weight of the load. Now, with wheels 6 feet in circumference in moving sixty feet there will be ten revolutions, and the surface of the hub or box in contact with the axle will travel around it the distance of five feet. But if you substitute wheels 12 feet in circumference, the wheels will make but 5 revolutions in moving 60 feet, and the rubbing surface of the hub or box will travel around the axle only a distance of two and a-half feet. The weight or pressure will be the same in both cases, and, consequently, the friction of each revolution will be the same, whether made in a longer or shorter time.

The law may be expressed in these words: If you move one surface over and in contact with another surface, under a given amount of pressure or weight, the fric ion to be overcome will be in proportion to the weight or pressure, and the distance which the moving body travels, without reference to the time occupied in traveling that distance.

I respectfully refer your correspondent to "Appleton's Dictionary of Mechanics," Vol. I, page 717, where he will find the law applicable to this subject clearly laid down, and fully sustaining my proposition.

After falling into the error which I have above pointed out, your correspondent goes on to show, that there is an "advantage" in large cart wheels over small ones, independently of any saving of friction; "and this advantage" he says, "depends on the road, whether there are obstructions, like stones, sand, mud, or the settling down of the road bed under the wheels," etc. This is begging the question. In my communication I did not say that the saving of friction was the only advantage gained by using large wheels instead of small ones, in traveling over common roads. My assertion was, that the difference in friction between the axle and the hubs, "is the only reason why a horse can draw, on a level plane, a heavier load, at the same speed, on large wheels than on small ones." I adhere to that assertion, it being understood, of course, that I mean an absolutely level plane, when there are neither obstructions to surmount, nor depressions into which the wheels may sink. But a cart moving over a road obstructed by stones, mud-holes, ruts, etc., does not move on a level plane. It must inevitably have its "ups and downs."

That large wheels will move over obstructions easier than small ones, is a proposition which I have never denied.

Washington, D. C. J. J. C.

Is Machinery Hostile to Mental Culture.

MESSRS. EDITORS:—Civilization always advanced in direct ratio to mechanical development; the remains of ancient Egypt, Greece, Rome, China, Peru, Mexico, and everywhere else, prove it incontrovertibly. As the laws of nature revealed themselves to men, they grew intelligent, and while some used the knowledge obtained for improvements in industries, others made it their aim to further explore the recesses of nature, from which all wisdom flows. In either case as the necessity for improved mechanical means became urgent, ingenuity was taxed to supply the want. Thus we have the progress in civilization through industry by mechanical means, deducted from the laws that rule the universe. Machinery, therefore, is the promoter of human progress, the great lever by which we open the portals that exclude our vista from the formerly unknown, and therefore mysterious regions, enlarges our knowledge, and dispels ignorance and intolerance.

Progress in knowledge is the certain road to perfection, to virtue, to further development of that intelligence in mankind, which only requires encouragement to expand over the immeasurable extent of the universe, finding there revealed the true source of all being; it directs to morality, to rectitude, through justice. On the other hand, the substitution of automatical work for hand labor relieves the mass from a great deal of soul-benumbing drudgery, gives each more time to reflect; and the observation of the numerous devices employed in itself promotes study, reflection, independent reasoning; the real and only source of true liberty, if joined to morality and justice. R. H.

New York city.

Excellent Copying Ink.

MESSRS. EDITORS:—In your issue of May 15th I notice a recipe for a new copying ink. Perhaps it may gratify some of your readers to be acquainted with another recipe which was published by me, in 1862, in *Wieck's Illustrated German Polytechnic Gazette*, and which will be found perfectly reliable.

Take one half of a pound of extract of logwood (Sanford's is best), two ounces of alum, four drachms of blue and as much of green vitriol, and one ounce of sugar; boil these ingredients with four pints of water, filter the decoction through flannel, and add to it a solution of four drachms of yellow chromate of potassa in four ounces of water, and finally two ounces of chemic blue in two ounces of glycerin. The chemic blue, also called "blue dye," is the solution of indigo in oil of vitriol, and otherwise used for dyeing wool.

You will notice that my composition differs from that given by you, in containing alum, instead of carbonate of soda, and sugar instead of gum arabic. Beside the ingredients of your ink, it contains chemic blue, and green and blue vitriol. In using these two salts I intend to effect a combination between them and the tannin of the extract of logwood. Your ink will probably just flow as well with one quarter less glycerin and one half less water of the quantity indicated.

New York city. ADOLPH OTT.

Why Large Wheels are of Lighter Draft than Small Ones.

MESSRS. EDITORS:—Your correspondent "J. J. C.," on page 311 of present volume, in answer to "F. R. P." criticising the latter's manner of explaining the reason why a cart with large wheels is of easier draft than one with small ones, gives an opinion I differ from as well as from that of "F. R. P."

