Bethell—by his process patented in England in 1838—rendered wood more imperishable by the use of a cheaper material; but his machinery was unnecessarily complicated, and his method of conducting the process quite imperfect and too expensive to admit of general application. We extract the following partial description of Bethell's process from a small treatise on the art of preserving wood, published in this country in 1859:—

It consists in impregnating the timber with an oily matter obtained from a rough distillation from coal tar. This oily matter contains a variety of substances, having different chemical properties; one of the essential ingredients for this purpose is said to be creosote which forms, as estimated, about thirty per cent of the product of distillation used for this purpose. The other ingredients have a no less important effect. The oily matter is injected into the timber by pressure in closed vessels, from which the air is first partially exhausted.

The subjoined letter from Dr. Dwinelle, who personally witnessed what he describes, is sufficiently explicit, in respect to Bethell's machinery and process.

LOUIS S. ROBBINS—*Dear Sir:* I cheerfully comply with your request to give you such information as I obtained in Europe, several years ago, in regard to the use of *coal tar* and its products as a means of preserving wood.

In 1852, while investigating different matters of public interest in London, I was invited by Mr. Burt to visit his extensive works on the Surrey side of the Thames, where he had, for several years, been treating—for the English and India markets—large quantities of wood with products of coal tar, according to a process patented by Mr. Bethell in 1838.

His process consisted in placing the wood or lumber in a large iron cylinder, constructed expressly for the purpose, and made very strong. When these cylinders were sufficiently charged with wood—it being carried into them on cars constructed for the purpose—the ends were closed in such a manner as to render them perfectly tight, the air and moisture were then exhausted, as nearly as possible, by air pumps attached to the apparatus for that purpose. Then other pumps were employed to force the liquid product, that had been obtained by distillation of coal tar, into the cylinders, which was continued until a pressure of 150 lbs. to the inch was reached. After a certain time had elapsed, the wood was taken out of the cylinders and placed in a suitable position for drying, when it was ready for use.

The machinery employed for these operations was both complicated and expensive, and so imperfect, in respect to its capacity to produce the result desired, that a large amount of time was required to saturate the wood to any considerable extent, or in a degree sufficient for the purpose of its preservation. This method, however, was considered the best then known, and had been proved to be a success for many years, by the practical use of the wood thus treated.

Bethell's process seemed to be very objectionable, not only because it required much time and labor, but also for the reason that it was only suited to the treatment of lumber to be used for the most ordinary purposes, such as railroad sleepers, piles for wharves, bridges, etc., etc.

I have carefully examined your patented process. It appears to be simple, rapid and inexpensive, and much more perfect in its results than Bethell's, inasmuch as the hot oleaginous vapors arising from the distillation of the coal tar must, under the circumstances, permeate every portion of the wood or lumber to any extent required.

Your process is open to none of the objections urged against Bethell's plan, since, by its use, wood may be rapidly and properly treated for all the various uses to which wood is applied in the mechanic arts. Moreover, the fact that you use the same material leaves no doubt as to the success of your patent, it having long since been practically established in Europe, that the products obtained from the distillation of coal tar, if properly applied to wood, will preserve it for a great length of time from decay, and also from destruction by marine and other insects. Truly yours,

WM. H. DWINELLE, M. D.,
No. 119 Tenth Street, New York.

The great value of Bethell's discovery has been so clearly demonstrated, by the uniform results of its application, that scientific men in Europe, and especially the most distinguished engineers in England, have come to entertain but one opinion of its merits. It can hardly be necessary to multiply authorities in this connection, since the following emphatic testimony—extracted from Dr. Andrew Ure's "Dictionary of the Arts," must satisfy the most skeptical reader. Treating of the results of Bethell's process he says:—

The effect produced is that of perfectly coagulating the albumen in the sap, thus preventing its putrefaction. For the wood that will be much exposed to the weather, and alternately wet and dry, the mere coagulation of the sap is not sufficient; for although the albumen contained in the sap of the wood is the most liable and the first to putrify, yet the ligneous fiber itself, after it has been deprived of all sap, will, when exposed in a warm damp situation, rot and crumble into dust. To preserve wood, therefore, that will be much exposed to the weather it is not only necessary that the sap should be coagulated, but that the fibers should be protected from moisture, which is effectually done by this process.

