mechanics, as the asteroids are too numerous to be symbolically arranged. Any one desirous of pursuing the subject further can consult the works of Long, Lalande, or Von Humboldt, where they will find much curious and interesting information on this subject.—*La Nature.*

The Angora Goat.

Mr. Joseph P. Devine, a stock raiser in Texas, writes as follows to the National Association of Wool Manufacturers, Boston, Mass.:

There are millions of acres of rocky, hilly undergrowth of live oak in Western Texas and other States also, that will not support one sheep to twenty acres, one cow to forty acres, or one horse to fifty acres; in other words, that are utterly worthless for any use on God's green earth except for goats. Now if there is a good and sure sale for mohair, there is no doubt but the common goat can be made to produce, in five or six removes, a fleece equal nearly to any pure blood hair in luster and length, and in weight far more, by breeding from a pure bred billy every time and always. To sum up the advantages of goats over other stock, they can be herded with perfect safety and to advantage in flocks of 2,000; for I now have one herd of 2,050 graded Angoras, herded by one Mexican. They can be located in summer eight miles from their watering place, and drink once in three days, returning to camp same day—a great item in this dry country; they can be raised and thrive best on land worth fifteen to twenty-five cents per acre; they are subject to no disease whatever, that I know of; they will protect themselves, that is the grown, against wolves or dogs; and last, but not least, they come home five times in six, if lost on the range. Then there is not a more agreeable or pretty pursuit in the world than raising Angora goats. That you may not think I am too partial to Angoras, allow me to say I am breeding cattle, horses, and have 3,400 head of Merino ewes; and if I had a little more encouragement as to the future of the Angora, namely, regular sale and fair price for hair of first quality, I would, if forced to give up all my interest in stock except one, keep my pretty, intelligent, and valuable Angoras; and let sheep, hogs, etc., go to grass.

Trout Breeding.

Any person in possession of a spring producing a supply through the year of from one to one hundred square inches of pure water may grow, with right appurtenances and requisite knowledge and care, from 6,000 to 60,000 trout in one year, worth, at present prices for stocking ponds and streams, $100 per 1,000, or 500 to 50,000 to weigh a pound each, worth $1 per pound. The first thing necessary in trout culture is the construction of a pond, which must be fed by pure spring water, and must be kept clear and fresh. It is essential to the preservation of the trout that the temperature of the water be preserved at from 40° to 50°. The success attendant upon the culture of trout is instanced in the establishments of Seth Green, Livingston Stone, and other noted fish culturists, who realize large profits from this source.—*Sea World.*

Fires and Firemen in London.

The report of the Chief of the London Fire Brigade reports 2,376 calls for the year 1881. Of these 240 were false alarms, 145 proved to be only chimney alarms, and 1,991 were calls for fires, of which 157 resulted in serious damage and 1,824 in slight damage. The fires of 1881 compared with those of 1880 show an increase of 120, and compared with the average of the last ten years an increase of 351. The number of fires in the metropolis in which life was seriously endangered was 107, and the number in which life was lost 29. The number of persons seriously endangered by fire was 154, of whom 114 were saved and 40 lost their lives. The number of journeys made by the fire-engines of the fifty-three land stations was 28,441, and the total distance run 62,904 miles. The quantity of water used for extinguishing fires was 17,232,682 gallons. or about 76,931 tons. The strength of the brigade at present is as follows: 53 land fire-engine stations, 11 movable land stations, 121 fire-escape stations, 4 floating stations, 3 large land steam fire-engines, 35 small land steam fire-engines, 78 six-inch manual fire-engines, 37 under six-inch manual fire engines, 137 fire-escapes and long scaling ladders, 3 floating steam fire-engines, 2 steam-tugs, 4 barges, 29 hose-carts, 15 vans, 2 trollies, 53 telegraph lines, 7 telephone lines, 7 fire alarm circuits with 44 call points, 536 firemen, including chief officer, second officer, superintendents, and all ranks. The report states that the fire-alarm circuits have been of great service, though the men are often harassed by false alarms through them.

The Highest Railway Bridge in the World.

The Erie Railway extension from Bradford to Johnsonbury, Pa., crosses the deep valley of the Kinzua Creek about thirteen miles from Bradford. Here the company are building a bridge which, when completed, will be the highest railway bridge in the world. The bridge will be somewhat over 2,000 feet long, and will consist of twenty-three spans of 60 feet each, resting on piers of stone and iron. The greatest depth of the valley at the point of crossing is 300 feet. The piers will be 40 feet long and 110 feet wide at the base, tapering to a width of 12 feet at the top. The iron work will weigh 2,500 tons, and the masonry will measure 2,200 cubic yards. It is expected that the work will be completed by June, 1882, at a cost not far from $300,000.

It is claimed that this is the highest bridge in the world resting on piers. The Kentucky River bridge is 276 feet high, the Great Peruvian Railway bridge is 235 feet, the Portage bridge, on the Erie's main line, is 234 feet, and the Niagara suspension bridge is 275 feet.

MISCELLANEOUS INVENTIONS.

