Borax Lake.

In speaking, recently, of boracic acid and its possible sources of origin, we mentioned the Sulphur Bank on the northern side of Clear Lake, in California. South of this, at a distance of less than a mile, is another spot which displays an immense outpouring of boracic acid, though here the emission has been only in times long past, and the acid has all entered into combination with soda, as the name above given indicates.

Borax Lake is very insignificant in its appearance, but fifteen years ago it completely revolutionized the borax trade of the United States, though of that we do not propose to speak to-day. It seems absurd to give the title of lake to it, for it is only a large pool of shallow water, with muddy shores and bottom, and without either inlet or outlet. The length of this oval "mud hole" varies with the season. At the close of the dry season the water has sometimes, though not commonly, entirely evaporated, leaving only a space of mud incrusted with salts, while after an extremely wet season the water is five or six feet deep in the middle, with a length of a mile and a half. This water, even in its most diluted condition, is intensely alkaline, its strength, of course, increasing with the progress of the summer's evaporation.

It is separated from the Sulphur Bank by a ridge somewhat over six hundred feet in height, and the two localities have apparently no relations, the one with the other. The ridge is composed of volcanic materials, scoriæ, obsidian, pumice, etc., and is continued in horseshoe form around three sides of the lake, leaving the southeastern end open.

There is no evidence of a crater having ever existed here, and yet the water plainly occupies a cup-like cavity of unknown depth, for the bottom is filled with an exceedingly smooth and plastic mud, which has been bored to the extent of thirty feet without reaching its lower limit or finding any change in its character, and explorations show that it steadily deepens from the shore toward the center. When the depth of the water is four feet, which may be reckoned a fair average, and which gives a length of about three-quarters of a mile, it holds in solution 18·75 grains of salts to the fluid ounce. These are salts of soda, in the following proportions: Sod. carbon., 0·618; sod. chlorid., 0·204; sod. bibor., 0·178. Each gallon of the water, therefore, holds about a quarter of a pound of borax.

This amount, however, is of small consequence in comparison with that which lies in crystals below in the mud. The change from water to mud is very gradual, the upper portion being semi-fluid. In this part no crystals are to be found. At the depth of perhaps a foot, when it has acquired sufficient consistency to be called liquid mud, the fingers in rubbing it can detect what feels like very fine "grit." This, when washed clean, shows under the microscope, of course, its true nature, and every particle is seen to be a most exquisitely beautiful crystal of pure borax. Going still deeper, the "grit" becomes "sand," for the crystals have become larger and are manifest to the eye, without assistance. As the mud becomes firmer the crystals become larger, being at the depth of two feet a quarter to half an inch long.

At the depth of three to four feet the mud suddenly changes its character. Above this it has been of a grayish-brown, some of it inclining to reddish, which ceases abruptly, being replaced by a firm, tenacious blue clay, the plane of distinction being as sharply marked as that of a course of brick upon stone. In this upper mud the crystals had been gradually increasing in size as the depth increased, until in its lower part they were from an inch and a half to two inches long. Every crystal was distinct and perfect in itself, and—a most wonderful feature—though often lying in contact, they were not adherent.

This last item is very difficult of explanation. We have in unnumbered instances seen them as the mud was removed lying in "layers" or "pockets," from one to ten pounds of separate crystals of the borax lying in one mass, as clean and free from mud as though they had been washed, and as loose and distinct as pebbles on a beach. Each crystal had its own existence. These "layers" were never uniform, and were scattered without apparent order, the adjacent mud often showing no crystals whatever.

When the "blue clay" is reached all this ceases, and crystals of a new style commence. Each one lies by itself, in a firm matrix, from which it can be picked out like a bullet from its mould. They have an individual appearance *sui generis*, so that it is easy to distinguish even the smallest of them from the largest of those in the mud above. But their chief feature is their size. We have taken out many of them which weighed more than a pound each, and a "blue clay" crystal of less than a quarter of a pound seldom occurs. But they cease about as abruptly as they commence, for they are confined absolutely to the upper two feet in thickness of the clay. Abundant examinations have shown that below that no crystals of any sort exist. The mud however continues to be of the same look and quality to the greatest depth reached (thirty feet), and though showing no crystals it holds everywhere a uniform amount of the salts of soda, being sixteen per cent. of its entire weight when dried. The proportions vary somewhat from those of the water above: Sod. carbon, 0·554; sod. chlorid., 0·164; sod. bibor., 0·282. We will show at another time the manner of obtaining the crystals. It was done in sections of four feet square, and we have often seen 900 pounds taken from that extent of the mud; and from the imperfection of the manipulation a large amount, certainly not less than a hundred pounds, escaped back into the lake.

