

Science Familiarly Illustrated.

What is Petroleum?

The crude petroleum of Pennsylvania always issues up out of the earth mixed with inflammable gas. This gas makes an excellent fuel, and is much used for generating steam for the pumping engines. It is abundant enough to run all the engines in the oil district.

If the gas as it issues out of the wells be subjected to pressure or to a temperature of zero, a considerable percentage of it will be condensed into a liquid, the amount condensed being somewhat proportioned to the pressure and cold. Some of it, however, refuses to condense at any pressure and cold which we can command, and such is consequently a permanent gas. That which condenses assumes the form of gas again as soon as the pressure is removed and it is exposed to ordinary temperatures. The change into gas or vapor is very rapid and violent, and in fact is a case of boiling. Some of the volatile liquids will boil on ice!

It is evident from these statements that petroleum gas is in fact a mixture of several gases and vapors, which may be separated from each other by careful management of pressure and cold.

We may likewise demonstrate the fact that the liquid crude petroleum is a mixture of different liquids. The partial separation of these may readily be effected by distillation. The oil which first appears on distillation is very light in gravity and has a low boiling point. As the distillation progresses the gravity and boiling point increase with remarkable regularity; from the beginning to the end there appears to be a constant and regular progression.

The reader is now prepared to apprehend the fact that petroleum is composed of a series of substances having properties which differ from each other only in degree. There is a beginning and an end, or top and bottom of the series, and between them regular gradations of intermediates. The beginning or top of the series is a permanent gas; the bottom or end is a solid. Between these are gradations of consistency, gravity, and volatility.

In an arithmetical or geometrical series there is always a peculiar difference between consecutive members of the series: given one member of the series and that peculiar difference, and the whole series may be determined, or any particular member of it. Is there any such certain and interesting relation between the members of the petroleum series?

The only chemical elements which enter into petroleum are carbon (C) and hydrogen (H). (Water, sulphur, nitrogen, compounds, etc., which are often found in crude petroleum are properly regarded as foreign substances.) Now it is evident that the members of the series must differ by varying proportions of these elements—there must be progressive increase of one over the other.

The beginning of the series has been found to be composed of two atoms of carbon (C₂) with four atoms of hydrogen (H₄); the beginning of the series is represented thus—C₂H₄. Now it happens that this substance C₂H₄ to chemists is a familiar acquaintance. It is commonly known under the name of marsh gas, and is known to coal miners as fire damp. The second member of the series is C₄H₆, and the third is C₆H₈. The reader hardly needs to be told that the fourth is C₈H₁₀, and he is able to determine the twentieth. The common difference of the series is C₂H₂, and the general formula for the series is C_nH_{n+2}.

We append a table showing the specific gravity and boiling point of a part of the series. The first four are gaseous at ordinary temperatures, and the specific gravities are given in comparison with air:—

	Specific gravity.	Boiling point.
1.....C ₂ H ₄	0.554	..
2.....C ₄ H ₆	1.04	..
3.....C ₆ H ₈	1.52	..
4.....C ₈ H ₁₀	2.01	32°
5.....C ₁₀ H ₁₂	.628	86°
6.....C ₁₂ H ₁₄	.669	158°
7.....C ₁₄ H ₁₆	.699	198°
8.....C ₁₆ H ₁₈	.726	243°
9.....C ₁₈ H ₂₀	.747	278°
10.....C ₂₀ H ₂₂	.757	321°
11.....C ₂₂ H ₂₄	.766	359°
12.....C ₂₄ H ₂₆	.766	408°
13.....C ₂₆ H ₂₈	.792	423°
14.....C ₂₈ H ₃₀	.800	460°
15.....C ₃₀ H ₃₂	..	496°
16.....C ₃₂ H ₃₄	..	527°
17.....C ₃₄ H ₃₆	.825	..
25.....Paraffine	.870	..

A National Survey.

