SCIENTIFIC AMERICAN

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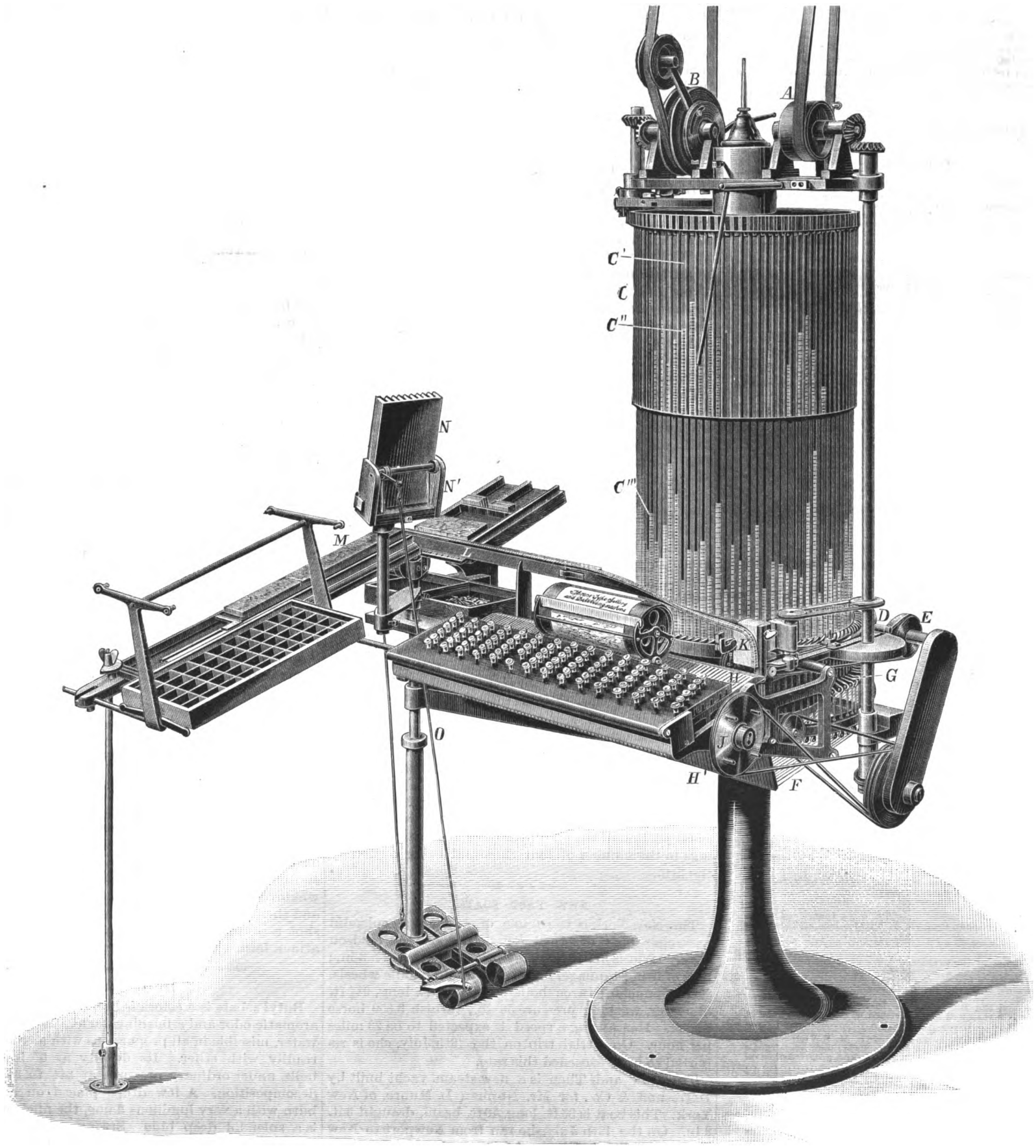
IMPROVED TYPE COMPOSING AND DISTRIBUTING MACHINE.

A great deal of ingenuity has been exercised upon the perfecting of labor-saving machinery for the composing rooms of printing offices, and quite a large number of devices for setting up and distributing type mechanically are now actually in use. Whether the ordinary conditions of the printing trade are such as to render a general use of this machinery impracticable, or whether a conservative adherence to time-honored customs is antagonistic to revolutions such as would ensue upon the adoption of wholly efficient composing and distributing machinery, need hardly be discussed. It is certain that in this country at least, while such machinery does find favor in quite a number of offices, their use does not extend widely. Of course they are necessarily costly and complicated, and assuming everything to be satisfactory, they must be kept in constant use to effect any marked economy, or rather perhaps to avoid a loss.

One of the most interesting objects at the American Exhibition, now open in London, is a machine of this kind. We illustrate it below by a general view, and by some diagrams which will serve to show the general mode of working.

As will be seen on reference to the general view, the two principal features of the Thorne type setting and distributing machine are a keyboard and two vertical cylinders, C and C[III], having the same axis, the upper cylinder resting on the lower one. Both cylinders are cut with a number of vertical grooves, C[I] C[II], of such a form as to receive the type, which is to be first distributed and then reset. In the machine shown at the exhibition there are 90 of these vertical grooves in each of the cylinders, sufficient to contain enough characters and kinds of characters as are wanted for ordinary purposes, but of course machines are made with a greater number of these grooves. The keyboard carries a number of keys corresponding to that of the grooves, and when the machine is in operation, whatever key is depressed, the letter corresponding to it is thrown from its proper groove in the cylinder, C[III], upon a circular and revolving table, D, which has the same axis as the cylinder, but is of larger diameter. Of course quite a number of types may thus be ejected from the gooves in each revolution of the disk, D, and all are brought round in their proper order to a point of delivery, where they are taken up by a traveling metallic band, K, and fed continuously in front of the keyboard to a galley, M. Here any justifying that is necessary is done by a second operator, who stands opposite the small case, N, containing spaces, quads., etc., any desired one of which can be thrown forward by an

(*Continued on page* 52.)



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NEW YORK, SATURDAY, JULY 23, 1887.

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(Illustrated articles are marked with an asterisk.)

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SCIENTIFIC AMERICAN SUPPLEMENT

No. 608.

For the Week Ending July 23, 1887.

Price 10 cents. For sale by all newsdealers.

ALFRED KRUPP.

The news of the death of the chief proprietor of the great Krupp steel works, at Essen, Prussia, has just been cabled to this country. On July 14, at his villa near Essen, Alfred Krupp breathed his last. He has been aptly classed with Bismarck and Moltke as the third of Germany's warriors, as his cannon did such fearful execution in so many battles for the fatherland.

Though it was in Alfred's hands that the works attained their great magnitude, he was not their founder. His father, Friederich Krupp, was born in 1787, and was proprietor of a small "hammer forge" driven by water power, and situated near the present Essen. In 1816 he moved to Essen, and on a locality in the center of the present works erected his modest shop. Here he remained to the day of his death, executing a variety of small work in steel. The works were of the smallest scale. The age of steel had not yet come. Four years before he moved to Essen, his eldest son was born. On April 26, 1812, Alfred Krupp first saw the light. On October 26, 1826, his father died.

The works were placed in charge of Alfred, who conducted them for his mother Theresa. For many years his younger brother Hermann worked as a workman in the forge. The growth of the business was very slow, and long before it attained any size, the brother Hermann left it and entered upon another line of work. On February 24, 1848, the firm was given the name of "Friederich Krupp," in honor of the founder of the Essen works.

The growth of the works became more rapid as steel was more widely used. In 1851, Krupp was already in the front ranks of the world's steel producers. He sent to London world's fair of that year a great block of steel, the largest that up to that time had ever been produced. Agricultural and engineering appliances received most of Krupp's attention until the manufacture of steel cannon was undertaken by him. In the Paris exposition of 1867 a prize was awarded him for his cannon, that four years later were to be a powerful factor in bringing about the conclusion of the Franco-German war. He was one of the early advocates of steel guns, and at an early period saw that the successful breech-loading cannon was to be the gun of the future. The size of his pieces increased year by year. He maintained a hot rivalry with Sir William Armstrong in the production of the largest and most powerful gun. With the exception of England and the United States, almost all of the principal countries bought cannon at Essen. The more peaceful branches of his business were not neglected, as massive steel forgings of all kinds of axles, crank shafts, locomotive tires, and the like were and are made in vast quantity at Essen. In 1864, at the conclusion of the Danish war, letters of nobility were offered him by the King of Prussia, but he refused them.

The works, and incidentally the town of Essen, had grown with unprecedented rapidity. The economic triumphs of his life, in developing such an establishment, are perhaps the greatest, exceeding in their beneficial aspect his metallurgical exploits. His father's works, it is said, began with two workmen. In 1860, 1,764 hands were in Alfred Krupp's employ. In 1870, 7,084 men were on his rolls. To-day, including the works, blast furnaces, and mines, nearly 20,000 workmen, representing with their families, as it is computed, about 66,000 souls, are maintained by the Essen works and dependencies. The establishment is classified by sections: 1, the factory at Essen; 2, three coal mines at Essen and Bochum; 3, five hundred and forty-seven iron mines in Germany; 4, several iron mines is Spain north of Bilbao; 5, the blast furnaces, in 1885 eleven in number; 6, a range for trial of artillery at Meppen; 7, other smaller ranges; 8, four steamers for marine transport; making eight sections into which the business is divided.

The management of the works is in the hands of a syndicate of the owners, who consult with Friederich Alfred, the only son of the late proprietor, as to the more practical details of the work.

The town of Essen now numbers nearly one hundred thousand inhabitants. Outside of the city limits a great portion of the employes have their homes, lodgings to the number of four thousand being owned by the firm.

NEW FAST BOATS.

The New York is the name of a new and splendid passenger boat designed for service on the Hudson River. She is 311 ft. long; depth moulded, 12 ft. 3 in.; hull of iron; tonnage, 1,552; feathering paddle wheels, 30 ft. diameter; three boilers each 33 ft. long, 9¼ ft. diameter, working pressure 50 lb., furnish 3,850 horse power. Her average speed is expected to be 23 miles per hour. On a trial trip on the 13th July, she is reported to have exceeded this rate.

The Now and Then is a new steam yacht built by Herreshoff & Co., for Mr. Norman L. Munro, of New York. This boat is 85 ft. long, 10 ft. beam, draught 3 ft. 8 in. On the 12th July she ran from Newport to New York, 170 miles, in 7 hours 4 minutes, being an average of 24 miles an hour. This is claimed as the fastest time for a steam vessel, for any considerable distance, on this side the Atlantic. The parties interested make considerable brag over her performances.

The speeds of both the above vessels are excellent, but they fall considerably short of the latest engineering realized in England. For example: The new passenger steamer Queen Victoria, of the Manx line, plying between Liverpool and the Isle of Man, is 340 ft. long, 39 ft. beam, 24 ft. depth, gross tonnage 1,500 tons, engines 6,000 horse power. Believed to be the fastest merchant steamer afloat. She lately steamed from Greenock to Liverpool, about 240 miles, in 9 hours 23 minutes, her average speed being 25·62 miles per hour.

The Prince of Wales, another boat of same build and dimensions, is expected to have the same speed. The Cunard steamer Etruria, plying between New York and Liverpool, sometimes steams 557 miles in 24 hours, being an average of over 23 miles per hour. J. & G. Thompson, of Clydebank, are now building two new steamers which are to surpass the Etruria in speed.

The Italian iron clad Dogali, 267 ft. length, 37 ft. beam, mean draught 14 ft. 6 in., has a speed of 23 miles an hour.

The new German war steamer Greif can make 25⅛ miles per hour. The Thornycroft torpedo boat lately built at Chiswick for the Spanish government is 147 ft. 6 in. long, 14 ft. 6 in. beam, and draws 4 ft. 8 in. water. On a recent trial trip, tide in her favor, she attained a speed of 33⅛ miles an hour with the tide, and a mean speed of 30 miles per hour, with and against tide.

A torpedo boat lately built by Yarrow & Co., for the Chinese government, is 128 ft. long, mean speed 27½ miles per hour. The same builders have delivered to the British government boats of the Falke type that average 26½ miles per hour, 135 ft. long, 14 ft. beam, boilers 1,660 h. p.

Torpedo boat number 79, same builders, reached a mean speed of 26⅛ miles per hour; 125 ft. long, 13 ft. beam. Engines 1,000 h. p.

The twin screw torpedo boat recently built at Poplar, by Yarrow & Co., for the Italian government, attained a mean speed loaded of 28 miles per hour. Length 140 ft., beam 14 ft., draught 5 ft. 4 in., displacement 100 tons. Engines 1,400 i. h. p.

It is doubtful if there are any corresponding vessels in our waters that can equal the foregoing in point of speed, nor is there any present evidence of our ability to construct them. We are building new war ships, but before they are finished they will be out of date in respect to speed. Not one of the new vessels is expected to run as fast as the boats above mentioned.

Whether for use in war or peace, the first requisite, in these active days, is high speed.

In the forthcoming international yacht race, in which sailing vessels only will compete, it is to be hoped our transatlantic rivals will, as before, suffer defeat; but if the race were to be with steam vessels, it is certain we should be left in the lurch.

Is there no one in this great country possessed of means and brains enough to produce a steam vessel that shall beat the world?

Magazine Guns.

The repeating rifle of the German army differs from the ordinary rifle in the fact that the stock, instead of stopping short where it is grasped by the left hand, is prolonged to within an inch of the end of the barrel. This constitutes the reservoir of cartridges. The firing consists of three movements—the "ready," during which each man gives a sharp turn to the right to a lever above the lock of his gun, and the familiar "present" and "fire." The company stand four deep, the two front ranks firing while the two rear ranks recharge their magazines. So rapid are the movements that the magazine is emptied, with a perceptible allowance each time for rapid aim, in ten seconds. To think of what would happen to any body of men exposed to half a minute of firing like this is simply appalling.

It is all very well for a Russian governor to issue orders to his troops calling upon them to remember that battles are won by courage, and not by repeating rifles; but the moral effect of the new weapon both upon those using it and those opposed to it must be enormous. To be able to wait until the enemy, in whatever form he may be, is within a few yards of you, and then to deliver your fire upon him at the rate of a shot a second, is quite enough to revolutionize all attack formations.—*Broad Arrow.*

Butyl Sebate.

Butyl sebate is a colorless liquid of an agreeable and aromatic odor and a burning taste. It is insoluble in water, miscible in all proportions with alcohol, but less readily with ether. Its density at 0° is 0·9417. It boils, under ordinary pressure, at 344° to 345° without decomposition. A few drops placed on a glass rod burn with a very luminous flame, the nucleus of which is a splendid deep blue. Strong sulphuric acid decomposes it, even in the cold. Caustic potassa saponifies it, ammonia gives a white precipitate of sebamide in microscopic crystals.—*G. Gehring.*

PHOTOGRAPHIC NOTES.

Toning Bromide Prints with Platinum.—In a communication to the *Photographic News*, Leon Vidal refers to the advantage of changing the character of bromide prints by toning with bichloride of platinum, which, in his opinion, renders them more permanent. He says: After development with ferrous oxalate, and washing in water acidulated with acetic acid, the prints are immersed in the toning bath, composed as follows:

Bichloride of platinum	1 gramme.
Water	2 liters.
Pure hydrochloric acid	30 grammes.

The prints are left in this bath sufficient time for them to be well covered with a good coating of platinum, this metal being gradually substituted for the silver. The image is weakened under the action of the toning bath. Therefore over-exposure is necessary, as is the case with impressions on albumenized paper. With a little practice, it is easy to know what the proportion of this over-exposure should be, and also the time necessary for the immersion in the platinum bath. To verify whether the toning action is produced, and to appreciate its intensity, have at hand in a small dish a solution of 12 per cent of bichloride of copper dissolved in water. Before toning, the image on a fragment of a print plunged into this bath will completely disappear, the reduced silver being transformed by the bichloride of copper into white chloride of silver; but as soon as the deposit of platinum has begun to take place, this metal not being attacked by the liquid in question, an image at first feeble is seen to remain, becoming more and more powerful in proportion to the time of immersion in the platinum bath. Images thus produced are indestructible; for admitting that that portion of the image which is of silver may completely disappear, there will always remain the platinum image, somewhat attenuated, it is true, but quite complete, however, if the duration of the exposure and development have given an intense proof. There will remain an image of sepia color; and we may assure ourselves, without waiting for it, of the effect of any alteration due to time, by plunging, after toning, the entire proof into the bath of bichloride of copper. All reduced silver which has not been replaced by platinum will be transformed into white chloride of silver; and what remains visible is an image formed solely of platinum. If it is desired to preserve it as such, there is nothing further to do than to place the image in hyposulphite of soda to dissolve all the chloride of silver, and an image will remain formed exclusively of platinum. It may be that in studying this question more deeply we may succeed in forming on the silver image a deposit of platinum of a black color. We are now engaged in experiments having this end in view. When a proof has been passed through the bath of bichloride of copper, in order to ascertain the amount of platinum that has been deposited, it may be easily restored to its primitive condition by immersing it, after washing it in three waters, in a bath of ferrous oxalate identical with that which has served to carry on the development. The image immediately regains its original vigor, and there is nothing to prevent its being afresh submitted to the action of the toning bath for a more complete platinization if required.

It will be noticed that when the image has been made to disappear in the bichloride of copper bath, it becomes more brilliant and of a bluer black tone when reconstituted in the ferrous oxalate bath. We may even, thanks to the use of this bath, succeed in reducing a too vigorous impression. This offers a very important advantage when enlarged proofs are in question. In such case we must over-expose, because we have the power of afterward very easily bringing back the image to the desired depth. From what has just been said, it naturally results that positive gelatino-bromide of silver papers conduce to applications which are of very great interest, and which could not be realized with so many advantages by any other sensitive preparations.

We only insist that platinum toning allows us to obtain, at less cost than by any other means, images having platinum as a base, and under conditions, as to rapidity, of great value. We believe we render a service to our photographic brethren by pointing out a method destined to extend the field of their labors. No one has up to the present, so far as we know, published the means of assuring the permanence of impressions obtained upon gelatino-bromide of silver papers, at the head of which we do not hesitate to place those of the firm of Eastman & Co.

Alabandine.

A solution of manganese acetate, even if slightly acidified with acetic acid, gives an abundant precipitate if treated in the cold with sulphureted hydrogen. There is formed the well-known rose-colored sulphide, which, if heated to 100° in a closed vessel, is transformed into the compact green variety. On prolonged standing, crystals are produced, even at common temperatures, and prove to be alabandine.—*H. Baubigny, Comptes Rendus*, vol. civ., No. 20.