We pass all other points at the present time, barely to consider the enormous quantity of boracic acid which we have here represented. Taking the data just given, the borax held in the water, the tangible crystals down to their lower limit in the upper part of the "blue clay," and the amount contained in the clay below that down only to the distance of which we have knowledge, it is perfectly safe to say that Borax Lake held, and holds now, not less than 9,400,000 pounds of borax to the acre of surface. The ground so rich in crystals does not extend over all the area, but at least twenty-five acres (and this is far within the reality) will come up to our estimate, and we have thus clearly over 200,000,000 pounds there existing.

The mode of its formation we will see later, but whence could this boracic acid have come? Here is a cavity like a crater, though its volcano is not apparent. Admit that the cup was filled with mud rich in soda and that jets of boracic acid were injected below. The space occupied by the jets was manifestly quite restricted, for the acid did not in its full force reach laterally even to the crater's border, and yet they came strong enough and long enough to combine with the soda to the amount we have given. But the *amount* of work done is the least surprising part, as we will see.

The Walled Lakes of Iowa.

The questions whether the so-called "walled lakes of Iowa" are the work of some extinct race or are natural formations, have periodically appeared for discussion. In his "Geology of Iowa," Prof. Charles A. White presents as a theory that in the shallow portions of the lakes the ice along the shores freezes fast to everything upon the bottom, whether sand, gravel, bowlders, or mud, and the expansive power of the water in freezing is exerted upon them, acting from the center of the lake in all directions toward its circumference. By this means whatever substances are frozen into the ice are pushed up upon the shores as far as the expansive force is exerted, and there left as the ice melts in the spring. By this means embankments have been formed, varying from 2 to 10 feet in width and from 5 to 20 or 30 feet across. The ice, during long ages, has brought these materials together in this manner, having in some instances moved large bowlders and piled them up with other materials.

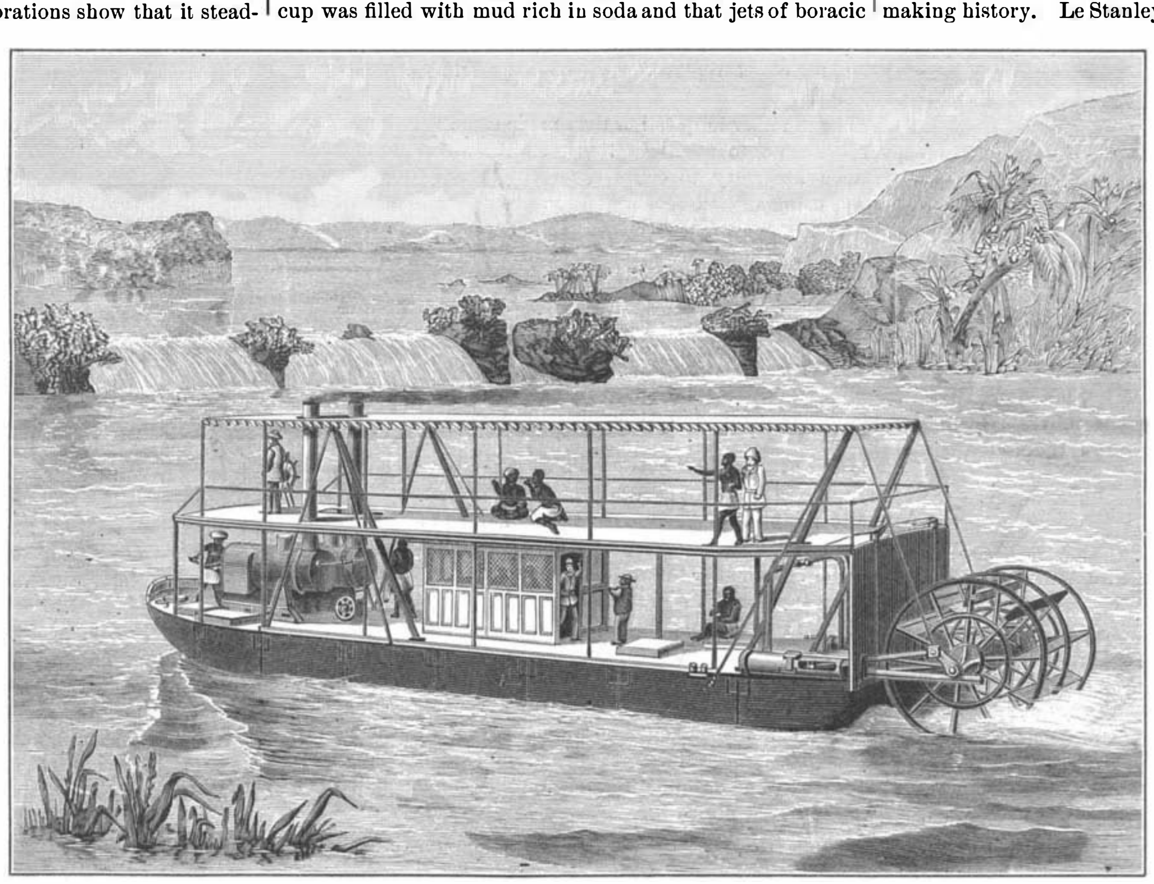
In corroboration of this, a writer in the *Sun* states that he has "seen the ice piled up on the shores of Walled Lake, in Wright County, pushed up along these embankments, and containing earthy materials of which the walls are made. Occasionally these walls were found along the old margin of some dried-up prairie slough, proving the existence of an open shallow lake in some time past."