The cause is change in the angle formed on the one side, by the line of draft from the axis of the wheel, and on the other side from the axis of the wheel to the top of any object in front and against the wheel. The axis of the wheel being the apex of the angle, it will be seen that the smaller the wheel the more acute this angle will be, the line of draft being then lowered comes more behind the object to be overcome and increases the draft. If the wheel be so small that the line of draft coincides with the line of resistance the cart cannot be moved at all. "J. J. C." says that a cart with wheels half the size of another will have double the friction at the axis because it moves twice as far in going the same distance as the large wheels, but "J. J. C." must recollect that draft has twice the leverage on the small wheels that it has on the large ones, therefore in this respect they would be equally balanced. G. B.

Princeton, Ind.

Extinguishing Kerosene Lamps.

MESSRS. EDITORS:—For the last ten years, I have hardly ever read a single number of the "Scientific American," without feeling, that it was well worth the price you charge for a whole year's subscription. *E.G.*, in the simple matter of extinguishing kerosene lamps; to have the safest, easiest, and best plan, is worth more to any family, using lamps, than the pittance paid for your paper. In No. 8 of the present Vol. of your excellent paper, we read—"To extinguish a kerosene lamp safely, turn the wick down until the flame is low and blow under the glass." In No. 10 of the same paper, we read—"Turn the wick up so as to produce a large flame, but not high enough to smoke; then blow squarely *across* (not down) the top of the chimney." In No. 14 we read—"Turn the wick down until it is out, then turn it up ready for lighting." In No. 21 we read—"A kerosene lamp will be found extinguished in less than one minute from the time of complete disappearance of wick below the edge of tube through which it passes."

I think the above plans objectionable.—First, because by "raising the wick before blowing out," the flame will immediately run down to the tube and thereby injure the quality of the wick for afterward conveying the fluid to the blaze. Second, because "lowering the wick to extinguish the lamp," will produce a kind of gummy substance in the upper part of the tube, which will ere long interfere with the raising of the wick when a new supply is needed. Third because "blowing under the the glass" takes such hard blowing and throws the blaze and smoke against the side of the chimney and soils it.

Fourth because "blowing down the chimney" is unsafe and also tarnishes the glass. Other objections might be given, but let these suffice.

After experimenting in the matter, I *think* I can give an easier, quicker, and safer plan than any of the above, for "extinguishing kerosene lamps."

It is simply this:—Blow across the top of the chimney, without either raising or lowering the wick. Let the blowing be a kind of *puff* and inclined upwards, so that no part of the blast will go down the chimney.

This plan needs no previous or subsequent fixing of the lamp. Try it. GEO. BUCHANAN

Washington, Pa.

Vibration of Metallic Vessels Containing Water.

MESSRS. EDITORS:—On a recent visit to Port Sullivan, Milam county, Texas, my attention was called to a curious fact bearing on this subject.

The college bell had been taken down from the tottering belfry, and placed, with its frame, upon the floor of the portico, where it was still used for college and church calls.

Some of the mischievous students turned it up, and propped it, and then filled it with water. Its diameter is about 18 inches, and its contents some five or six gallons. They then undertook to ring the bell by slight blows of the clapper against its walls. They, however, got little response; and after a few blows it was discovered that the bell was cracked in several directions. In fact, the pieces came asunder after emptying the bell, and showed the bell metal to have been of the most compact quality. The fracture was granular, but each grain clear and glistening.

"What was the cause of the fracture? The bell was accustomed to much more violent blows for years before."

To the professor who asked this question, the writer gave this extemporaneous reply, without being very confident that it was satisfactory.

"Instantaneous vibration against the water inside was probably impossible, and hence the momentum of the blow forced a rupture; or more specially, when the clapper struck the concave rim of the bell, there should have been in the open air, or any elastic medium, an instantaneous yielding of the concave in the direction of the blow, and a corresponding retraction on the opposite end of the diameter, and the circle for the moment would have assumed an ovate form. But as water is practically inelastic, the yield to the blow is not compensated by retraction and change of form; and hence the bell would crack, probably at some point of minimum strength."

Experiments may readily settle the question, but we have a great scarcity of bells in Texas, and cannot afford to make these tests. C. G. FORSHEY.

Galveston, Texas.

Cosmos states that a committee has been formed at Copenhagen with the intention of erecting a suitable monument in honor of the great Danish *savant*, Hans Christian Oersted. A statue, representing the distinguished natural philosopher, is ordered to be made by a Danish sculptor, named Ferichau, and is to be placed in a prominent situation in Copenhagen.