Many Items of Interest.

The *Electrical Review* thinks many will be surprised by the statement that more than 8,500,000 passengers are carried annually in this country on street cars moved by electric motors. In Montgomery, Ala., electricity is used on eleven miles of road, and the cost is reported by the general manager to be only one-half the cost of horse power. Roads on which electricity takes the place of horses are found in Baltimore, Los Angeles, Port Huron, Detroit, Scranton, Appleton, Wis., and Denver. Electric railways are either in course of construction or under contract in twelve other cities, and in thirty-seven, companies have been formed or other steps taken for the building of such roads. Upon none of the roads now in operation in this country, however, is force supplied by storage batteries attached to the cars. In most cases, power is communicated by an overhead conductor.

The pests known as Buffalo moths prevail in many localities along the Hudson River, and in the aggregate the loss they have entailed is large. All sorts of devices, including benzine, tobacco, cedar shavings, and various other agents, have been used by busy housewives for the extermination of the pests, but without avail. They infest bureau draws, and riddle holes in linen and in all kinds of dry goods. They are found in closets and wardrobes, in trunks and under carpets. In some places these little furry-coated moths pursue their way so industriously that housewives do not fasten down their carpets, as they have to be lifted regularly every day to kill the moths.

For a kitchen floor, especially one that is rough and uneven, some one in the New York *Tribune* recommends the following glue paint: To three pounds of spruce yellow add one pound, or two pounds if desired, of dry white lead, and mix well together. Dissolve two ounces of glue in one quart of water, stirring often until smooth and nearly boiling. Thicken the glue water after the manner of mush, until it will spread smoothly upon the floor. Use a common paint brush, and apply hot. This will fill all crevices of a rough floor. It will dry soon, and when dry apply boiled linseed oil with a clean brush. In a few hours it will be found dry enough to use by laying papers or mats to step on for a few days When it needs cleaning, use hot suds.

The Hartford Steam Boiler Inspection and Insurance Company have favored us with a bound volume of the *Locomotive* for 1886. It is a book of nearly 200 pages, full of matter of interest to steam users and those having charge of boilers. This matter relates to current practice, and gives the latest experience and observations on steam boilers. The price is one dollar, and it may be had at the office of the company, Hartford, Conn.

The way in which glass may best be cut with scissors is told in the *Pottery Gazette*, London: Glass may be cut under water with great ease, to almost any shape, with a pair of shears or strong scissors. Two things are necessary for success. First, the glass must be kept quite level in the water while the scissors are applied; and secondly, to avoid risk, it is better to perform the cutting by taking off small pieces at the corners and along the edges, and to reduce the shape gradually to that required. The softer glasses cut the best, and the scissors need not be very sharp.

A singular fire occurred in this city on the 13th inst. in the following manner: By the crossing of two telegraph wires, sparks were produced which set fire to a telegraph pole in John St., opposite the Western Union building. There were about 150 wires hung on the pole. An alarm of fire was sounded, and soon engines arrived and the pole was saved. The flames were near the top, and it was with some difficulty that water could be raised to such a height; but at last the effort was successful and the flames were overcome, amid the shouts from the 2,000 or 3,000 persons who had assembled on Broadway.

Some new quick-firing guns of heavy caliber, intended for the British navy, have just been successfully tried upon the proof ground of Sir William Armstrong, Mitchell & Co., near Silloth. The first weapon tried was a 36 pounder improved rapid-fire breech-loading gun of caliber 4·724 in. This was fired with 7½ lb. of powder. The weapon is made entirely of steel, its length being 14 ft. 2½ in., length of barrel 35 calibers, and weight 34 cwt. Ten rounds can be fired in 47 seconds, giving a rate of fire six times faster than the present service of guns of the same caliber. The next gun tried was a 70 pounder, which was discharged about half a dozen times, both with 25 lb. and 30 lb. charges, at a speed of from eight to ten rounds per minute. According to the *Naval and Military Gazette*, London, the results were considered satisfactory.

Copies of photographs of flashes of lightning are desired by the Council of the Royal Meteorological Society, London, who hope that many photographers may be found willing to take up the matter. It is pointed out that there is no special difficulty in photographing lightning, as, if a rapid plate and an ordinary rapid doublet with full aperture be left uncovered at night during a thunderstorm for a short time, flashes of lightning will, after development, be found in some cases to have impressed themselves upon the plate. There is, however, uncertainty whether any particular flash will happen to have been in the field of view.

California has a well deserved reputation of doing everything on a grander scale than any other State in the Union, and this peculiar phase of her development is soon to be manifested by the erection of a huge tomb in the Mountain View Cemetery, Oakland, Cal. This mortuary monument is being erected by the millionaire physician, Dr. H. D. Cogswell, to his own memory and from designs made by himself. Dr. Cogswell has already achieved notoriety, not perhaps always properly appreciated, by his presentation of drinking fountains to various cities, from designs of which he himself is the originator. The monument, which is his latest achievement, and with which he proposes to keep his memory ever green, and which he intends shall stand as an everlasting memorial of his wealth and genius, will be over 70 ft. high, and will be placed in the center of his large circular lot. The granite plinth contains 23 square feet, and is in four pieces. The first base stone is over 12 ft. square. There are three enormous stones placed one above the other over the base stone, and each slightly smaller than the one below it. The die is 5 ft. square, with raised polished moulded tablets on each side, and upon this will be raised the obelisk. There are polished columns at the four corners of the die, and upon the columns at the base of the obelisk are placed four female marble figures, 7 ft. high, representing Faith, Hope, Charity, and Temperance. The obelisk is 4 ft. square and 36 ft. high, and weighs 29 tons, and carries at the top a dome covered with bronze work, with a single glass star, measuring 7 ft. from point to point. There will be elaborate stone work about the monument, and the whole will cost, it is estimated, over $75,000. The granite work is being conducted by Mr. Alexander McDonald, of Cambridge, Mass., the stone being supplied from Mr. McDonald's quarry at Mason, N. H., and is now in course of transportation across the continent.

"Are you aware of the extent of the toothpick business in Maine?" Mr. J. C. Bridgman, who represents the National Toothpick Association, asked a representative of the Portland (Maine) *Press* the other day. "That seems to be a pretty big name for small business, I suppose you think," he continued. "But you will be surprised when I tell you that our association have contracted for enough toothpicks to be made in Maine the coming year to load a train of fifty cars with nothing but toothpicks. We shall take out of Maine before next June five thousand million toothpicks. A pretty fair sized wood lot, you see, will be slit up to go into the mouths and vest pockets of millions of Americans. Maine furnishes the larger portion of all the toothpicks used in the country. Our association controls the trade. It is something like the Standard Oil Trust, the Cotton Seed Oil Trust, and the lately formed Rubber Trust. It regulates the price and output of toothpicks as the big trusts regulate the prices and output of oil or rubber goods. We have not adopted the name Toothpick Trust yet, however. We have a mill at Belmont, N. Y.; Harbor Springs, Mich; and Fond du Lac, Wis. Besides these, all our mills are in Maine; one at Strong, one at Farmington, one at Canton, and two at Dixfield. There is a small mill at Mechanic Falls, also, but it has not joined our association. In Massachusetts, also, there is one small mill not in the association. So you see Maine is the great center of the industry of toothpick making."

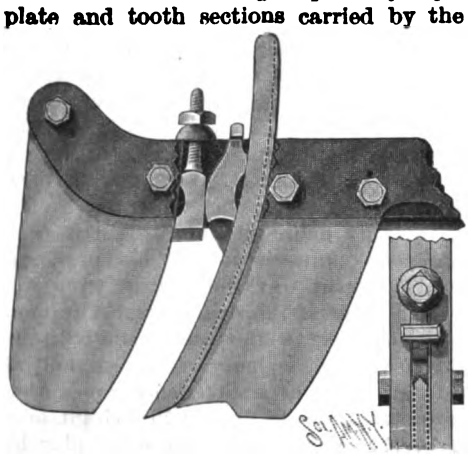
A Gigantic Oak.

One of the sights at Havre Maritime Exhibition is the trunk of a gigantic oak placed in an iron boat especially constructed for its reception. This trunk was found accidentally in the bed of the Rhone, at La Balme, as long ago as 1874, when, during a period of low water, a branch was observed projecting above the surface. On a closer examination, this was found to belong to a huge trunk embedded in the mud of the river. It was not till ten years later (1883) that the level of the water was low enough to enable the tree to be taken out. It took five months to remove it from the bed of the river, some 30 feet of sand and gravel having to be removed in order to liberate it. At length, on March 25, 1884, it was brought to the shore, where the dimensions of the trunk were found to be as follows: Length, 101·6 feet; circumference at the origin of the roots, 29·5 feet; circumference at the level of the soil, 19·6 feet. The actual weight of the tree is 121,000 pounds, and its age is estimated to be from 400 to 450 years.

The boat, called the Dryophore ("oak bearer"), is intended to transport the tree from river to river, for exhibition.

AN IMPROVED FASTENING FOR ICE PLOW TEETH.

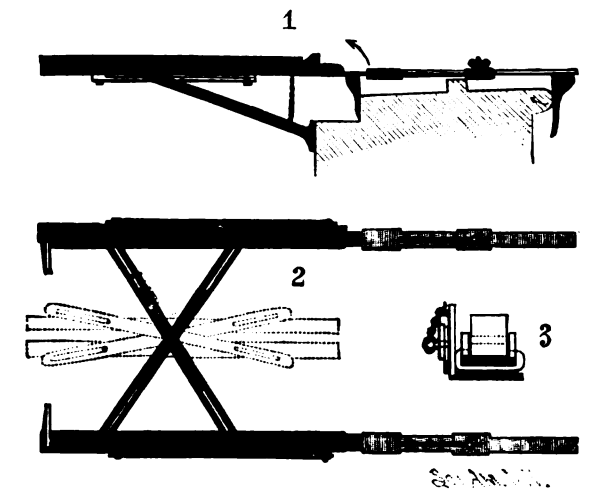
In the cutting of ice for market in large quantities, as the industry is carried on up the Hudson River, and in other places, plows are employed, which have several teeth, one behind the other, each following tooth cutting deeper than the one preceding it, and the shallower cutting teeth set at a greater inclination than those which cut deeper. On this account it has heretofore been necessary to fit each tooth fastening separately upon the plow plate and tooth sections carried by the plow beam. This difficulty is obviated by the invention herewith illustrated, which forms the subject of a patent recently issued to Mr. Henry Bodenstein, of Staatsburg, N. Y., the fastening shown accommodating itself to the various inclinations of the inserted teeth, which are thus held firmly and rigidly in position, yet so as to admit of ready adjustment. The forward edges of the plate sections against which the teeth rest are beveled to receive grooves formed on the back edges of the teeth, and against the front edge of each tooth is held a stop plate of novel form, this stop plate having two bearings against the tooth, and being held in position by a wedge key, which brings the teeth in rigid contact with the plate sections. The peculiar formation of the stop plate and wedge key is such that they always have an even and positive bearing upon each other and upon the teeth and plate sections, and when a new tooth is inserted of greater or less width, the inclined edge of the stop plate will accommodate itself to the difference.



BODENSTEIN'S FASTENING FOR ICE PLOW TEETH.

A STAND ADJUSTABLE FOR MANY USES.

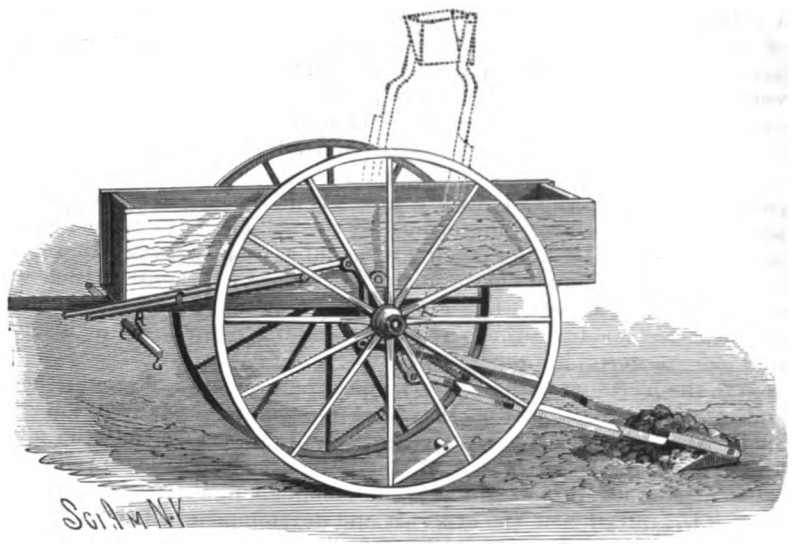
A framework of simple construction, adapted for readily forming therewith quite a variety of stands desirable for various household uses, and which can be quickly taken apart and folded up into compact form for storage or removal, has recently been patented by Mr. Frederic S. Weatherley, of the city of Quebec, Canada. Its adaptations and the principal features of construction will be readily understood from the illustration, the vertical posts forming the end supports being permanently connected in pairs, and rigidly braced by four parallel cross bars. The end posts are longitudinally connected by side bars, one end of each bar being hinged to a post and its free end being formed with a tenon that fits in a corresponding slot in the opposite post, each post thus carrying one hinged end of the side bar, and having a socket for the reception of the free end of another side bar. Three boards of like size are employed in connection with the frame, each of them having slots in their edges adapted to fit closely the posts, and the end and side bars, which are of equal and uniform cross section. At the base of each of the slots in the boards is pivoted a catch adapted to be swung into angle slots in the inner corners of the side bars and end cross bars, and small blocks, equal to the thickness of a board, are adapted to fit in the corners in such way that a table may be made with its upper surface flush with the tops of the posts, or the boards will fit the posts to make a table with an inclined top.



STRACHAN'S RACK FOR SOLAR PRINTING FRAMES.

A SELF-LOADING DIRT CART.

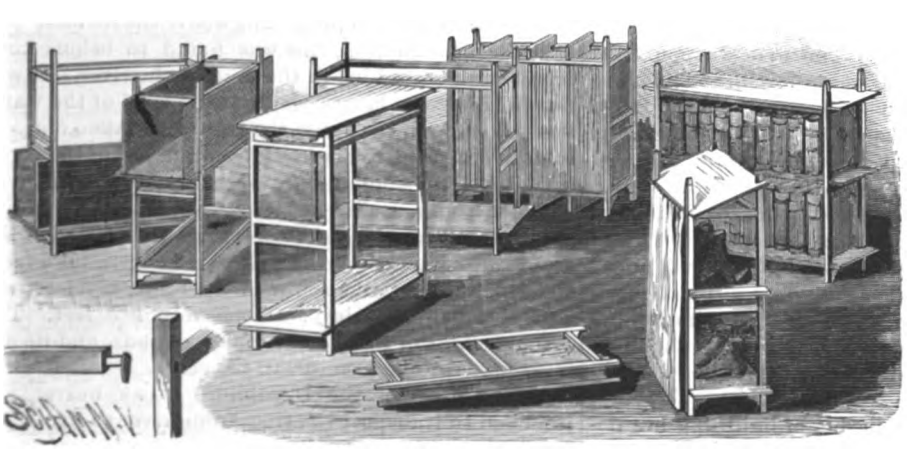
A cart designed to automatically take up its load as the cart is started forward is shown in the accompanying illustration, and forms the subject of a patent issued to Mr. Samuel M. Stevenson, of Bastrop, La. The scoop or shovel is rigidly attached to two rearwardly extending levers, pivotally connected to clips secured to the axle, these levers having outwardly extending flanges, which lie within the path of roller-carrying pins upon the spokes of both wheels. When the wheel is revolved, these rollers attached to the spokes raise the levers, carrying the scoop with its contents up over the body of the cart to the position shown in dotted lines in the illustration, whereby the scoop will be emptied into the cart. Just as the levers carrying the scoop reach this position, the rollers upon the spokes of the wheels pass beyond the upper edges of the flanges upon the levers, and the latter drop back to the ground. To an upwardly extending arm of the clips upon the axle are connected levers carrying rods and standards, whereby either of the wheels of the cart can be readily raised from the ground and turned to register with the other wheel, so that the rollers upon the spokes of both wheels will engage simultaneously with the scoop-raising levers. After the cart has been loaded, and is to be moved from place to place, the levers, with the scoop, are held in vertical position over the cart body by side chains from the shafts, the load being delivered from the cart by dumping in the ordinary way.



STEVENSON'S DIRT CART.

A FOLDING RACK FOR SOLAR PRINTING FRAMES.

An improved rack for holding the frames to obtain sun exposures conveniently from a window, as ordinarily required in photographic printing, is shown in the accompanying illustration, and forms the subject of a patent recently issued to Mr. Joseph Strachan, of No. 322 Madison Street, Brooklyn. Fig. 1 is a side view, the parts being represented as they appear locked in the window in position to support a printing frame. Fig. 2 is a plan view, the dotted lines showing the frame as folded for storage, Fig. 3 being a sectional view through the clamping attachment. It will be readily understood from the illustration how the side arms are fixed at the desired distance apart for holding the printing frame, by the clamping of the cross rods at the requisite angle, the side arms having flanges for the introduction of the frame. The extensible clamping attachment on the inner ends of the arms is so made that the rack can be readily fixed in position in any window frame, and the brace rods under the arms are adjustable to support the rack in a horizontal plane, or at any desired angle, as will most facilitate printing at different times of the day, according to the position of the sun.



WEATHERLEY'S CONVERTIBLE STAND.

Nitro-Glycerine in Shells.

A number of experiments were made with nitro-glycerine on San Francisco Bay, north of San Francisco, California, on June 11th, which were witnessed by many interested persons. A number of shells were fired from a twenty pound Parrott gun, a three pound charge of powder being used. The first experiment was successful, the shell plowing on the opposite bluff ten seconds after leaving the gun. In the second and third experiments the shells used were defective, and failed to explode. The fourth struck the water and extinguished the fuse. In the fifth trial the gun was aimed into the mud, and the shell exploding sent up a column of mud 100 feet into the air. The hole made by this shell was eight feet in diameter and five feet deep. In the sixth trial the shell was loaded with common powder, the other conditions being the same as in the fifth experiment. The concussion, however, was much lighter, the hole two and a half feet in diameter, and but one foot deep. The experiments were regarded as highly successful, as demonstrating the possibility of firing charges of nitro-glycerine in ordinary shells.