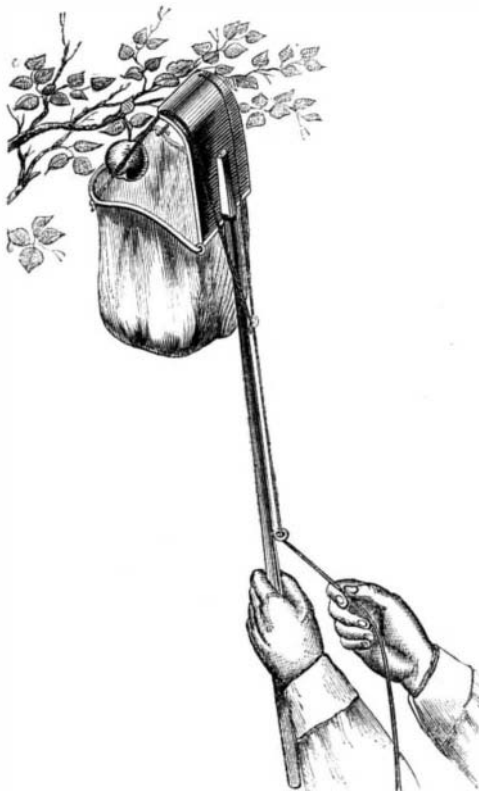
The survey ordered by Congress, under the direction of the Secretary of War, of a belt of land extending from the Rocky Mountains to the Sierra Nevada, on the route of the Central Pacific Railroad, will probably be commenced by the first of July. The exploring party, to which we have already referred, headed by Mr. Clarence King, who has had several years experience as a mountain explorer, in connection with the State Geological Survey of California, has already started for the Pacific Coast. Among the nine assistants, as we learn from the *Nation*, are Mr. James T. Gardner, who has lately been engaged with Mr. King in surveying and mapping the Yo Semite Valley and the adjacent mountain region, as first assistant in topography, and Professor James D. Hague of the Massachusetts Institute of Technology, likewise an experienced traveler, as first assistant in geology. There are also two other topographers, two other geologists, and a zoologist, a botanist and a photographer. On their arrival in California, a squad of twenty-three mounted Californians,

under non-commissioned officers, will be detailed as a military escort, and with six drivers and packers will make up a party of thirty-nine.

The proposed line of exploration extends about 1,000 miles, by 100 broad, from Pyramid Lake, near Virginia City, on the eastern slope of the Sierra Nevada, to Denver City, on the eastern slope of the Rocky Mountains. The party hope to go this year, as far as Fort Riley, and spend the winter in the neighborhood of Virginia City. Next year they hope to reach Salt Lake City, and their work out of doors is to be completed in the third year.

BROWN'S FRUIT GATHERER.

In picking fruit trees the danger of climbing and of ascending ladders detracts much from the pleasure. To be sure "when the pear is ripe it will fall into our hands," if our hands are in the proper position. But in the engraving is shown a very simple fruit gatherer by which one may stand on *terra firma* and exploit the denizens of the orchard. It is merely a bag for the reception of the fruit secured to a pivoted frame of wire, which when the cord is pulled, closes against the edge of a curved plate. The operator holds the staff to which the apparatus is fixed, in one hand and pulls the cord which operates it, with the other



Placing the aperture so as to envelop the fruit, he merely pulls the cord, when the fruit is separated from the branch and drops in the bag. For the picking of fruit designed to keep, much care is required, and those which fall to the ground by the force of the wind or the violent shaking of the tree are almost always more or less injured. In raising fruit for market these injuries are elements of deterioration, and the fruit, whether apples, pears, peaches, or high growing and lasting fruits, should be presented to purchasers in the best possible state.

To secure these results is the design of the inventor, Mr. Wm. Brown, who patented his invention Feb. 5, 1867, and may be addressed at Box 1,021, Worcester, Mass.

TAYLOR AND LAFFERTY'S BROOM HEAD.

Metallic heads by which the broom corn can be attached to the handle are coming into common use. They are economical, although costing somewhat more in the first instance than the common brooms, because the handle and head need not be thrown aside soon as the corn is worn to stubs, but by a simple replacement of the comparatively cheap fiber the worn-out implement becomes again a broom.



The head in the engraving is of sheet metal, fastened at the top to a block through which is a hole for the reception of the handle. The handle tapers to the end, which is received in the socket of the yoke, through which pass two screws on each side of the handle, having on the outside of the case two metal braces for stiffening the box. The broom is introduced into the head, the butts being placed on each side of the central bar or yoke, until the head is filled, while the screws are slackened. These are then screwed up and by compression hold the broom very securely. It makes a light and handy implement.

A patent for this device was issued Sept. 11, 1865, to J. Taylor and R. M. Lafferty. For other information relative to it address J. E. Prutzman & Co., Three Rivers, Mich.

Exposition Notes.