(For the Scientific American.)

COAL TAR AND ITS PRODUCTS AS PRESERVATIVES FOR WOOD.

Ever since the establishment of gas works it has been considered a matter of great importance to find some useful application for their waste products, principally the coal tar The old custom was to use wood tar as a coat for common wood structures exposed to the inclemency of the weather, and it was soon found that coal tar resinifies, dries, and hardens quicker than wood tar. This circumstance led to experiments to ascertain the preservative nature of coal tar.

More than fifty years ago W. H. Hyett and others impregnated wood with gas tar, and reported that such wood, placed in a damp cellar, became moldy sooner than the same wood in its natural state, and that it showed fungi, particularly where the tar abounded.

In 1830, Reichenbach published his experiments, by which he obtained creosote from beech-wood tar. He subjected the tar to a fractional distillation, the heavier products, which distilled over by increased heat, were washed with an alkali, redistilled, again treated with lye, and then with sulphuric acid, and again distilled. The substance so obtained he found to preserve meat, and therefore called it "creosote," meaning meat preserver.

This invention of Reichenbach served as a nucleus for a number of erroneous conclusions. It was alleged that a substance which preserves meat also preserves wood, which is not true. A solution of common salt, for instance, serves to preserve meat and fish, while it accelerates the decay of wood It was said that coal tar is the same as wood tar, and furnishes creosote, but the truth is, coal tar differs materially from wood tar, and contains no creosote. It was further stated, that the mere distillation of coal tar is sufficient to convert the same or part of it into creosote, and the coal tar, which distilled over by increased heat, and was found heavier than water, was deceptively called "creosote," sold as creosote, and used as creosote to "creosotize" wood and preserve it yielding, through such misrepresentations, large revenues to the gas works and inventors of various processes to impregnate wood with gas tar or its products.

The first man whom we find engaged in the creosotizing patent business, and probably the most candid inventor, was Franz Moll in A. D., 1835. He found, by practical experiments, that the so-called "creosote of coal tar" was worthless to protect wood from decay. He ascribed its failure to the presence of other substances therein, with which the "pure creosote" is associated, and strongly recommends its previous purification with alkaline lye, similar to Reichenbach's process described above. When coal tar is heated in a still by gradually increasing heat, the product first obtained, which is lighter than water, is called by him "eupion," the heavier liquid obtained thereafter he calls "creosote." Merely coating wood or timber with coal tar or other tar, he finds of but little advantage.

Moll's British patent was granted in 1836, and is the more interesting, as his process is based on the best principle, so far known, to saturate wood with liquids, and as his specification accounts for the necessity of tedious operations, without which he finds the application of the products of gas tar of no practical advantage. His process is as follows: The wood is placed in a close chamber, which is connected with one or more stills. He begins the operation by heating the inside of the chamber by a steam pipe or elsewise, to about 100° Fah., and then increases the heat gradually till sufficiently warm, to assist in maintaining the vapors of eupion and creosote in a vaporous state. The water from the damp timber is then drawn off, and eupion, previously sufficiently purified, is heated in the still, from which the vapors enter the chamber. When the wood is considered sufficiently impregnated with the eupion vapors, the surplus vapor is drawn off, and vapor from a still containing creosote, also previously purified, is then admitted, and finally boiling liquid creosote is introduced into the chamber by a pipe in a quantity sufficient to cover all the wood therein. After the whole has become cold, the wood is removed from the chamber.

He describes the following experiment, made by him "on a balk of good oak which was rather in a damp condition, the same was fourteen inches square, and about ten feet long, which, on being submitted to the vapors of eupion for about six hours, when cut in two parts, was found to be impregnated proportionately, even to the heart, with eupion, and when the two parts were afterward submitted to the vapor of creosote, and boiling creosote, the same was found to have taken effect within 12 hours. But subsequent experiments have proved that it is better to submit the wood or timber for a comparatively short time to the action of the vapors of eupion and creosote, and depend more on the liquid bath, as described, this process being less liable to crack the wood or timber than the vapors."

MOLL'S SIMPLIFIED PROCESS.

"Where it is not thought a matter of importance, whether the timber be chiefly penetrated with creosote or eupion, the former of which I consider the chief agent against dry rot, or where the operation is chiefly performed in order to prevent the effects of penetration of water into the wood, or where it is judged to be immaterial, whether these fluids convey any acidity into the timber, and when the proportion of eupion and creosote contained in the tar is well known, the operation may, of course, be much simplified by letting the vapors or liquid products of tar, or other matter containing eupion or creosote, or both, enter into the timber. But I am bound to state that the above-described method of washing the substances, and applying them separately, will be found far superior in use, as the volatility of the eupion and its fluidity will allow its rapid penetration into the timber more perfectly than when in combination with the cresote, whose entrance

the former will greatly facilitate when once lodged in the pores through the affinity of the two substances, and as by these means the quantity of eupion can be regulated which is to be absorbed by the wood; moreover, the antiseptic power of the creosote will be augmented by the washing and freeing from matters mixed with it."