The atmospheric action on wood thus prepared, renders it tougher, and infinitely stronger. A post made of beech, or even of Scotch fir, is rendered more durable, and as strong as one made of the best oak, the bituminous mixture with which all its pores are filled acting as a cement to bind the fibers together in a close tough mass; and the more porous the wood is, the more durable and tough it becomes, as it imbibes a greater quantity of the bituminous oil, which is proved by its increased weight. The materials which are injected preserve iron and other metals from corrosion; and an iron bolt driven into wood so saturated, remains perfectly sound and free from rust. It also resists the attack of insects; and it has been proved by Mr. Pritchard, at Shoreham Harbor, that the *teredo navalis*, or naval worm, will not touch it.

Wood thus prepared for sleepers, piles, posts, fencing, etc., is not at all affected by alternate exposure to wet and dry; it requires no painting, and after it has been exposed to the air for some days, it loses every unpleasant smell.

This process has been adopted by the following eminent engineers, viz.: Mr. Robert Stephenson, Mr. Brunel, Mr. Bidder, Mr. Brathwaite, Mr. Buck, Mr Harris, Mr. Wickstead, Mr. Pritchard, and others; and has been used with the greatest success on the Great Western Railway, the Bristol and Exeter Railway, the Manchester and Birmingham Railway, the North Eastern, the South Eastern, the Stockton and Darlington, and at Shoreham Harbor; and lately, in consequence of the excellent appearance of the prepared sleepers, after three years' exposure to the weather, an order has been issued by Mr. Robert Stephenson that the sleepers hereafter to be used on the London and Birmingham Railway are to be prepared with it before being put down.

For railway sleepers it is highly useful, as the commonest Scotch fir sleeper, when thus prepared, will last for centuries. Those which have been in use three years and upward, look much better now than when first laid down, having become harder, more consolidated and perfectly water-proof; which qualities, combined with that of perfectly resisting the worm, render this process eminently useful for piles, and all other woodwork placed under water.

It is stated by the best authorities, and confirmed by ordinary experience and observation, that the decay of wood is due to the action of oxygen and moisture; and we find that in proportion as it is excluded from these destructive agents it retains its durable and substantial qualities. It would seem that the direct effect of these elements is to remove the antiseptic principles of the wood, and afterward to permeate its substance with moisture, thus softening its fibrous portions and producing mold or decay.

From this brief statement it will be obvious that to preserve wood it must, in some way, be protected from the action and influence of these decomposing agents. In its growing state, wood has all the elements of self-preservation; and, if undisturbed, it will continue to live and grow without decay during the natural period of its development. When a limb is broken, the bark removed, or an abrasion made, so as to expose the circulating fluids to the action of the elements, then decay commences—this fact is patent to all observers.

All growing wood has an oleaginous covering, which protects the fluids from the elements, but when wood is cut down and the oily supply for the surface can no longer be obtained from the soil, artificial means must then be employed that will fully protect the wood from the influence of oxygen and moisture. Oleaginous compounds, such as are obtained from the distillation of coal tar and similar substances, are adapted to this purpose; and they can be applied to wood in such a manner as to preserve it for an indefinite period. This is what is accomplished by Mr. Robbins's patented process hereinafter described. The oily products obtained from the distillation of bituminous substances are not decomposed and destroyed by the action of oxygen and moisture at ordinary temperatures. Hence, when they are properly applied to wood they must protect and preserve it.

