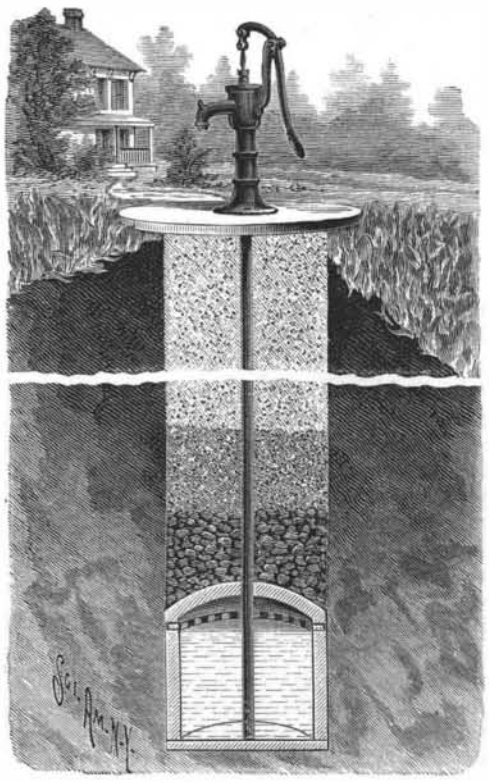
NEW TUBULAR WELL.

Where driven wells are feasible, they have become very popular, because surface drainage into the well is avoided and the entrance of foreign matters into the water chamber is prevented by a thick stratum of earth, but driven wells are objectionable insome places



RICE'S TUBULAR WELL.

on account of the liability of the strainers, the valves, and even the pipe to stoppage by gravel and sand.

To avoid these difficulties Mr. John Owen Rice, of Hutchinson, Minn., has invented and patented a device by which the advantages of the driven well may be secured, while its disadvantages are claimed to be avoided. As will be seen by reference to the engraving, the improved well, which is of considerable diameter, is dug down to the water-bearing stratum, and at this point is built a reservoir of brick, cement or wood, provided with perforations for the entrance of water, and arched over the top. At some point in the arched top of the reservoir, preferably at the center, is inserted a tube which extends from the bottom of the reservoir to the pump above. The lower end of the pipe is perforated to allow water to enter, and the space above the arched top of the reservoir is filled with stone, gravel, and earth, preferably arranged in the following order, stone being placed upon the arch, gravel upon the stone, and earth above the gravel.

With the well constructed in this manner, the water in the reservoir is perfectly protected against contamination from surface drainage or from the entrance of foreign substances, and at the same time gravel, sand, and earth are prevented from entering the pump chamber.

THEATRICAL ILLUSIONS.

An explanation of the illusions employed in theaters is always welcome, and the spectators take more interest in seeing a mystery performed whose hidden working is familiar to them than do those who do not possess the key of the enigma.

We are going to describe two tricks which, though now old, have had much success. The first of these, called the palanquin or stretcher, was employed in an old fairy scene whose name escapes us. It was almost as much of an illusion as is obtained in prestidigitation, and the rapidity with which it was performed did not allow the secret of it to be perceived.

One of the heroines of the play was presented on the stage in a palanquin carried by four slaves (Fig. 1). At a given moment the curtains were drawn and then immediately opened, when it was seen that the actress had disappeared; and yet the palanquin was well isolated on the shoulders of the carriers, who resumed their journey and carried it off the stage.

This trick, which preceded by many years Bualtier de Kolta's experiment, in which also a woman was made to disappear, but by an entirely different process, was performed as follows:

The four uprights arranged at the four corners of the apparatus were hollow, and each contained at the top a pulley over which a cord passed. These cords were attached by one end to the double bottom of the palanquin, and by the other end to a counterpoise concealed in the canopy.

At the precise moment at which the curtains were drawn, the carriers disengaged the counterpoises, which, sliding within the uprights, rapidly raised the double bottom, with the actress, up to the interior of the canopy. The person thus made to disappear was quite slender and took a position such as to occupy as little space as possible. By making the shadows of the mouldings of the canopy and columns more pronounced through painting, and by exaggerating them, the affair was given an appearance of lightness that perplexed the most distrustful spectator.

This illusion appeared extraordinary, and has hardly been surpassed except by the disappearances effected by prestidigitators. The second trick that we shall describe is employed in the *Peau d'Ane*, for producing the fairy robes of the story—color of the sun, color of the moon, and color of the sky—required by the play. In the midst of a brilliantly illuminated procession come two porters carrying quite a large chest by its handles. Having reached the royal throne, they place the chest on the floor and raise its cover, when there is immediately seen a fabric of the color of the sun, that is to say, of a luminous golden yellow, that overpowers the dazzling luster of the cortege. Afterward, two other porters come with a similar chest, which, when opened, exhibits a fabric as if phosphorescent, of a slightly bluish white. The third chest contains the sky-colored robe, that is to say, of a celestial blue, luminous like the two preceding colors. These wonderful fabrics are moved about by the porters, who make them sparkle.

