a mass, to the depth of eight to eighteen inches, with a breadth of about four or five feet, and to such lengths as may suit the convenience of the laborers. In this condition it is brought to a homogeneous mixture by harrowing, raking, working over with hoes, spades, or other tools, or by the treading of men or animals, until it is of about the consistency of stiff mortar, when the surface and sides are smoothed, and it is left in this state to drain and dry.

After remaining for one, two, or three days, according to the weather, and acquiring a somewhat greater degree of consistency, it is rendered still more compact by beating the surface with shovels, spades, or paddles adapted for the purpose; and in some parts of Europe this is accomplished by treading, which is there mostly done by women and children, who attach flat boards, about six inches broad and twelve to fourteen inches long, to their feet.

By this time the peat has acquired such solidity that it will bear a person's weight upon it without sinking.

The surface is then marked off, or cut by the sharp edge of a board, or a large knife adapted for the purpose, to the depth of one or two inches, into squares; the sides of which are from three to six inches, according to the size desired for the fuel when it shall have been thoroughly dried, and ready for use.

In this condition it is left to dry; and, as evaporation proceeds, the squares contract, the cuttings gradually open down to the bottom, and the mass is separated into blocks of somewhat uniform size, standing on end, and of pyramidal form, the base being still quite moist, and covering nearly the whole surface, while the top, which has been most exposed to air and sun, has contracted, to nearly or quite one-quarter of its original size, and is dry and hard. The blocks are then turned once or twice, in order to give a more uniform exposure; and, at the expiration of a few days of good weather, they are in condition to be removed, and stored for use; care being taken however, that it be in a sheltered but airy location, and that it be not too closely packed; for, notwithstanding it may have the appearance of being quite dry, it will be found to have still retained a very considerable amount of water, and, if too closely packed, is liable to a fermentative process, which injures the quality, and has been known to raise the temperature so high as to cause spontaneous combustion.

RECENT PEAT.

Professor Lyell, in his "Principles of Geology," says,—"It is a curious and well-ascertained fact, that many of the mosses (bogs) of the North of Europe occupy the place of immense forests of pine and oak, which have, many of them, disappeared within the historical era. Such changes are brought about by the fall of trees, and the stagnation of water caused by their trunks and branches obstructing the free drainage of the atmospheric waters, and giving rise to a marsh. In a warm climate, such decayed timber would immediately be removed by insects or by putrefaction; but, in the cold temperature now prevailing in our latitudes, many examples are recorded of marshes originating in this source. Thus, in Mar Forest, in Aberdeenshire, large trunks of Scotch fir, which had fallen from age and decay, were soon immured in peat formed partly out of their perishing leaves and branches, and in part from the growth of other plants. We also learn that the overthrow of a forest by a storm, about the middle of the seventeenth century, gave rise to a peat-moss, near Lochbroom, in Ross-shire, where, in less than half a century after the fall of the trees, the inhabitants dug peat. Dr. Walker mentions a similar change, when, in the year 1756, the whole Wood of Drumlaurig was overset by the wind. Such events explain the occurrence, both in Britain and on the Continent, of mosses where the trees are all broken within two or three feet of the original surface, and where their trunks all lie in the same direction.

"Nothing is more common than the occurrence of buried trees at the bottom of the Irish peat-mosses, as also in most of those of England, France, and Holland; and they have been so often observed with parts of their trunks standing erect, and with their roots fixed to the sub-soil, that no doubt can be entertained of their having generally grown on the spot. They consist, for the most part, of the fir, the oak, and the birch. Where the sub-soil is clay, the remains of oak are the most abundant; where sand is the substratum, fir prevails.

"In the Marsh of Curragh, in the Isle of Man, vast trees are discovered standing firm on their roots, though at the depth of eighteen or twenty feet below the surface. The leaves and fruit of each species are frequently found immersed along with the parent trees; as, for example, the leaves and acorns of the oak, the cones and leaves of the fir, and the nuts of the hazel.

"The durability of pine-wood, which in the Scotch peat-mosses exceeds that of the birch and oak, is due to the great quantity of turpentine which it contains, and which is so abundant that the fir-wood from bogs is used by the country people, in parts of Scotland, in the place of candles. Such resinous plants, observes Dr. Macculloch, as fir, would produce a fatter coal than oak, because the resin itself is converted into bitumen.

"In Hatfield moss, which appears clearly to have been a forest eighteen hundred years ago, fir-trees have been found ninety feet long, and sold for masts and keels of ships: oaks have also been discovered there, above one hundred feet long. The dimensions of an oak from this moss are given in the Philosophical Transactions, No. 275, which must have been larger than any tree now existing in the British dominions.