It appears to have been the leading idea with all the European inventors, if we except Bethell, to deprive wood of some of its important constituents and essential properties, or to otherwise change them by chemical action. In this, they not only disregarded the common experience of all ages, but they were at war with Nature. The common mistake among them consisted in attempting to produce a condition of wood that is wholly unlike its living state, instead of restoring to it what had been lost by time and exposure to the elements. Moreover, while the materials used actually destroyed the native integrity of the wood, they were of far too costly a nature to admit of general application. For these reasons the several processes of Kyan, Margary, Burnett, Payne and Boucherie, will ultimately be regarded as failures, practically and in every essential sense.

Very different will be the public verdict respecting the claims of Bethell's discovery. How far he really comprehended, or even perceived the principles which the subject involves, we may not be able to determine; nor is this important in estimating the value of what he accomplished. It is manifest that his course of experiment was in the right direction. He sought to preserve, by artificial means, the vitality of Nature—to prevent the loss of those constituents and properties which are essential to wood in its normal and undecaying state. To him belongs the credit of originality, and of furnishing the potent suggestion which has enabled Mr. Robbins to complete a discovery second to no achievement in the useful arts, in the universality of its application, and in the consequent magnitude of its practical results.

Hitherto we have discovered nothing that will so effectually resist moisture as oil. It is not only a demonstrated fact in science, but it has become a proverb everywhere, that oil and water have no affinity—that they will not unite. While water finds its way through the closest animal tissues and into the hardest wood, and, by mechanical pressure, may even be forced through the solid metals, this antagonism between oil and water is universal and irresistible. This suggests the immense value of oil in preparation of all durable fabrics and manufactures of wood that are required to be impervious to moisture. In all civilized countries, and back through the entire historic period of the world, men have acted on this suggestion; in the preparation of the skins of animals, for shoes and for other purposes; in the manufacture of various outside garments; in painting their dwellings, ships, fences, furniture, and all the other superstructures of wood. These are rendered durable by the proper application of oil, and in proportion as the oil so applied is of a nature suited to endure the action and influence of oxygen and moisture.

The vegetable and animal oils differ essentially in their constituents from the oleaginous compounds derived from bituminous substances. The difference in their inherent capacity to resist moisture is equally marked and no less deserving of notice. The exposure of the former to the action of the elements gradually diminishes this power of resistance. Heat brings the organic oils to the surface of whatever they are applied to, and some of them are soon dissipated so that they no longer afford a sure protection. But it is not so with the products of coal tar, or with the bituminous oils. These, instead of being dissipated in part, or otherwise impaired by the ordinary changes of temperature and the varying degrees of moisture, become resinous from exposure; and hence the substances to which they are applied become harder and more durable by time. It is the unqualified testimony of Dr. Ure that railroad sleepers, that had been in use for more than three years, "looked much better than when first laid down."

At the time we write corrosive sublimate is worth one hundred and thirty-five dollars per one hundred pounds, while chloride of zinc is still more expensive. The preparation of railroad ties, by the use of such materials, would cost some four or five dollars each, while the cost of a far more effectual treatment, by the heavier products arising from the distillation of coal tar, would scarcely exceed ten cents. In the treatment of railroad ties and the timber for bridges and wharves, acids and alkalies are especially objectionable because they corrode the iron bolts and spikes that are necessarily employed, and thus impair and ultimately destroy the wood with which they are in contact. If copper nails and sheets be employed, as in covering the hulls of vessels, the corrosion must be more rapid when such substances have been employed in the preparation of wood. On the contrary, oil prevents this corrosion of the metals, and in this respect it contributes essentially to the inherent durability of any structure that may be made of such composite materials.

SPECIFICATIONS OF THE ROBBINS PATENT.

To All Whom it may Concern:—Be it known, that I, Louis S. Robbins, of the City, County and State of New York, have invented a new and improved process for preserving wood from mold or decay; and I do hereby declare that the following is a full, clear and exact description thereof, which will enable those skilled in the art to make and use

the same, special reference being had to the accompanying drawings forming part of this specification.