The bottom, B, of each of these chests is capable of being opened over a trap, A, and, by means of an electric light device, C, a powerful ray is directed upon the light and transparent fabric, which seems to be on fire.

The yellow light suffuses the fabric of the same color, envelops it, and incorporates itself with it. After the cover has been shut down upon the stage, the bottom is closed from beneath, the trap is shut, the light is extinguished, and the chest is carried away by the porters.

The same is done with a slightly bluish white fabric, and a white light for the moon-colored fabric; and then with sky-colored tarlatan and a light with a bluish tinge for the sky-colored fabric. These effects, if not the most astonishing, are at least among the most dazzling of any of those that have been employed in the theater.—*La Nature.*

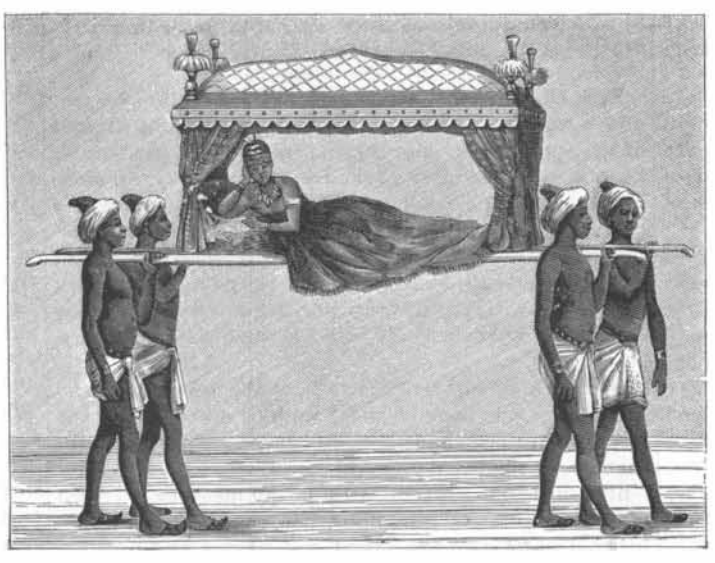


Fig. 1.—THE MAGIC PALANQUIN.

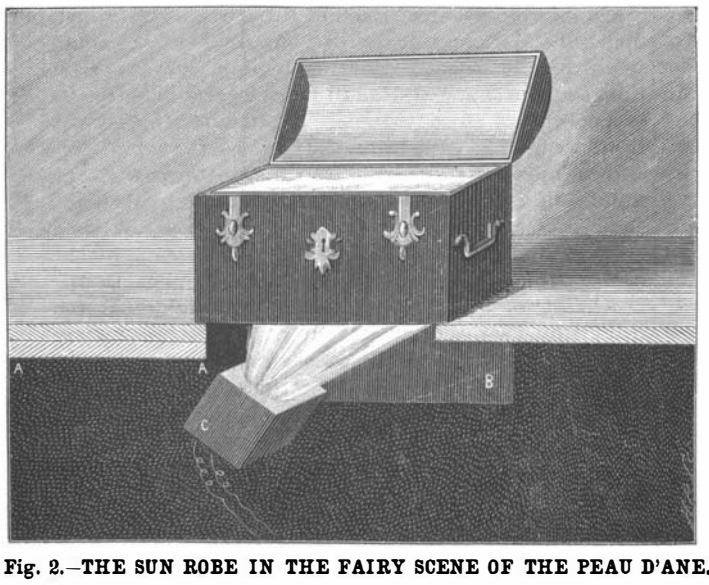
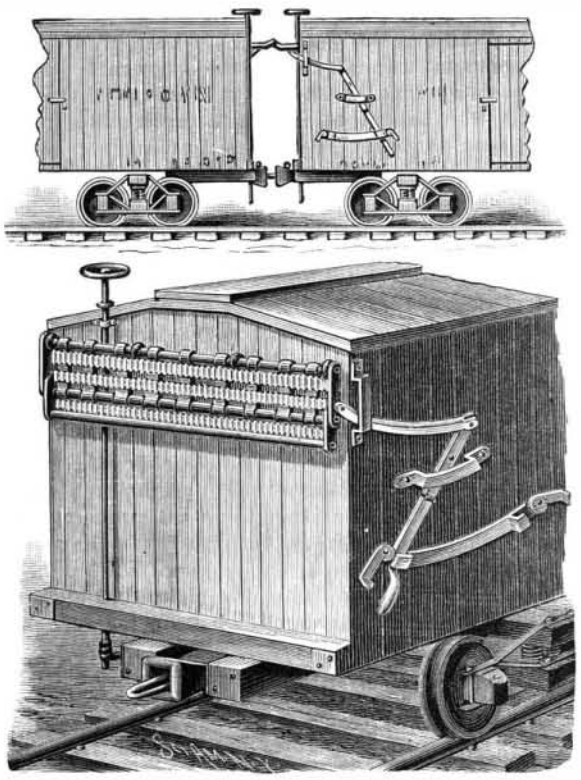


Fig. 2.—THE SUN ROBE IN THE FAIRY SCENE OF THE PEAU D'ANE.