LOUIS S. ROBBINS' PROCESS.

The process just described by Moll as his simplified operation, was reinvented thirty years thereafter and patented here, A. D., 1866, by Louis S. Robbins, of New York, and the patent was lately purchased by "The National Patent Wood Preserving Company," by whose order a pamphlet was published last year under the title of "Discovery of a Lost Art of the Egyptians."

Robbins, like Moll, uses a chamber, in which the wood is placed; Robbins also uses a retort, or still, in which, like Moll, he heats coal tar and introduces the vapors from the retort into the chamber by a gradually increasing heat, lets off the water from the damp wood, and impregnates the wood with the vapors of coal tar, which he calls "oleaginous vapors," while Moll calls the same "eupion and creosote." Robbins says further, that he does not limit himself to any particular form of apparatus, nor does he intend to limit himself to the removing of the surface moisture from the wood by means of oleaginous vapors, as there are various ways in which the same can be accomplished with the use of heat. "But what I claim as 'new' is the process consisting in first removing the surface moisture from the wood and then charging and saturating the same with hot 'oleaginous' vapors and compounds, also removing the surface moisture from the wood by means of hot oleaginous vapors."

We suppose that Robbins did not know of Moll's process, as he says in his specification: "From the above description it is apparent that by my process I am enabled to more completely saturate the wood with the preservative compound than has been, or can be done by any of the processes heretofore in use, for the reason that I cause the preservative compound to permeate the pores and fibers of the wood in a *vaporized state*, while in the others it is made to enter in a liquid state."

JOHN BETHELL'S PROCESS.

Patented in England in 1849. He applies the "creosote," or coal tar, in its liquid state, without any previous purification. The wood is placed in a pressure tank, from which the air is exhausted previous to the introduction of the "creosote," which is then forced into the pores of the wood by a pressure pump. Bethell's process, being the most simple and quickest in its operation, was extensively used, and of the results we have reliable reports.

David Stevenson, the eminent English engineer, states that although highly recommended to him by Bethell, he found such creosotized wood to be wholly unfit for use on piers or other water structures, as it was soon destroyed, perforated, and eaten off in places where the creosote abounded, though the most favorable location had been selected for trial, and every precaution used by Bethell in the preparation, the wood having been creosotized after being cut into the shape in which it was applied. (*Civil Engineer and Architect's Journal*, vol. 25, page 205. London, 1862.)

Wm. Jerry Walker Heath reports (*ibidem*, vol. 29, page 301. 1866) that square rail ties sent by Bethell for use in South America, even when laid on the best sandy ground, were soon totally destroyed.

John Bethell himself stated (*ibidem*, vol. 29, page 323) at a meeting of the association of the engineers, that he received from Belgium rail ties of the round shape back, which were previously creosotized by him in the best manner, and which were then found to be hollow like a cannon, the heart being all gone, and the outer part representing a black, hard mass.

FAILURE OF COAL TAR OIL FOR THE PRESERVATION OF WOOD.

The causes of the failure are explained by the fact that coal tar does not yield any creosote, even if treated in like manner as wood tar, which often yields as much as 25 per cent of creosote. The substance obtained by the treatment of coal tar is carbolic, or phenic acid, which differs materially in its properties from the real creosote. Being an effective disinfectant, carbolic acid does not prevent fermentation nor putrification; on the contrary, Ilisch, of St. Petersburgh, found that some substances impregnated with a solution of carbolic acid showed the formation of mold within a fortnight. This circumstance, taken in connection with the fact that coal tar resinifies and hardens quicker than wood tar, explains the failures observed by Hyett, Stevenson, Heath, and others, when used in a wet place, where the tar cannot quickly dry and form a hard coating. This also explains why nothing but a hard mass outside remained in the rail tie spoken of by Bethell, where all wood within was gone, leaving the resinified tar as the "hard, black mass." Such is similar to the experience of coachmakers relative to hubs, which, when painted with oil color before being well seasoned, soon rot on the inside. Experience and science seem to teach that the use of coal tar or its products is, in most cases, more detrimental than advantageous for the purpose of preserving wood.

Women as Farmers and Cattle Breeders.