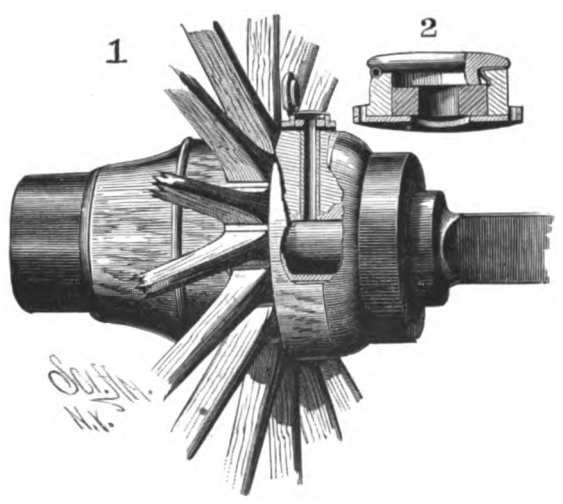
Curious Cause of a Fire.

The Boston *Commercial Bulletin* records a noteworthy instance:

A fire happened in a woolen mill in a most remarkable way a short time since. Two shuttles in a flannel loom got out of adjustment and the metal points struck each other so exactly on the end as to cause a spark that set fire to the warp. A pail of water extinguished the fire. A fire from this cause was never known before, and might never be known to occur again, as the most minute deviation would have caused the shuttles to slip by. Considering the velocity of their movement, it is as remarkable as though two bullets meeting in the air should strike one another exactly on the tip.

AN IMPROVED VEHICLE LUBRICATOR.

A lubricator intended for application to wheels of almost any vehicle has been patented by Mr. James P. Ruth, of West Alexander, Pa., and is shown in the accompanying illustration, Fig. 1 representing a hub with the lubricator in position, and Fig. 2 being a sectional view of the lubricator removed. The lubricator is in the form of a circular box, with outwardly extending lugs by which it may be fixed upon a hub, through the wooden and metal portions of which a vertical hole is made, and lined with a tube. About the upper end of this tube is placed a rubber washer, upon which the lubricator is seated, so that any lubricant poured through the central opening finds its way to the axle and box. Any escape of the lubricant is prevented by turning down the hinged cover, which is clamped to place by a spring. The use of this device obviates the necessity of removing vehicle wheels in order to lubricate the axles.



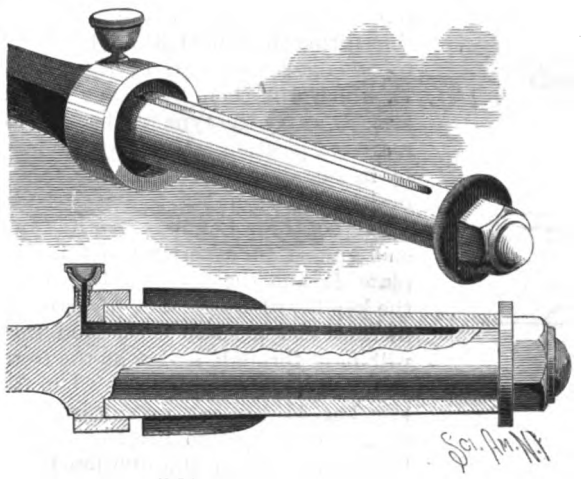
RUTH'S AXLE LUBRICATOR.

Magnesia for Vines.

Magnesia forms a very important constituent in all soils in which the French vine resists, and in those where the American vine flourishes best. Its percentage in the ash of the American vine is more considerable than in the ash of *V. vinifera*. Practical experiments are needed on the use of magnesium-ammonium phosphate as a manure for vines.—*A. C. Dejardin.*

AN IMPROVED LUBRICATING WAGON AXLE.

A wagon axle that may be easily and perfectly lubricated has been patented by Mr. Cornelius M. Regan, of Brooklyn, N. Y., and is represented in the accompanying illustration. A flange encircles the axle and overlaps the inner end of the box, which is thus protected from the sand and dust, and in the upper portion of the axle is formed an oil groove, about three sixteenths of an inch deep at the point to five sixteenths of an inch deep at the shank, to facilitate the distribution, but prevent the too rapid flow of oil. The oil is admitted to this groove through a vertical hole made in the axle back of the flange, an oil cup closed with a



REGAN'S WAGON AXLE.

cap being fitted to the vertical opening, so that the axle may be conveniently lubricated without removing the wheel.

For further information concerning this invention, address Mr. A. M. Levy, of No. 760 Myrtle Avenue, Brooklyn, N. Y.

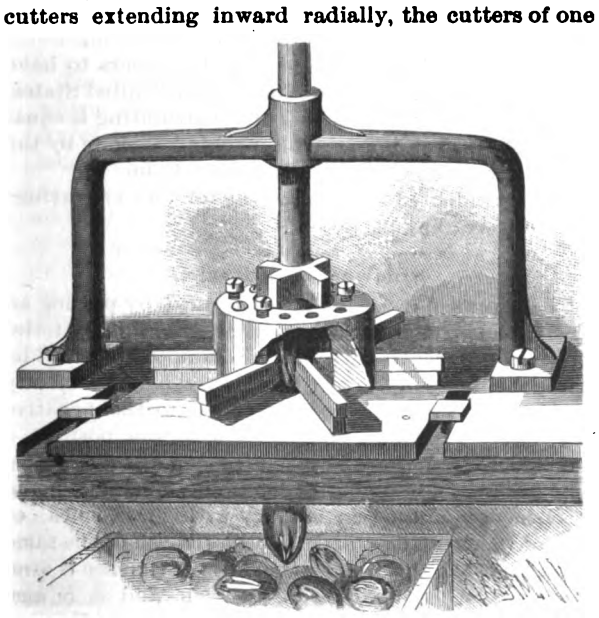
AN IMPROVED PAD FOR HORSE COLLARS.

The collar shown herewith has a pad so attached that it supports the whole weight of the collar, and leaves a small air space between the pad and the top of the collar. The pad forms the subject of a patent recently issued to Mr. John S. Pope, of Madison, Lake County, Dakota Territory, and is made of a single piece of leather or other suitable material, perforated with small holes, stiffened at the back by narrow strips of sheet metal. The collar is suspended from the pad by straps and buckles on either side, the collar being free to turn with the movement of the horse's shoulders without moving the pad, thus preventing the chafing and galling of the horse's neck so frequently caused by the ordinary form of collars.

POPE'S PAD FOR HORSE COLLARS.

A NUTSHELL CUTTER FOR CONFECTIONERS, BAKERS, ETC.

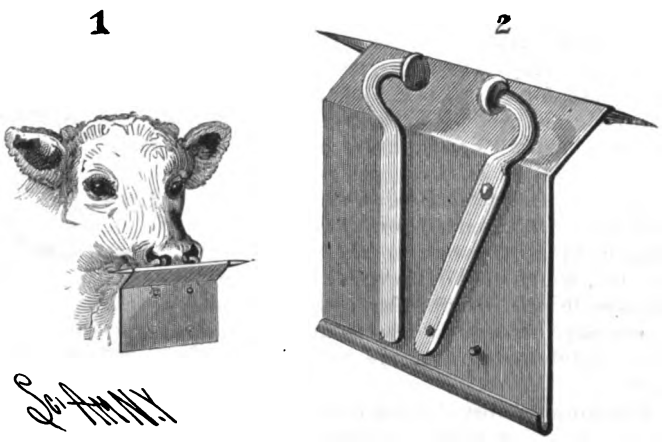
The accompanying illustration represents an effective device for cutting the shells of nuts, to release their kernels without bruising the meat, which has recently been patented by Mr. Charles Pecht, of No. 804 Red River Street, Austin, Texas. The nuts are placed successively in the metallic ring, which has a series of cutters extending inward radially, the cutters of one series being set farther in the ring than the cutters of the other series, the nuts being pushed through between the cutters by a follower, which may be driven by hand or power. The cutters are set at the required distance apart for different sized nuts by a plug gauge, and clamped in their places by set screws. A number of these machines may be clamped side by side on a table, and fed through a system of perforated cylinders, so that a boy or girl can feed two or three machines without danger of crushing or maiming the fingers. By actual experiment it is stated that the shells have been cut on forty pounds of nuts by the machine in an hour, steam power being used, and by running it with a treadle, thirty pounds have thus had their shells cut in an hour.



PECHT'S NUTSHELL CUTTER

AN IMPROVED CALF WEANER.

A simple, easily applied, and effective device to prevent a calf from drawing milk from its mother when the period for weaning arrives is shown in the accompanying illustration, and forms the subject of a patent recently issued to Mr. Robert L. Rickman, of Graham, Texas. The pendent plate is formed of galvanized iron or other light, yet strong and stiff, material, and is bent at an angle near the top to form an inclined portion, at the top edge of which is longitudinally attached a rod with projecting sharpened ends. Upon the plate are two arms, one rigidly attached and the other pivoted, the arms carrying buttons, adapted to fit on the sides of the cartilage of a calf's nostril, the buttons being lightly clamped thereon and the plate thus held in suspension over the mouth. The inclined portion of the plate does not permit the weaner to be thrown up over the nose, and the pointed rod pricks the mother when the calf comes in contact with her, thus effectually preventing the animal from drawing milk from the mother.



RICKMAN'S CALF WEANER.

Fast Steaming by Clyde-built Vessels.

Much of the ship building and engineering work which has recently been turned out exhibits the high qualities for which Clyde workmanship has long been famous. In support of this we might instance several cases of huge steamships notable for strength of structure and power of engines, *e. g.*, the magnificent P. & O. liner the Victoria, of 6,600 tons, built by Messrs. Caird & Co., and the belted cruiser for H. M. government, the Australia, built by Messrs. Napier & Sons; but there is more call to point to the number of "fastest passages on record" which different types of vessels of recent Clyde build have been achieving. Notable among these are the performances of the Queen Victoria and the Prince of Wales, the new paddle steamers on the Liverpool and Isle of Man service. On the trial trip of the latter vessel the speed attained was 24¼ knots, or 28 miles per hour, and on a steaming distance of 32 knots between Ailsa Craig and Cambric Light, which was accomplished in 1 hour 25 minutes, the average speed was 22·6 knots, or 26 miles an hour. The Prince of Wales is, therefore, entitled to be considered the fastest steamer in the world (exclusive of some recent torpedo boats), and only slightly better than her sister ship, Queen Victoria, which covered the distance between Tail-of-the-bank, Greenock, and Liverpool in 9 hours 23 minutes, steaming time, the mean speed being 22¼ knots per hour.

The race for supremacy in this important service has seemingly not yet been completed with the placing of these two craft on the route, as it is stated that the Isle of Man Steam Packet Company have asked the Barrow Shipbuilding Company if they can guarantee to produce a steamer to go at least 25 knots or the matter of 30 miles per hour. The reply to this, it is understood, has been made in the affirmative, and it will probably lead to an order. This, of course, means additional and still faster vessels of Clyde build in the future. The new steamer Meteor, built by Messrs. J. & G. Thomson for the London and Edinburgh Shipping Company, has accomplished the voyage between London and Leith—wharf to wharf—in 27 hours and 45 minutes, and from Gravesend in 25 hours 40 minutes, this being the fastest passage on record between the two places, a distance of 475 nautical miles. Of this steamer it is interesting to note that although exactly of the same form and dimensions as the Iona, the last crack vessel built for the company, she is about 5 per cent lighter in structure, owing to improvements in systems of construction. She is fitted with the now universal triple-compound engines, and the substitution of these for the ordinary double-compound type results in the engines developing 50 per cent more power with an addition in the weight of engines of only 16 per cent over the old system. The Iona, it may be added, which left London 1 hour and 50 minutes before the Meteor on the passage above alluded to, only reached Leith 5 minutes sooner than the latter vessel.

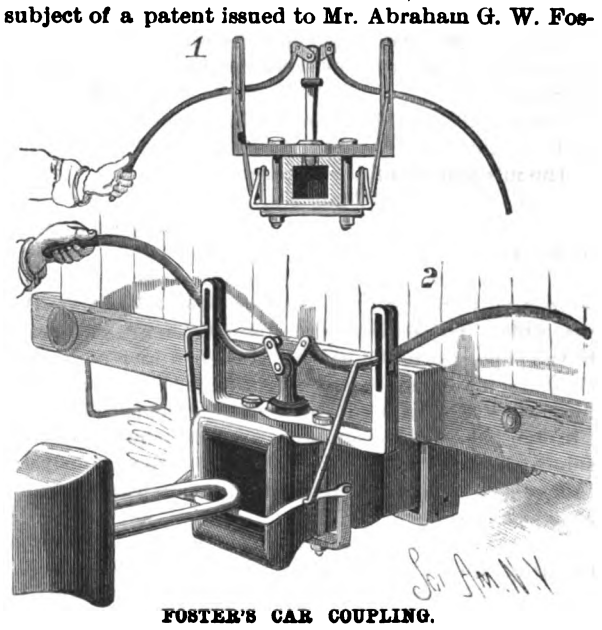
Another circumstance in which Clyde people justly take pride is the recent "breaking of the Atlantic record" by the Cunarder Umbria. This noble vessel recently made the run from Queenstown to Fire Island, New York, in 6 days 2 hours 37 minutes, the shortest time on record. The best passage previously made was accomplished by her sister ship, the Etruria, in 6 days 5 hours 31 minutes to Sandy Hook, the latter being 35 miles, or equivalent to 1¾ hours further steaming than Fire Island.—*Marine Engineer.*

Removing Iodine Stains.

The *Repertoire de Pharmacie* describes a method of removing the disagreeable yellow stain produced upon the skin by the application of tincture of iodine, and which in ordinary cases remains for a considerable time. In the case of the hands, we are told, where the skin has become hardened, dilute ammonia, soda, charcoal, or common soap may be employed; but in treating women, whose skin is tender, and for those parts of the body, such as the face and neck, where the epidermis is not hardened by friction and exposure, it is preferable to employ the sulphite or bisulphite of soda, which are not irritating, and at once absorb the superfluous iodine to which the stain is due. The sulphite of soda has been used for this purpose in solution varying in strength from $\frac{1}{100}$ to $\frac{1}{10}$ in water. The liquid is penciled on to the place where the tincture of iodine has been applied, or used in compresses. In a few moments it will be found that the pain and irritation caused by the free iodine, as well as the disagreeable yellow stain, will have all totally disappeared, to the great satisfaction of the patient. As tincture of iodine is in daily use, and many persons are prevented from visiting or receiving visits for many days after an application of it, the little recipe above mentioned will prove frequently of great service.

AN IMPROVED CAR COUPLING.

The invention herewith illustrated, which forms the subject of a patent issued to Mr. Abraham G. W. Foster, of Newnan, Ga., provides a coupling which may be operated from the sides of the car, and in which the link may, from the same point and with the same lever, be adjusted to enter an opposing drawhead of different height. Bolted to the top of the drawhead is a bar having upright arms, and with a central aperture registering with the pin aperture in the drawhead, the upright arms having vertical slots at right angles to each other, through which extend, sidewise, curved levers, pivoted through short connecting plates to the coupling pin. The curved levers are pivotally held in the side slots by connecting rods which pass through the front slots, extending thence forward and downward, where their ends are attached to a U-shaped guide bar for raising the coupler link, as shown in Fig. 2, the coupling pin being shown in raised position in Fig. 1. For use on passenger cars, a single arm will be all that is necessary, having its free end bent upward to extend above the car platform, instead of the two curved levers reaching to each side. For further particulars about this invention, address J. H. Shelnutt, Newnan, Ga.



FOSTER'S CAR COUPLING.

IMPROVED TYPE COMPOSING AND DISTRIBUTING MACHINE.

(*Continued from first page.*)

ingenious treadle arrangement, N and O. Proof corrections are, of course, done in the ordinary way. The lever connections between the keyboard and the stops, which eject the various types from their respective slots, are indicated by F, J, G, H, and H¹. They are necessarily complicated, but, according to the manufacturer, are not liable to get out of order. Their mode of working will be presently explained. In the general view, A B show the mechanism for causing the distributing cylinder to revolve. As in many other machines of this class, the control of the types is effected by forming on the side of each character recesses something like the wards of a key, the arrangement, of course, being different for each different character. Besides this, some very thin types, such as *l* and *i*, are formed with a nick at the bottom. The grooves on the cylinders are provided with projections corresponding to those on the types, so that no type will fall into any groove other than that it is intended for. This arrangement applies only to the cylinder, C‴, which does not revolve. The grooves in the distributing cylinder, C, are large enough to receive all the types indifferently that are fed into them.

The work of distribution is effected as follows: A suitable attachment to the side of the cylinder, C, enables the operator to place the galley containing the type to be distributed in contact with the cylinder, and by a very simple device line after line of type is fed into the cylinder until, if desired, every groove is nearly filled. Weights are then introduced into the grooves above the type to keep the latter steady, and the upper cylinder is caused to revolve upon the lower one with which it is in contact. As the columns of mixed type pass over the heads of the shaped grooves of the lower cylinder, letter by letter falls into its proper groove as soon as the nicks in the type find their corresponding wards. In this way, and at a speed depending on the rate at which the cylinder, C, is driven, the types are all distributed ready for the work of the compositor.

The details on this page, while not representing exactly the arrangement of the mechanism of the Thorne machine shown at the American Exhibition, will give a clear idea of the principles upon which its action depends.

Fig. 1 is a diagram plan of the stationary type case, showing a sufficient number of grooves to illustrate the principle. These grooves or channels, 2, are so formed in the type case as to be open at their upper ends, and they are closed at their bottom ends by means of the base, 20, Fig. 3, which forms a rest for the type lying in the channels. These channels are all furnished on one side with one or more wards, 8, which are variously arranged so as to correspond with nicks made in the types as already said.

The type conveying mechanism consists of a type carrying table, 30, the surface of which lies in the same horizontal plane as that occupied by the bottoms of the type channels formed by the base, 20. It is mounted so as to revolve with the center of the type case for its center of movement, and thus is adapted to receive type from the channels, 2, upon its surface and carry the same around with it in its circular path of travel.

A circular vertical guard, 21, forms the outward limit to which the types may be projected. This guard is attached to the base, 20, so as to project above the face of the table, 30, to a height at least equal to the thickness of the largest type used in the machine, and this vertical guard is supplemented by a horizontal guard, 22, which projects inwardly and nearly covers the type race that is formed by the type case, the table, and the vertical guard.

The lower end of the type case is furnished with guards covering the space between the type channels that prevent type in process of composition from becoming jammed between the guard, 21, and the type case, as will be explained further on.