"In the same moss of Hatfield, as well as in that of Kincardine and several others, Roman roads have been found, covered to the depth of eight feet by peat. All the coins, axes, arms, and other utensils found in British and French mosses, are also Roman; so that a considerable portion of the European peat-bogs are evidently not more ancient than the age of Julius Cæsar: nor can any vestiges of the ancient forest described by that general, along the line of the great Roman way in Britain, be discovered, except in the ruined trunks of trees in peat."

## Correspondence

### Proportion of Power Obtained by the Steam Engine.

MESSRS. EDITORS:—One of your correspondents seems to doubt if there be so much more efficiency in fuel than is obtained from it by the best steam engines. A few figures showing that it is so may, at the same time, suggest to him in what direction to apply his ingenuity to make the fuel more available. Chemists tell us that one pound of carbon completely burned furnishes 14,500 units of heat as they are termed, each of which will raise the temperature of one pound of water one degree, and also that each unit of heat may be converted into force sufficient to raise 772 pounds one foot high. The total energy of the pound of carbon will be 14,500 times 772, or 11,194,000 foot-pounds. A steam engine burning four pounds of coal per horse power per hour furnishes for each pound of coal 495,000 foot-pounds, since it raises 33,000 foot-pounds per minute, and one pound of coal lasts fifteen minutes.

Let us now examine the causes of this great difference in the result obtained in practice and the theoretical one. Charcoal contains about nine-tenths its weight of carbon, anthracite the same, and wood, if dry, one half as an average, so that the quality of the fuel may reduce the effect one half. Next, if the carbon be partly burned into carbonic oxide with six pounds of air to the pound of carbon, instead of being burned into carbonic acid with twelve pounds of air, the number of units of heat obtained from it is reduced from 14,500 down to 4,400.

Another cause of the difference is the quantity of unconsumed air passing through the furnace and thus lessening the volume of gases as it cools them, for if the pound of carbon burned with the proper quantity of air gives off its heat at an estimated intensity of 4,580°, it will have a temperature lowered to 2,440°, if twice as much air is admitted as is required for combustion. Besides these grounds of difference between theoretical and actual effect there is still another very important one. Carnot first pointed out the fact that the effect of an engine using heat depends upon the limits of temperature between which the engine works and not on the nature of the substance conveying the heat: and Rankine on "Prime Movers," page 304, remarks, that the difference between the whole heat absorbed and the whole expansive energy exerted depends on the initial and final conditions of the substance alone and not on the intermediate process. The true path for improvement, therefore, would seem to be in endeavoring to use water or some substance to which a given quantity of heat can be applied at a greater intensity or higher temperature than that at which it is used at present, and to expand it to the ordinary temperature of things around us. M.

Newburgh, N. Y., April 18, 1865.

### Gas for Balloons.

MESSRS EDITORS:—Will you please inform me what kind of gas is the best for inflating balloons—the gas that will lift the greatest weight per cubic foot—and how such gas can be made. I would also like to know if gas would have the same lifting power in a hollow wooden or tin globe as it does in a balloon-shaped receptacle. I would also like to know what weight the lightest gas will lift per cubic foot.

S. S. R.

Petersburg, Ill., April 3, 1865.

[The lightest substance known is hydrogen gas. It is obtained by decomposing water; water being formed by the combination of oxygen and hydrogen in the proportion of 8 lbs. of oxygen to one of hydrogen. Chemical affinities generally change with the temperature. At ordinary temperatures there is no cheap substance for which oxygen has a stronger affinity than it has for hydrogen, but at a red heat it has a stronger affinity for iron, and at a white heat for carbon. Iron is therefore used for decomposing water on a small scale, and carbon on a large scale. If a gun barrel be filled with iron filings and heated red hot, and a stream of water or steam be passed through it, the water will be decomposed, the oxygen combining with the iron, and, the hydrogen being set free, when it takes the gaseous form. On page 280, Vol. III., SCIENTIFIC AMERICAN, new series, we published an illustration of an apparatus employed for decomposing water on a large scale by means of carbon.

Atmospheric air is 14½ times heavier than hydrogen, and 100 cubic inches of air weigh 31·01 grains; hence it would require about 14 cubic inches of hydrogen to raise 1 lb. in the air. The form of the balloon does not affect its buoyancy, but if the material be so heavy as to balance its whole lifting power, of course it will raise nothing else in addition.—EDS.

### FARMERS' CLUB.

The Farmers' Club of the American Institute held its regular weekly meeting at its Room at the Cooper Institute on Tuesday afternoon, April 11, the President, N. C. Ely, Esq., in the chair.

From the several subjects discussed we select the following:

#### WHITE MAPLE SUGAR.

Solon Robinson presented from a correspondent a sample of maple sugar which was nearly as white as the best loaf sugar. A letter accompanying the sample stated that it was made by simply boiling down the sap slowly without any clarifying.

Prof. Mapes explained that if that was the case the result was due to the sugar having been crystalized from low-proof sirup—that is, sirup which was not boiled down to a very concentrated condition. This plan is not economical, as the sirup retains a large portion of the sugar in solution.