Mr. George H. Beck, of New York city, has patented an improved apparatus for spreading varnish, paint, etc., in a uniform layer, for the purpose of facilitating applying the varnish or paint on the printing surface of the blocks used in printing hand-made wall papers. The invention consists in an endless belt or apron passing over suitable rollers and over a vertically adjustable cushion box, which is combined with mechanism for raising it when the machine stops, so that the wall paper printing blocks can be placed on this apron for the purpose of transferring some of the varnish spread on the apron by a spreading roller (dipping into a varnish box) upon this wall paper printing block.

Mr. Charles H. Henderson, of Philadelphia, Pa., has patented an improved waste water pail provided with a convex lid resting on a series of brackets projecting from the inner surface of the pail and united by a wire, this lid being so much smaller than the pail that an annular space will be formed between the edge of the lid and the inside of the pail; through this annular space the water flows and then runs down on the inside of the pail without dripping or splashing.

In hydraulic rams as ordinarily made it is difficult to adjust the valve screw with delicacy, and, furthermore, the constant pulsation or jar of the outlet valve tends to " back out " the screw, so that the tension of the spring is reduced and the effective working of the valve interfered with. Mr. Henry F. Morrow, of Chester, Pa., has patented an improvement in hydraulic rams which obviates this difficulty. In horizontal hydraulic rams of ordinary construction air accumulates in the air chamber until the water with difficulty gets access thereto, and consequently the ram labors in its work and does not operate effectively. To remedy this defect an open tube is introduced down through the top of the air chamber to a little below the water level therein. This tube serves as the water discharge pipe, as well as to prevent the excessive accumulation of air in the chamber.

An improved sash-fastening device, which can be easily applied to window sashes, has been patented by Mr. Silas G. Austin, of Boston, Mass. The construction of this fastener is such that it can be readily fixed to two light sashes opposite their center vertical dividing rails, in which position a sash fastener properly belongs to preserve the symmetrical appearance of the window; and instead of fixing a locking plate to the upper face of the meeting rail of the upper sash by small screws, which may be easily forced off, the construction of this fastener is such as to admit fastening it to the face of the meeting rail with such large and strongly holding screws that any attempt to force it off by prying up the lower sash would most likely demolish the glass in the sash and alarm the occupants of the house.

Mr. John F. Petri, of Midland Park, N. J., has patented a coupling by means of which wires can be joined more expeditiously and with less labor and expenditure of force than by the usual method of twisting them about each other. The invention consists in coupling the wires by means of a semi-cylindrical metallic plate having two radial holes to receive the bent ends of the wires. The wires, having their ends bent at right angles, are laid in the plate with their ends entered into the holes therein, and the said plate is then, by means of a hand vise or other suitable tool, clasped tightly about the wires, so as to form a closed sleeve about the point of union.

An improved combined hoe and cutter has been patented by Mr. Parrott M. Hardy, of Aurora, N. C. When the implement is to be used for cutting purposes the blade is to be detached from the end of the handle, which is easily done by simply partially removing a pin and sliding or tipping the blade forward and placing it upon the side of the handle; in this position pins projecting from the handle fit into the notches in the upright sides of the blade, and serve to hold the blade in place.

An improved safety attachment for elevators has been patented by Mr. Frank T. Ward, of New York city. This inventor employs a toothed eccentric held out of engagement with the rack, when in its normal position, but is released when the rope on the elevator car breaks.

The Explorer Leichhardt's Journals.

There seems to be no reason for doubting the reported discovery by Skuthorpe of the journals of the explorer Leichhardt, who lost his life in Eastern Australia many years ago. Baron Müller, of Melbourne, who for more than thirty years has been an ardent promoter of the search for the relics of Leichhardt's expedition, writes to Dr. Behm, at Gotha, that Skuthorpe probably continued Hume's routes until he successfully reached the most western stations in the interior of Eastern Australia. Here he found the journals of Leichhardt and Classen, and gained possession of them in return for a small present to the holders. Both journals are said to be in English and well preserved. Classen confirms the report of Hume's nine weeks' stay with him, and records how the expedition suffered terribly from want of water. He was sent by Leichhardt in search of water, and on his return, two days later, he found Leichhardt dead. Afterwards Classen fell into the hands of the aborigines, who carefully watched him. Once he attempted flight, but was brought back and severely beaten. In 1877 Classen felt death approaching. He revisited the place where Leichhardt's journal, enveloped in leather, was hidden, and added to it part of his own journal.

Proposed New Patent Department.

To the Editor of the Scientific American:

The bill Mr. Phelps presented December 13, 1881, is calculated to supply a desideratum long felt and not disputed by those best qualified to form an opinion. It is substantially what has been recommended to the consideration of Congress by almost every succeeding Commissioner of Patents and repeatedly urged by you, and is, in brief, simply a permission to the one self-supporting bureau to extend its revenue on means, perfectly understood and defined, for the proper administration of its duties. One of the most important of these means is a completely indexed digest of industrial art. With such a repository at their disposal inventors (who constitute the principal contributors to the fund), would be able to concentrate their energies on untrodden fields of discovery, by informing themselves of what others had already accomplished. Manufacturers and users of machinery could at a glance, so to speak, inform themselves of the best appliances. The community at large, which is the chief beneficiary of invention, would in this simple act of justice be largely benefited by the increased discrimination exercised in patent grants. G. H. KNIGHT.