At the annual meeting of the Northwestern Dairymen's Association, held in Elgin, Ill., on the 9th and 10th of February, the Hon. K. A. Willard, of Herkimer county, N. Y., made an address from which we extract the following:

Mr. Willard said he did not mean to advocate female field labor, such as is known among the lower classes in Europe, nor would he abridge one iota any female accomplishment; but he could see no objection to any man's daughter or sister taking her seat occasionally on the mowing machine, the hay tender, the wheel rake, the sulky plow or cultivator, or in the direction of some light farm machinery, where she can gain strength and health in the open air. He was confident women enjoy such things, and are much happier, stronger, and better, if they are taught that such work is not unwomanly, and the knowledge gained would be of immense service in after life, in assisting the father, brother, or husband with suggestions and advice. In their education we do not give our girls a fair chance in the race of life. The majority of American boys and girls do not like to make a choice of farming as a livelihood. The farmer's educated daughters of to-day prefer the town or city, and have little sympathy for the farm; and if they marry a farmer, often urge him to abandon the business for something more genteel. In England they have better tastes, where their women have more fondness for country life than ours. A well-bred English woman seems to take pride in the knowledge of business suitable to her station. Lady Pigott, the wife of Sir Robert Pigott, has one of the most noted herds of short horns in England. She has made it both a source of profit and reputation. A high bred American woman can hardly understand such a taste, and regards it with intolerable disgust. He did not care to discuss this question. He only asked that farmers try in some way to make farming pleasant and interesting to wives and daughters, that the farm may have their sympathy and influence, for without such help it is hard to make farming successful.

The Rubbish in the Patent Office.

"What rubbish!" is frequently in the minds, and not seldom on the lips, of those who daily throng the galleries of the United States Patent Office at Washington. A very little reflection will show to what a limited extent these but too carelessly-conceived thoughts, and these equally carelessly-uttered words, are just.

On the 15th of December, 1836, the General Postoffice Building at Washington was entirely destroyed by fire. In the upper portion of this edifice the United States Patent Office then had its home; its scanty rooms being filled to confusion and repletion with models, drawings, and specifications, coming from the inventive mind of the nation, and deposited there from the time patents were first issued by our Government. These models, drawings, and specifications were all destroyed with the postoffice building; ashes and melted or twisted fragments of copper, brass, iron, and steel being all that was left of that which had often been looked upon with a feeling akin to wonder by the thoughtful—wonder that so much time, thought, and money had been spent in elucidating and preserving plans and schemes (many of them could not be called inventions), never heard of, noticed, or seen outside of the rooms in which they had found a legal home.

Since the disaster of 1836, a new and spacious building, one of the striking ornaments of our national metropolis, has been erected for the use of the patent office; and this building, with a current issue of about three hundred new patents per week, is now filled almost to its utmost capacity with models of nearly every conceivable form and for almost every conceivable purpose.

How comes all this strange medley? this aggregation of odds and ends? and what are their uses? Man might be called a blundering animal, not guided by the unerring instinct that prevents the lower animals from making a mistake; not satisfied to follow the beaten track, he tries different modes of doing the same thing, often blundering most glaringly, but sometimes, in the result, reaping a full reward in fame and fortune by hitting upon and bringing out something invaluable to his fellow-man. Slow, and even obstinately unwilling as we are to change from old to new ways, "Let well enough alone," and, "It is good enough as it is," have been deeply fixed in our natures from the beginning. Hence, innovators have never met with favor, and instead of being helped and encouraged, they are but too often sneered at and hindered even by those who are most likely to be benefited by their labors. Many a really valuable invention or improvement has been persistently resisted and opposed at first by the very persons who, in the end, are to derive the most benefit therefrom; and ere a foothold could be gained, many a battle has been fought for years, against the most unfair odds, with those who should have been doing most to aid and assist in the advancement of the new idea. Even the workmen in charge of dangerous apparatus, and whose lives hang sometimes upon a thread, not only do not seek or care for greater safety, but they often persistently and willfully set themselves against the very thing they should do their utmost to help on as a good to themselves. It is a strange anomaly that it is in cases where life and property are most in jeopardy by defective modes of using some needed but highly dangerous thing, that the greatest apathy is felt; and those who thoroughly understand the question often make great opposition toward even a fair trial of a proposed improvement.

On the contrary, most of what is seen at Washington is the work of men often with little or no experience in the particular branch they have taken in hand. It would seem from this that those most familiar with a subject, may not be best calculated to improve it, simply because they do not care to get out of the old ruts. Hence, the innovator, and sometimes improver, is most likely he who lacks almost all knowledge of what has preceded him. On the other hand, hundreds of patents are rejected upon application, simply because an idea has been hit upon by the applicant quite new to him, and apparently valuable, but which, from some good reason, only learned by experience, has proved fallacious, and consequently has long ago been discarded.

