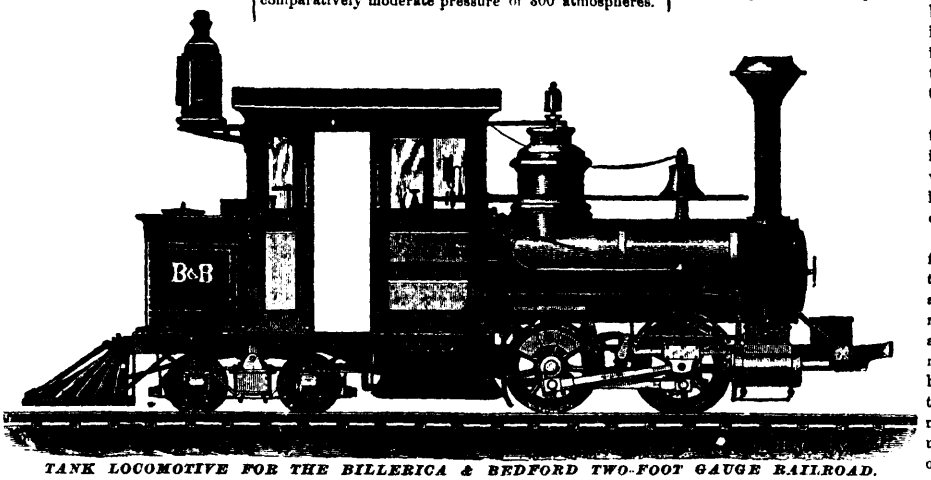
SPONTANEOUS GENERATION.—An interesting series of experiments has been conducted in London, says the *Polytechnic Review*, to decide the question of spontaneous generation; that is to say whether vegetable or animal life can start into existence itself or whether all life is but the perpetuation of life already existing. Prof. Tyndall declarge the question "practically set at rest for the scientific world" in the negative. His last experiment was on the Alps, he took with him from London, packed in sawdust, 60 flasks containing infusions of animal and vegetable matter, boiled to destroy all living organisms and sealed while the fluid was still in ebullition. The necks of six of the flasks were broken by accident, and were found filled with organisms. The other 50 remained for six weeks perfectly clear and pellucid. Twenty-three of the flasks were then opened in a hay loft. The other 27 were opened at a high elevation, and on the edge of a precipice, where the air was absolutely pure and free from "spores." The two groups were then placed in a warm kitchen. The 27 flasks opened out of doors remained pure, and without any indication of microscopic life. Of the 23 opened in the hay loft 21 were instinct with life, and filled with darting, dancing minute forms. Two of the 23 remained clear.

Important Improvement in Locomotives.

On some of the narrow-gauge railroads several additional improvements have been lately introduced. Thus on the Billerica & Bedford two-foot gauge railroad locomotives are used, built by the Hinkley Locomotive Works of Boston, in which the engineer, with his cab, coal, and water tank, is in front, just behind the cow-catcher, while the smoke-stack is behind. We represent such a locomotive in the adjoined engraving, and will here give the advantages claimed for this new, peculiar, and thus far entirely unusual arrangement.



TANK LOCOMOTIVE FOR THE BILLERICA & BEDFORD TWO-FOOT GAUGE RAILROAD.

It is claimed that with the chimney behind and next to the car, the smoke and gas from the fire are thrown up above the train, and consequently do not enter the cars so much as they do when the chimney is in front. The reason for this is that the cab, in moving rapidly through the air, creates a partial vacuum behind it, to which the surrounding air has a tendency to flow, and when the chimney is in front the escaping gas and smoke from the top of it are drawn to this vacuum, which is in front of the first car. When the chimney is next to the car this does not occur, or, at least, not to nearly the same degree, because the smoke then escapes behind this rarefied air produced by the movement of the cab, and consequently the car, as it were, runs under the escaping gases, which are then drawn toward the partial vacuum formed behind the last car of the train. Mr. Mansfield, the General Manager of the Billerica & Bedford railroad, writes: "We find that our smoke-stacks, being near to the car, there is no vacuum, and all cinders are thrown over the train, so that the passengers receive none."

In the next place, the truck being some distance forward of the fire-box, the position of the engineer and fireman is necessarily between the truck and the driving-wheels, which is the steadiest part of the locomotive, and therefore the most comfortable place to ride; and as there is no flexible joint in the frame between the boiler and the tank, as between ordinary engines and tenders, the cab can be shut up in cold or stormy weather, affording complete protection to the engineer and fireman. In summer the motion of the locomotive carries the hot air from the boiler *out* of the cab instead of into it, as is the case when the boiler is in front. The cab is thus warmer in winter and cooler in summer. Reversing the position and motion of the boiler necessarily brings the cab in front, and the dome and smoke-stack behind it. This leaves a perfectly unobstructed view of the track in front, and the smoke and escape steam are behind the engineer, and therefore will not obscure the objects in front of him.