Cincinnati, January 30, 1882.

Rapid Growth of New York.

The annual report of the City Inspector of Buildings shows that during the past year plans for 2,682 buildings, to cost $43,391,300, were filed at the Building Bureau. In 1880 the number of new buildings erected was 2,252, at a cost of $29,115,335. There were more buildings erected last year, and their estimated cost was greater than in any previous year.

Of last year's buildings, 940 were dwellings, whose estimated cost was $12,521,500; 356 were flats, costing $8,080,480; 808 were tenements, costing $8,284,100; 8 were hotels, costing $923,700; 123 were stores, costing $3,643,500; 23 were to be used for office purposes, costing $4,453,500; 116 were factories, costing $1,723,935; 13 were places of amusement, costing $1,196,300; 6 were churches, whose aggregate cost was $316,000. and 6 were school houses, that were to cost $217,000. One thousand four hundred and ninety-seven plans for alteration of existing buildings, at a cost of $4,142,070, were filed. Two thousand two hundred and twenty-five buildings were found to be unsafe, and 2,229 were either pulled down for this cause or strengthened.

Self-Acting Fire Apparatus.

Prof. Obernien proposes the following ingenious and simple arrangement for theaters: Cords of hemp are stretched from left to right across the upper part of the entire space above the stage. They are fixed at one side, and on the other they pass over pulleys, and are kept tight by means of weights which are surrounded with cases. Perpendicularly under the weights, at the bottom of the cases, is a button, which, if pressed downward, closes the circuit of a powerful battery. If a flame rises up it catches and ruptures one of these threads, when the weight falls in the same moment upon the button and closes the battery. The results are: 1, a telegraphic message to the nearest station of the fire brigade; 2, a fireproof curtain is let down by a mechanism set in motion by a suitably arranged electro magnet; 3, an electro-magnet opens a large ventilator in the roof above the stage for the escape of the flames and smoke; and 4, a reservoir is opened which lays the stage under water.—*Chemiker Zeitung.*

Tan Bark for Exportation.

The demand for tan bark in Europe is urgent, but the price is not sufficient to make the exportation of bark in bulk profitable. It is now proposed to grind and compress the bark where it is abundant, and ship it in kegs or half barrels. For this work a steamer has been built on the Ohio, to be used on the upper waters of the Tennessee River, along whose shores tan bark is plentiful and cheap. The steamer carries special machinery for grinding and compressing the bark.

The St. Lawrence Tunnel.

The railway tunnel under the St. Lawrence at Montreal, Canada, is to have the following dimensions: Entire length, about 21,700 feet; open cuttings on Hochelaga side, 2,500 feet, and on the Longueuil side, 4,220 feet; actual length of tunnel proper, 14,980 feet. It is to be 26 feet wide inside and 23 feet high. It will be lined with brick masonry throughout, except the fronts, which will have façades of stone. The arch will vary from 20 to 30 inches in thickness, according to the character of the ground to be supported.

Discovery of a New Constituent of the Blood.

The discovery of a new and important constituent of the mammalian blood has, says the London *Lancet*, just been announced by a distinguished investigator of blood formation—Professor Bizzozero, of Turin. This new element is not the same as the invisible corpuscle of Norris, but presents nevertheless somewhat similar characters. If the course of the circulation is watched in the small vessels in the mesentery of chloralized rabbits and guinea pigs, there are seen, besides the ordinary red and pale corpuscles, third elements—very pale, oval, or round disk-shaped or lenticular bodies, one-half or one-third the diameter of the red corpuscles, among which they are scattered. "Blutplattchen," Bizzozero proposes to call them. They have hitherto escaped notice, probably because they are so colorless and translucent, less numerous than the red, and less visible than the white corpuscles; and on account of the difficulty of observing the mammalian blood in the course of the circulation with a high magnifying power. They are to be observed also in freshly drawn blood, for the most part aggregated around the colorless corpuscles, or, ascending to the upper layer, they adhere to the cover glass. They change, however, with great rapidity, rapidly become granular, and appear to be the source of the small granule masses which have been described by many observers. The corpuscles can be preserved unaltered in form for more prolonged examination by certain reagents, as, for instance, by a solution of chloride of sodium tinted with methyl-violet. They are to be found also in human blood, but they undergo alterations with extreme rapidity, and the best method of observing them has been found to be by placing a drop of the above solution over the puncture, and then squeezing the blood out, and immediately examining it under the microscope.

Bizzozero has been unable as yet to ascertain anything regarding the origin of these elements. It is exceedingly improbable that they are in any way derived from the ordinary colorless corpuscles, because they possess a very definite and characteristic form, and the leucocytes contain no element from which these objects could be derived. A comparison between the blood in the vessels and out of the body thus clears up the origin of the granule heaps, which some regard as products of the destruction of leucocytes, and others, as Hayem, ascribe to changes in peculiar flat corpuscles. The latter view is undoubtedly correct, although Hayem does not seem to have observed these elements in the circulating blood, since he describes them as biconcave disks which are transformed into red corpuscles, and calls them "hæmatoblasts." The objects regarded by Bizzozero as the source of the granules possess no stroma, and never contain hæmoglobin; they differ therefore from the hæmatoblasts of Hayem.