It would be well for those who profit by the real improvements that come from the teeming brains of those who fill the galleries of the Patent Office with their curious labors, to keep back their too-ready shrug and sneer when new inventions are brought to their notice by some poor devil of a patentee, as innovators are but too often termed. Look at least with charity and consideration, upon a class to whom we owe so much. Help them when you can, and be not niggardly in kind words of encouragement, and with money, too, when you can do so out of your own excess. Remember that, since the time when man has needed anything, it is from just such men as these, whom you but too often discard unthinkingly, have come all the comforts we enjoy in our homes, in our business, and in every walk of life. To this ever-restless band we owe all of improvement that so strongly marks this epoch in the world's history. The minds of but few in the grand total of humanity have thus worked incessantly for our good, in the long past as in the present, and they should be treated, individually, and as a class, not as half-witted visionaries, but as the benefactors of our race. They have ever battled on against every discouragement and every hindrance, each, like the soldier in a forlorn hope, trusting that he might be the one to plant the flag on the parapet and reap the wished-for reward.

The work of these men—these martyrs as they may sometimes be called—can never be really known. Its record would take in all the failures, and it would also take in that much larger aggregate of all the brain-worn hours, which have left no mark except that deep one on the weary mind of the thinker, who, after all his labor, finds that he has only succeeded perhaps in, as it were, proving a fallacy. But we can measure the value of the work done—of the wheat winnowed from this large amount of chaff—by what we see of success all around us; and by these fruits we should know them, and with this knowledge we should ever be willing to admit that those who have piled up the rubbish in the Patent Office at Washington, are worthy of more honor and more reward than they usually receive.—*Lippincott's Magazine.*

The American Association for the Advancement of Science.

This Association has issued a circular announcing that the eighteenth meeting will be held at Salem, Mass., commencing on Wednesday, August 18th, 1869, at 10 o'clock, A. M. For the general good of the meeting it is hoped that all who can will be present at the organization.

On the afternoon of the first day of the meeting, the Association will be invited to participate in the dedication of the Museum of the Peabody Academy of Science, followed by a levee in the evening.

It will be the aim of the local committee to make the sojourn of the members of the Association in Salem pleasant, as well as profitable in a scientific point of view. The usual local courtesies will be extended. Special arrangements will be made for members wishing to collect marine animals for their cabinets.

The committee is giving attention to the facilities for coming to and returning from the city over all routes of travel, and it is hoped that arrangements will be made with the railroad companies by which half fare will be secured for those attending the meeting.

As the hotel accommodations in the city are very limited, special arrangements will be made with the proprietors of several boarding houses for the accommodation of members, and many citizens have signified their desire to extend the hospitality to members of the Association; but in order that all may be provided for without confusion or delay, it is requested that persons intending to be present at the meeting, will notify the local secretary at as early a day as practicable, and when possible state the day they will arrive. The committee will engage rooms for those who request such an arrangement to be made on early notice being received.

A prominent feature of the meeting will be the department of microscopy. The local committee, in order to give encouragement to the general and increasing interest in the use of the microscope, have decided to furnish rooms for the display and comparison of microscopes, objectives, accessory apparatus of all kinds, test objects, and objects of scientific and popular interest.

It is intended to have as complete a collection as possible of instruments of both American and foreign manufacture. Those who are possessed of microscopic stands, objectives, or accessory apparatus, in any way remarkable for excellence of performance or design, are requested to bring them to the meeting.

The objects of this exhibition will be to assist the progress of scientific research, by social intercourse and a full comparison and discussion of whatever is new and important in microscopical investigation, and to encourage the manufacture and use of this valuable instrument.

New Process for Manufacturing Beet Root Sugar.

The eminent French chemist, Payen, has recently communicated to the *Société d'Encouragement*, in France, a new and simple process for manufacturing sugar from the beet root, which has been successfully practiced during the last sugar campaign by Mr. Champonnois. It is as follows: The beet root is reduced to pulp by the ordinary process, and treated by the Perrier, Possoz, and Cail process of double defecation and carbonatation. After crystallization, the remaining sirups are reduced to a density of 10·40, or about equivalent to that of the original juice. The temperature is then raised to 158° Fah., and this diluted hot sirup added to a second portion of fresh pulp. This is allowed to drip, and treated in the same manner as the first. A repetition of these operations is effected ten times in succession with new bodies of pulp and residual sirups. The sirups obtained each time are clear and limpid.

The salts contained in the beet root, and a large portion of the nitrogenized substances are left in the pulp by coagulation and by dialysis during the application of this method.

Improvement in Velocipede Wheels.