THE LOCOMOTIVE GOLD MEDAL.—A letter in the *Boston Journal* gives the following circumstance connected with the award of the gold medal to the Paterson engine "America." The Austrian and French members of the jury took exception to the "America" because it was so light in some of its parts. But fortunately the English member of the jury is well informed on locomotive engines and American engineering, and he explained that the railroads in America are of an entirely different construction from European roads; that the country is new, and the roads cheaply built, and the ties are subject to displacement from frost; that to ride over rough roads there must be elasticity in the machinery; that American engineers had difficulties to contend with wholly unknown to Europeans; that, taking all things into consideration, the American locomotive was superior to any other in the exhibition. His arguments were so convincing that the other jurors gave way and awarded the gold medal to the "America." This is a great triumph, and it has been achieved through the intelligence and honesty of the English juror.

AMONG the models, Thomas Dunn, of Manchester, illustrates a mode of erecting a steel bridge, by weaving straight bars into a self-supporting structure progressing from the shore, without supports or scaffolding.

A PARIS firm exhibit a machine automatically cutting, jointing, punching, countersinking and finishing sixty brass hinges per minute from the sheet metal.—Another Paris machine cuts cylindrical lucifer matches, ready for dipping, at the rate of one or two boxes per second. It consists of a slide carrying a row of parallel cutting tubes, made of a solid piece of steel, oscillating very rapidly, and cutting a row of matches at each stroke from the surface of a block of the proper length. A series of cutters on the same slide multiply the production to any desired extent.

THE English Society of Arts have made a handsome appropriation, and appeal to the public for funds, to aid artisans to visit the Exposition: a portion of the allowance being payable on the reception and approval of a report upon some object exhibited relating to the art or craft of the workman. The Lords of the Committee on Education have also proposed an allowance of \$25 toward the expenses of any master engaged in schools of science and art under their direction, who may wish to visit the Exposition, coupled with a condition similar to the above, and with the addition of prizes of \$100, \$75 and \$50 respectively for the best three reports in each department (science and art).

T. LABAT, of Bordeaux, exhibits a patent slip for drawing a ship out of water, consisting of a cradle horizontal on its upper surface, whereon the ship rests and thus retains her natural position, but with the under side parallel to the incline of the ways on which the whole is drawn out of the water. It runs on wheels traveling ten pairs of rails, and is drawn out of water with its load by ten long screws.

THE French Government exhibits a model of a submarine torpedo boat, propelled with a screw by compressed air. The roof is recessed to receive a small boat with a water-tight deck and manholes in its deck and bottom, and there is also an intermediate chamber, with manholes, beneath the recess in which the boat rests and having a water-tight connection with the boat: so that ingress and egress for the crew of the submarine vessel are practicable in comparatively rough water.

THE "CARRÉ" FREEZING APPARATUS has been set up in the park, to supply ice for the restaurants. It consists of a sort of boiler, in which ammonia is volatilized by heat until it reaches a pressure of five or six hundred pounds to the square inch, and by its sudden emission produces intense cold.

AMONG the outside objects is a chime of forty-three fine bells, weighing from 40 to 5,000 lbs. each, made for the cathedral at Buffalo, N. Y. The tunes are played by a great organ barrel, 4½x6½ feet, and pierced for 6,000 pins, with which a great variety of airs can be set, the musical machine being actuated by a 2,500-lb. clock weight.

BREVAL'S TAN PRESS, which is on exhibition, is said to be capable of extracting instantaneously about 60 per cent of liquor from the bark, and of getting through with about 66 cubic feet of bark in an hour and a half, employing one horse-power.

A STEAM DRYING DRUM for cotton goods, by Turpin, of Rouen, is readily adapted to any width of cloths, from three to six quarters, and dries 600 yards per hour.

THE Industrial School of Tournay sends to the Exposition a pair of vertical engines, about 20 horse-power, the designs, patterns, castings, and the workmanship throughout, made by the boys of the school, who are from 16 to 20 years of age. It is felt that this visible illustration of itself gives a strong impulse to the idea of industrial schools in every country in Europe—we hope it will in America.

PARISIAN working hours are remarkably early—two or three hours earlier even than the English, it is said—and hence the day's work is done and the population are in the streets, gaily enjoying themselves, at an hour in the afternoon which in other countries is as busy and humdrum as any other in the day.

THE Lords of the Council on education have made arrangements for the conversion of the Museum of Irish Industry in Dublin into a College of Science. It will have ten professorships, seven of which already exist.