Improvement in Springs for Vehicles.

This improvement consists first, in the substitution of taper longitudinal ribs, A, (see engraving) for the ribs and slots in common use, which prevent lateral slipping of the leaves of carriage springs, and second in the application of India-rubber bearings—one of which is represented at B—to the cast metal seat of the spring, C, whereby much of the jar and concussion, when vehicles are in motion, is prevented from transmission to the spring, and greater play and elasticity also secured.

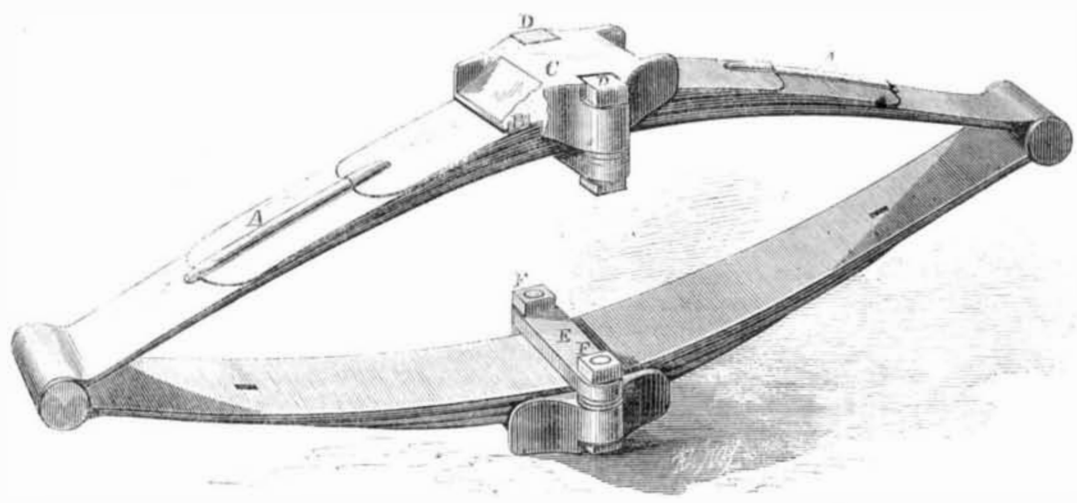
The ribs, A, are formed in the leaves by swaging, and are so made that the convex side of any leaf exactly fits the concave side of the leaf exterior to it, when the leaves are put together.

The cast metal seat, C, is fastened by bolts, D, passing through the bar, E, and held firmly by the nuts, F. The seat is so constructed that the rubber bearing, B, separates the leaf next it slightly from the seat, so as to admit of compression and expansion, corresponding to the motion of the spring. By this means considerable elasticity is gained over that attained by the ordinary method, and the force of violent shocks much weakened.

Beside the gain in elasticity this method is claimed to possess the following advantages over the old method. The form of the ribs gives greater strength to the leaves. Their tapering form limits the amount of the depression when heavily loaded, in consequence of the binding or wedging of the convex surface of each rib in the concave surface of the one lying upon it.

The spring can be made as light and graceful in appearance as those of the old style, and the number of leaves is entirely unessential to the application of the improvement, which is adapted to all springs from those of the heaviest locomotive to springs for the lightest buggy.

This improvement has been made the subject of two patents—the first bearing date, May 26, 1863, and the second June 9, 1868—both of which were obtained through the Scientific American Patent Agency, by George Douglass, whom address for further information, Bridgeport, Conn.



DOUGLASS' IMPROVED CARRIAGE AND CAR SPRING.

UTILIZATION OF BONES.

Not much more than fifty years ago old bones went to the refuse or dirt heap, being thrown away as a valueless substance, with the exception of a very small amount of them which was employed in the manufacture of glue.

In our day, however, the trade in bones has acquired a vast importance. From them are manufactured soap, glue, phosphorus, bone black, and valuable manures.

Many ships sail to distant parts of the world in order to obtain cargoes of bone. The battle-fields of Europe have even, in some instances, been dug up, and their long pent treasures sent to the bone mills to be converted into "superphosphate," which, applied to the wheat and fodder crops, has helped in the shape of bread and meat to support the present generation.

Men have thus actually been made to feed upon the remains of their ancestors through the speculative genius of the manufacturer of artificial fertilizers!

Bones are collected along with old rags in every country in the world, but the largest supplies are obtained from South America, where an immense number of cattle are annually slaughtered for the sake of their hides and fat.

The city of Hull, in England, is the principal depot for bone for the European market, and possesses many large and powerful crushing mills, where they are reduced into fragments of the desired size.