New Discoveries in the Liquefaction of Gases.

Of the thirty-six substances gaseous at the common temperature, thirty have been liquefied by cold or pressures, or both, while six had thus far resisted all attempts to liquefy them. These six gases are the elements oxygen, nitrogen and hydrogen, and the compounds carbonous oxid, nitric dioxid, and light carburetted hydrogen; and this is the statement found thus far in the text-books of chemistry, while some mention that these gases have been submitted to pressures of 1,000 atmospheres, (15,000 pounds to the square inch), and even more, without showing any sign of impending liquefaction.

Now however we see it reported in the scientific papers that Mr. Raval Pietch, of Geneva, Switzerland, has succeeded in liquefying oxygen by the combined effect of the most intense cold he could produce and the comparatively moderate pressure of 300 atmospheres. The cold he produces by the evaporation in vacuo of solidified carbonic acid, which, as well known, can be liquefied at a temperature of 85° below zero Fah. by a pressure of 6 atmospheres. If this liquid is allowed to evaporate in the air, by being suddenly relieved of the pressure under which it was formed, the escaping vapor will absorb so much heat as to freeze the remnant and cause its temperature to descend quite low, and lower still if this evaporation is accomplished in a vacuum. In a tube containing thus solidified carbonic acid gas, is placed a much narrower tube, through which oxygen is passed. This oxygen is developed in a cylindrical-shaped generator with spheroidal ends, which can stand a pressure of 800 atmospheres. It is made in the usual way by decomposing chlorate of potash by heat, and the pressure obtained is due to the forcible development of the gas, in the same way as carbonic acid is liquefied by the pressure developed by its evolution when bicarbonate of soda is acted upon by sulphuric acid in a hermetically closed strong vessel. The oxygen thus compressed to 320 atmospheres, and passing under that pressure through the narrow tube lying in the solidified carbonic acid while it is evaporated in vacuo and cooled to 220° below zero Fah., liquefies, and a jet of the liquefied oxygen was seen spurting out from the narrow tube the moment the stop-cock at its end was opened.

It is also stated that Mr. Cailletet liquefied nitric dioxid and carbonous oxid in a similar manner.

When further details reach us, we will communicate more about this discovery to our readers, which certainly is important, not only theoretically, demonstrating as it does the general law that all gases are vapors from liquids or solids, but also practically, as never any great chemical discovery has been made which did not sooner or later bare useful fruits.

A JAPANESE DIRECTORY.—Prof. Edward S. Morse, now of the University of Japan, in lecturing about the Japanese in Cambridge, the other evening, praised their diet of grasshoppers as extremely palatable. He described the city directory of Tokio as a much more poetical volume than people are accustomed to think directories can be; it contains, besides the names of streets and business places, the localities of pleasant walks about the city, with directions where "sweet singing insects" can be heard, the best place to see fireflies and tinted foliage, etc.

Elastic Soapstone Roofing.

Nine years ago a roof was laid of what was then a newly introduced material, called elastic soapstone, upon the roof of the South Grammar School in Manchester, N. H. This roof has not since been touched, and is still in the most perfect condition. This compound had then just been patented, and has since been most extensively employed in several localities, giving the utmost satisfaction.

The claims made for this kind of roofing, are, that it is cheaper than any other, durable, and handsome; that it will not run or crack, being unaffected by heat or cold, is perfectly water-proof, and will not take fire by sparks, and that it is quite light, being only one-fifth the weight of the tar and gravel roofs.

Among the practical advantages, important to the workmen who lay it, is that it is so easily applied, and can be used on the flattest as well as the steepest roofs, and this with no more trouble than a common tarred roofing; that it can be put over old tin, while the material can be used as a superior or cement, being very adhesive in its nature. The advantages to the occupants of a house with such a roof are: Perfect reliability, absence of disagreeable smell; it does not alter the color or purity of the rain-water passing over it; it forms an excellent walk, superior to anything else, while if it is desired to paint it, it can be painted any color.

We have before us numerous testimonials signed by hundreds of parties who have this material in use, and all unite in the expression of their fullest satisfaction with the same. Among the largest roofs covered with this material we may mention that of the Renfrew Manufacturing Co., of South Adams, Mass., where 58,000 square feet have been covered.

The material is also very well adapted for the lining of cisterns, being much cheaper than lead or zinc, and far better in a sanitary point of view. While metals oxidize and dissolve in smaller or larger quantities in the water contained in the cistern, according to the quality of the water, this material is absolutely insoluble, and unaffected by any kind of water. Recently a large water tank on the Albemarle Hotel in New York city, was lined with this material, and is of course perfectly tight, while the water is kept pure, rendering it adaptable for drinking purposes. We ought to add that the cost was only about one tenth of what would have been the cost of a lining of sheet-lead.