The type case, C, and the mechanism and devices sustained by it are supported by a central shaft, 31, mounted in a stand, 61, and by the framework that carries the keys and the side plates, 62, 63.

IMPROVED TYPE COMPOSING AND DISTRIBUTING MACHINE.

Fig 2.

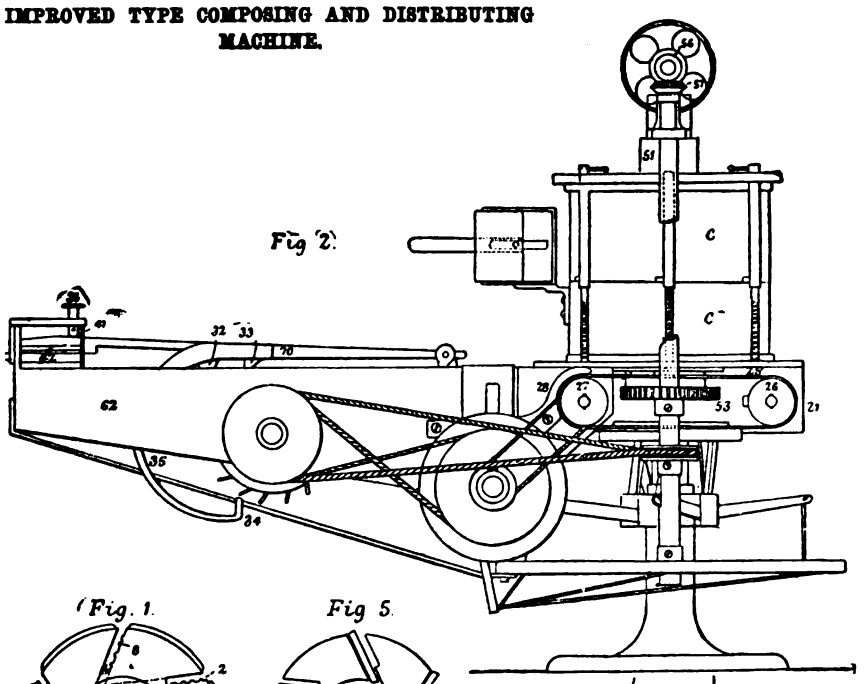


Fig. 1.

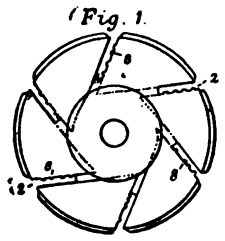


Fig 5.

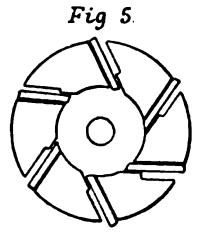


Fig 3

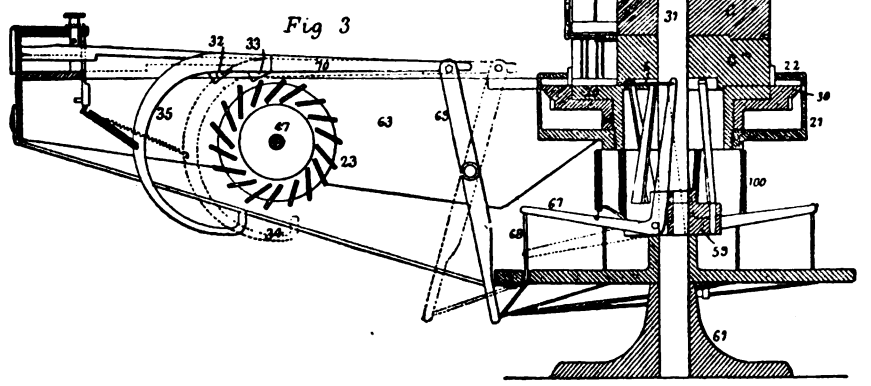
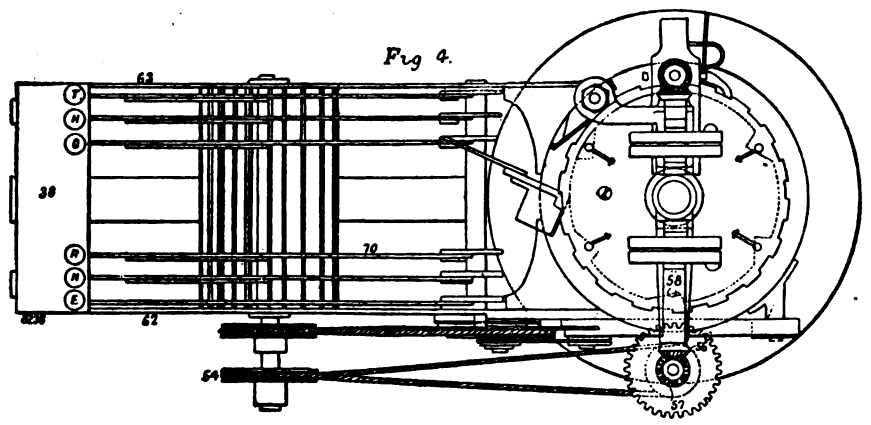


Fig 4.



The means for revolving the type carrying table, 30, is a vertical shaft, 51, at one side of the machine, which carries a spur wheel, 53, that engages the toothed perimeter of the table, 30. This shaft is driven by means of bevel gears, 56, 57, from a cross shaft, 58, mounted above the machine, and supplied with driving and loose pulleys.

The type ejecting mechanism is constructed as follows: Each type channel of the type case, C, is provided with a type ejector, 6, each of such ejectors consisting of a flat plate of metal of a width adapted to that of the type channels, and of a thickness less than that of the type it is to operate upon. The faces of these ejectors are beveled and are carried at the ends of bell crank levers, 67, that are pivoted in recesses of a fixed hub, 59, and held normally in the positions shown in Figs. 2 and 3 by springs, 100, the movement of which bell cranks causes the ejectors to reciprocate horizontally in the bottom ends of the type channels, and during each forward movement to push the lowermost type out of a channel on to the revolving type carrying table, and during each rearward movement to clear the channel, so that the types remaining therein may fall.

The bell cranks, 67, are attached by means of cords, 68, to the lower ends of rocking levers, 69, to the upper ends of which latter the key bars, 70, are pivoted. These key bars are provided with tappets, 32, 33, attached to their bodies so as to be above the plates, 23, of a rotating type bar driver, and with a tappet, 34, that is carried by a curved arm, 35, so as to be below the plates, 23, of the same type bar driver.

This type bar driver consists of suitable heads attached to a carrying shaft, 47, and provided with a number of angularly arranged plates, 23, and it is constantly rotated by means of a pulley, 54. The key bars are capable of being moved vertically as well as horizontally, and when carried downward their tappet, 32, will be engaged by one of the revolving plates, 23, which will thus move the depressed key bar forward and carry its tappets, 33 and 34, into their foremost position. When the key bar is thrown so far forward that the plate, 23, which propelled it passes off from the tappet, 23, it will have brought its tappet, 33, into a position to have its rear face engaged by another of the plates, 23, which plate, in moving over the inclined rear face of said tappet, 33, presses the same upward and raises the key bar to which it is attached, thus lifting the tappet, 34, high enough to be engaged by one of the plates, 23, which will then, by means of the arm, 35, carry the type bar back to its rearward position, when it will be held by its sustaining spring in the raised position shown in Fig. 3.

Each of these key bars has its front end guided in a vertical slot in the plate, 41, and the division plate, 42, of the key board frame, and it carries at its front end a small cross stud that will pass through a slot at the front end of the division plate, 42, when the key bar is pressed downward and forms a riding guide bearing against the under side of the division plate, 42, as the key bar is carried inward. At its rear end this division plate has another slot that permits the upward passage of the stud, 43, and consequently allows the key bar to rise at the end of its rearward stroke, so that it may be moved forward with its stud, 43, riding upon the top of said division plate.

Each key bar is surmounted by a key, 36, which keys are held in vertical guide slots in the top plate, 38, of the key board frame, and so as to rest upon the upper surface of the key bars. When a key is depressed, it forces a key bar downward, thus bringing its tappet, 32, into a position to be engaged by one of the plates, 23, the slot in the front end of the division plate causing the stud, 43, not to obstruct such movement. When a key bar, 70, is thus moved downward, a plate, 23, engages its tappet, 33, and forces the bar rearward by a positive movement. The stud, 43, then bears against the under face of the division plate, 42, and with it acting as a guide, holding the key down, the tappet, 32, is in engagement with the said plate. The rearward or inward movement of the key bar moves the lever, 69, and rocks the bell crank, 67, the latter forcing a type ejector, 6, outward, and causing it to expel a type from its type channel. The type thus ejected is received upon the rotating carrying table, 30, and is carried around with its face foremost until it reaches the throat, 3, through which it is propelled on to a type conveying belt, 25, running over pulleys, 26, 27, which is arranged to travel with its edge in the same plane as that of the table, 30. This belt travels at a speed slower than that of the carrying table, and conveys the type to an inclined guiding chute, 28, whence it is conveyed to the line forming mechanism with a momentum that will not cause its face to be injured.

The detailed figure illustrates the type distributing mechanism, which is very simple and has already been sufficiently described.

From the foregoing description the great ingenuity of this machine will be evident. It appears to have been very successfully introduced in the United States, where its capacity for setting and distributing is equal to 12,000 ens per hour. The machine is made by the Thorne Machine Company, Hartford, Conn.

We are indebted to *Engineering* for our engravings and the foregoing particulars.

Fluoride of Nitrogen.

The supposed compound was formed by passing an electric current from seven ferric chloride batteries through a concentrated solution of ammonium fluoride. After the lapse of a short time, several drops, of oily consistence, were observed attached to the negative plate. On becoming connected with the positive, a thin gold wire, these drops exploded with violence. The compound is undoubtedly highly unstable, being at once decomposed in contact with glass, silica, or organic matter, thus rendering the analysis of the same one of considerable risk. Its explosive violence is even greater than the chloride of nitrogen, and it is also prone to spontaneous decomposition.—*Chem. News.*

Gymnastics at School.

The honorary secretary of the National Physical Recreation Society gave some interesting evidence lately before the Royal Commission on Elementary Education, and it had the advantage over much of the other matter collected by that body of being statistical in large measure. Speaking of the work done by the Liverpool Gymnasium for the treatment of spinal curvature, he stated that some 3,000 cases had come under his own observation there, of which 2,500 were cases of children between the ages of eight and fourteen years, 2,000 of these being girls. There can be no doubt, we think, that deficient physical exercise, if not the only or even perhaps chief cause of this very common deformity, is highly calculated to promote it; and, even apart from any specific evil, a well-considered and systematized plan of training for the muscles is undoubtedly a most valuable regimen, and eminently adapted to preserve and benefit the general health. But it is of the highest importance, in following out this object, to avoid pernicious exercises, which may do irreparable mischief to the growing organs and unbraced body of a child. The following instance is very much in point: "The caretaker commanded them all (like children of an elementary school) to keep their knees stiff and touch their toes with their hands, and while he kept them in that position he proceeded to give them an impromptu discourse upon the benefit of physical training. When the children rose up you could tell from the hectic color of their cheeks that they were evidently suffering at that moment from palpitation of the heart caused by leaning down in this extraordinary position." Equally sound appears to us the following comparison between the horizontal and the parallel bars: "In the case of the horizontal bar, or anything pendent, children naturally jump up and get on with their hands together; that is a position of contraction; the chest is contracted and the shoulders brought forward, unless they have a very painstaking instructor, who will make them widen out their hands and change frequently. In the case of the parallel bars, the ordinary position of a child upon it causes expansion of the chest; the very movement of resting upon the parallel bars is one of expansion, without any teaching whatever."—*Lancet.*

Does Labor Produce All the Wealth?

Rev. Dr. G. M. Steele, in *Work and Wages:* "Is it really true that 'labor produces all the wealth of the world'? Of course, by labor here is meant the putting forth of physical energy, otherwise the succeeding sentences have no meaning. Does any one who thinks at all about the subject believe that the great factories, the docks, the vast buildings of stone and brick and iron in our great cities, the railroads, the mighty steamships, the complicated machines and innumerable other structures are the result of manual labor alone? Suppose there is a line of railway fifty miles in length to be built, and five thousand steady, intelligent, and reliable laborers are told to go and build it. Will they be able to build the bridges, to make the deep cuts, to construct the causeways through treacherous swamps, to calculate the grades, and do other equally difficult parts of the work? How many ordinary wage laborers would it take to produce a Corliss engine, the first of its kind? No; there must be much besides muscular effort in order to attain these results. There must be toil of brain, long and protracted, and often exhausting thought, sometimes accompanied by great sacrifices and great hardships. In order to extensive production there are required great mental qualities, some of them of a rare kind. There is needed power to contrive, to invent, to organize, to direct, or little can be achieved. The man who blows the organ might claim that he produces all the music of the instrument. It is true he is generally an essential condition, but not by any means the only or the most essential condition. No more is manual labor the only or the most essential condition of the production of great wealth."

A Long Tramway.

The longest street tramway in the world will be that which is to connect a number of towns near Buenos Ayres, South America, and which will have a total length of 200 miles. The road will also be exceptional in that sleeping cars will be run upon it for the comfort of the passengers. Horses will be employed as a motive power instead of steam, because horses are cheap, fuel is dear, and the people are slow. The price of two tons of coal will buy a horse with its harness. The sleeping cars and all the other equipments of the line are being supplied by a Philadelphia company, and these cars are stated to be curiosities. They are four in number, 18 feet in length, and are furnished with four berths each, which are made to roll up when not in use. The cars are furnished with lavatories, water coolers, linen presses, and other conveniences, and are finished throughout with mahogany. The other rolling stock comprises four double-decked open cars, twenty platform cars, twenty gondola cars, six refrigerator cars, four poultry cars, furnished with coops, eight cattle cars, two derrick cars for lifting heavy material, and two hundred box cars.

Carriers of Contagion.

Flies, aside from being pests, are actual conveyers of contagion. The fly can communicate virus from an open sore, and can carry this from one person or place to another. This may not be credited, but it has been proved by direct experiment to be not only possible, but an actual fact. The common house fly, by lighting on a diseased spot, either in an animal or a man, and thence passing to a healthy subject, has been known to impart the infection to the latter. Whether the poisonous matter be an animal virus or a germ of disease, a bacillus, does not matter; and in this connection it is well to speak of other common methods of possible disease infection. A postage stamp may in various ways convey contagion. One of the simplest and most plausible is that in which a postage stamp, partially attached to a letter to pay return postage, is sent by a person infected with some disease to another person. The disease is transferred, in the first place, to the adhesive stamp through the saliva, and in being attached to the letter by the receiver the poison may be transmitted to him in turn through the saliva.

Another cause may be the infection of the stamp with disease germs. The stamp, having been exposed in a room where a diseased person lies, may become slightly moistened and thus retain the germ. That this is true can be proved very simply by a microscopical examination. It is even possible that an active and tangible poison, as arsenic, may accidentally or intentionally be attached.

We often see a person holding change for a moment in the mouth, probably not knowing that investigation has shown that disease germs can be carried by money. If one could see through what hands the money has passed, they would hesitate before using such a third hand. Silver money is as bad as paper money; but while many would hesitate to hold a dirty bank note in their mouth, they think that a silver piece, because bright, is apparently clean.

Cigars may convey contagion, especially syphilis. We have seen a note in which a physician gave as an excuse for not loaning a light to a friend, that he was afraid of contagion; but if he was so afraid he should have been consistent and refused to smoke the cigar. Cigar wrappers are in the cigar factories, especially in Cuba, moistened with the lips and tongue, and the girls who roll the wrappers are by no means of the highest reputation. Disease can be carried in this way. Tobacco, contrary to the common belief, does not destroy disease germs, and smoking will not confer immunity from contagion.

Any one who uses a towel in common with the public, or a piece of soap, or brush and comb, or any requisite of the toilet, runs the risk of possible infection. The subject of antisepsis, simply another word for cleanliness, has not necessarily brought to light many new facts, but has set people to thinking of old ones. The germ theory of disease is to most people a very vague one. There is a general idea that disease is carried by germs, and that the air is filled with these, and it is a wonder to most people that every one is not so afflicted, the laity conclude that the germ theory is an absurdity and a contradiction. They do not consider the element of a fertile soil. The germ is the same as a seed, and all organic bodies are reproduced by a seed. We must plant seed in a soil suitable for it, and the surroundings—heat and moisture—must be adapted to it if it is to grow. As we descend in the scale of organic life, we find that some of the lower animals can hardly be distinguished from plants, and these are reproduced not by seed, but by a process of division or budding. A part of the animal is divided and separated, and forms a new animal.

As we descend in the scale, we find that instead of seeds we have spores, as in ferns; but these serve the purpose of seeds, and demand a fertile soil before they can grow. Of many million spores, but one or two may serve their purpose; the rest die without giving any result. As we descend still lower, we find that fungi and moulds need not only a fertile soil, but a peculiar soil, and many of them will not grow except in or on another organic body.

In medicine, a common example is the ergot of rye. Another is corn smut. These, in addition to requiring a peculiar soil, undergo an "alternation of generation." For example, corn smut is first reproduced on the barberry leaf as "rust," and this rust in turn produces corn smut. The theory of disease germs is founded on the knowledge of the actions of the lower animals and plants. The bacillus may be an animal or it may be a plant, poisonous in itself or simply a carrier of contagion. It may even be a result of disease, and have nothing to do with its cause except as a foreign body. Still as we find it present, and find it always present, we are necessarily induced to believe that it is an active agent, but in order to reproduce itself it must have a fertile soil. This it finds, as a rule, in a person whose constitution is run down from overwork, lack of rest, poor living, or disease. It may be introduced into the system, directly into the blood, through an open wound, thus inducing septicæmia, a state of poisoned blood, or it may be introduced indirectly into the blood through the alimentary system. In this case it must be inhaled or eaten with food. In either case it is absorbed, or perhaps actively works itself through the mucous membrane. Once in the blood, the bacillus grows, as a rule, by division, and multiplies to an enormous extent. Disease may also be carried by a virus, which may in turn consist of bacilli or of organic putrefactive matter. The common example of this is the virus of cow pox or of a snake, an actual poison.

Either of these factors may be present on a piece of soap or money, or a soiled towel, or a book that has been in constant use, in fact, any article that has been handled by a number of people; and we can perhaps realize how omnipresent disease germs are, when we consider that washing our hands in an antiseptic solution, and wiping them on a perfectly clean antiseptic towel, we shall find they are still, scientifically speaking, unclean. Cleanliness, then, is above all to be inculcated as a preventive of disease. If not next to godliness, it is surely next to health.—*M. T. E., Technics.*

Ball Lightning.