A NOVEL method of strengthening iron castings has been brought out by Mr A. Jepson, of Manchester, England. The process consists simply in casting the metal around a wrought iron core. Thus, for thin plates, like stove plates, a thin wrought iron perforated plate is placed in the center of the mould, and the metal is poured around it. Wire (either straight or in coils), rods, bars, sheets or any form of iron, may be used according to the shape of the casting. It is stated that the close union of the cast iron with the wrought is assured by plating the wrought core with a thin coat of tin.

PLATFORM FOR FREIGHT CARS.

An inquiry into the cause of accidents which happen to trainmen on freight cars reveals the fact that the great majority of such accidents are caused by the trainman losing his footing in passing from one car to another, causing him to fall between the cars. This is sometimes owing to irregularity in the running of a



TYRRELL'S PLATFORM FOR FREIGHT CARS.

train, and at other times to inadvertence on the part of the man.

The frequency of these accidents has led Mr. Thomas C. Tyrrell, of Glendive, Montana, to devise a platform for the ends of freight cars, which will not only prevent such accidents, but will also facilitate the work of the trainman in operating the brakes.

A single car having this improvement applied is shown in perspective in the lower view, and the adjoining ends of two freight cars are represented in the upper view, showing the platform in the position of use. The platform consists of two parts hinged together, one of the parts being connected with the end of the freight car, so that it may be raised up into a horizontal position for use, or dropped down parallel with the end of the car when out of use, as shown in the lower figure of the engraving. The main portion of the platform is formed of three rods secured to end pieces, and cross bars connecting the said rods and supporting strips of corrugated iron which afford a suitable footing for the trainmen. The upper rod of the three is pivoted in eyebolts screwed into the timbers in the end of the car. Upon the lower or outer rod is pivoted the second part of the platform, which is free to turn upwardly, but its end pieces are shouldered so that it cannot turn in the opposite direction. This construction is designed to prevent injury to the platforms when the cars are forced toward each other, as in the case of coupling, or retarding or stopping the train by reversing the locomotive.

To the side of the car is pivoted a lever, which is connected with one of the end bars of the platform by a curved connecting rod formed in two sections, the shorter section being pivoted to the longer section, to allow the platform to turn upwardly when the space between the ends of the cars is very small. The lever which operates the platform is made in two parts hinged together, the lower end being arranged to swing outward laterally to permit of passing it over clips at the ends of a curved bar secured to the side of the car, and designed to hold the lever in either of the two positions in which it may be placed. The extremities of the curved bar are provided with eccentrics, either of which may be closed down upon the side of the lever to hold it in place in the clip.

This invention, which is covered by a patent, is well calculated to lessen the danger and discomfort of trainmen, and to facilitate the operation of the brakes.

When the car is not in use, the platform is folded down closely against the end of the car, as shown in the larger view of the engraving.

MAYER has calculated that, if the motion of the earth were suddenly arrested, the temperature produced would be sufficient to melt and even volatilize it; while, if it fell into the sun, as much heat would be produced as results from the combustion of 5,000 spheres of carbon the size of our globe.

Patents and Copyrights.

The country has just completed its first century of experience with patent law. The first statute enacted concerning patents was in 1790. Mr. Madison is supposed to have been the author of the patent provision in the Constitution, he having introduced the clause in 1787. It is difficult to estimate the influence of patents upon the wealth and progress of the country. During the year after the first statute was enacted, but three patents were granted. Now thousands are granted yearly, and over 450,000 in all have been granted up to the present time. Counting the aggregate wealth of the country at $43,000,000,000, it is estimated that two thirds of it is due to inventions upon which patents have been secured. There is a close analogy between a patent and a copyright, the latter being practically a patent secured on some kind of mental invention put in type or found in a map, drawing, or picture of some kind. The subject of patents and copyrights has an unceasing interest for people who think, since it involves the very interesting question of the proper limits of property in ideas. There seems to be little doubt, however, that the notion of "perpetual property in an idea" is not tenable. The fact that both patents and copyrights are made the subjects of statute law is in itself pretty conclusive evidence that they are proper subjects of statutory limitation. It is said that if Shakespeare had taken out a copyright on his plays, and it had remained as the perpetual property of his legal heirs and assigns, a fortune would have been amassed equal in value to half of Great Britain. Such things show the absurdity of the claim that ideas and combinations of words should be property like other property.—*Boston Globe.*

The Faith of Inventors.