The new elements seem to play an important part in the functional alterations of the blood. They are increased in certain morbid conditions—as, for instance, after bleeding—and play an important part in the production of thrombi, They constitute the chief part of the white clots in the mammalia, since they give rise to the granular material which is seen between the pale corpuscles, and which has hitherto been ascribed to the degeneration of fibrin. In the process of coagulation these elements appear to exert the influence which has been attributed by Mantegazza and Schmidt to the colorless corpuscles. Schultz, Ranvier, Hayem, and others, have noted that the reticulated threads of fibrin often present at their junction these groups of granules, and hence inferred that the latter were produced by the degeneration of the fibrin. Hayem, however, found that certain fluids which hinder coagulation preserve unchanged the form of his "hæmatoblasts." It will also be remembered that A. Schmidt asserted that the coagulation of the blood is effected by the white corpuscles, which by their destruction yield the granules, and so constitute a considerable part of the substance of the clot. Bizzezero, however, now urges that the formation of the clot is due not to the white corpuscles, but to these new elements. He has never been able to satisfy himself of the wholesale destruction of white corpuscles assumed by Schmidt. Leucocytes are comparatively few in the circulating blood, and he could never observe any destruction of them after the blood was drawn, provided it was mixed with an indifferent fluid, such as a saline solution. The time at which coagulation occurs in a given drop of blood corresponds closely to that at which these new elements present the degenerative changes. The fluids which retard or prevent coagulation—solutions of carbonate of soda or of sulphate of magnesia, for instance—also hinder the granular transformation of the new corpuscles. The indifferent solution of chloride of sodium does not preserve them, but one to which methyl-violet has been added does so. With the former the blood coagulates in a quarter of an hour, with the latter it remains liquid for twenty-four hours. If a vessel of a living animal is included between two ligatures, the blood within it remains liquid for hours, and during the whole time these elements preserve their characteristic form, although in blood outside the vessels they undergo degeneration in a few minutes. If blood is "whipped" and the fibers employed are withdrawn before coagulation commences, and are then immersed in a liquid capable of preserving the new elements unaltered, it will be found that they are covered with a thick layer of the new elements, among which are very few white corpuscles. If the whipping has been continued longer, these elements are found to have undergone degeneration and to remain on the layer of fibrin. From these facts it follows that whereas the ordinary white blood corpuscles present no noteworthy changes at the commencement of coagulation, these new elements are considerably altered, and where they adhere, there the fibrin is deposited, and, finally, that all agents which hinder their transformation retard also the coagulation of the blood. The evidence is thus very strong that this coagulation—that is, the formation of fibrin—takes place under the direct influence of these corpuscles.

Action of Coffee and Sugar in Digestion.

M. Leuen makes a report before the Paris Biological Society of the effects of these articles of food, in connection with Dr. Semerie. There is great diversity of opinion on these subjects. Some, as Trousseau and Pidoux, consider coffee an excellent digestive. Others, on the contrary, consider it very injurious.

M. Leuen thus writes: He mixed 30 grammes of coffee in 150 grammes of water, for a dog, which is killed three hours after. The mucous membrane of the stomach is found pale, discolored, and profoundly anæmic. The vessels on the internal surface, as well as those in the periphery, are contracted. There remains 145 grammes of the mixture undigested, and the stomach digestion dimiuished, because the contraction of the vessels, and the consequent anæmic condition of the mucous membrane, prevent the secretion of the gastric juice. The abuse of coffee will produce dyspepsia. Thus the English and the Dutch, who drink freely both of tea and coffee, are very dyspeptic. Coffee increases the cerebral functions, an effect useful, agreeable, and innocuous.

Sugar has been denounced by modern chemists as a substance whose effects on dyspeptics are deplorable.

Dr. Leuen does not partake of these fears. He cites the case of a dyspeptic doctor, who for twenty years had a terror of sugar, but who now consumes 120 grammes (3¾ oz.) of sugar daily, without inconvenience. He followed similar experiments with sugar. A dog ate 80 grains of sugar with 200 of other food. Six hours afterwards its stomach showed little food. The mucous lining of the stomach was red and highly congested. The congestion of the liver was notable. If one opens an animal after eating 200 grains of food and no sugar, 90 to 100 grammes of food is undigested. Sugar, then, favors the secretion of the gastric juice. Coffee sweetened loses part of its defects.—*Le Medecin Practicien.*

Changes Accompanying the Ripening of Certain Plants.

BY P. P. DEHERAIN AND BREAL.