At the recent meeting of the Royal Meteorological Society, June 15, the following papers were read:

"Note on a Display of Globular Lightning, at Ringstead Bay, Dorset, on August 17, 1876," by Mr. H. S. Eaton, M.A. Between 4 and 5 P. M. two ladies who were out on the cliff saw, surrounding them on all sides and extending from a few inches above the surface to two or three feet overhead, numerous globes of light, the size of billiard balls, moving independently and vertically up and down, sometimes within a few inches of the observers, but always eluding the grasp. Now gliding slowly upward two or three feet, and as slowly falling again, resembling in their movements soap bubbles floating in the air. The balls were all aglow, but not dazzling, with a soft superb iridescence, rich and warm of hue, and each of variable tints, their charming colors heightening the extreme beauty of the scene. The subdued magnificence of this fascinating spectacle is described as baffling description. Their numbers were continually fluctuating. At one time thousands of them enveloped the observers, and a few minutes afterward the numbers would dwindle to perhaps as few as twenty, but soon they would be swarming again as numerous as ever. Not the slightest noise accompanied this display.

"Ball Lightning seen during a Thunderstorm on July 11, 1874," by Dr. J. W. Tripe. During this thunder storm the author saw a ball of fire of a pale yellow color rise from behind some houses, at first slowly, apparently about as fast as a cricket ball thrown into the air, then rapidly increasing its rate of motion until it reached an elevation of about 30°, when it started off so rapidly as to form a continuous line of light, proceeding first east, then west, rising all the time. After describing several zigzags, it disappeared in a large black cloud to the west, from which flashes of lightning had come. In about three minutes another ball ascended, and in about five minutes afterward a third, both behaving as the first, and disappearing in the same cloud.

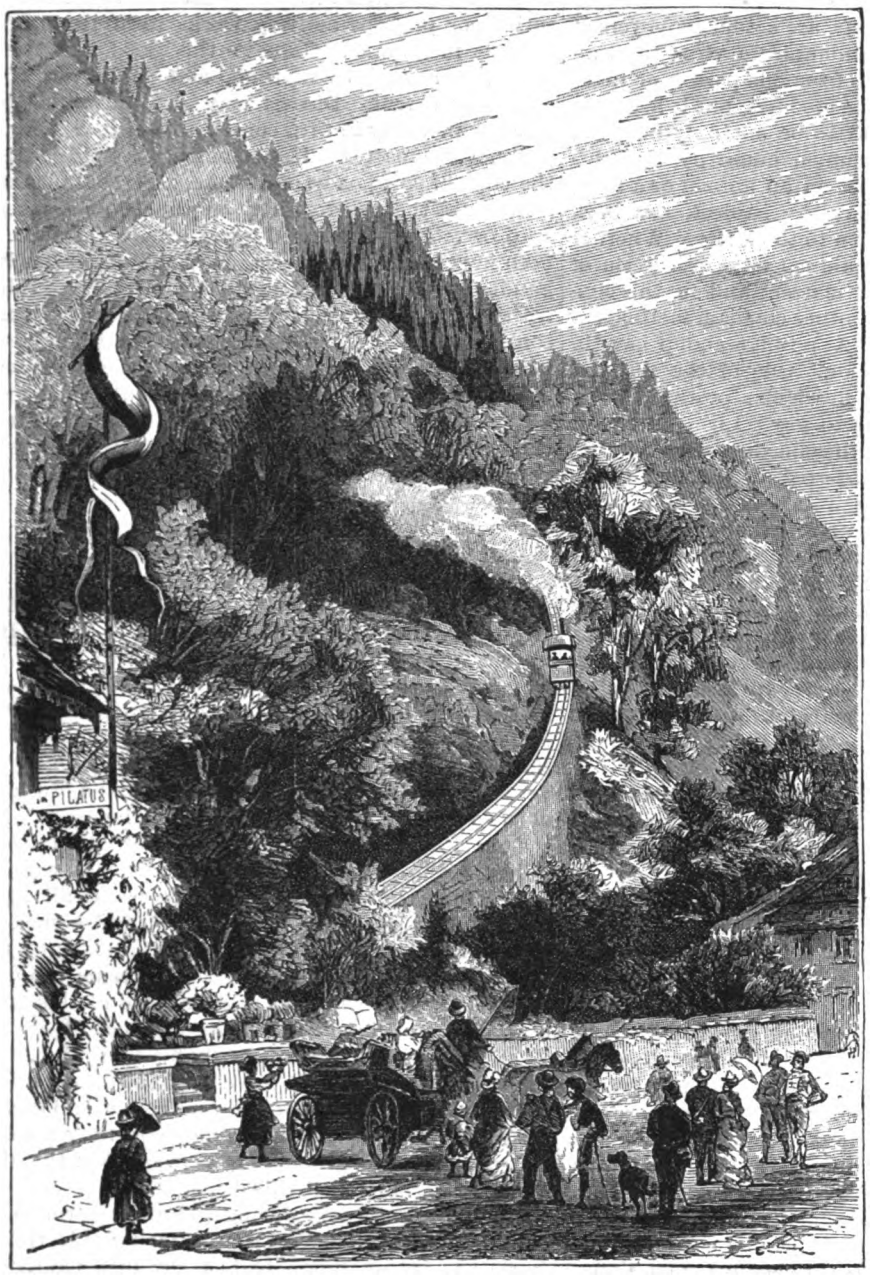
"Appearance of Air Bubbles at Remenham, Berkshire, January, 1871," by Rev. A. Bonney. Between 11 and 12 A. M., a group of air bubbles, of the shape and apparent size of the colored India-rubber balls that are carried about the streets, were seen to rise from the center of a level space of snow within view of the house. The bubbles rose to a considerable height, and then began to move up and down within a limited area, and at equal distances from each other, some ascending, others descending. These lasted about two minutes, at the end of which they were borne away by a current of air toward the east, and disappeared. Another group rose from the same spot, to the same height with precisely the same movements, and disappeared in the same direction, after the same manner.

Mr. H. C. Russell, F.R.S., of Sydney, described a fall of red rain which occurred in New South Wales, and exhibited, under the microscope, specimens of the deposit collected in the rain gauges.

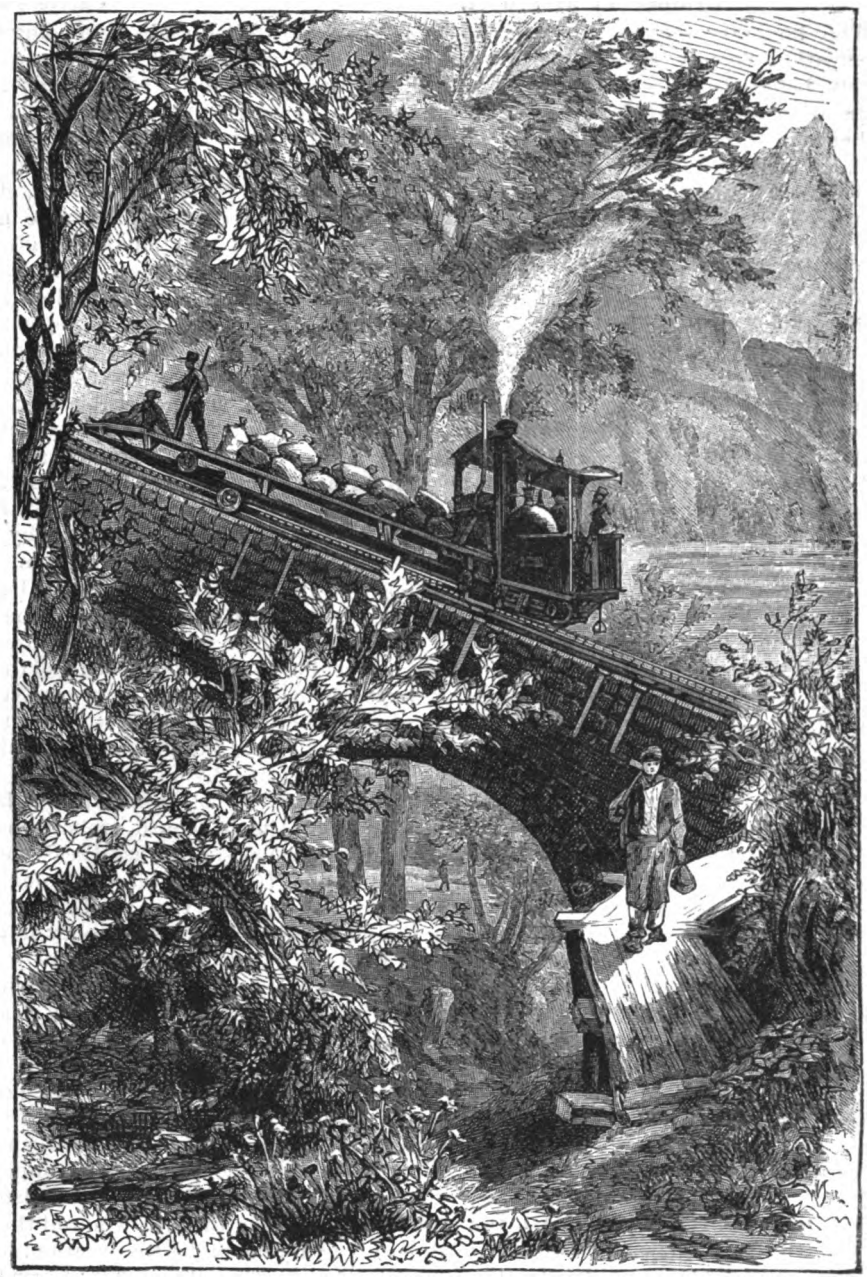
Simple Method of Artificial Respiration.

In the *Brit. Med. Jour.* (*London Med. Record*), Mr. J. A. Francis describes a simple method of artificial respiration which, he alleges, combines all the advantages of the Marshall Hall, Sylvester, and Howard methods, without any of their disadvantages. The plan is as follows:

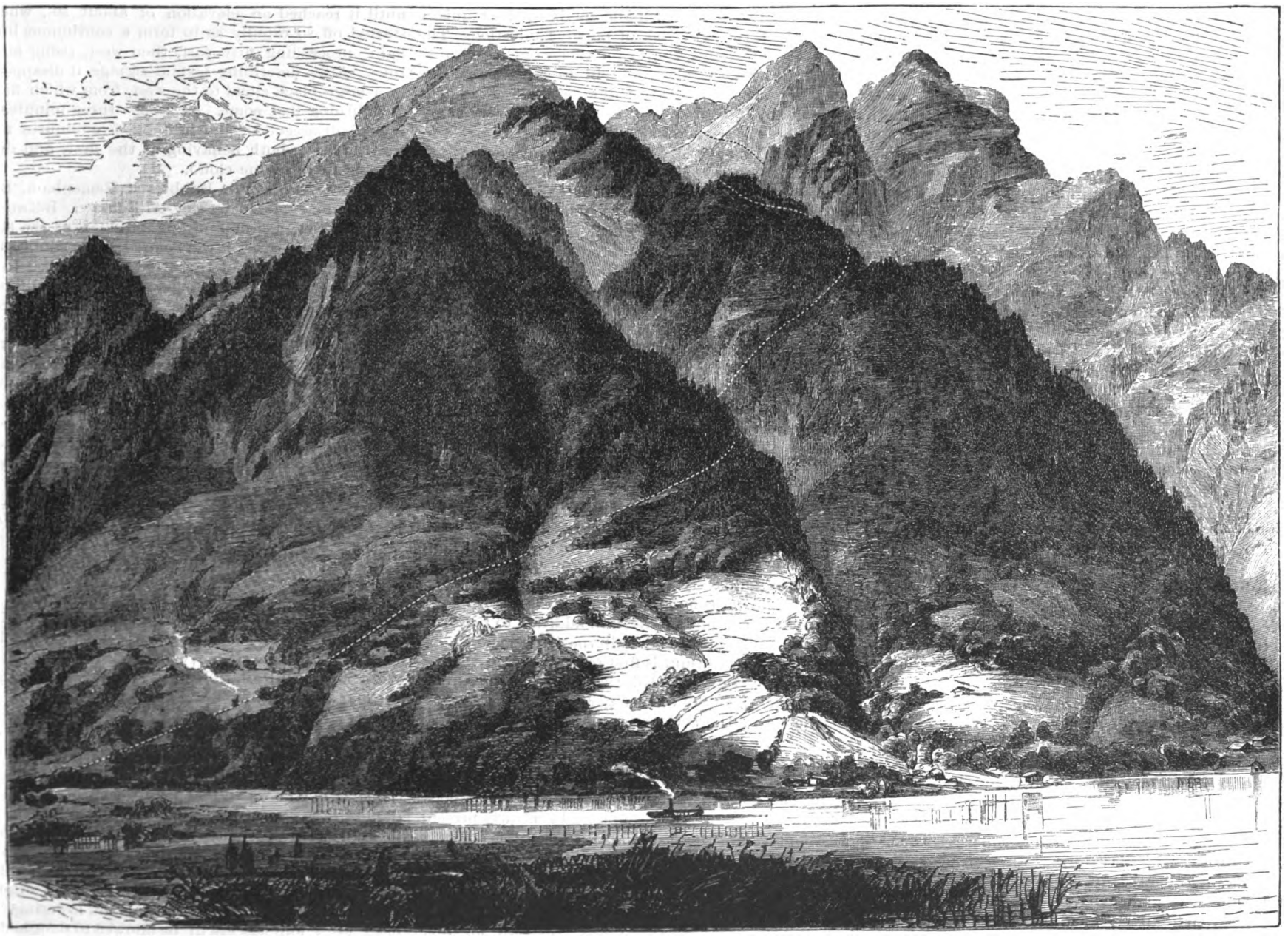
The body of the patient is laid on the back, with clothes loosened, and the mouth and nose wiped. Two bystanders pass their right hands under the body at the level of the waist, and grasp each other's hands, then raise the body until the tips of the fingers and the toes of the subject alone touch the ground; count fifteen rapidly; then lower the body flat to the ground, and press the elbows to the sides hard; count fifteen again; then raise the body again for the same length of time; and so on, alternately raising and lowering. The head, arms, and legs are to be allowed to dangle down quite freely when the body is raised. The author alleges that this method is most successful, and it is so simple that any one can perform it without any teaching.



THE STARTING PLACE.



LOCOMOTIVE AND FREIGHT TRUCK.



GENERAL VIEW OF THE ROUTE OF THE MOUNT PILATUS RAILWAY.
[The dotted lines indicate the track of the railway.]

THE RAILROAD ON MT. PILATUS.

If the Rigi railroad is worthy of being considered an extraordinary and wonderful piece of work, the latest undertaking of this kind—the building of the railroad on Mt. Pilatus—certainly ought to attract the attention of engineers and of the traveling public. This new road differs essentially from its older rivals in the construction of its roadbed, as well as of the rolling stock. The ruggedness and steepness of the mountain, together with its great height (6,882 feet, against 5,905 in the case of Rigi), offered much greater obstacles than the roads previously built, and required an entirely different system.

The restless spirit of man is always glad to set for itself some new task, and consequently men were found who, equipped with the necessary capital, were willing and able to carry out this tremendous undertaking. When a portion of the road had been completed, all fear in regard to strength and safety were removed, for it was thoroughly tested every day, the locomotives going as often as was necessary to that part of the road on which they were at work, carrying materials of all kinds, weighing from 20,000 to 22,000 pounds.

The southeastern side of the mountain was chosen for the road, which begins at Alpnach-Stad, between the Hotel Pilatus and the Eagle Hotel (1,448 feet above the level of the sea). From there it climbs in a northerly direction to the Aemsigenalp, then westward to the Mattalp (5,315 feet above the sea), and after much winding reaches the plateau of the Hotel Bellevue on Mt. Pilatus (6,811 feet above the sea).

The road is about 2¾ miles long, and the total height climbed from the shore of Alpnacht Bay to the Hotel Bellevue is 5,360 feet. The grade is from 18 to 48 per cent, which is scarcely exceeded by any rope road. In the middle of the line, at Alp Aemsigen, there is a switch. Seven thousand two hundred and sixty-seven feet of the entire road consists of straight stretches, curves, with radii of from 262 feet to 328 feet, constituting the remainder. The road includes a viaduct, three short tunnels and one long one. The width of the track is 2 feet 7 inches. The foundation consists of a wall covered with plates of granite and loose material, and on this the superstructure is firmly anchored.

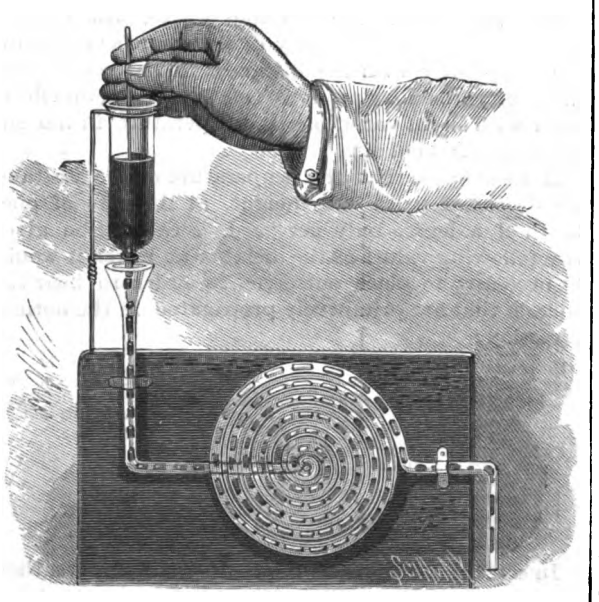
The toothed bar—which is placed midway between the rails and is somewhat higher than the latter—consists of soft steel, and is provided with a double row of vertical teeth, which are milled out of the bar. The cogged wheels on the cars, which engage the toothed bar, are arranged in pairs at the right and left of the same. The axles of these cog wheels are not horizontal with the level of the road, as in the Rigi system, but perpendicular to the same, this arrangement making it impossible for the cog wheels to become displaced.

The locomotive and cars form a train with two running axles and four cog wheels engaging the toothed bar. The boiler and engine are behind or below the cars, which latter accommodate thirty-two passengers. Brakes can be applied to all of the cog wheels, and besides this there are two clamps at the upper running axle which clutch the head of the rail, thus preventing the upsetting of the cars by the wind. The weight of the loaded cars is about 21,000 pounds, and one trip up or down can be made in about 80 minutes.