American Car Wheels.

"There are more than 10,000,000 iron car wheels in use on American railroads," said the master mechanic of one of the trunk lines, "and it requires about 525 pounds of pig iron to make one wheel. About 1,250,000 wheels are worn out every year, and the same number of new ones must be made to take their places. The iron men are called upon for only a small proportion of the 312,500 tons of material required for these new wheels, however, for nearly 290,000 tons are supplied by the worn out wheels themselves. Formerly, the life of a car wheel was estimated at eight years, but the reduction of the railroads generally to the standard gauge, and the improvements in loading and unloading facilities, have materially decreased the length of service that a wheel may be depended on to perform. The uniformity in gauge keeps cars in more continuous use, while the decrease in time of loading and unloading enables them to be put to more active service even where they are run only on short local routes.

"These figures do not include the wheels on palace coaches and the better class of passenger coaches. The wheels on that grade of rolling stock are for the most part what are known as paper wheels. That is, the wheel is made with steel rim or flange and iron center or hub, but the filling or web between hub and rim is composed of sheets of paper cemented together. They are as serviceable as the wheels of solid iron, and combine lightness with strength—a great desideratum where speed and economy in motive power are of paramount importance."

THE SECTIONAL STEAMER LE STANLEY.



STERN WHEEL SECTIONAL STEAMBOAT, LE STANLEY FOR AFRICA.

A river run was lately made in the Thames with a small vessel of peculiar construction, and for a purpose which may some day single it out as one of the steamers with an epoch-making history. Le Stanley is the name given to this small steamer, in honor of the celebrated African explorer. She has been built near London, under the inspection of Monsieur Delcourt, Chief Engineer of the Belgian Government, for L'Association Internationale, of Brussels, of which the King of the Belgians is the head. It is an association having for its object the opening up to commerce and civilization of the unknown regions of Africa, said to be wholly without political aim, and what it is doing must therefore be looked upon as for the universal good. Mr. Stanley, who is engaged establishing numerous stations, is the head of the expedition in Africa; the little steamer is to assist him in his operations, especially in the district of the Congo and its tributaries; and some idea of the magnitude of an expedition of this kind may be formed when it is stated that no less than 500 natives have already been engaged to accompany the steamer and assist in its transport overland. About the middle of last year the Belgian authorities placed themselves in communication with Messrs. Yarrow & Co., with a view to build a thoroughly serviceable steamer of exceptionally shallow draught and able to steam in places where there is not water sufficient for vessels constructed in the usual way. The main point, however, was to design something that could be easily transported overland, so as to pass by and avoid the numerous rapids and cataracts which render navigation impossible. With these requirements before them Messrs. Yarrow & Co. have constructed the present steamer; it consists of six galvanized steel square-shaped pontoons, 18 feet long by 8½ feet wide by 4 feet deep; these sections, each of which is watertight and therefore floatable, are placed side by side; to these are added a bow piece and a stern piece, making together a hull 70 feet long by 18 feet beam. By means which we shall describe at more length at another time these sections can be readily united and disunited, and this can be done afloat. On the bow division are placed two boilers, and on the stern division the engines, which are designed for a working pressure of 140 pounds per square inch, and have cylinders 10½ inches in diameter by 2½ feet stroke, which, by means of a crank on each side, drive a paddlewheel situated aft, well clear of the stern. The engines are each made up on a steel tube as a frame. The strain due to these weights being concentrated at the extreme ends of the boat is taken by a system of light steel tie rods above, secured to tubular king posts; the effect of this system is at all times to throw a compression on the hull, thereby tending to keep the various sections together in close contact and free from alternating strains. Above the vessel, and completely covering it, is a wooden awning deck, which in an African climate is very necessary to protect the passengers and crew from the sun. The boilers are made with very capacious grates, and of course wood is the only fuel procurable, and will not always be the driest and best adapted for making steam.