Unshaken faith in their ideas and a determined perseverance to overcome obstacles are gifts with which inventors have been endowed, or, in common parlance, they have their inventions "on the brain"—mount their hobbies and ride them continually. If they were influenced by rewards, or hopes of reward ultimately, it would seem, in the eyes of the world at large, that there was a "method in their madness," and that the tangibility of wealth was the terminus of the "hobby" race. But we find a large proportion of inventors unbiased and uninfluenced by any hope of wealth, money or reward. They labor and experiment as though their existence depended upon it; they labor with the hope only of ultimate success in accomplishing what they proposed to perform, and that labor is with them a labor of life and love. This labor is ever constant to their minds, ever uppermost in their thoughts, ever exerting itself in every movement and every action. They are determined, in overcoming every resistance. It is an example of the power of mind over matter—of intelligence over the powers of nature.

And what does the world not owe to inventors? Civilization, arts, and commerce are the fruits of the inventors' "hobbies," and the greater part of these fruits have been the product of toil, many years of labor, at a cost of life, privation, and poverty; yet such was the inventors' faith that all obstacles have been overcome, and often after the results are obtained the fruit is left for others to mature and gather. Galileo declared the world "did move," and a prison was the result. Columbus, on the eve of his discovery, was nearly being thrown overboard by his discontented mariners. Harvey, the discoverer of the circulation of the blood, and Jenner, who first practiced vaccination, may be cited as examples of how great discoverers may be treated by the world before their discoveries are appreciated. Among the mechanics of a later day, Fulton, who was declared crazy; Colt, who had to mortgage his little stock of tools to obtain money to make his pistol; Goodyear, patiently toiling to obtain his results in the manufacture of rubber: Howe, bravely meeting all adversity to finish and introduce the sewing machine, may be cited as a few—very few—examples of struggling but afterward successful inventors. The list might be extended almost *ad infinitum*. Yet when success is achieved and the true value of the invention appreciated, the tardy meed of praise is tendered to the persistent faith of the inventor who accomplished the results.

Nor are poverty and adversity all that tries the inventor's faith in his projects. The ridicule of the masses and the sneers of the ignorant are perhaps as great discouragements as the former. Want of appreciation must be the only excuse for such undeserved and unmerited echoes, which rebound upon the faith of the inventor.

We might say that all workers are inventors, few in the extreme, but all in a degree. He is an inventor who produces a cheaper product or goods of a better quality—who brings about a better result; he who simplifies a process—who modifies proportions of ingredients, or he who excludes an unnecessary portion from a machine, producing like results with fewer parts and motions. Anything of benefit to humanity is invention, and the author or producer is an inventor. A test of invention is the faculty to adapt means to an end without complexity, and an ability to advance human knowledge. Faith in this ability is omnipotent and tantamount to success, and this success is purchased with self-sacrificing and energetic action, and a zeal to introduce the blessing of the results of their inventions and labors.

It is well the inventor has faith in the project of his brain, and the prospect of ultimate success is ever before him, and the dream of each night is that the morrow will produce the brilliant results which his dreams have depicted. It is well that it is so; for were it otherwise—were there no inventors—the world would be even now a barbaric chaos.—*The American Engineer.*

Chinese Insect Wax.

In his notes on Chinese materia medica the late Daniel Hanbury, writing thirty years ago regarding Chinese insect wax, said that this wax was "secreted by *Coccus pe-la*, Westw., upon the branches of *Fraxinus chinensis*, Roxb., which is cultivated for the purpose, and possibly upon other trees. Some accounts of the habits of the insect by a competent observer are much required, the Chinese statements on the subject being extremely obscure." Since that time it has become known for certain that the wax is mainly secreted on the tree *Ligustrum lucidum*, but there was no proper response to Mr. Hanbury's suggestion until Mr. Alexander Hosie, M.A., of our consular service in China, took up the matter when he resided in the Szechuan province in order to study the conditions of British trade in that western region of the Celestial Kingdom. While there Mr. Hosie made several journeys for specific purposes, and a narrative of his observations was published in book form two years ago. This book we commented upon at the time, and now give an abstract of his observations regarding insect wax, a subject in which interest has recently revived.