The idea of the Pilatus road originated with Edward Locher, of the firm of Locher & Co., in Zurich, under whose supervision and control the road has been built. The engine was invented by mechanical engineer Haas, and engineer Hensler, who has had much experience in the construction of railroads, undertook to act as the representative of Messrs. Locher.—*Illustrirte Zeitung.*

NOVEL LANTERN SLIDE.

The engraving shows an inexpensive and very simple and effective device for exhibiting the action of the circulating fountain upon a screen. It consists of a glass tube of small diameter bent into the form of a volute, with the inner end of the tube extended laterally, and



CIRCULATING FOUNTAIN FOR PROJECTION.

then bent vertically and provided with a funnel at the upper extremity. The tube at the outer end of the spiral is bent outward radially, then downward at right angles. The tube thus bent is mounted on a board having a circular aperture a little larger than the spiral, so that the entire spiral may be strongly illuminated while the ends of the tube leading to and from the spiral are concealed by the board.

Above the funnel is supported a reservoir with a fine ajutage, the reservoir being provided with a pointed wooden rod which extends down into tube at the lower end and forms a valve for regulating the flow of liquid.

The liquid employed is water to which has been added some coloring matter, such as aniline blue, red, or green. A few drops of aniline red ink answers for this purpose.

The flow of the liquid is started by loosening the valve, so that the water drops regularly into the funnel of the tube below. The drops should fall so as to include air spaces between them. The liquid, as it issues from the downwardly turned end of the spiral, is received in a cup, by which it may be returned to the reservoir to be used again.

When it is desired to accelerate the motion of the liquid in the tube, a short rubber pipe is connected with the downwardly turned end of the glass tube.

The glass tube is about one-sixteenth inch internal diameter, and the spiral is three and one-half inches in diameter.

When the fountain is in operation, the material of the spiral appears to revolve, but each convolution at a different rate of speed, owing to its increasing diameter. When projected with a good lantern and a strong light, it becomes a very interesting object.

G. M. H.

SUSPENSION FOOT BRIDGE.

An instance of the practical work done by amateurs in mechanics is furnished by the suspension bridge which has been erected at Oak Park, Ill., and which we illustrate in the accompanying engraving. The bridge is very light, and is intended solely for the use of foot passengers, and it is suspended from a large double elm tree on one side of the river, while a tower has been erected as a pier on the other bank, which is a rather high bluff. The cables at this end, however, are carried to an oak tree, where they are anchored at the ground.

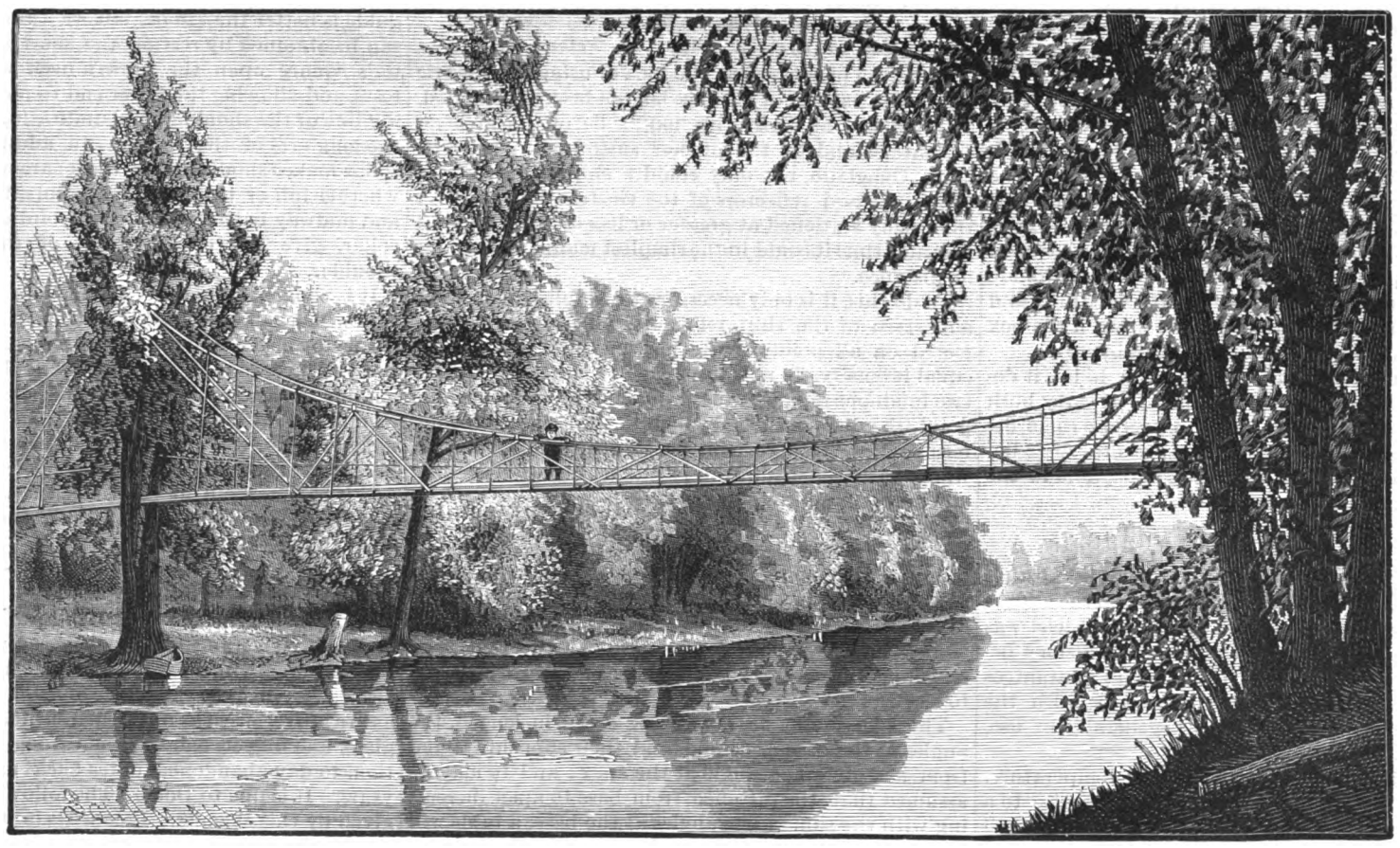
Mr. Leo G. Haase, who sent us the photograph, says in his letter that "the bridge was built by amateur mechanics, with no other knowledge of bridge building than that gained by observation and constant and thorough reading of the SCIENTIFIC AMERICAN. The builders were young men, just in their twenties."

The bridge extends over the river Displaines, with a span of 125 feet in the clear. The distance from the tree pier to the concrete anchorage is 75 feet clear, and the distance on the other bank between the tower and the tree anchor is 50 feet. The total length, therefore, is over 225 feet. It weighs but 2,750 pounds, and has been tested by placing fifteen men thereon. There are four five-eighths inch cables, but only two carry the load, the other two forming an auxiliary support in case of accident to the main cables.

The passenger way is narrow, the floor being about 3 or 4 feet wide, and passing directly between the two trunks of the tree through which the cables are passed. The height of the floor at the tree is about 10 feet. The flooring is built of planks 1 inch by 6 inches, laid 1 inch apart, on account of snow, on longitudinal stringers, 2 inches by 4 inches. These are supported by 1 inch gas pipe, hammered flat at the ends. One-half inch pipes are used at the middle of the bridge. The bottom ends are bolted to the stringers, and upper ends are provided with small wooden blocks clamped by two three-eighths inch bolts, and a space being left in the blocks for the passage of the cables. The bridge was built in the winter time, in order that a scaffolding could be erected on the ice on the river to facilitate the construction. The bridge is considered quite a curiosity, and many thousands cross it every year.

Brown Reins or Saddle Leather.

Unstained leather may be colored a fine chestnut brown by treating it daily for a week or more with a solution of pine and alder barks. The bark is leached with rain water, using, by bulk, ten times as much water as ground bark, returning the water to the leach until all the coloring matter is extracted from the bark. The leather is then laid into the water, and allowed to remain until wet, then hung up to dry. By repeating the process three or four times, a fine color is secured.



A CURIOUS SUSPENSION BRIDGE NEAR CHICAGO, ILL.

An Insect Destroyer of Boots and Shoes.

In the last report of the Commissioner of Agriculture, Professor C. V. Riley states that the beetle known to science as *Dermestes vulpinus*, and, in its larval state, to tanners as the "dry hide worm," came under his observation in 1884, for the first time, as a destroyer of boots and shoes. The insect was first noticed in the establishment of a wholesale manufacturer in St. Louis, in the spring of 1884, when a lot of boots and shoes which had been shipped to some Southern town were returned condemned as "wormy." This led to an examination of the stock in store, and the proprietor found, to his astonishment, that there was justice in the complaints of his customer, and that several boxes of heavy boots and shoes which had been packed for some time were literally swarming with the insect in all stages of development. This was the first time that he had ever known of the existence of such a pest.

About the same time, the insects were found in numerous leather houses throughout the same city, and invaded the manufactories. In the summer of 1885, public attention was called to the pest by various oral and exaggerated accounts of the "grub" that worked unseen in the soles of shoes, reducing them to mere shells, which crushed into fragments when subjected to the pressure of the foot in wearing.

Another case of the destructive action of this same beetle was brought to Professor Riley's attention at about the same time by Mr. F. Eisenstein, of A. Eisenstein's Sons, of Savannah, Ga., whose firm had instituted a lawsuit against the Boston & Savannah Steamship Company, by reason of damages done by the insect to boots while in transit from Savannah to Boston.

In the St. Louis cases, none of the dealers was able to trace the introduction of the insect from any particular warehouse or tannery, but learned from tanners that it was quite common in old hides.

In the warehouses and manufactories the insect still retained its partiality for undressed leathers, and an examination at once shows that the soles and heels of boots and shoes are more liable to injury than the uppers. It seems probable that the comparative immunity of the uppers is due to the oily dressing used in the finishing processes. They do not, however, entirely escape, for they are occasionally found bored by the larva or roughened and eroded by the beetle.

The work of the larvæ, both young and full grown, consists in boring smooth, round channels in every direction through the leather, preferring, as above stated, the soles and heels. A favorite place for entering the shoe is in the angle between the sole and heel, or in the crevice between the upper and the sole, a crack of some kind seeming to be necessary to enable them to get sufficient purchase to begin boring.

The principal occupation of the adult beetle is the propagation of the species, yet it also is a leather destroyer, gnawing and scoring the surface of the boot or shoe, but not burrowing bodily into its substance.

Professor Riley states that when the insect has already made an entrance into cases of boots and shoes, it will not be a difficult matter to destroy it by a proper use of bisulphide of carbon. Of course, it would be preferable to overhaul the contents of each box thoroughly, and to treat the boots in which the insect is found with benzine or some other efficacious insecticide; but, where this cannot be done without too great expense, it will probably suffice to open each case and place an open saucer of the bisulphide on top of the contents. The liquid will volatilize, and the vapor will sink down through the mass, if the box be tight, and will kill the insects in their burrows.

As the natural home of the insect is in hides, it devolves upon transportation companies that carry both made-up leather goods and hides to exercise some degree of care and cleanliness, as they are otherwise liable to lay themselves open to damages payable to the owners of the more expensive goods.

The Mirage of Sound.

Mr. H. Fizeau has just presented a very interesting note to the French Academy of Sciences, on the mirage of sound. The attention of this learned physicist was attracted to this subject by the recent collisions between ships which presented the greatest guarantees of security, and were provided especially with the powerful sonorous apparatus now generally in use, such as sirens, steam whistles, etc.

Under the influence of variations in temperature, the propagation of sonorous waves may give rise to a sort of *mirage of sound*, entirely analogous to the well known phenomena of light, and which results from a more rapid propagation in the less dense strata.

If, then, we suppose that, under certain circumstances, the sea is hotter at its surface than the neighboring strata of air, the latter in fair weather must, in the vicinity of the warmer water, take on an arrangement of strata of decreasing temperature, in measure as their distances increase up to a certain height above the level of the water. This is what is oftenest observed at sea during the night, and frequently during the day in foggy weather.

Under these circumstances, which are precisely those under which the greatest use is made of acoustic signals, the sonorous rays designed to propagate themselves horizontally in the strata of air in the vicinity of the sea necessarily undergo, through the effect of the inequalities in the temperature under consideration, unequal velocities—those nearest the surface of the water getting ahead of those that traverse the strata situated above. Now, as the direction of the rays is always given by a line at right angles with the common tangential plane of the waves, it will be seen that this direction must be successively inflected from below upward, so long as the propagation continues in a direction near a horizontal one.

This inflection of the sonorous waves, which is not very sensible in the vicinity of the sound's origin, increases greatly with the distance, and at some hundreds of yards may produce considerable of an effect, even with slight variations in temperature in the superposed strata of air.

If we suppose that the temperature of the strata of air decreases with the height, at the rate of one-tenth of a degree only per yard, a calculation gives the following values as the heights at which it would be necessary to place ourselves, in order to hear the sounds that are primitively propagated in the normal direction:

Horizontal distances starting from the origin of the sonorous waves.	Vertical heights of the sonorous waves above their primitive horizontal direction.
328 feet	0·36 inch.
3,280 "	3 feet.
8,200 "	18·78 "
16,400 "	75·14 "
24,600 "	168·9 "
32,800 "	300·5 "

In certain cases, for example during foggy weather, fair nights, and a calm sea warmer than the neighboring strata of air, we would obtain still greater differences than these, resulting from the above hypothesis, and it would be necessary to double or treble the vertical heights if the decrease in the temperature of the air happened to reach two-tenths or three-tenths of a degree per ten feet of height.

The means to be employed for correcting the effects of this accidental deviation in sonorous signals, and to obtain the greatest range possible in all weather, are obvious. Since we have to fear an inflection of the sounds in the direction of a curve whose concavity is turned upward, it must be advantageous to place the starting point of the sounds on one side and their point of arrival on the other, at a sufficient height above the lower strata of air to allow the sounds to follow their path in a straight line freely, without getting out of the space wherein they can be heard.

In conclusion, Mr. Fizeau expresses the hope that special experiments may soon be made, on the open sea and near the coast, under circumstances proper for utilizing practically what is formulated in the above theory.—*La Nature.*

Use of Electric Light in Telemetry.

Up to the present time, the idea of using the electric light as a measurer of distance has not been entertained. Nevertheless, at night this might be of the greatest advantage, and by the process suggested to us by M. Edme Genglaire, not only could a ship provided with producers and reflectors of the electric light discover the enemy stationed at greater or less distances, but at the same time it could in the simplest manner determine its distance.

To do this, it is only necessary to establish in the bow and stern of the ship reflectors, whence can be projected on all points of the horizon luminous rays of equal intensity. If now from each of the two reflectors two luminous rays are caused to converge upon the same point, the distance from which to the ship is to be determined, a triangle will be furnished for solution whose base (the distance separating the two reflectors) and two adjacent angles are known.

To facilitate the measurement of these angles, the support of each reflector carries a needle, perpendicular to it and which moves over a graduated circle. With regard to the distance to be determined, the two luminous rays can be regarded as the sides of an isosceles triangle whose base is the space between the reflectors, and this consideration will yet be of the greatest use to us.

The two luminous rays being equal in length, the angles at the base are equal, and their sum subtracted from 180° gives the angle at the apex; and it may be assumed that, the distance from base to apex increasing with the sum of the angles at the base, a table will be arranged containing, opposite to each value of the sum of these angles just spoken of, the corresponding distance from the base to the desired point. The two luminous rays grow larger as they increase in length, and it is only with difficulty that the point seen will be brought into the central axis of both converging rays. It is only by a succession of trials that this question can be determined, and great precision as yet cannot be looked for. Following out the above course of reasoning, a ray of light should be projected upon the desired point, so that it shall be well lighted by the central luminous area. The angle of the reflector required for this result is to be calculated, it is multiplied by two, and the table constructed as a preliminary will show opposite the doubled angular value the desired distance.

This process will be of the greatest utility on account of its ease of execution, on occasions when great exactness is not required and where quickness is of importance. On the other hand, the table can be determined experimentally.—*Electricité.*

Harness Collars.

Custom has much to do with the styles of harness used and the manner of mountings. This is shown in the use of the collar. A man who would use a breast collar upon a coupe or coach harness would become a laughing stock for all his neighbors, while to use a round coach collar upon a trotting horse would bespeak a lack of taste and judgment.

This adopting of a fixed style for any one kind is due in part to the study of the requirements of the case by men who have interested themselves in improving the horse. The trotting horse, in order to give full action to his shoulders, works best in a breast collar when driven single, as the only strain put upon the shoulders is the draught. But if driven double, the pole and yoke must be supported, and the bearing down upon the neck requires more support and a better distribution of the strain than can be given by the breast collar, so a light round collar is preferred. The making of the latter collar is a branch of business that requires much skill if the work is to be well done. A ring around the neck is not what is wanted. The collar must be more than a ring. It must be made to fit the horse's neck. It should set snugly, but not bind at any point. If too narrow in the neck it chokes the horse, and if too wide it falls too far back and interferes with the freedom of the shoulders and produces permanent injury. It was long argued that a soft cushion was wanted, and that the galls on horses were due to the bad character of the collars. This theory seems to have been abandoned by the most intelligent horsemen, who now demand a collar that is solid, smooth, and firm, and one that fits the neck, and in order to maintain the latter quality the hames are fitted to the collar instead of being allowed to draw the collar out of shape, as they will if not bent to fit.

It is not always possible for the owner of a horse to have his neck properly fitted, owing to the distance from the collar manufacturer, but he may give such directions as will produce a well fitted collar. There is no fixed rule that can be relied upon, owing to the difference and size of horses' necks. But an old rule is to measure the height of a horse and add 5 inches to the number of hands for the size of the collar. Thus a horse 15 hands high would require a 20 inch collar. It is claimed by some that this rule works well, and can be relied upon except in the case of heavy draught horses or ponies. In the absence of a collar rule, this guide is better than none, but we think a better result can be obtained by resting the short arm of a carpenter's square upon the horse's neck where the collar rests, and allowing the lower end to rest upon the bearing line of the shoulder, and indicating the length by the long arm of the square. In addition to this, the collar maker should know the character of the neck, whether full or thin at three points, top, at shoulder, and midway between these two points. For weight of collar, give the circumference of the body at the shoulder.