Deherain explains the loss in weight of dry matter which occurs during the maturation of the seed in the cereals and other plants. The formation of the seed involves the transport of carbohydrates and nitrogenous bodies from one part of the plant, to be afterwards stored up in another part. In the case of the carbohydrates, this transport does not necessitate any loss in weight, since they exist in the form of reserve materials (starch, etc.), which take no active part in the phenomena of growth. But in the transport of nitrogenous bodies a certain quantity of protoplasm has to disappear from the living cells in the form of asparagine, to reappear in the seed as legumin, glutin, etc. Assimilation then ceases in the cells thus deprived of protoplasm, but oxidation still goes on, and thus a loss of weight is produced. The authors distinguish three cases. In those plants which flower rapidly and bear simultaneously a large number of flowers in proportion to the size of the plant (*Sinapis nigra, Colinsia bicolor*), there is always a loss in weight of dry matter; assimilation suddenly ceases throughout a large portion of the plant, but oxidation still goes on. In plants which do not produce many flowers at once, nor in too great proportion to the leaves, ripening is accompanied with only a temporary loss of weight; a sufficient number of chlorophyl granules remain intact to carry on the work of assimilation, which proceeds with renewed vigor after the seeds have ripened (*Eschscholtzia californica, Delphinium ajacis*). When the flowers are very few and the leaves numerous (*Papavera somniferum, Hesperis maritima, Silene pendula*), the dry matter increases in weight during the ripening of the seed.—*Jour. Chem. Soc.*

Permanent Magnetism of Steel at Different Temperatures.

The steel rods were cylindrical, and passed in a vertical direction through an induction coil. The influence of the earth was evanescent. In order to assume the permanent magnetism corresponding to a certain temperature, the rod requires a somewhat longer time for cooling than for heating. The greater the total decrease of the magnetism, the longer are these times. The number of the successively following heatings and coolings by which the rod is brought to a permanent condition is about proportional to the permanent decrease of the initial magnetism. The greatest loss is between 170°-200° C. Every shock effects a decrease of magnetism when the rod is hot. After repeated agitations and heatings the rod undergoes no permanent changes. The distribution of the magnetism was likewise examined in long rods, according to the methods of Van Rees. In his formula for the moment, M, at points distant, x, from the end, $M = a\,(1 + k^{-1} - k^{-x} - k^{(1-x)})\,l\,x$, where l denotes the length of rods and a and k are constants, it appeared that under certain circumstances k is constant at all temperatures for the same magnet, while a varies with the temper ature. Jamin found a depend merely on the nature of the rod. Below 180° C. the distribution of the magnetism varies no longer; *i. e.*, the value of k remains constant, and the neutral line lies always in the middle of the rods. Above 180° C. the same thing takes place if the rod has been repeatedly heated before being magnetized. But if it has been magnetized before the heatings and coolings, k varies with the temperature, and the neutral line is displaced towards the north pole, so that austral magnetism extends over two-thirds of the rod.—*G. Poloni, in Wiedemann's Beiblätter.*

How to Make Brick Walls Water-tight.

The Sylvester process was successfully applied to the interior walls of the gate houses of the Croton reservoir in the Central Park in this city, in 1863, on the advice of the late William Dearborn, C. E., and under the immediate supervision of George S. Greene, Jr., C. E., now the Engineer in Chief of the Department of Docks.

The process and its results in this case are described fully by Mr. Dearborn in a paper read by him before the American Society of Civil Engineers, May 4, 1870.

The process consists in using two washes or solutions. The first composed of three-quarters of a pound of castile soap dissolved in one gallon of water, laid on at boiling heat with a flat brush. When this has dried, twenty-four hours later apply in like manner the second wash of half a pound of alum dissolved in four gallons of water. The temperature of this when applied should be 60° to 70° Fahr. After twenty-four hours apply another soap wash, and so on alternately until four coats of each have been put on. Experiments showed that this was sufficient to make the wall water-tight under forty feet head of water.

At the time of application the walls had been saturated and the weather was cold. The gate chambers were covered over and heated thoroughly with large stoves. The drying, cleaning the walls with wire brushes, and applying the mixture, took ninety-six days. Twenty-seven tons of coals were used for the drying and one ton for heating the soap solution. 18,830 square feet of wall were washed with four coats. The drying and cleaning of the walls cost six and a half cents per square foot, and the plant, materials, and labor of applying the wash cost three and three-eighths cents per square foot.

Stoves and Lamps in Railway Cars.

It is natural, says the *National Car Builder*, when a railway accident occurs attended with loss of life by the burning of passenger cars, that there should be a good deal of animadversion on the methods of heating and lighting in which the conflagration originated. The views of the great majority of people, however, who talk and write under the spur of a sudden calamity, are apt to be crude and ill considered. They assume that something is imperfect from somebody's fault, and that the stoves and lamps might have been better and safer had proper care been exercised in their selection. Little heed is given to the fact that railway men and inventors have for a long time been engaged in devising means for warming cars without the actual presence of fire within the cars, and for lighting them without danger of conflagration under any circumstances. The fact that these efforts have thus far been unsuccessful is an evidence of the practical difficulties of the problem. It is a favorite idea with many that cars can be heated by steam from the locomotive, or from a special generator placed in the baggage car. As regards the first method, it is impracticable without such a draught on the capacity of the engine as would necessitate slower and lighter trains; and as to the second, it has been tried again and again, if we mistake not, and found to be beset with such serious mechanical difficulties as to render it impracticable except in its application to special trains.