Mr. Hosie's third journey was in one sense the most interesting of all, for, although the country traversed was not all new, the object was to study carefully, for the Kew authorities, the Chinese insect wax industry. A special chapter of the book is devoted to the insect, and the industry associated with it, in which he traces the career of the *Coccus pe-la* of Westwood from its cradle, through its busy and interesting life, to its dishonored grave. The chief object of Mr. Hosie's journey was to procure for Sir Joseph Hooker specimens of the foliage of the flowers, and trees, on which the insects are propagated, specimens of the living incrusted wax, samples of the latter as it appears in commerce, and Chinese candles made from it.

The Chien-chang valley, which is about 5,000 feet above the level of the sea, is the great breeding ground of the wax insect. One very prominent tree there is known to the Chinese as the insect tree. It is an evergreen, with the leaves springing in pairs from the branches, very thick, dark green, glossy, ovated and pointed. In May and June the tree bears clusters of white flowers, which are succeeded by fruit of a dark purple color. The Kew authorities have come to the conclusion that it is *Ligustrum lucidum*, or large-leaved privet.

In March, when Mr. Hosie saw the trees, he found attached to the bark of the boughs and twigs numerous brown pea-shaped excrescences. The larger of these were readily detachable, and, when opened, presented either a whity brown pulpy mass, or a crowd of minute animals like flour, whose movements were just perceptible to the naked eye. From two to three months later these had developed in each case into a swarm of brown creatures each provided with six legs and a pair of antennæ. Each of these was a wax insect. Many of the excrescences also contained either a small white bag or cocoon covering a pupa, or a perfect image in the shape of a small black beetle. This beetle is a species of *Brachytarsus*. If left undisturbed, the beetle, which is called by the Chinese the "buffalo," will, heedless of the *Cocci*, continue to burrow in the inner lining of the scale, which seems to be its food; the beetle is, in fact, parasitic on the *Coccus*. When a scale is plucked from the tree, the *Cocci* escape by the orifice which is made. Two hundred miles to the northeast of the Chien-chang valley, and separated from it by a series of mountain ranges, is the town of Chia-ting, in which insect wax as an article of commerce is produced. The scales are gathered in the Chien-chang valley, and are made up in paper packets each weighing about 16 ounces. Sixty of these packets make a load, and are conveyed by porters from Chien-chang to Chia-ting (in former years there are said to have been as many as ten thousand of these porters). They travel only during the night, in order to avoid the high temperature of the day, which would tend to the rapid development of the insects and their escape from the scales.

At the stopping places the packets are opened out in cool places, but in spite of this each packet is found to have lost on an average an ounce in transit. A pound of scales laid down in Chia-ting costs, in years of plenty, about half a crown, in bad years the price is doubled. [Compare with this the consular note in the *Chemist and Druggist*, April 27, 1889.] In favorable years a pound of scales will produce four to five pounds of wax. In the plain around Chia-ting the plots of ground are thickly edged with stumps varying from 3 or 4 to 12 feet high, with numerous sprouts rising from their gnarled heads, and resembling at a distance our own pollard willows. The leaves spring in pairs from the branches, and are light green, ovate, pointed, serrated, and deciduous. The tree is said in all probability to be the *Fraxinus chinensis*, a species of ash.

On the arrival of the scales from Chien-chang about the beginning of May, they are made up in small packets of from twenty to thirty scales, which are inclosed in a leaf of the wood oil tree. The edges of the leaf are tied together with a rice staw, by which the packet is suspended close under the branches of this ash, or white wax tree as the Chinese call it. A few rough holes are drilled in the leaf with a blunt needle, so that the insects may find their way through them to the branches. On emerging from the scales, the insects creep rapidly up to the leaves, among which they nestle for a period of thirteen days. They then descend to the branches and twigs, on which they take up their position, the females doubtless to provide for a continuation of the race by developing scales in which to deposit their eggs, and the males to excrete the substance known as white wax. This first appears as an undercoating on the sides of the boughs and twigs, and resembles sulphate of quinine, or a covering of snow. It gradually spreads over the whole branch, and attains, after three months, a thickness of about a quarter of an inch.

After the lapse of a hundred days the deposit is complete, the branches are lopped off, and as much of the wax as possible is removed by hand. This is placed in an iron pot of boiling water, and the wax, on rising to the surface, is skimmed off and placed in a round mould, whence it emerges as the Chinese insect wax of commerce. Where it is found impossible to remove the wax by hand, the twigs and branches are thrown into the pot, so that this wax is darker and inferior. The insects, which have sunk to the bottom of the pot, are placed in a bag and squeezed of the last drop of wax, and are then thrown to the pigs. The wax is used for coating the exterior of animal and vegetable tallow candles, and to give greater consistency to the tallow. It is also said to be used as a sizing for paper and cotton goods, for imparting a gloss to silk, and as a furniture polish.

Removing the Epidermis.