We shall limit ourselves to-day to the manufacture of soap and glue from bones; reserving for a future article the method of utilizing them in the production of phosphorus and of superphosphates.

Practical information being what is needed in this matter, we shall sum up the whole subject as concisely as possible for the benefit of our readers.

1. Place the bones in large baskets, or nets, in running water so as to wash off the adherent dirt.

2. Hang the baskets to dry and drip, or spread the bones on an incline so as to allow the water to run off from them.

3. Carry the bones to a crushing mill or to a stamp mill, and reduce them to the size of a hickory nut. If this be done between revolving, horizontal cylinders, these must have sharp-edged ridges about three-quarters of an inch broad on their outer surfaces.

4. Receive the crushed bones on a bottom formed of parallel rods which will allow fat and marrow to ooze through, without giving passage to the bone.

5. Place the crushed bones in wicker baskets in large vats or tanks, and cover them with water, the temperature of which must be from 120° to 140° Fah., *and no more.*

6. Skim the fat as it forms from the top of the warm water, and it is then ready, after mixing with alkalies, to be boiled, into soap. *If the bones had been boiled,* the soap obtained would contain glue, be of inferior quality, dark-colored, and bad scented.

7. Take the baskets and their contained bones from the grease vats, and let them drip, after which suspend them in wooden vessels, into which pour muriatic acid, diluted with water, until it marks 7 degrees of Baumé's areometer (spec. grav. 1·05.)

7. Leave the bones in this mixture until the upper ones are soft and pliable; this generally takes places is about six or seven days if the proportion of bone and acid has been well regulated.

9. Sink the baskets in a second set of wooden vessels, filled to half their hight with muriatic acid, diluted with water, till it marks 3° on Baumé's areometer, and leave them in this solution until they are transformed into a soft, malleable, semi-transparent substance, out of which all the lime has disappeared.

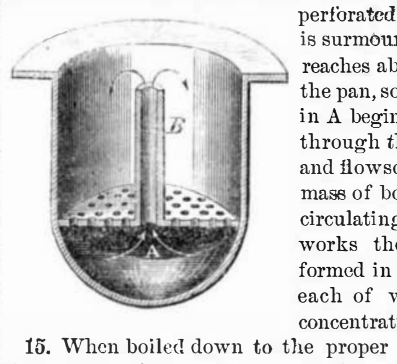
10. Wash the bones by running a stream of cold water over them for one-quarter of an hour.

11. Place the bones in a tank containing lime water to neutralize the acid, and after this, wash them again several successive times with cold water. The lime must be slaked in the water used, and 1 part of lime by weight employed to every 200 parts of water. The whole must be well stirred, covered, and allowed to rest for some hours.

12. The bones, after these last washings are completed, are now in a suitable state for the manufacture of the best quality of glue.

13. The acid, at 3° Baumé, used for the second operation, is suitable for conversion into that of 6° Baumé for the next first maceration.

14. Boil the bones in pans constructed as shown in the following cut. The bottom plate which supports the bones is perforated by small holes, and is surmounted by a pipe which reaches above their surface in the pan, so that when the water in A begins to boil it runs out through the top of the pipe, B, and flows over and through the mass of bones in a perpetually circulating stream. In large works the operation is performed in successive boilers, in each of which the degree of concentration is increased.



15. When boiled down to the proper consistency, run out the glue in flat, wooden molds, three feet long by one foot broad, which must be washed and wetted before the introduction of the glue.

16. Take up the glue sheets from the molds with a knife slipped under them, and cut it crosswise into six or seven lengths by means of a "special" glue cutter.

17. Dry your glue on twine netting, the strands of which must be $\frac{1}{12}$ inch in diameter. The netting is stretched on frames 6 feet long and $1\frac{1}{2}$ feet broad. The temperature of the drying rooms must be maintained at from 59° to 77° Fah. When the outer air has this temperature, it is allowed to freely circulate among the layers of frames, through lattices situated all round the building, and which can be closed or opened at will. When dry it is ready for market.

18. The muriatic acid solutions are separately treated, in a manner we shall describe in a future article, in order to save the valuable phosphoric acid they contain.

Hydropathic Treatment of Railroad Stocks.

The *Merchant's Magazine* publishes the somewhat startling fact that twenty-eight of the leading railroads of the country have, within the short space of two years, increased their combined capital from 287 millions to 400 millions of dollars, showing an average inflation of 40 per cent. The editor argues, what is undoubtedly true, that it is impossible to adduce any really sound justification of the "watering" policy. It is, in most cases, simply a deceptive game played by speculative directors, who, after the inflation has been consummated, will be the first to forsake the bubble, and quietly wait to profit from the ultimate violent revulsion in values; while the attempt to draw out of the consumers of the country high charges for freight, so as to pay dividends on the increased stock, is a direct check to our material progress.