It is safe to say that a dozen accidents a year like the recent one on the Hudson River road would not lead to the immediate disuse of stoves for car heating; but it would most certainly lead to more effective means for the prevention of such collisions between trains. There are many excellent car stoves—safety stoves, so-called—and they are none the less worthy of their name, even if they happen to be broken in a crash, the force of which no structure of a similar kind could be expected to resist. There is a limit to the usefulness of almost everything. Make a car stove of the best wrought iron of any desired thickness for resisting shocks, it must have a door, and perhaps two of them, and these must be open and closed several times a day to feed and keep up the fire. The chances are, that under such circumstances, they would not always be in trim for a first-class telescoping collision, so as to keep the live coals from spilling out, especially when such collisions almost always occur with little or no warning.

As regards lighting, we doubt whether any safer material can be used than heavy mineral oils, unless it might be electricity, which will perhaps be utilized for car lighting at some future time. These oils are not explosive, and are certainly less dangerous than coal gas. There is no instance that has come to our knowledge in which they have set fire to cars. The shock of a collision, the upsetting of a lamp, or an excess of oil forced through the wick, extinguishes the flame.

A WOMAN who carries around milk in Paris said a naive thing the other day. One of the cooks to whom she brought milk looked into the can, and remarked with surprise: "Why, there is actually nothing there but water!" The woman, having satisfied herself of the truth of the statement, said: "Well, if I didn't forget to put in the milk!" —*Medical Advance.*

The Fastest Boat in the World.

A new steam torpedo boat, 100 feet long, 500 horsepower, has lately been tried in England, the officially recorded maximum speed attained being twenty-six miles an hour. This is believed to be the fastest vessel afloat. The vessel is able to carry coal and supplies enough to steam 1,000 miles and remain at sea for a week. She has two bow tubes for delivering torpedoes. With a fleet of such boats in readiness for action it would seem to be not a difficult task to defend maritime cities like New York and Brooklyn from the approach of the most powerful invading fleets. The new steamer is thus described by the *Engineer:*

On Wednesday, January 18, Admiral Brandreth, Controller of the Navy, Messrs. Morgan, Butler, and Allington, of the Admiralty, and several naval *attaches* of European powers, visited a torpedo boat brought up to Westminster Pier for the purpose by Mr. Yarrow, of Poplar. This craft may be regarded as the latest example of torpedo boat construction, and thus deserves more than a passing comment.

The experience acquired by Mr. Yarrow during years of successful construction of this type of vessel he has utilized continually, with the result of making his designs more and more perfect. The boat of which we are now speaking has been built for the Italian Government, and is of the largest size, being 100 feet long. She is of what is known as the Batoum class, and is very similar to many sent by Messrs. Yarrow to the Mediterranean, which have reached their destination in safety. She is propelled by a pair of compound engines capable of indicating about 500 horse power, steam being supplied by a boiler of the locomotive type. She has a two-bladed screw, the results of the experiments carried out by Messrs. Yarrow, and reported in our columns, showing that the two-bladed screw is better for high speeds than either the three or four-bladed propeller. This boat has attained the highest velocity ever reached by any vessel fully equipped and ready for action. Her measured mile speed is the highest ever officially recorded, namely, 22·46 knots, or very nearly 26 miles per hour. We believe, however, that in a private trial even this performance was slightly beaten. She is fitted with a bow rudder, by the aid of which she can be turned round almost in her own length; and the screw has been so designed as to give great backing power. This is regarded by all naval powers as a most important qualification, because in consequence of the extended use of machine guns, it is of the utmost importance to present as small a mark as possible to the enemy, and this can only be done by keeping bows on to the ship attacked. Immediately after the torpedo is discharged the boat goes ashore as quickly as possible, out of gun shot. The new boat is fitted with two tubes in the bows for discharging Whitehead torpedoes, so that she is a much more dangerous foe than the ordinary spar torpedo boats. She is steered from a point near the bows, the steersman being in a bullet-proof conning room; while the sloping deck forward is made of steel plates which would probably resist any but very heavy Nordenfelt or Gatling projectiles, so that the men engaged in getting the fish torpedoes ready for launching would be tolerably safe. The enormous velocity of the boat gives her a great advantage. It may be taken for granted that at a distance of one mile from a ship to be attacked she would be safe, and she need not approach nearer than 300 yards to discharge her projectile. Thus she would certainly have to remain under fire only while she was attacking. If she did not succeed, she would of course still be exposed to risk, but the chances are that she would succeed, when of course little more attention would be paid to her. But steaming at 22 knots an hour, she would be only in imminent danger for about 2½ minutes, during which time her range would be continually altering, and it would not be by any means easy to hit her.

We have said that she is the fastest craft afloat, and it might be supposed that this result is due in some measure to her comparatively large dimensions. It is ordinarily assumed that, other things being equal, the larger a ship is the more easily will she be propelled; that is to say, that the resistance of a steamship does not increase so rapidly as her dimensions. This law holds good with torpedo boats up to about 15 knots; and Mr. Yarrow has found that at that speed a boat 100 feet long and displacing about 25 tons can be propelled with absolutely—not comparatively—less power than a boat displacing 15 tons. But after 15 knots have been reached a new law appears to come into operation, and the resistance of the 25 ton boat is just the same proportionately, or nearly the same, as that of a boat of 15 tons. This is another of the anomalous results obtained at exceptionally high velocities.