It is intended to ship this steamer, in her several sections, direct to the mouth of the Congo, where she will be put together afloat, which, it is contemplated, will not occupy more than twenty-four hours. She will at once proceed, under her own steam, as far up the river as it is navigable; then be taken to pieces for transport overland; and in this operation will be seen one great novelty in her design. After the machinery is removed from the deck the hull will only draw 6 inches; it is then brought into exceedingly shallow water, and the operation of disconnecting the various sections proceeded with. To each section while still afloat will be secured four large light steel wheels having very wide tires. This being done, the divisions are ready to be hauled out of the water and over land, and what was once a section of a boat now becomes the body of a wagon of ample capacity to convey the lighter portions of machinery and stores. On arrival at the next navigable part of the river, these wagons so constructed are run into the water, the wheels are removed and the various divisions reunited, forming again an entire vessel. In this way the journey can be continued, the steamer being taken to pieces and put together as often as circumstances require.

At the preliminary trial the vessel went through numerous maneuvers; the mean draught was 14 inches in working trim, and with a steam pressure of 100 pounds per square inch a speed of nine and a half to ten miles an hour was obtained—an excellent result, taking into consideration the proportion of length to beam and other peculiarities of the craft. Great steering power is of course necessary, and the most striking performance was the marvelous facility with which the boat could pivot on a center only a little within a point a few feet from the stern, which was very remarkable, and clearly rendered this type of steamer admirably suited for tortuous and winding rivers. On the deck is a small, well ventilated saloon, and the steering wheel is placed high up on a bridge some 12 feet above the water, giving the pilot a good view all around.

It would seem to us that this system of construction, namely, that of uniting together a number of floating sections so as to form a vessel of moderate and useful dimensions, and of good carrying capacity, opens up a new field, as the difficulty hitherto experienced in the development of trade with Africa has been due in a great measure to practical difficulties in placing vessels of light draught on the rivers.

MODE OF TRANSPORTING THE SECTIONS OF THE STEAMER.

The Florida Everglades.

A correspondent of the *Boston Journal* thus speaks of the drainage work already accomplished in the Florida Everglades, under the direction of Capt. R. E. Rose: "From Sanford, on the St. Johns River, the Florida Central Railroad brought us through 40 miles of incipient towns with winter hotels to Kissimmee on the edge of Lake Tohopekaliga, which is near the upper level of the great swamp region. Imagine a shallow basin from 30 to 50 miles wide and 150 long, sloping slightly to the south and divided by low dams across it into shallow ponds or lakes, slowly oozing and overflowing from one to the other until the whole is lost by evaporation in the Okeechobee Swamp. Canals 40 feet wide and of a depth increasing as the water lowers, have been cut from one lake to another, the Kissimmee River channel almost made anew, and the great swamp connected by direct channel with the Calobahaichie River, emptying into the Gulf. A steamboat 130 feet long and 30 feet wide, lying here at the wharf, has come from New Orleans across the Gulf and up the artificial canals. The work of cutting has been done by endless chains armed with buckets, lifting the earth from the bottom and discharging on each side, and working down stream and then back again until the requisite depth is obtained. So that the first boat, all the materials of which were hauled here by ox teams or cut from the surrounding forests, has actually dug its way to the sea. The lake in front of us has already been lowered seven feet, turning from impassable morass into arable land about 150 square miles. I have seen sugar cane growing where two years ago the first dredge boat came to anchor."

IN the opinion of the *Medical Press*, most physicians are very decidedly in favor of the total abolition of corporal punishment in schools. The editor asserts that the London University College School, which is attended by 500 boys, has been carried on from the first without corporal punishment, and is equal to any school in England with respect to discipline.

The Matrix of the Diamond.