It is claimed by some collar makers that there is no rule which can be followed, and they live up to their theory by making all collars over a single shaped block, but the success of a few men who have made collar making a study falsifies all such claims. There are men in the business who obtain from 20 to 25 per cent more for their collars than their neighbors do, simply because of the collars fitting the horse's neck properly, and if one man can fit from stock a variety of horses, we can see no reason why another should not do the same thing.—*Harness.*

Platinizing Glass.

In the gallery of the *Conservatoire des Arts et Metiers* is preserved a frame of glass covered with a thin layer of platinum, which exhibits this remarkable property. Used as a reflector, the image of an object appears in it as in a mirror; used as if transparent, it acts like common glass, and objects can be seen through it. This invention, to-day abandoned, dates back more than twenty years. It is due to Dodé. The following is the process given by this chemist. It consists in intimately mixing platinic chloride with essence of lavender, A, and on the other hand in preparing a flux consisting of essence of lavender, borate and oxide of lead, B. A and B are mixed. When the paste is quite homogeneous, it is spread by a fine brush over one side of the glass. When dry, it is baked in a muffle at a low red. The volatile matters, including chlorine, are driven off, and the metal is left, mixed with the flux, to which it communicates a gray color. These objects, quite difficult to prepare, have hitherto been little appreciated. This might offer an interesting field for work.—*La Nature.*

THE DINOCERAS, AN EXTINCT MAMMAL.

In 1870, while Prof. O. C. Marsh was making some explorations in central Wyoming, he discovered the remains of a huge animal whose form was entirely unknown to him, and which he at once recognized as an extinct form, and which he named the dinoceras. His explorations in this region, at this time and subsequently, were extensive, and remains of different parts of this type were found from time to time, and the Peabody Museum at Yale College, over which Prof. Marsh presides, now contains specimens or portions of specimens of over 200 individuals, showing how common and abundant a type this must have been during a certain period of the earth's development.

These specimens were found in a basin north of the Uinta Mountains of Wyoming, and east and west of the Green River, within a hundred miles of its banks on either side. During the tertiary period this basin was an inland sea, and was formed into such by the elevation of the Rockies on the east and the Wasatch Mountains on the west, which cut off its connection with the open sea, and turned it gradually into a fresh water lake.

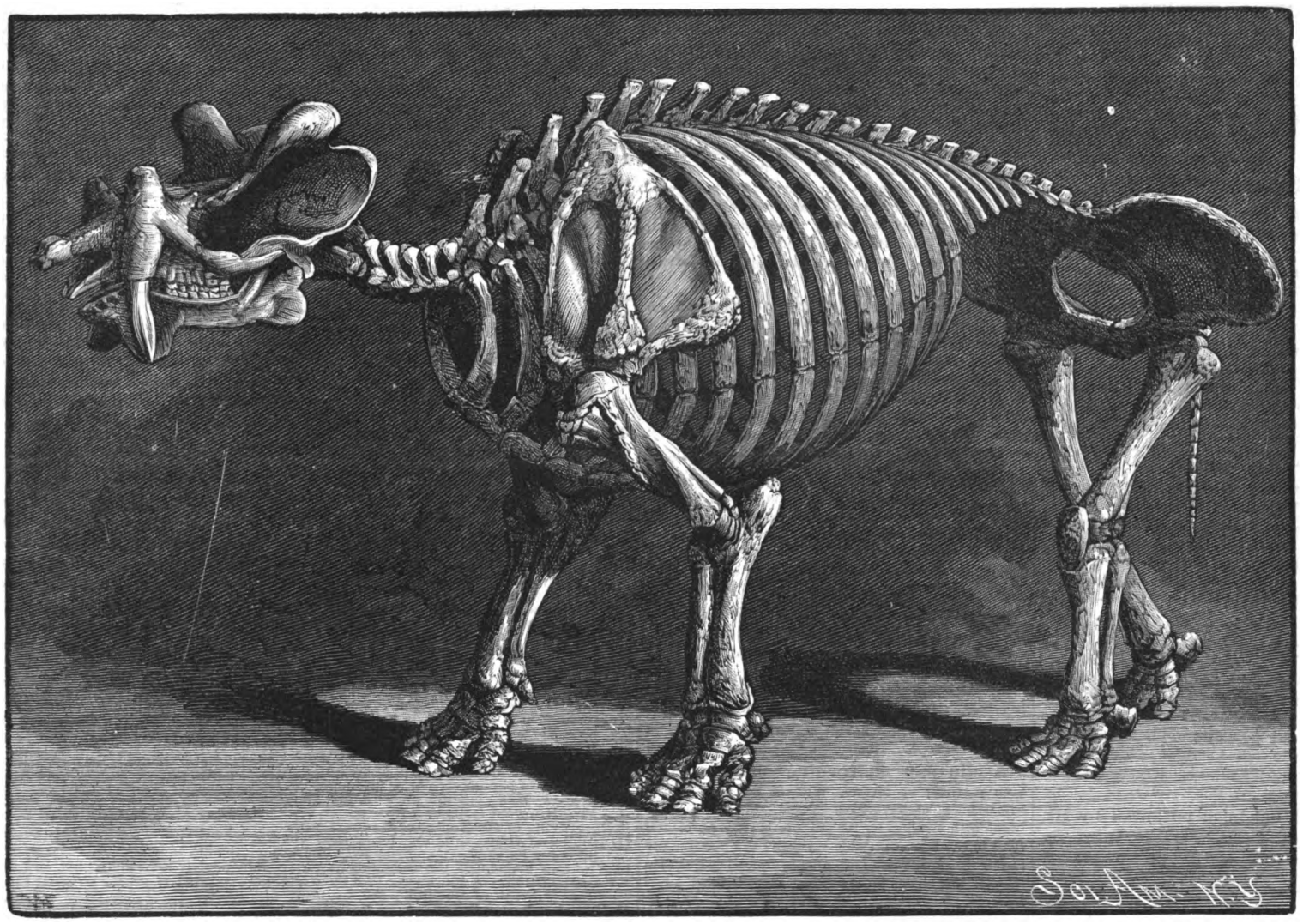
The surrounding lands were covered with a luxuriant tropical vegetation, and as this whole region was gradually raised from the sea level to a height of 7,000 or 8,000 ft., these basins were filled by sediment and wash from the surrounding mountains, and deposits were formed which reached during the Eocene period between one and two miles in vertical thickness. A complete record was thus kept in these gradual deposits of the history of animal life during this period of early tertiary, and the tracing and reading of this history is facilitated by the subsequent washing away and denudation of some portions of this territory, and by the vast process of erosion that has taken place.

In this Eocene lake region were found types innumerable; among others, the ancestral forms of the horse, the tapir, lemurs, crocodiles, tortoises, lizards, fishes, and serpents. Many specimens of forms hitherto unknown were discovered, and most prominent among these are the dinocerata, which have been separated into three groups, the dinoceras, the tinoceras, and the uintatherium.

The skill and perseverance which were displayed in making the collection of fossils which have been so instrumental in the classification of these curious forms is manifested by the difficulties that were overcome in securing a complete specimen of the skull of the dinoceras mirabile, which has been taken as a type. The skull was found embedded in a soft matrix, which permitted the brain cavity to be readily worked out. It was, however, located on the edge of a steep precipice, and it was discovered, as the work of exhumation progressed, that several important parts of the skull were missing, and it was necessary to institute a systematic search, which finally resulted in the unearthing of the missing parts in a deep ravine many feet below, where they had been washed down and covered up. A considerable portion of the skeleton was discovered near the place where the skull was found, and the engraving represents the specimen as it now appears, the missing parts in certain portions being made up from other individuals. The skull is very perfect, and the skeleton, as a whole, affords an excellent opportunity of study, and an excellent estimate may be formed of the probable appearance of the animal when it was a living inhabitant of the marshy shores of this vast inland sea. The dinoceras appears to have possessed traits in common with the elephant and rhinoceros.

In his walk he must have resembled closely the former, while in some other particulars there is a likeness to the hippopotamus, the neck being longer than that of the elephant (thereby enabling the head to reach the ground); and the horizontal nasal opening and the overhanging nasal bones and well developed turbinal bones render the presence of a proboscis extremely improbable, and, in fact, such a feature would have had no function, and could not well have existed. The brain was small, and the massive bones would indicate a sluggish, dull, slow-moving animal, little adapted to withstand the climatic changes, and unable to adapt itself to the altered environment at the close of the Eocene. They therefore probably became gradually extinct about that period, and no forms have been discovered which would lead one to presume that they had survived a much later age.

The exact nature of the horns is still a matter of conjecture, but Prof. Marsh assigns as possible a form of horn similar to those of the American antelope; or still more probable is, perhaps, the explanation that the horns were covered with a thick, callous skin, and certain injuries found on the horn core of some specimens would indicate that blows had been inflicted through the outer covering on the core during conflict with other animals. Judging from the inside of the foot, this must have been covered with a thick pad, like the elephant. The size of the tinoceras, which is the largest type of the dinocerata, was about twelve feet in length; the height to top of the back was about six and one half feet, and the width across the back about five feet. Judging from existing animals, the weight must have been about 6,000 lb. The dinoceras mirabile was somewhat smaller. The numerous remains found in these deposits would indicate that these strange, uncouth monsters must have been very abundant during the period of the middle Eocene, and the plentiful distribution and the position of these remains lead one to believe that they lived probably in herds on the shores of the tropical lakes, feeding upon the luxurious vegetation that abounded in these localities. For the data from which the above information has been drawn, we are principally indebted to Prof. Marsh's monograph entitled "An Extinct Order of Gigantic Mammals," published by the U. S. Geological Survey.



THE DINOCERAS—A GIGANTIC EXTINCT ANIMAL FOUND IN WYOMING.

New Bridge across the Mississippi at St. Paul, Minn.

The specifications are out for the new bridge, and proposals were opened in June. In accordance with American practice, the design of the bridge is left to the contractor; the design being in conformity with the general plans furnished as to length of span, location of bents, clear headway, grade elevations of masonry, etc., and to the specifications in regard to construction, materials, and unit strains. The structure will be a deck bridge throughout, and will be 41 feet 6 inches wide between railings, having 24 feet roadway and two 8 feet sidewalks. Its total length will be 2,770 feet, with the following spans: Four 40 feet tower spans, three 50 feet tower spans, and two 60 feet spans, all riveted plate girders; nine 80 feet and five 90 feet spans, riveted lattice girders; one 170 feet and four 250 feet spans, pin connected trusses. There will be two trusses 22 feet apart, c. to c., and the single intersection type is preferred. The trusses and girders will be carried on iron trestle bents, each composed of two columns, and the bents united in pairs to form towers at certain designated points. No compression member is to have a length exceeding forty-five times its least width; in beams and girders the compression flange is to be of the same gross section as the tension flange. No continuous girders admitted. Rolled beams for roadway stringers to have a depth not less than one-fifteenth of span, and riveted plate girders not less than one-twelfth of span. The heads of eye bars to be so proportioned that the bar will break in the body rather than in the head or neck; no welds allowed in the body of eye bars, lateral sway rods, or counters, except for loop-eyed bars. Hole one-fiftieth larger than pin.

Two Large Fast Steamships.

Messrs. J. & G. Thomson, of Clydebank, have orders for two steamships of the largest and most powerful type now employed in ocean navigation, to be built for the Inman and International Steamship Company for its mail and passenger service between Liverpool and New York. In point of size alone these two vessels are noteworthy, being about 8,500 tons gross measurement each; but in respect of other features, such as proportions, speed, means of propulsion, and structural character, they will form most noteworthy departures in the development of modern steamships. Their outstanding characteristics will be propulsion by two screws actuated by two separate and self-contained sets of engines and boilers of the most modern type, as regards high pressure and increased expansion of steam, and minute subdivision of the hull by longitudinal and transverse water-tight bulkheads, rendering the ship unsinkable through collision with another vessel, and almost absolutely unsinkable from any cause whatever. It is expected that these vessels will attain a speed of 19 knots per hour on trial.

ENGINEERING INVENTIONS.

A machine for unloading cars has been patented by Mr. John Scully, of South Amboy, N. J. It is a construction made to operate horizontally movable blades or shovels arranged to be carried back and forth from the ends to the center of the car, for shifting coal or other material to the discharge opening there provided in many cars.

An air regulator for furnaces has been patented by Mr. Frank C. Smith, of Delaware, Ohio. It is an automatic device, operated whenever the fire door is opened, and effecting the closing within a prescribed time from the opening of the damper, in order to admit cold air on the top of the fire for a limited period after the fuel is supplied.

A car coupling has been patented by Mr. Thomas Maroney, of Weedsport, N. Y. By this invention the coupling pin is automatically set and held for coupling with an entering link, and the coupler has a link-adjusting attachment by which the projecting end of the link may be raised or lowered to a proper position to couple with cars of different standard heights.

A draught attachment for furnaces has been patented by Mr. George W. Wheater, of Ogdensburg, N. Y. It is designed especially for locomotive furnaces with fresh air, for which a draught flue, extending from the roof or side of the cab, enters the front end of the ash pit, the opening of the flue mouth being controlled by a lever on the outside, and graduated deflectors attached to the grate bars directing the air thus admitted to most efficiently promote combustion.

MECHANICAL INVENTION.

An improvement in gearing has been patented by Mr. Coles D. Hardcastle, of New York City. The invention covers a novel construction and combination of parts in a system of gearing intended to cause but little friction, and so devised that there will be no cessation or irregularity of motion during its operation.

AGRICULTURAL INVENTIONS.

A hay elevator has been patented by Messrs. Ellis O., Willard O., and Herbert S. Long, of Hayesville, Ohio. This invention covers novel features of construction and combination of parts of an apparatus adapted to raise loads of hay or grain in a store house or barn and dump them into a mow at one side of the driveway.

A plow has been patented by Mr. William J. Locke, of San Antonio, Texas. It is hung upon an axle, is readily adjustable to plow at any desired depth, has a landside wheel and an inclined furrow wheel, the plow having no landside, but only a point and mouldboard, and may be readily changed to take more or less land as desired.

A hay rake and stacker has been patented by Mr. Buck Mason, of Trenton, Mo. This invention covers a novel construction, combination, and arrangement of parts in a horse rake, whereby the hay may be gathered in the field and transported to the wagon or stack, and there elevated and deposited upon the wagon or stack.

MISCELLANEOUS INVENTIONS.

A nut lock has been patented by Messrs. Stephen H. French and William J. Maltby, of Baird, Texas. It is formed with a wedge or body and a head having extensions or flanges, the locking being effected by turning to desired position on a slitted bolt, and driving a key into the slit, when its extensions rest against the flanges.

A hasp lock has been patented by Mr. Brunswick W. Leonard, of Old Saybrook, Conn. The bolt is pivotally connected with and also movable longitudinally with reference to the hasp, by which means, in connection with other novel features, the lock may be used to form a "latch" fastening or a lock fastening as desired.

A reversible folding slate has been patented by Mr. Louis Steinberger, of New York City. It consists of two reversible hinged slate or tablet panels having an adjustable spacing attachment, whereby the two tablets may be held extended at any desired angle, either face of each tablet being arranged so that it may be brought into use.

A knife has been patented by Mr. Isaac E. Schollars, of Bellamy, Mo. It has a pair of blades peculiarly beveled, with equidistant holes for receiving fastening or pivotal screws, with other novel features, it being designed for use as a plain knife, a drawshave, a spokeshave, pruning hook, pruning shears, a chisel, and a vegetable cutter.

A rowing attachment for boats has been patented by Mr. Selden B. Lard, of Waterville, Kansas. This invention covers a novel construction for propelling boats by means of valvular oars, which open when forced through the water in one direction and close in returning, the mechanism to be operated either by hand or by steam.

A nut lock has been patented by Mr. J. Frank Dill, of Ridgway, Pa. It is especially adapted for use with bolts and nuts employed to secure fish plates upon rails of railway tracks, two metal plates being used, one plate passing through the other, so that each holds the other in place, even when the bolts have become worn and loose.

A flower pot and flower pot holder has been patented by Mr. Gayger D. Tolman, of Shawano, Wis. The flower pot is made of a sheet metal blank cut to form a strip for the sides, a disk for the bottom, and a tongue to cover the joining of the sides, the holder being formed of bent wire or a metal bar, adapted to be easily secured to any woodwork.

A rice machine has been patented by Mr. Frederick J. Syme, of New Orleans, La. It consists of a cylinder, bowl, and plug with spiral rib, with mechanism for revolving the bowl and plug in opposite directions, for removing from rice that covering immediately within the hull without to any considerable extent crushing or breaking the grains.

A bottle stopper has been patented by Mr. Frederick Thorn, of Wilkesbarre, Pa. The bottle is made with a lug or projection slightly below its neck, and a neck band held on the bottle carries swiveled side bars, one end of which carries a stopper frame and an elastic stopper, the other end being adapted for engagement with the lug or projection formed on the bottle.

An indicator for exhibiting advertisements by day and night has been patented by Mr. Jose E. Mercadante, of Rio Janeiro, Brazil. A hollow column has a double arm carrying in vertical bearings a horizontally revolving casing, in which are transparent sign plates, a gas pipe through the column and one arm supplying a burner within the casing.

A fence has been patented by Messrs. John A. Williams, of Orange, and Edwin H. Thomas, of Hornby, N. Y. It is made without driving posts into the ground, having cross base pieces, to which are attached side braces for the uprights, and a bottom rail or board, inserted in mortises in the uprights, and notched over the base piece.

An apparatus for the manufacture of salt has been patented by Mr. Richard G. Peters, of Manistee, Mich. It has an elevator carrying buckets which have little holes or perforations, together with a peculiar construction of storage and other troughs, and various other novel features of construction and arrangement of parts.

An extension fire ladder has been patented by Mr. Frederick A. Warner, of Halifax, Nova Scotia, Canada. This invention covers a novel construction, combination and arrangement of parts and details, making a ladder capable of being quickly moved about, raised and set to any angle in a narrow or wide street, and having means for leveling the front truck carrying the ladder.

An evaporator has been patented by Mr. Seth W. Lowell, of Belfast, N. Y. It is designed more especially for use as a fruit drier, and has a case, open at one side, provided with sections of steam pipe, and having inclined deflecting plates removably connected to the under side of each section, the fruit to be dried being set in trays upon the upper faces of the pipes.

A process of producing designs on glass plates has been patented by Mr. Ludwig Lendry, of New York City. A specially prepared coating is put upon the glass plate, and then the pattern is placed on the coating and the plate exposed to light, after which the pattern is removed and the glass plate washed with oil, whereby the design of the pattern appears upon the plate.