A few days since, says the Boston *Herald*, at the Massachusetts General Hospital, a little instrument, invented by Dr. Mixter, wonderful in its simplicity, constructed so as to separate quite large portions of epidermis from the subcutaneous tissue, was used for the first time.

The patient had been etherized, and had undergone operation for the removal of a cancerous growth from the left breast, and the wound thus made was quite an extensive one. The instrument was applied to the anterior portion of the right thigh, and three strips, about an inch wide by six inches long, were taken off and transplanted to the exposed surface of the breast. The operation of removing the skin and transplanting it to its new quarters did not occupy more than about six minutes. A very few days suffice to restore the denuded surface of the thigh to its normal condition, leaving few traces of the reparative process to which it has contributed, and, other things being equal, the surface from which the cancerous tumor has been excised will heal over by first intention, thus saving the patient from a prolonged and painful period of convalescence. Of course, every precaution is taken, by the use of sterilizing processes and antiseptic solutions, to render the operation thoroughly aseptic, so that the chances of inflammatory disturbances from bacterial sources are reduced to the lowest minimum.

The thickness of these delicate human plasters probably does not exceed one-sixtieth of an inch, and the resulting hemorrhage is not more than what one sees on a slight abrasion of the skin, or it may be compared to the sanguineous oozing one gets from too earnest tonsorial attention. The advantages of the new over the old method of epidermic detachment are obvious. It is expeditious, the sections of shaved cuticle are much larger and of a more uniform thickness than can be obtained by the most dexterous manipulator, and the chances of successful grafting are enhanced by the fact that the skin is transplanted while the cellular elements are in their full vital activity.

Water.

Elaborate work has been done by E. W. Morley relating to the volumetric composition of water. In his summary he says: For the present we may believe that water, when the gases are measured under ordinary temperatures and pressures, is composed of 2·0002 volumes of hydrogen to 1 volume of oxygen; or that under ordinary conditions the number of molecules in a given volume of oxygen is one nine-thousandth part greater than the number of molecules in an equal volume of hydrogen.

Whitewashing Nero.

According to Signor Lanciani, the learned Italian writer in *Iron*, the Emperor Nero has been libeled. Instead of being the cruel tyrant he is generally represented to have been, he was a benefactor of mankind and a well-intentioned sanitary reformer. It has for centuries been commonly understood that Rome was set on fire and burned by Nero, in the year 64, either through brutal malice or drunken incapacity and indifference. Signor Lanciani's investigations put a very different interpretation upon the matter. Nero desired to make many changes in the streets of Rome by increasing their width and making many of them more direct, and also to introduce many improvements by reconstructing public buildings. His efforts in this direction were met by an opposition from property owners—it is a strange thing that property owners have not changed since Nero's time—and were also embarrassed by the fact that the city abounded in temples, altars, and shrines which were inviolate. While he probably made light of the property interest, religious sentiment the Emperor knew ought to be respected under all conditions and at all times, and he acted accordingly.

He directed two architects, Severus and Celar, to prepare plans for the rearrangement of streets in certain parts of the city, making them as near to straight lines and right angles as the hilly configuration would render feasible. Numerous public squares were laid out, and a system of sewers was planned. Regulations for buildings were prepared, in which it was provided that the height of houses should not exceed double the width of the street, that each house should be completely cut off from the adjoining buildings, that each house should have a portico in front, and that wood ceilings should be excluded from the first stories of buildings. Tents and booths were secretly prepared, and vessels were sent to various Mediterranean ports after grain, with orders to meet at the mouth of the Tiber on a certain date.

In accordance with Nero's plan, the city was fired in numerous places, and, of the fourteen wards, three were entirely destroyed, and seven were burned in great part. The crowds driven out of their homes found the booths in the outskirts of the city ready for them. The grain-laden vessels appeared in time, and the townspeople were fed and housed during the rebuilding, the whole plan having been carried into effect without exposure, famine, or loss of life, although the population of the city at the time was very large.

The Hair Worm.

The common hair worm of Europe is technically called the *Gordius aquaticus*, and the allied or representative American species is *Gordius varius* of Dr. Leidy, but we also have *G. longilobatus*, *G. robustus*, and *G. subspiralis*. In a volume now before us, entitled "Naturalist's Miscellany," published by Shaw & Nodder, London, 1791, we find an interesting illustrated article on *Gordius aquaticus*, from which nearly as much information may be obtained about the development of the Gordians as may be obtained from works on the subject published at the present day; for it seems that after the exclusion of the animal from the egg, very little about its subsequent development has been learned, between that period and its mature condition, when it looms up before us a perfectly formed and wriggled "hair worm." It was demonstrated more than a hundred years ago that the animal was not a vivified or animated horse hair, but that it was a distinct living animal, that had been developed through the media of *bona fide* eggs. Indeed, more than fifty years ago, after an experience of more than six months, it became manifest to us that a horse hair would never be transformed into a *Gordius*. We have taken them from water puddles, cabbage heads, moist earth, grasshoppers, ground beetles, and apple seed cavities—dark and light brown, red, pink, nearly black, pale and white, alive and squirming.—*S. S. R., in American Notes and Queries.*

Shading Greenhouses.