Until the South African mines were discovered the diamond was always found in sands and gravels, different from the mineral in which it was believed to be formed. At Griqualand West, however, the consolidated eruptive mud of the mines was believed by some to be the true matrix of the diamond; but opinions differed on the question, and arguments were found on both sides. M. Chaper, a French geologist, has, however, during a scientific mission to Hindostan, succeeded in finding the diamond in its mother rock. At Naizam, near Bellary, in the Madras Presidency, M. Chaper has found the diamond in a matrix of rose pegmatite, where it is associated with corundum. The tract of country is almost denuded of trees, bare and rocky, and the rains wasting the rocks, every year expose fresh diamonds in the soil. The rock is traversed by veins of feldspar and epidotiferous quartz. Here the diamond is always found, associated with epidotiferous rose pegmatite. The diamond crystals observed are octahedral, but less distinct in line than the stones of South Africa, which seem to have been formed in a freer matrix. It follows from M. Chaper's discovery that diamonds may exist in all rocks arising from the destruction or erosion of pegmatite, for example, in quartzites with or without mica, clays, pudding stones, etc.

Time by Telephone.

A lawyer whose office is in the Leffingwell building stepped up to his telephone one morning, watch in hand. He did not ring or talk into the transmitter, but listened intently for several seconds with the tube at his ear, and his eyes fastened upon the face of the watch. "Just ten minutes past 11 o'clock," he remarked, as he returned the watch to his pocket and hung up the tube. "I am precisely half a minute slow."

Only a few of the local telephone subscribers are aware of the fact that they can ascertain the correct time by simply listening at their telephone instruments. A clock apparatus has been connected at the central office with all the circuits, by which there is given at the end of each minute the hour of the day and the number of minutes past the hour. The beats signifying this are distinctly audible, although not loud enough to interfere in any degree with conversation. The attachment of this time apparatus explains the ticking sound which has mystified many persons within the last few days. The apparatus is not connected with the clock in the Yale Observatory, although it is regulated by the observatory standard.

Manager Fairchild, of the Telephone Company, said: "The apparatus was put into the office Monday by way of experiment. It is worked by batteries, and gives the hour and the minute simultaneously over all our circuits. To ascertain the precise time it is only necessary to step to your instrument. At the end of every minute there is clicked off the hour and then the number of minutes which have elapsed since the hour was struck. If it happens to be thirteen minutes past there is one beat, then a short pause, and then three more in quick succession. The attachment works successfully, and the only question about retaining it is the cost. The expense will be about $1,000 a year, and if our subscribers are willing to pay for the accommodation they can have it."

"But suppose the subscribers on some of the circuits are willing to pay and those upon others are not?"

"We can render it useless on any given circuit by putting on an attachment called the confuser. This mixes up the beats so that no one can tell what they mean."—*New Haven Register.*

How to Attain Old Age.

The Psalmist David allowed seventy years as the natural duration of life, Pythagoras placed the limit at eighty, London's hygienic philosopher, Dr. Richardson, gives us ten more, while Flourens believed that man ought to live one hundred years.

There is no doubt that the physiological limit of human life has been slightly increased in the present century, and a hundred years later it may be found that old age comes on still more slowly and gently. For, with the increased uncertainty as to a future life, human energies are directing themselves with greater earnestness toward solving the problems of a more healthful and longer terrestrial existence.

The physiological chemist tells us that after the age of forty or forty-five, disassimilation gradually begins to exceed assimilation, and the structures of the body slowly waste. Muscle and nerve, which are the "master tissues," feel this first. The dynamic coefficient of both striped and unstriped muscle decreases after forty; the limbs become less supple, and the hollow viscera have a feebler expulsive force; the nervous system is less sensitive and plastic; impulses travel between center and periphery with more difficulty. The individual loses spontaneity, and becomes more automatic, more a creature of determined habits.

The lower tissues also undergo very marked and characteristic changes. The fibrin-factors of the blood increase in amount, the bones become drier, the cartilages ossify, and the arteries especially become the seat of fatty degeneration and calcareous deposits.

Dr. Richardson announces that "his experiments show" that the colloidal matter (protoplasm?) of the body in old age contains less water, and that its particles are consequently more cohesive. It is true, at any rate, that the total amount of water in the body is less.

The essential fact as regards senile changes is that the metabolic function is weakened. Consequently the food, instead of being built up into good tissue, is oxidized into less complex substances. The protoplasm turns out fat instead of new protoplasm, the circulatory apparatus becomes weaker, the blood stagnates, carbonic acid precipitates, and earthy salts, which it kept in solution, are deposited.

Now, certain recent philosophers have thought that, by preventing these fatty and calcareous changes, old age could be delayed. A Swiss physician, a few years ago, argued that lemons, *i. e.*, citric acid, would accomplish this end, and saw immortality in lemonade. More recently, a writer in *Knowledge*, Mr. W. O. Dawson, has presented a new *regimen sanitatis*, which he claims is the most rational and certain means of retarding old age. It consists in avoiding all food rich in earthy salts, and in taking, daily, two or three tumblerfuls of distilled water with ten or fifteen drops of dilute phosphoric acid in each glassful. The food freest of earthy salts is: fruits, fish, and poultry, young mutton and veal.