The most noteworthy novelty in the new boat is an arrangement extremely simple, but none the less ingenious, for preventing the fire being put out should the stokehole be drowned. In all torpedo boats previously built, if shot entered the stokehole, and made anything like a large aperture, the furnace would be quickly submerged, and the boat would be left a helpless log on the water. For those who are not well acquainted with the internal arrangements of torpedo boats, it is proper to explain that they are divided into watertight compartments, in which are inclosed the engines, the boiler, and the stokehole, in which the coal is carried in sacks. The stokehole is shut down by air-tight lids, and a fan forces air into it to maintain the draught, which is very intense. The end of the boiler is, so to speak, fixed in a bulkhead, and in this are made two flap doors. The pressure of air in the stokehole forces open these doors, and the air then enters the compartment in which the boiler is fixed and gets into the fire through the ash pit and bars. It will be understood that there is no communication whatever with the ash pan from the stokehole. If a boiler tube burst while the fire door was shut, the smoke-box doors might be blown open; but the rush of steam and water would be confined to the compartment in which the boiler is, and the firemen could not be hurt, because the flap doors before alluded to would close and shut off the stokehole from the boiler room. The last improvement introduced by Mr. Yarrow consists in carrying up the sides of the ash pan above the bottom of the boat for about 3 feet 9 inches. The utmost depth to which the water can rise in the stokehole is 3 feet 3 inches, representing about 11 tons, which sinks the boat some 7 inches. The water rises some way up on the fire door; but this door is made of the cupped form, and the edges are a good fit against the plate. The result is that but little water gets past it into the fire box, and what does is immediately evaporated, and gives no trouble. Thus, in case of accident, the stokers would have time to withdraw from the stokehole, leaving the fire door shut. The fire box readily holds half a ton of coal, and this will keep up steam for forty miles at a speed of ten knots.

As torpedo boats are not intended to go far from a harbor it is clear that an ample margin of power is thus provided to give the boat an excellent chance of escape. In the absence of this appliance, should water in quantity find its way into the stokehole, the fire would be extinguished, and the boat left to float like a helpless log, a ready prey to the most insignificant adversary. On Wednesday, as the boat lay beside Westminster Steamboat Pier, the stokehole was drowned several times without in any way affecting the fire. Indeed, the steam pressure kept rising, although much steam was needed for pumping the stokehole out, and the draught was of course not on, the hatch to the stokehole being open. This we regard as one of the most important improvements recently effected in torpedo boats.

We may add in conclusion that, as the little vessel is intended for service at sea, she has a neatly fitted cabin, with sofas, which will accommodate four officers, while forward as many as eight men can be berthed with tolerable comfort. It would be quite possible for such a vessel to remain at sea for a week; and it is worth notice that she can carry coal enough to steam about 1,000 miles at a moderate speed. She will probably go to the Mediterranean under steam.

ENGINEERING INVENTIONS.

An improved storage tank for petroleum has been patented by Mr. Francis H. Benton, of Renovo, Pa. A stationary tank, a washing reservoir, supported on top of the tank, a short pipe connecting the top of the tank with the bottom of the reservoir, and a conducting pipe extending from the top of the reservoir downward on the outside of the tank and underground.

An improved nut lock has been patented by Messrs. James C. Beamer and John M. Richardson, of Carthage. Mo. The invention consists of two plates of strong sheet iron or other suitable material, wide enough to cover the fish-bar, with each edge resting on the rail. Each plate is centrally slotted, and the edges of the slot are turned outward wide enough and long enough to stand out over both nuts in the end of a rail. These plates are connected at one end with a spiral spring, and their other ends are formed into hooks that go around and under the ends of the fish-bar.

Improved Steel Tire Car Wheels.

Mr. L. W. Washburn, of Allston, Mass., is the inventor of a mould and process for casting steel tire car wheels that is of late attracting considerable attention. The object of this invention is to cast wheels of two distinct metals in such manner that the difficulty experienced by wheelmakers from unequal contraction is entirely obviated. The operation consists in first casting the center or body of the wheel from anthracite iron. While this part of the wheel is assuming a semi-molten state and slowly shrinking, a metallic ring, forming the outside periphery or tread of the body portion, is removed and another metallic ring of larger inside diameter, having a small fire cope attached, substituted therefor, after which crucible steel, sufficiently high in carbon as to render its running perfectly solid, is cast through the small fire cope, striking the upper outside edge of the still white hot center or body, and partially remelting it, thereby enabling the cast steel tire to thoroughly unite with the soft iron center, completing a wheel that must of necessity shrink from the center or hub, thus preventing any liability of cracking from unequal contraction. Were it not for the difference in grain and color, the *National Car Builder* says, it would be an utter impossibility to detect the line of union between the two metals. These wheels have already made a record of 100,000 miles before the first turning, between Boston and Chicago, under Wagner sleeping cars, and are guaranteed to run 200,000 miles. Owing to its composition, this wheel can be made at a great deal less expense than the steel wheels, while it answers the same requirements. They are now made in Canada, but arrangements are being completed for their manufacture in the United States.