There is some difficulty in choosing a shading for greenhouses, as some materials wash off too quickly, and others not readily enough, as in the case of the common limewash. A correspondent in the *Gardener's Monthly* says he has tried many materials, but all have proved unsatisfactory. He found the following, however, very useful for many other purposes besides shading: Take one pound common whiting, one ounce of the best glue, and a quarter of an ounce of bichromate of potash, called also red alum. Soak the glue the day before using, melting in a common glue pot, and then dissolve the bichromate in warm water. Mix the materials together, and thin them down to the consistency required. These, after being exposed to the light, are almost as adherent as oil paint. Of course, by reduing the proportion of bichromate, the material can be made less retentive, but a coat of this wash on the greenhouse will last the whole summer, and even be troublesome to wash off, not to such a degree, however, as limewash It should be constantly stirred up while being used,

Power of Water in Motion.

About two months ago there was a dinner party at General Schofield's house in Washington. Among the guests were President Harrison, Chief Justice Fuller, the late Secretary Windom, Speaker Reed, Senator Sherman, and Senator Stanford, and Mr. Justice Stephen J. Field.

During the dinner the conversation turned upon mining operations in California, and Judge Field, whose knowledge of all matters relating to the Pacific coast is as extensive as his powers of narrative are entertaining, astonished the distinguished company by some of his assertions in regard to the force of the jets of water employed in hydraulic mining. He described the wonderful manner in which the streams from the hose cut to pieces and tear down the hills that hold the precious metal. Judge Field cited the Hon. James G. Fair as his authority for the statement that under a vertical pressure of 100 or 200 feet the force of the stream is sometimes so great as to hurl away or hold bowlders weighing a thousand pounds; and that it would be no more possible to cut through such a stream with a crowbar or an ax, where it issued from the nozzle, than to sever eight inches of solid iron with a penknife.

As Judge Field afterward informed Senator Fair, in a letter asking for expert testimony about the power of water applied by hydraulic machinery, these assertions were received by some of General Schofield's guests with smiles of polite incredulity. The eminent jurist felt that his position, for the moment, was somewhat like that of the Englishman who informed the King of Siam that in England water ofter became so hard that people could walk on it. It is not at all surprising that the facts gravely alleged by Justice Field should stagger even an imagination like the Chief Justice's, or strain the faith of so profound a believer in dynamics as the Hon. Thomas B. Reed.

In consequence of this incident, and for the vindication of his own reputation for veracity, Justice Field has collected from several of the highest authorities on practical hydraulics evidence and opinions that are of great interest.

Ex-Senator Fair tells Justice Field that at the Spring Valley gold mine in Cherokee, Cal., the water used in the hydraulic mining operations was brought in pipes and ditches from a distance of nearly 100 miles, and that the volume of water used on every working day in that mine amounted to three times the number of gallons consumed daily by the entire city of San Francisco.

Mr. Louis Glass, for 16 years the superintendent of the Spring Valley mine, assures Justice Field that he has seen an 8 inch stream, under 311 feet of vertical pressure, move in a sluggish way a two-ton bowlder at a distance of 20 feet from the nozzle; and that the same stream striking a rock of 500 pounds would throw it as a man would throw a 20 pound weight. "No man that ever lived," adds Mr. Louis Glass, "could strike a bar through one of these streams within 20 feet of discharge; and a human being struck by such a stream would be killed—pounded into a shapeless mass."

Mr. Augustus J. Bowie, of San Francisco, the author of a standard book on hydraulic mining, estimates that the stream from a six-inch nozzle, under 450 feet vertical pressure, delivers a blow of 588,735 foot pounds every second, equivalent to 1,070 horse power. "It is absolutely impossible," says Mr. Bowie, "to cut such a stream with an ax, or to make an impression on it with any other implement." Mr. Bowie adds that although never to his knowledge has a man been struck by such a stream as it comes from the pipe, several accidents have occurred where miners were killed by very much smaller streams at distances of 150 or 200 feet from the nozzle.