We can testify with Mr. Dawson that this kind of diet is harmless, but we are profoundly skeptical as to its efficiency.

Old age is part of the life history of the organism. There is that in the child at birth which determines very nearly when old age shall appear. Senility is a failure of nutrition. We can only delay its appearance by living a life which puts no undue strain on the organism, and by furnishing it with the easiest means of working. We cannot expect to accomplish this end simply by cutting off certain deleterious supplies. If one would live long, let him especially take care of his "master tissues"—the muscle and nerve—when young. This means rational exercise of body and a well balanced cultivation of mind. Brain workers live long, brain and muscle workers longer still. No one has yet given better advice for the retarding of old age than did Christopher Hufeland, a century ago. Let those who wish old age study him, and put no trust in distilled water.—*Medical Record.*

To Prevent Scratching Matches on Paint.

A correspondent in Florida, of *New Remedies*, speaking of the defacement of paint by the inadvertent or heedless scratching of matches, says that he has observed that when one mark has been made others follow rapidly. To effectually prevent this, rub the spot with flannel saturated with any liquid vaseline. "After that people may try to strike their matches there as much as they like, they will neither get a light nor injure the paint," and most singular, the petroleum causes the existing mark to soon disappear, at least when it occurs on dark paint.

The Decay of Westminster Abbey.

The atmosphere of London has played havoc with the stone in this famous building, and although the interior is in good condition, beneath the coating of grime and dirt with which long ages have covered the structure, and which conceals the decay from the eye of the casual observer, there has been long going on a process of decomposition which, if not arrested, will speedily cause ruin. The London *Times* states that in 1882 a well known architect examined and reported upon the condition of the Abbey. The wall surfaces round the clear story windows, wherever the fire stone has been allowed to remain, have become very seriously decayed, the decay in some places penetrating to a depth of seven or eight inches, "so that the architect is surprised that the heavy cornices and parapets should have found a sufficient support in so ruinous a wall." Before the report was made, in some of the worst places in the nave, the superstructure had been removed and the face of the wall rebuilt; but the architect was of the opinion that "immediate and very extensive repairs and restorations were urgently needed for the whole of the masonry of these clear stories." The conclusion was the same regarding the flying buttresses supporting the clear story walls, which in some places are dangerous and in others so decayed that pieces of stone are constantly falling from them upon the lead roofs. In regard to the south side of the nave, over the cloister roof, the report says:

"Large pieces of stone are continually falling, being detached by the rusting of the iron clamps with which the masonry was thoughtlessly put together. Very considerable damage has from this cause been done to the western towers, the whole surface of which is disfigured by the bursting off of triangular and other shaped pieces of stone; these heavy pieces fall not infrequently, and do much damage."

The transept on the south side has been recently restored, and the porch of the north transept is also new, but above the porch the masonry is in places very loose and unsafe, and demands complete and extensive repairs. The stone of the clear story of Henry VII.'s chapel, of the flying buttresses, and of the pinnacles is also badly decayed.

It is estimated that the cost of the restorations will be from £60,000 to £80,000, and the *Times* asks the pertinent question: "By what means may future generations be spared the periodical scandal of discovering that this great historical church has fallen into decay?" Judging from the rapid rate at which disintegration is now going on upon some of the buildings in this city, it will be but a few years before the above question may be applied to many of our finest edifices.

To Prevent Railroad Accidents.

Railroad spikes pull out of ties by the spring of the rails under the weight and pressure of engines and trains. The spreading of rails, for this reason, is one of the principal causes of railroad accidents. General Manager F. K. Hain is putting in "interlocking bolts" on the curves, switches, and frogs of the elevated roads, where the greatest danger is encountered, as a protection against accidents. These are the device of Capt. Thomas J. Bush, of Lexington, Ky., and are without heads. They are put in from the upper side of the tie. Holes are bored vertically on either side of the rail in the places where the spikes would go. They cross under the rail, forming the letter X. The bolts have threads turned on the upper ends, which are bent so as to cause the nuts, when the bolts are inserted at angles, to come squarely down on the flange of the rail. A slot is cut in the side of one bolt, which is inserted first. The side of the other bolt is beveled up to a point where a notch is cut on the under side to come squarely against the shoulder and in the slot of the first bolt, and in that way the two lock. The nuts are then screwed down, and the rail is held as if in a vise. The pressure against the side of the rail, tending to turn it over, is resisted by the lower part of the X-like adjustment of the bolts, and nothing but the tearing out of the solid wood will release the rail. The device is expected to greatly deaden the sound, and in case a rail should break it would still be held in place. A number of roads are experimenting with the bolts, among them the New York Central, the Pennsylvania, the Erie, the West Shore, and the New York City and Northern, and Elevated Railroad.