Lightness and strength are two essentials in velocipede construction, and many otherwise meritorious inventions have failed to become popular simply because one, or both, of these points were lost sight of in devising them. The improvement which we this week lay before our readers, is one directed especially to securing these vital points, and will become obvious with a very brief description. The rim, a portion of which is shown at the upper right hand corner of the engraving is corrugated as there plainly shown. The spokes are inserted into the rim alternately on opposite sides of the groove in the rim; those inserted into the left lateral portion of the rim connecting with the right end of the hub, and those entering the right lateral portion of the rim joining with the left end of the hub, thereby supporting the rim on both sides, and strengthening the wheel against lateral strains, at the same time admitting the easy attachment of rubber tire if desired. This form of the wheel gives very much greater strength and elasticity with a given weight of metal than could be attained by the old method.

The engraving shows an improved bicycle with the wheels constructed as described. The airiness and grace of the wheels are well delineated, thus illustrating the truth, that beauty of design is always connected with perfect fitness in mechanical construction.

In fact the bicycle from which this engraving was taken, is a marvel of perfect workmanship, and reflects great credit upon the manufacturer and inventor, Mr. Virgil Price, 144 Greene street, New York city, whom address for further information. Patented through the Scientific American Patent Agency, May 4, 1869.

PRICE'S IMPROVED BICYCLE.

THE INDICATOR.

No engineer conversant with the scientific principles of the steam engine denies that the indicator is of immense value. It is to be deplored that the use of this instrument cannot be more general. The comprehension of its principles is within the reach of almost any engineer in charge of stationary or other engines. Why is it that this instrument, so well calculated to add to the perfection of the steam engine, is, among those directly connected with the running of engines, so little known? It is not on account of the difficulty of understanding a card when taken, much less is it the difficulty of attaching the indicator to the engine that hinders its general introduction, but it is the price that is charged or an indicator. Few engineers can afford to pay one hundred dollars for an instrument, and the owners of steam engines are loth to pay the price for a thing, the utility of which they think is at the best but doubtful. The indicator very often is the means of showing the imminent peril at which the engine is working, and this is particularly true where two engines are connected together, for a derangement of one engine affects the other in the highest degree. If the demand for instruments was greater the present styles could be made much cheaper, but, on account of the high prices, the demand is so small that it does not pay to get up machinery for their special construction. The only way we see out of the dilemma is to design a style of instrument which will not be so costly in its construction, and, at the same time, will be ascertain and as accurate in its action. This no doubt presents many difficulties—some persons may say that they are insurmountable, but I scarcely think so, the thing is possible and will be accomplished by some enterprising person. The indicator in the hands of the great body of engineers will tend towards a better understanding of the action of the steam and will promote inquiries into the more difficult and complex principles of the steam engine, which will be as beneficial to the owners of the engines as to the engineers themselves. Coal would be saved, and many a break down could be avoided if the engineer in charge had a clear knowledge of those parts of his engine not immediately within his reach. ENGINEER.

PETROLEUM--IMPORTANT DISCOVERY.

M. Henri Sainte-Claire Deville has recently presented to the French Academy of Science the third portion of his valuable researches on the physical and heating properties of mineral oils. M. Deville, in this memoir, dwells largely on the dangers incident to the use and storage of petroleum, and on the modes of preventing the disasters which are of such frequent occurrence.

Most persons suppose all such cases to be due to one cause only; namely, to the highly inflammable nature of the volatile ingredients contained in these oils, which, by admixture with air, form explosive compounds. This is a cause of real danger, but the above-named chemist calls attention to a hitherto unnoticed reason for many fires and accidents.

This he attributes to the very great expansion in bulk which mineral oils undergo by increase of temperature. If petroleum has been barreled during the cold season, it will expand largely with the first appearance of hot weather, and will then burst the containing vessels, on the same principle that ice ruptures our water conduits and hydrants. The inflammable material then oozes out, often without being noticed, and is a lurking cause of danger. It is well known that the burning of petroleum refineries and storehouses generally takes place in hot weather after a cool period has just elapsed.

Now is the time of the year to look out for petroleum fires, and to see to their prevention. The conclusion to be derived from M. Deville's memoir is, that it is essential to leave sufficient space for expansion by heat in all vessels containing petroleum, and never to fill them to repletion.

When the paper of M. Deville shall have been published, we shall be able to tell our readers the exact extent of space needed for the mean expansion of all mineral oils.

This statement, taken in connection with the very recent and destructive oil-fires at Hunter's Point, L. I., and at Weehawken, N. J., occurring under the precise conditions of temperature described by Mr. Deville, will attract much attention.

THE ADJUSTABLE LOOKING-GLASS REFLECTOR.