A dry goods exhibitor has been patented by Mr. John W. Leass, of West Manchester, Ohio. It consists in a support of suitable form and convenient height, provided with a wedge-shaped standard, having a rounded end adapted to enter into the end of a cloth bolt and support it in vertical position, to economize time and labor in showing and handling goods.

An ink eraser has been patented by Mr. Richard M. Swinburne, of La Crosse, Wis. It consists of a fibrous holding body charged with citric acid, rolled to pencil form, and having a cover, the moistened end of the eraser being rubbed on the ink to be erased, followed by a drop of water charged with chloride of lime, and excess of moisture absorbed by blotting paper.

A gin saw sharpening machine has been patented by Messrs. William Behan and Paul Frienschner, of Texarkana, Texas. It consists of a frame with bearings for the gin saw shaft, a horizontal shaft in bearings adjustable vertically and horizontally to suit the saws, a filing machine being made adjustable thereon, and means for operating it, with other novel features.

A book binding band has been patented by Mr. George Huether, of New York City. It is formed of heavy twisted warp cords bound or woven close together by fine filling threads, making a band of sufficient strength, thickness, and uniformity to take the place of the parchment or raw hide now in common use, which frequently loses strength with age and is irregular in quality.

An evaporator has been patented by Mr. Rufus Goodson, of Barnesville, Mo. It is for defecating or purifying saccharine juices, and has a furnace body with a circuitous combustion chamber, tracks held to the body, and a rotatable carriage mounted on the tracks, the carriage carrying pans which close the top of the furnace, these pans holding the saccharine juices in different stages of evaporation.

A temperature alarm has been patented by Mr. Donald McDonald, of Louisville, Ky. The invention covers an apparatus of peculiar construction by which a connection is formed between an alarm or cock, put into operation by an open column of mercury and alcohol contained in a space communicating with the mercury, and may be used with or without electrical devices.

A gas burner has been patented by Mr. David R. Kline, of Ridgway, Pa. The inlet pipe has a nipple screw-threaded on its inner and outer sides, a tube screwed into the inner thread of the nipple and a disk upon the outer thread, with a detachable cap and pendent flange supported upon the disk, to heat the gas more highly and give more perfect combustion when it issues through the jet holes.

Bird food forms the subject of a patent issued to Mr. John D. Heins, of New York City. A new article of manufacture is described, consisting of the whites and yelks of boiled eggs, mixed with pulverized farinaceous substance, prepared after a specified manner, making an article that will keep and can be put up in small boxes or packages and sold upon the market.

A bottle stopper has been patented by Mr. William Beardsley, of Beacon, Iowa. This invention covers an improvement on a formerly patented invention of the same inventor, of stoppers for bottles designed to hold aerated liquids, in which the pressure of the gas forces a ball held within the bottle into a packing ring in the neck of the bottle, provision being made for the expansion of the packing ring.

A bottle casing has been patented by Mr. Wilson Godfrey, of New York City. Its outside portion is formed of three ply veneer, inside of which, against the bottle, is a thick packing of felt or other suitable material, the top being also of veneer, of conical shape, fitting around the neck of the bottle, an inside and an outside hoop fitting around where the bottle bends to form the neck, and there being a hoop around the bottom.

A lumber cart has been patented by Mr. Thomas B. McFaul, of Phillips, Wis. Across opposite ends of the frame are journaled rollers, and there is an intermediate roller armed with short spikes adapted to take hold of the lumber, this roller being adapted to be conveniently locked, while under one end of the frame there is a trailing wheel, the cart being durably built and designed to easily discharge its load without breaking the ends of the lumber.

A beer cooler has been patented by Messrs. Edward J. Liddicoat and Albert W. Utzinger, of Astoria, Oregon. It consists of a specially devised box, readily attachable to the chines of the beer keg at the end carrying the tap, the box carrying a spiral pipe which may be surrounded with ice, said spiral pipe connected at its inner end with the inner tap, and terminating outside the box in an outer tap, so that the beer will rest in and be drawn through the ice-covered spiral pipe.

A baling press has been patented by Mr. William A. Laidlaw, of Cherokee, Kansas. The frame has a feed opening to the baling chamber, a follower and sweep, a compressor within the chamber, and a sliding frame connected thereto, with other novel features, the invention being an improvement on a former patented invention of the same inventor, and designed to compress hay to one half its bulk before delivering it to the bale chamber, thereby dispensing with the usual door and catches.

Business and Personal.

The charge for Insertion under this head is One Dollar a line for each insertion; about eight words to a line. Advertisements must be received at publication office as early as Thursday morning to appear in next issue.

NEW BOOKS AND PUBLICATIONS.

FIFTH ANNUAL REPORT OF THE OHIO AGRICULTURAL EXPERIMENT STATION FOR 1886. Columbus, O. 1887. Pp. 317.

In this admirable manual is a review of the extensive work of the State Experiment Station under the directorship of N. S. Townshend, Esq., assisted by his staff. The experiments for the past year included field tests of a great variety of wheat, potatoes, strawberries, and other crops. The opinions formed by the station authorities as the result of these trials are given succinctly for each kind or variety of plant. As an indication of the laborious nature of this investigation, it may be mentioned that of wheat alone some hundreds of named kinds are elaborately reported on. Thick and thin seeding was tried, different fertilizers were used, and the results are tabulated. Pigs were examined, to ascertain the relative merits of different breeds and of different systems of feeding, and are reported on. Insects, weeds, vitality of seeds, botanical notes, and veterinary observations also form subjects of parts of the book. It is sent free to all inhabitants of Ohio, to others on remittance of 10 cents. It is a volume that no farmer of the State or its vicinity should be without, and to all intelligent agriculturists it is a work of the highest interest.

Notes & Queries

HINTS TO CORRESPONDENTS.

Names and Address must accompany all letters, or no attention will be paid thereto. This is for our information, and not for publication.

References to former articles or answers should give date of paper and page or number of question.

Inquiries not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all, either by letter or in this department, each must take his turn.

Special Written Information on matters of personal rather than general interest cannot be expected without remuneration.

Scientific American Supplements referred to may be had at the office. Price 10 cents each.

Books referred to promptly supplied on receipt of price.

Minerals sent for examination should be distinctly marked or labeled.

(1) T. O. T. asks: 1. Can you give a receipt for a good toning solution? A. Acetate of soda and common salt, each 15 grains; chloride of gold, 1 grain; 8 ounces water. This makes a good, practical toning solution, but something always depends on the way your paper is sensitized. 2. Is there any way of polishing photographs without the aid of a burnisher or glass plate? A. Not any way of making so good a polish. 3. What is the best cure for ringworm? A. Wash the part affected with a little lemon juice; then rub in with the finger a little gunpowder which has been bruised in a mortar. Do this gently about twice a day. 4. Can you give a receipt for good rubber cement? A. See receipt given in article on Cements in SCIENTIFIC AMERICAN SUPPLEMENT, No. 158.

(2) B. F. McD. asks: What is the best kind of steel to make magnets of for telephone receivers? Can Bessemer, good tool, or spring steel be used? Also should the same be tempered or hardened? A. For magnets the usual run of Bessemer steel is too soft. Good tool steel is to be recommended, tempered to a straw color, provided you can subjeet it to a sufficiently powerful source of magnetization. You may very well use a purple tempering color.

(3) E. M. asks the radius of the sharpest curves in use on the elevated railroads in New York city. A. 90'.

(4) F. J. P. asks how he may construct a reliable telephone from his store to his residence, a distance of 180 rods. A. Cut a circular aperture about 6 inches in diameter in a board. Over this tack a piece of parchment. To a wire solder a button or disk one inch in diameter. Pass the wire through a hole in the center of the parchment, support the latter horizontally, wet it, and suspend a weight to the wire. Prepare two of these. When dry, place one at each end of the line and stretch a wire tightly between them, drawing against the bottons. Where the wire goes around corners, which should be avoided as much as possible, one or more loops of marlin must be used to carry it. It must touch no solid object. If properly arranged, on talking against one drum head the sound will be reproduced by the other.

(5) S. A. H. writes: Many of the spectacles sold are advertised as Russian or Scotch pebble. Do they make any glass of Russian or Scotch pebble? Is it superior to ordinary flint or crown glass for spectacles? A. Pebble spectacle glasses are made from pure crystal quartz. The advertised name of origin has no significance whatever as to their quality. Fine crystalline quartz is found in every country, and probably none better than in the United states. It is no better than good optical glass in its optical properties, but is somewhat harder than glass, and when well polished, retains its luster longer than glass. Ordinary spectacle glasses are made of plate glass, which is inferior to quartz in optical quality, and generally imperfectly polished.

(6) T. H. asks: 1. Will it be a good plan to connect a lightning rod to an iron pump in well that has 1½ inch gas pipe for suction? A. Yes; but the pipe should not be relied on as the only ground for your rod, unless it always extends deeply into the water. 2. Are the nickel or silver plated points on lightning rods better than plain copper wire points? A. Bright points are more efficient than dull ones. 3. How many points should there be on one story house, about 27 feet square, with L 24×14 feet? A. There should be one on each chimney and one on each gable. 4. How to make a bright black paint for locomotive stack and smoke box, that can be put on with a sponge? A. Coal tar answers very well for this purpose. Asphalt varnish is also good.

(7) H. C. O. asks if hard rubber would do as well or better than glass for the plate of a Wimshurst electric machine, such as has been described in the SCIENTIFIC AMERICAN several times in the past few years. I have constructed one, and it worked well, but I have trouble with the glass plates breaking. A. Rubber plates are sometimes used for this purpose, but in time they deteriorate. The sulphur which separates from the rubber and incrusts its surface seems to interfere with its action. Glass seems to be preferable.

(8) H. S. B. asks: Does the phonograph imitate the peculiar tone of voice of the person who speaks into it, and can it imitate the different notes in a piece or song, and can it imitate the different musical instruments? A. The phonograph does imitate all the features of the voice or any other sound affecting it, but imparts also its own metallic character thereto. Musical notes will be reproduced if the exact speed of rotation is preserved in the second turning of the barrel.

(9) H. J. K. desires a formula for the wax used for map engraving by the wax plate process. A. Take of white wax 2 ounces, asphaltum 2 ounces. Melt the wax in a clean pipkin, add the asphaltum in powder, and boil to a proper consistence. Pour it into warm water, and form it into balls, which are kneaded and put into taffeta for use.

(10) W. C. C. writes: 1. I have two pop valves on my compress set at 90 pounds, and neither ceases to pop until they get to near 80. What is the remedy? A. There is none, but to relieve them of any undue friction by cleaning free from rust and dirt. Possibly the spring is not set with a central tension, which may cause slight friction. No safety valve will close within 2 or 3 pounds of its opening pressure unless pulled back to its seat. The increased area after opening is the primary cause of this, which with friction from dirt or rust may add several pounds to the difference of opening and closing. 2. Last year I had three ⅜ steel sheets put on the bottom of each of my boilers, the original boiler being seven-sixteenths iron. Boilers are 60 in. by 16 ft. long. Was it a good plan to put steel sheets on old boilers? A. There should be no apprehension in regard to putting steel sheets in your old boilers, if the work is well done. 3. We use water from artificial tank. What kind of scale preventive would you advise me to use? A. Could not give advice in regard to scale without knowing kind of scale you have. See SCIENTIFIC AMERICAN SUPPLEMENT, Nos. 286, 137, also Davis on steam boiler incrustation, which we mail for $2.00.

(11) C. W. B. asks a receipt for bluing gun barrels. A. Clean bright, then heat in an oven or long muffle until the desired color is obtained. Cool and rub with linseed oil.

(12) N. McG.—You can japan brass by heating, to oxidize the surface, or dipping in acid for the same purpose. Bright work does not take the japan well. It is also liable to crawl in baking.

(13) T. M. B. asks a receipt for icing for cakes and pastry. A. 10 teaspoonfuls of pulverized sugar to the white of one egg. Beat to a stiff froth.

(14) C. R. asks when a rattlesnake has its first rattle. A. At 2 years of age.

(15) A. J. G.—To make stick rouge. Melt paraffine and mix rouge so that there shall be as little paraffine as will possibly hold the rouge together, and roll into sticks.

(16) W. T. B.—The amount of flow in an artesian well is not always indicated by the static pressure when the well is closed. The kind and coarseness of the sand or gravel composing the stratum from which the water enters the pipe, governs the volume of the flow to a large extent. A high static pressure with the lower end of pipe terminating in a coarse gravel usually gives an abundant flow of water. While if it terminates in close sand the flow is strangulated or the water may bring sand with it if under great pressure.

(17) A. N. S. asks: What weight will be sustained by a cubic foot of air at 150° Fah., the outside air being at 80°. A. 0·008463 of a pound per cubic foot.

(18) J. M. W. asks: Why are kites not more used for propelling boats? A. It would not be possible thus to obtain as much power as can be got from sails, and the direction of the vessel could not be as readily controlled. Short trips have thus been effected frequently as an experiment, a man having thus made good time across Long Island Sound in a small boat, and it is reported that Benjamin Franklin was once towed across a pond while in swimming, by holding a kite string in his mouth.

(19) F. V. V. writes: In reply to G. S. D., No. 19 query of July 9, page 27, I find that you have made a mistake. You state never sharpen the clipper on the flat side, always on the bevel side. Use Washita or Arkansas stone and oil. Being a cutter and grinder, and having about eight or nine years' experience in the business, I feel it my duty to inform you of your error. I grind from 15 to 30 pairs of clippers per month myself, and have tried almost every way and everything. The way that I have succeeded in turning out a clipper to give perfect satisfaction was to take the clipper apart and grind the flat surfaces on a wheel running horizontally. This wheel is made up of two-thirds tin and one-third lead, and is turned up on a lathe perfectly flat. Then it is ready for use. When in use, Soling flour emery is used the most, as it is the most effective. A little sprinkled on the wheel when in motion gives great satisfaction. When the wheel is in such constant use, it must be turned up every three months, to be in good condition.

(20) F. L. D.—The force of dynamite and all other explosives is equal in all directions from the center fire. Whatever is laid upon the charge has weight. The air has weight. Tamping is, however, more necessary with gunpowder than with dynamite, guncotton, and the other high explosives, because the latter act with many times the suddenness of gunpowder.

(21) W. I. asks: Does a larger coal stove produce more heat from the same amount of coal than a smaller one? A. The size of stove should be proportioned to that of the room to be heated, when the stove is burning the fuel in the manner for which it was designed. There is a great difference in the way various stoves are intended to operate, but the forcing of combustion in too small a stove, in order to warm a large room, frequently results in carrying no inconsiderable portion of the heat up the chimney.

(22) Americus. — Balloons cannot be made of papier mache with rivets and braces, nor are they yet made of sufficient buoyancy to carry their own gas-generating apparatus. See a great number of articles on balloons in back numbers of SCIENTIFIC AMERICAN SUPPLEMENT.

(23) J. R. D. asks if meerschaum pipes are ever colored by a chemical process. A. They are. Various dealers throughout the United States boil the meerschaum in an oily mixture, the exact composition of which is kept secret, and thereby artificially color the pipe. The process is restricted to the cheaper varieties.

(24) H. J. asks about liquids for silver plating. A. Such preparations are usually salts of mercury in combination with silver, of which combinations the following is one of the better class: Take 3 ounces of nitric acid, put it in a bottle, and add a 25 cent piece, cut fine. Let it dissolve, and then add 3 ounces mercury, which is also to be dissolved; finally add 2 quarts rain water. In using, immerse the article to be plated, and after a few minutes rub gently with a piece of sponge wet with the solution, and polish with buckskin. The thickness of the plate may be increased by repeating.

(25) E. M. asks if silver chloride without being in contact with organic matter is decomposed by sunlight, also silver cyanide such as used in plating. A. The former is, while the latter, which is the double cyanide of potassium and silver, is not affected by light.

(26) A. B. desires a receipt for a varnish that when applied to one side ordinary glass will imitate the genuine ruby glass. A. Use an ordinary shellac varnish, made by dissolving shellac in alcohol, and color to suit your fancy by dissolving some aniline red in a little alcohol and mixing it with the varnish.

(27) C. P. McG. wants a formula for making a paste or glue with which to stick labels to tin boxes. A. Use starch paste with which a little Venice turpentine has been incorporated while it was warm.

(28) A. H. N. asks if there is anything that will positively remove freckles from the face of a person. A. Nothing will entirely banish freckles, although a wash made by dissolving three grains of borax in five drachms each of rose water and orange flower water is said to be excellent.

(29) P. H. C. desires a receipt for making a washing blue, and the best way to make it and compound it. A. Take one ounce of soft Prussian blue, powder it in a mortar with 1 quart of clear rain water and add ¼ ounce of oxalic acid. A teaspoonful of this is sufficient for a large washing.

(30) M. S. T. desires a receipt for mixing white paint (lead or zinc) to paint inside woodwork for his house, so it will not turn yellow. A. Use zinc white mixed with white varnish, and finish off with white varnish, also use best quality of ingredients to insure perfect success.

(31) R. S. McI. writes: Water, when allowed to freeze upon glass, adheres quite strongly. Will you please explain the philosophy of this? A. The ice is in intimate contact with the surface of the glass, and adheres, as all substances do under like conditions. The phenomenon is described in manuals of physics as adhesion. Glue and other substances show it in a high degree.

(32) T. K. P. desires a receipt for making a paint for branding wood red, something that will dry quick and not run when varnished. A. Take of shellac, 2 ounces; borax, 2 ounces; water, 25 ounces; gum arabic, 2 ounces. Boil the borax and shellac in water until they are dissolved, add the gum arabic, and withdraw from the fire. When the solution has become cold, complete 25 ounces with water, and add Venetian red enough to bring it to a suitable consistence and color.

(33) J. J. desires recipe for a good, harmless hair wash. A. Take of scalded black tea 2 ounces, with 1 gallon boiling water; strain, and add 3 ounces glycerine; tincture cantharides ½ ounce, and bay rum 1 quart. Mix well by shaking, and then add perfume.

(34) E. M. R.—High and low tone is difference in pitch, which is made by difference in the number of vibrations per second. The same tone may be loud or strong, or weak or soft, with the same number of vibrations per second. The strength of tone is a separate quality from pitch. A is right. B is also right. You have the terms confused. High and low are properly pitch terms. Loud and soft are properly volume terms. The lowest sound recognized in music has 32 vibrations per second. Highest, C, 9th octave, 16,384 vibrations per second. Vibrations may be heard slightly below and considerably above these figures.

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