Glue, Paste, or Mucilage.

Lehner publishes the following formula for making a liquid paste or glue from starch and acid. Place 5 pounds of potato starch in 6 pounds (3 quarts) of water, and add one-quarter pound of pure nitric acid. Keep it in a warm place, stirring frequently for 48 hours. Then boil the mixture until it forms a thick and translucent substance. Dilute with water, if necessary, and filter through a thick cloth.

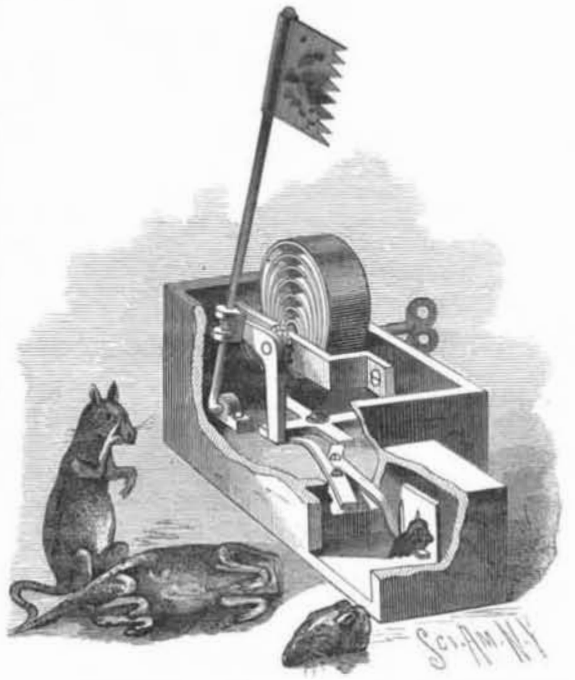
At the same time another paste is made from sugar and gum arabic. Dissolve 5 pounds gum arabic and 1 pound sugar in 5 pounds of water, and add 1 ounce of nitric acid and heat to boiling. Then mix the above with the starch paste. The resultant paste is liquid, does not mould, and dries on paper with a gloss.

It is useful for labels, wrappers, and fine bookbinder's use.

Dry pocket glue is made from 12 parts of glue and 5 parts of sugar. The glue is boiled until entirely dissolved, the sugar dissolved in the hot glue, and the mass evaporated until it hardens on cooling. The hard substance dissolves rapidly in lukewarm water, and is an excellent glue for use on paper.—*P. Notiz.*

ANIMAL TRAP.

A powerful coiled spring surrounds a shaft, on one end of which is mounted a ratchet wheel with which a pawl, pivoted on a loosely mounted elbow lever, engages. The bent end of a rod is journaled in bearings secured to the base plate in such a manner that the rod can swing in a vertical plane parallel with that of the spring. Upon the free end of the rod is a serrated knife. The rod passes loosely through the jaws of a U-shaped piece pivoted to the end of one arm of the elbow lever. The other end of the lever rests against one arm of a cross-shaped piece centrally pivoted to the base. A bent lever is pivoted to the base in such a manner that the arms of the cross can rest against the bent section. On the other end of the lever are a plate and two prongs for holding the bait—this end of the lever being in a separate compartment of the trap. Pressing against the side of this lever is a second one. A mouse nibbling at the bait would pull the lever forward, thereby freeing the cross-shaped piece and allowing the shaft to make a complete revolution, during which the knife would descend, decapitate the animal, and ascend to its normal position. The mechanism will continue this operation until the spring has been uncoiled.



HALL'S ANIMAL TRAP.

This invention has been patented by Mr. Charles Hall, of Changewater, N. J., and further information may be obtained from Messrs. J. Hill, Jr., and V. Castner, of same place.

FIRE ESCAPE.