After an elaborate series of computations, Prof. Samuel B. Christy, of the University of California, an eminent authority on mining and metallurgy, reports to Justice Field that if a nozzle of from 6 to 9 inches diameter were specially arranged to throw a stream vertically upward against a spherical bowlder of quartz weighing 1,000 pounds, the vertical head being anywhere from 100 to 500 feet, the bowlder would be forced up until the diminished velocity of the stream established an equilibrium of pressures. There would be a point at which the upward pressure of the stream would exactly balance the gravity pressure of the bowlder, holding it, the half ton rock, there suspended. In practice, of course, the bowlder could not be balanced accurately upon the axis of the stream, but would fall to one side or the other. But if a large conical basket of iron bars were arranged about the nozzle so as to catch the bowlder whenever it should be deflected from the stream, and return it to the nozzle, the 1,000 pounds of quartz would be kept in play like a ball in a fountain. As to cutting these streams, Prof. Christy says that he has often tried to drive a crowbar into one of them. The stream felt as solid as a bar of iron, and, although he could feel the point of the crowbar enter the water for perhaps half an inch, the bar was thrown forward with such force that it was almost impossible to retain it in the grasp. An ax swung by the most powerful man alive could not penetrate the stream; yet it might be cut by the finger of a child, if the child were seated on a railway train moving parallel with the stream in the same direction and with the same velocity. That velocity would be considerably more than a mile a minute.

Justice Bradley, of the Supreme Court, has also tried his intellect upon the mathematics of the problem submitted by Judge Field. He delivers this opinion: "I can well believe all you say with regard to the tremendous force of streams issuing from the pipes of the miners under a large head of water. Of course, they would produce instant death if directed against a man standing near, and would probably cut his body in two."

The statements here presented in summary will not astonish engineering experts or members of the New York Fire Department. The average citizen, however, is accustomed to regard water as the least destructive liquid that can be put in motion, and he is familiar with no stronger manifestation of its power than the velvety touch of the stream from the Croton faucet.

We should say that the distinguished Californian upon the bench of the Supreme Court had amply vindicated his right to be heard with respect and perfect confidence by any dinner party on the subject of hydraulic pressure. Does it occur to General Schofield that in these facts there is the suggestion of a novel and most terrible engine of military defense against assaults at short range?—*New York Sun.*

Sale of Professor Koch's Lymph.

The following official rescript appeared in the German *Medical Gazette* of March 13, and a translation has been transmitted to the *Lancet* (London) for publication from the Foreign Office.

Professor Dr. Koch has published in the German *Medical Gazette* of January 15th last a description of the manner in which the lymph, discovered by him for the cure of tuberculosis, is prepared, and according to this description it appears that this remedy comes within the provisions of Section 1 of the Imperial Ordinance of January 27 of last year, and can therefore, with the exception of wholesale trade, only be sold by licensed chemists (apothecaries).

Chemists can at present obtain the lymph, prepared under the personal supervision of the inventor, only through his authorized representative, Dr. Libbertz, 28 Luneburgerstrasse, Berlin, N. W. It is supplied to them in special bottles of a capacity of 1 or 5 cubic centimeters. These bottles have glass stoppers covered with bladder and secured by a leaden seal bearing the letter "L." On one side they bear the name "Tuberculinum Kochii" in white letters on a black ground, on the other side a white label with the signature of Dr. Libbertz, and a note giving the date on which the lymph was prepared. Each bottle is accompanied by a printed paper containing instructions for its use.

With regard to the preservation and sale of the remedy in chemists' shops, the following regulations must be observed:

1. The "Tuberculinum Kochii" must be kept in the poison cupboard, and in the division reserved for alkaloids.

2. It can only be sold in the original bottles, and only upon the written order of an approved physician, and delivered to such physician himself or to a person authorized by him.

3. A record of the purchase and sale of the remedy must be kept in a special book, in which each bottle must be entered. The contents of the bottle, the date of preparation, of purchase, and of sale, the name of the physician to whom it has been sold, or eventually the removal of the unsold bottle from the shop, must all be noted.

4. If a bottle has not been sold within six months of the date of preparation marked upon it, it can no longer be sold or otherwise disposed of, but must be removed from the shop. Such bottles will be exchanged by Dr. Libbertz for others containing freshly prepared lymph free of charge.

5. The price of the "Tuberculinum Kochii" is hereby fixed (exclusive of the cost of packing) at 6 marks for a bottle containing 1 cubic centimeter and at 25 marks for one containing 5 cubic centimeters.

I have the honor to request you to cause the above regulations to be communicated to the chemists in your district for their guidance, and also to take steps to insure their due observance.

(Signed) DR. VON GOSSLER.

Berlin, March 1, 1891.

To the Governors of Provinces and the President of Police in Berlin.

The Doctor who Succeeds.

A physician who understands human nature, who plays with the baby, makes friends with the children, and listens to the woes of the good wife and mother, says a medical journal, is the fellow to whom the master of the house most cheerfully pays the largest bills. It isn't the medicine that's bottled up, but it's the comfort and consolation that are unbottled that mark the broad line between an unsuccessful and a popular physician.