How the amount of labor involved in the complicated structures which ladies now wear at the backs of their heads can be accomplished by a pair of hands without eyes, has always been to us an inscrutable mystery. Our own back hair

with its simple parting is a matter of some anxiety, only relieved by consultation with some one of our household, previous to our emergence into the street of a morning; and when the answer is satisfactory there always remains a gloomy doubt on our mind, as to whether the inspection was carefully made and the answer based upon the real state of things. We have been assured the amount of experiment which enables a lady to adjust her hair unaided is something very remarkable; and that it has hitherto been guided only by the sense of feeling, the result of each experiment being determined by aid of a hand mirror. If this be really so, the article herewith illustrated must be a boon, which to the science of hair-dressing is what the telescope is to astronomy.

This adjustable mirror is attached to the frame of any toilet glass, no matter what size or shape, by means of a flat plate screwed to the back side of the top of the frame, and having a shoulder which also rests on the top of the frame. This plate has a double adjustable joint from which extends forward a hollow rod, movable in any direction and held when adjusted by milled set-screws at the double joint. Within the hollow rod slides a bent rod to which a circular mirror is attached, which may be drawn out, or thrust in as occasion may require, and fixed by a set-screw passing through the side of the hollow rod. The reflector may thus be lowered or elevated, turned to the right or left, and fixed in any position required. The reflector is also fixed to the rod by a movable joint and set screw, so that it can be placed at an any required inclination.

It is finished in superb style, being silver-plated throughout, and makes an elegant and ornamental addition to the toilet glass.

We are informed this article has met with a very favorable reception in Europe, and as its convenience and utility are obvious, its introduction in the United States will probably be an easy matter. The agent for the patentee, is Chas. J. Hartmann, room 46, No. 40, Broadway, New York city, whom address for further information.

How Bronze Statues are Cast.

Among the various branches of fine-art metal work, the casting of bronze statuary, a *chef-d'œuvre* of Elkington's establishment, possesses perhaps as many points of interest as any. A leading process of bronze casting is known, says the *Engineer*, as the *cire perdue*, or wax process. A structure of iron bars, forming the skeleton of the statue, sustains the core. This rough angular outline stands on a kind of platform, having a fire-hole beneath for the purpose of melting the wax when the statue is completed. A mixture of clay, pounded brick, and other material, capable of being easily worked when moist, and very solid when dry, is then used for building up the skeleton, so as to present the general contour of the figure, but less than the proposed statue by just the thickness of the metal to be employed. Over all this is placed an equal layer of wax, on which all the details are expressed by the sculptor. "When," says Mr. Aitkin, our informant, "the work is satisfactory from every point of view, ascending rods of wax representing channels, by which air is to find exit on the metal entering the molds, are placed wherever required. Viewed in this state, the model and its accompaniments strongly suggest the venous and arterial system of the human body, as shown in anatomical works, with the difference that the wax rods are external to the model of the body, which is visible through the intervening mesh-work. The whole model and rods are then painted over with fine loam in a liquid state, the process being repeated until the crust is strong enough to sustain a thick loam plaster. It is then bound with iron hoops, and a fire is lighted beneath the platform. The outer coating of wax, exactly representing the metal to be cast, is melted out, and the mold is intensely heated until dry enough to receive the molten metal from a reverberatory furnace adjacent to the mold. Jets are made for the introduction of the metal, and the apertures left by the melting of the wax rods afford a ready mode of exit for the air. The plug of the furnace is withdrawn, the flowing metal fills the mold, and the statue is completed. This process is somewhat hazardous, seeing that any defect in the casting would completely destroy the long labor of the artist." —*Mechanics' Magazine.*

Telegraph Verdict.

The case of Henry L. Davis against the Western Union Telegraph Company, which has recently been on trial at Cincinnati, Ohio, resulted in a verdict for three thousand dollars damages, with costs, amounting to over two thousand dollars more, against the company.

This was a very important suit, involving the question of the right of telegraph companies to discriminate in the transmission of dispatches. The plaintiff's telegraphic reports were delayed in order to give the company's reports precedence.

The legal principle on which this decision is founded is, that a telegraph company is a public servant, bound to transact all business confided to it fairly and impartially, and that it has no right to afford exceptional facilities, even for the transmission of its own business, when such business comes into competition with that of the public. The fairness and justice of this principle must be admitted by every unprejudiced person, and we hope that it will be vigorously maintained by courts and legislatures, until the time shall come when a person desiring to make use of telegraphic facilities shall have assurance of fair treatment under any and all circumstances.—*Telegrapher.*

A FIRM in Oshkosh, Wisconsin, has contracted to make 1,000,000 feet of wooden tubes, to lay down in that city for gas pipes. They are made of timber six inches square, bored in the same way as pump barrels.