On a truck formed as shown in the engraving is an upright frame to which is connected, at each side near the end, a lazy tongs extension frame—one of the bars of a joint being pivoted to the frame. The other bar of the joint has a bar connected to it, which extends downward over the drum of a windlass, to which it is connected by a chain or rope. At the junction of these two bars is a friction roller that rolls along the side brace for support. The two extension frames are connected together by rods forming the pivots of each joint; to each alternate rod is connected the upper end of a short ladder, the lower end of the lowest ladder resting on the drum, and the lower ends of the others resting on the next ladder below. When a hand crank shaft, with which the drum is geared, is turned so as to wind the chains upon the drum, the extension frames will be projected upward; by unwinding the chains the frames and ladders will be lowered and folded down on the truck.

LETTON'S FIRE ESCAPE.

The bars pivoted to the upright frame are placed between disks provided with stops, to arrest the extension frames when elevated to the desired extent; when the windlass is strained up and made fast, the bars will be held firmly between the bearings thus formed, holding the frames rigidly in their working position. To the upper connecting rod of the frames is attached a pulley block and rope carrying a basket, which can be used for letting down persons or goods. Detachable braces stay the platform laterally, and pivoted bars swung down to the ground prevent the truck from rolling on the wheels. The device can be used from stationary platforms, awnings, etc.

This invention has been patented by Mr. T. P. Letton, and further particulars may be obtained by addressing Mr. F. M. Curtis, Ottawa, Kansas.

The Cost of Running a Train.

As the passenger sits at a car window and sees the mile posts whirl past, he seldom stops to reflect what it has cost the company to pull the train a mile. A party of gentlemen, some of them experienced business men, sat in the lobby of the Kennard House yesterday, when the question as to the cost of running an ordinarily heavy passenger train was raised. Several of them made estimates, but every one of them was far below the amount. The average cost of running an ordinary passenger train of from six to ten coaches is from $1 to $1.25 a mile. This may seem large at first, but when the several items are taken into account one will suspect, after all, that the estimate is too small. One of the principal items is the running of the locomotive. It has been the study of master mechanics to reduce the cost of running an engine, and each claims to be a little closer in his calculations than the other. The average cost during January of running the engines on the Bee Line, for example, was 15·77 cents per mile. Freight engines run at a cost per mile of 17·73 cents. Passenger engines cost less, viz., 17·24 cents per mile; while switch engines, which are credited with so much mileage per day, regardless of the distances run, are run at so low a cost as to reduce the average to 15·77 cents per mile. The engines ran 34·63 miles to a ton of coal, and 16·38 miles to a pint of oil.

Added to the expense of motive power is the outlay for wear and tear of cars; it is estimated that it costs 3 cents a mile to keep a sleeping car running, and the wages of train hands, etc. The expense from the item of wear and tear is increased by an increase of the speed of a train. The special trains on the Lake Shore, running at a speed of about forty miles an hour, and the fast mail, at about thirty-seven miles, are the most expensive trains on that line. It is not generally known what the Government pays the Lake Shore people for running the fast mail from New York to Chicago, but it ought to receive at least $800 to fully compensate it. Another little item of railway operation is the expense of stopping and starting a train, which an experienced railroad man said yesterday could not be effected at a less expense than from 18 to 25 cents at each stop.—*Cleveland Herald.*

Analyses of Dry Wood, and the Relation of Composition to Heat of Combustion.

Ernst Gottlieb has been investigating the elementary composition of wood dried at 115° C. (239° Fahr.), and the amount of heat that each is capable of yielding when burned. The carbon and hydrogen were determined directly by combustion, weighing the carbonic acid and water produced. The remainder, after deducting ash, represents the total oxygen and nitrogen. The actual quantity of the latter was determined only in a part of the samples.

	Oak.	Ash.	Yoke elm.	Beech	Birch	Fir.	Pine.
Carbon	50·16	49·18	48·99	49 06	48 88	50·36	50 31
Hydrogen	6·02	6·27	6·20	6·11	6·06	6·92	6·20
Oxygen				44·17	44·67	43·39	43 08
Oxygen and Nitrogen	43·45	43·98	44 31				
Nitrogen				0·09	0 10	0·05	0·04
Ash	0·37	0·57	0 50	0·57	0 29	0 28	0 37

(It will be noticed that in no case is there sufficient oxygen to combine with all the hydrogen, hence a portion of the latter must exist in the form of a hydrocarbon.)

For the determination of the heat of combustion, the author constructed a particular form of calorimeter, described in *Journal fur Prak. Chemie,* in which the wood was burned in pure oxygen gas. The operation required but three minutes.

The results were higher than those calculated by Dulong's formula for the same composition. Wood containing 49·03 per cent of carbon, 6·06 of hydrogen, gave out 4,785 calorifics, whereas the amount calculated would be 4,139, if carbon gives 8,080, and hydrogen 34,180 units of heat.