The Game of Croquet.

A counterpart to the railway velocipede, illustrated on another page, for the amusement of young persons, is the game of croquet, one of the out-of-door entertainments which has become very popular within a few years. It has the advantage over the railway velocipede in the matter of expense—the price of a set of croquet implements costing but a fraction of that of the railway; but where parties can afford it we recommend the introduction of both. The game of croquet is healthful, graceful, and social, and for young persons of both sexes we know of no open-air amusement that combines so many beneficial qualities with that of pleasure. The introduction of the game into schools is becoming quite common.

The manufacture of croquet implements has grown into an extensive business at Springfield, Mass., and the firm of Milton Bradley & Co., of that city, has become identified with the manufacture of the finest qualities of these goods.

Explosion of a Gasometer.

The city of Cincinnati felt the rumble and roar of a great explosion on the 24th ult. The *Commercial* says: "A great mass of black smoke rose above the Gas Works, then came a concussion that shook the windows, and immediately the smoke was crowned with a big, red flame-burst that shot up to an amazing hight. The shock was felt all over the city, except in the extreme limits, and probably not less than a third of the population realized immediately that something extraordinary had occurred.

"The gasometer, or holder, which burst, was a mass of boiler-iron of a quarter of an inch thickness, 127 feet in diameter, and 35 feet in height. It was an immense, inverted, circular tank, that rose and fell slowly, according to the amount of gas confined between its top and the surface of the water. Sunk into the ground, with a depth of 35 feet, is the tank proper, circular, of course, of stone, brick, and mortar. There were 375,000 feet of gas in the holder when the explosion occurred. We find it impossible to state the cause of the explosion, and difficult to convey any idea of the appearance of it. It appeared as if the roof of the holder was rent in twain from north to south, that as it rose and fell back the overwhelming sound was heard, and then the great bursts of flame and smoke arose. For an instant, for a square around, the breath of a mighty heat played. The woodwork of doors and windows was blistered and blackened. Men a hundred feet away found their faces, arms, and hands scorched to the flesh, and for many squares around, the close, stifling heat was felt, and then it was all over.

"The explosion is not accounted for by even the best informed gas manufacturers. When it occurred there was no fire near the holder, and no gas had been let into it for six hours. One theory is that of great expansion of the gas by solar heat on the holder, the consequent bursting of the roof, and flame communicated to the escaping contents from the stack of the Globe Rolling Mill. The idea has quite generally prevailed that there is no danger of an explosion to a holder. Several instances refute this. In October, 1865, a gasometer of the London Gaslight Company's works, at Nine Elms, Battersea road, exploded, killing ten men. It was twice the size of this. Not long since, we are informed, there was a similar explosion at Chicago. Both these explosions, however, were accounted for, the fire communicating from the governor in the first instance. How this ever occurred no one seems to know. The officers and employés of the works are puzzled, and cannot solve the mystery. So far as we can learn the only sufferers as to property, by this affair, is the gas company, whose loss is about $100,000, on which there is no insurance."

Correspondence.

The Editors are no responsible for the Opinions expressed by their Correspondents.

Large and Small Cart-Wheels.

MESSRS. EDITORS:—Your correspondent, "F. W. B.," in No. 22, current volume, page 342, in his comments upon my communication in No. 20, of same volume, makes an amusing misapplication of a well-known law of friction, to prove that the friction between the axle and the hubs of cart wheels, moving the same distance, in the same time, with a given load, will be the same, whether the wheels are large or small.

The law which he invokes in support of this paradoxical proposition is laid down in the books in these words:

"The friction is entirely independent of the velocity of continuous motion."

All that this law establishes, in relation to the friction between the axle and hub of a cart wheel, is this: In moving the same cart, with the same load, a given distance, you will have the same amount of friction to overcome, whether it moves at a greater or less velocity; because there is the same amount of rubbing between the axle and its "circumscribing box or bearing," in the one case as in the other; and it makes no difference whether that amount of rubbing is performed in a long or a short time.

It is precisely this law that proves the correctness of my proposition; viz., that "by doubling the size of the wheels, you reduce the friction one-half."

To illustrate: Suppose the axle, on which the wheel turns, is six inches in circumference. It is manifest, that at each revolution, every particle of matter in the hub or box, which comes in contact with the axle, must move around the latter a distance of six inches, and with the friction due to the 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 sub stance 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