A Twenty-one-Inch Hawser.

A rope of extra large size has recently been made for a firm in New Zealand, where it is to be used in hauling up ships when they run aground on the soft mud bottom there, which they occasionally do. This rope is a 21-inch white manila hawser, 120 fathoms long, and composed of nine strands of 316 yarns to the strand. Another rope for the same purpose is a 15-inch hawser of the same material and length, and composed of nine strands with 164 yarns to the strand. When it is remembered that 12-inch ropes are the largest ordinarily made, the magnitude of those just described becomes apparent. The two ropes were manufactured by Messrs. Frost Brothers, of Shadwell, England.

How to Soften Hard Water.

At the recent Health Congress at Brighton, the Mayor (Alderman Hallett) read a paper on the above subject, in the course of which he said the benefits to arise from softening chalk water for drinking purposes was often discussed, but unless a water company undertook the task, consumers continued to drink the hard water as though no remedy was within their power. His object was to state a means by which softened water could be obtained with little trouble and at small expense.

It was more than a quarter of a century since Dr. Clark, of Aberdeen, made known his valuable invention, and, as the patent had expired, the application of the system was open to all who were disposed to make use of it. His description was substantially as follows:

The invention was a chemical one for expelling chalk by chalk. Chalk consisted—for every pound (16 oz.)—of lime, 9 oz.; of carbonic acid, 7 oz. Nine oz. of lime, which could be obtained by burning in a kiln, required at least 40 gallons of water to dissolve it. This was called lime water. Chalk was very sparingly soluble in water, so that one pound would require 5,000 gallons to dissolve it; but if there was combined with it an additional 7 ozs. of carbonic acid, the chalk became readily soluble in water, and when so dissolved it was called bicarbonate of lime. If the quantity of water containing the one pound of chalk, with 9 oz. additional of carbonic acid, were 400 gallons, then the solution would be a water of the same hardness as well water from the chalk strata, and not sensibly different in other respects.

Thus it appeared that one pound of chalk, scarcely soluble in it by either of two distinct chemical changes—soluble by being deprived entirely of its carbonic acid, when it was capable of changing water into lime water, and soluble by combining with a second dose of carbonic acid, making up bicarbonate of lime.

Now, if a solution of the 9 oz. of burned lime, forming lime water, and another solution of the one pound of chalk and 7 oz. of carbonic acid, forming bicarbonate of lime, were mixed together, they would so act upon each other as to restore the two pounds of chalk, which would, after the mixture subsided, leave a bright water above. The water would be free from bicarbonate of lime; free from burned lime, and free from chalk, except a very little. A small residuum of the chalk remained, not separated by the process.

Of the 17½ grains in a gallon of water only 16 grains would be deposited and 1½ grains would remain. To soften water on a small scale, it was necessary to provide lime water about one-tenth of the quantity of water to be treated. He had used during the last twelve months two gallon stoneware casks with wooden taps. The casks were placed near a constant service tap; 1½ pints of lime water being first put in, the cask should be filled up to two gallons. After standing twenty-four hours, the supernatant water would be as clear as before, and at the bottom of the vessel would be found a precipitate of chalk.

The shape of the vessel would be better if cylindrical, with a tap hole a short distance up the side. This form of vessel would allow the process to be completed in twelve hours. The second cask or vessel was to form a reserve of the clear water which was being treated. He had been thus supplied without any difficulty.

There was no weighing of the lime required. If it was objected that the quantity was small, he answered, more casks could be used, or larger ones, so as to meet the requirements. This softening might easily be applied by laundresses by using larger casks, and the saving of soap would repay them for the little trouble.

Three years ago, when the Warren Industrial Farm School well was under discussion, it was said that soft water was a saving of many pounds per annum, compared with what would be the cost of using the town water. The town water was used now, and the time seemed to be come for the guardians to consider the use of a softening apparatus fitted for extensive use—Porter Clark's or the Atkins process.

The Sixth Report of the Rivers Commission (1874), page 205, put the saving in soap by the use of lime as follows: One cwt. of lime will do the work of 20¼ cwt. of soap; cost of one cwt. quicklime, 8d.; cost of 20¼ cwt. of soap, £47 1s. 8d. There was, therefore, very little question that the adoption of some mechanical means of mixing and rapidly filtering off the separated chalk would soon be paid for by the saving of soap.—*Journal of Gas Lighting.*

Antiseptic Properties of Essence of Wintergreen.

We see in the *Concours Médical*, that Professor Gosselin and Dr. Bergeron have experimented with oil or essence of gaultheria (*Gaultheria procumbens*), wintergreen, and have obtained good results from it, as an antiseptic in the dressing of sores. Essence of wintergreen is much used in perfumery; it has an agreeable odor, and is insoluble in water, but soluble in alcohol.

Two solutions are used by Professor Gosselin:

No. 1. Oil gaultheria, f. ʒ i¼; alcohol, 60°, f. ʒ xiiss.; and No. 2. Oil gaultheria, f. ʒ ⅝; alcohol, f. ℥ iij.–f. ʒ j; water, f. ʒ xiiss.