His practice of slow boiling is also wasteful. The longer sugar is kept at a high temperature in contact with the atmosphere, the larger the proportion of it which will absorb oxygen and be converted into molasses. The more rapidly sap can be evaporated, therefore, the larger the yield of sugar. The principal advantage of the vacuum pan is to prevent the conversion of the sugar into molasses by oxidation; this it does in two ways—by effecting very rapid evaporation, and by shielding the sirup from contact with the atmosphere.

#### CARBONIZED SHINGLES.

Professor Mapes exhibited some shingles manufactured by Tenney & Bennett, of Hubbardston, Mass., and explained that they were partially carbonized by passing them between red-hot rollers; the object being to render them more durable. The bearings of one roller are pressed down by springs so as to equalize the pressure throughout the length of the shingle. The expense of the operation was stated to be about one dollar per thousand.

#### THE CANKER WORM.

Dr. Trimble read a letter from a correspondent in relation to some insects which were inclosed, and stated that they were specimens of the male and female moth of the canker worm. He remarked, further, that this is the insect which he had spoken of as having been found in the crop of the cedar bird. Unlike other span worms, the chrysalis of the canker worm passes the winter in the ground, and the female being wingless her ascent of the tree is effectually prevented by surrounding the trunk with some impassable obstacle.

#### BLACK KNOTS ON PLUM TREES.

Dr. Trimble also replied to the question of a correspondent in relation to the cause and remedy of the black knots on the plum tree. They are caused by an insect of which there is a large class—the cynips. The effectual remedy is to cut them off when they are first formed, in the month of June. Some people cut them off in the winter or spring, but that has no effect in destroying the insect. These knots are used sometimes by the curculio as a deposit for her eggs before the fruit is sufficiently grown for the purpose. I have hatched numbers of curculios from eggs in these knots.

#### LIGHT MILK BETTER THAN HEAVY.

An article was read from some French *savant* on a new grass, in which it was stated that the grass made better milk than lucern, as shown by the hydrometer, the milk from the new grass being of greater specific gravity than that made from lucern.

Professer Mapes remarked that the richer milk is in cream the lower its specific gravity, cream being lighter than water.

Several other subjects were discussed but none of special interest for our columns.

### Effect of Saleratus on the Teeth.

A correspondent of the *Dental Quarterly* makes the following statement in regard to the effect of saleratus on teeth:—

"I do not think it is generally known how much of this article is used in the community. To satisfy myself, I took the trouble to ask each of the grocers in Portsmouth, how much saleratus and cream of tartar they sold in a year, and the amount of all was—*saleratus*, 50,198 lbs.; *cream of tartar*, 15,100 lbs. Thus over twenty-five tons of the former, and more than seven of the latter, are probably used in Portsmouth and vicinity in a year! Portsmouth has 10,000 inhabitants.

"I subjected a handful of teeth to a strong and warm solution of saleratus, for about fourteen days; the consequence was, they became as brittle as burnt bones. The same time I subjected some to a solution of cream of tartar; the consequence was not the same, but equally, if not more injurious. This also may be called an extreme case, but subjecting them to common water for *fourteen months* would have but little or no effect on them. The saleratus removes the gelatine, the cream of tartar removes the lime, the two principal ingredients of the teeth; and between the two evils the teeth stand a poor chance, and hence the result."

### Hunt's Feed Cutter.

A good feed cutter is a very essential thing on a farm, or, indeed, where cattle of any kind are kept. For some time past one has been standing in our office, which is pronounced by persons using it, whose testimonials have been shown us, to be a perfect thing. It is entirely self-operating, and can be worked by boys or persons of moderate strength with great efficiency. This machine is known as "Hunt's Hoosier Feed Cutter." and an advertisement of it can be seen in the last number of the SCIENTIFIC AMERICAN. A machine can also be seen at this office.

THIRD DENTITION.—In a letter from Brazil to the *Dublin Medical Press*, Dr. Richard de Gumbleton Daunt states that "in this city, Campinas, San Paulo, exists a person (a mulatto girl, with a severe chronic cough, a chronic discharge from the ear, with occasional severe ear ache, but not rachitic) in whom the second set of teeth were shed during convalescence from a fever at the age of 14, and were succeeded by a third dentition, which resulted in as fine and perfect a set of teeth as may anywhere be seen."

EXPORT OF FISH BAIT.—A Boston paper states that the schooner, *M. C. Rowe*, is loading at Gloucester a cargo of some six hundred barrels haddock spawn for France direct. They are used by the French fishermen in the Sardine fishery for bait, and a small number of barrels have been shipped from Boston. It is stated that this is the first fishing schooner from the United States direct with a cargo for the fishermen of France.

As cold articles taken into the stomach, are warmed by the circulation of the blood, and as muscular exercise increases the circulation in every part, it should always be used when any chill is felt at the stomach after taking anything cold.