It is a well known fact that woods when cut down, and separated from the roots which supply it with its antiseptics, immediately becomes affected by exposure to the heat and the moisture of the atmosphere; the former of which rapidly dissipates the fluid or sap of the wood, while the latter impregnates the woody fibers with substances which the wood while growing, by its antiseptics, entirely excluded. These alternate actions upon the wood gradually and finally cause it to decay. To prevent this decay of wood is, therefore, the object of the present invention, and this object is accomplished thereby. The method consists in subjecting the wood to a preservative process by which nearly all of its antiseptics are retained within the same; and for those lost, supplying such substances as will prevent their further waste; at the same time closing the pores and forming such a combination with the fibers of the wood, as will effectually prevent the deteriorating effects of either heat or moisture at ordinary temperatures, or of both upon the same, as hereinbefore alluded to.

Many processes have been heretofore invented for the preservation of wood, some of which were entirely impracticable, while others were only partially successful; but by none could the wood be sufficiently impregnated or saturated with the preservative compound, to insure its preservation for a great length of time, owing to the manner in which the same was applied to the wood.

One form of apparatus for carrying out my improved process, is represented in the accompanying plate. A, in the drawing, represents a retort, made of any desired form or size, in which coal tar, resin, or other oleaginous substances or compounds are placed, and subjected to the action of heat from any suitable furnace. B represents the man-hole in the upper portion of the retort, used in cleansing the same or in changing its contents. C C, a pipe communicating with retort A, at or near its top, passing to, and communicating with, chambers or receptacles D. E represents the discharge pipe, employed for removing the remaining contents after the operation is over.

Heat being applied to retort A, containing the coal tar, etc., as described, oleaginous vapors are generated therein, which pass out of the same through the connecting pipe, C C, into the wood chambers, D, or into only one of the same as may be desired. The heat thus applied, first causes the surface moisture of the wood to be removed therefrom, taking the form of steam and condensing on the sides of said chamber, from which it is drawn off through pipes, H, which may be placed in or near the bottom.

Having thus removed the surface moisture from the wood, I then thoroughly impregnate and saturate it through all its pores and fibers by the oleaginous vapors and heavier products of the distillation, until it is made impervious to moisture, and so as to entirely resist the action of the atmosphere, when it may be removed from the chambers, D, through the doors, M M; when the chambers are again to be charged with wood, and so on as long as may be desired.

In this connection we give the outlines of another view of the apparatus, so modified as to adapt it to use in cases where it may be convenient to have the retort and furnace under the chambers containing the lumber. A marks the retort as in the former illustration. D D, exhibits the ends of the receiving chambers, one of them being filled and the door open, while the door of the other is closed.

In the operation of my process, a temperature of from 212° to 250° Fahrenheit is sufficient to remove the surface moisture from the wood; but to saturate the same with oleaginous vapors and other products, it is best that the temperature should be raised to 300° Fahrenheit, or higher if necessary.

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; and it is also evident that it is accomplished in an economical, expeditious, effective and practical manner.

I do not intend to limit myself to any particular form of apparatus; nor do I intend to limit myself to the removing of the surface moisture from the wood by means of oleaginous vapors, as herein described, as there are various ways in which the same can be accomplished with the use of heat. But what I do claim as new, and desire to secure by Letters Patent, is:—

The process herein described for preserving wood from mold or decay, the same consisting in first removing the surface moisture from the wood, and then charging and saturating the same with hot oleaginous vapors and compounds, substantially as described.

Also removing the surface moisture from wood by means of hot oleaginous vapors, substantially as herein described. LOUIS S. ROBBINS.

Witnesses:
M. M. LIVINGSTON,
ALBERT W. BROWN.

It will be perceived, from an examination of the foregoing specification, that Mr. Robbins's method of treating wood possesses great advantages over even that of Bethell. Indeed, it will be obvious on a moment's reflection that his process must be far more rapid and complete. For while Bethell employed his oleaginous compounds in a liquid state, Robbins uses the same materials in the form of vapor, in which condition they are sublimated to a degree which is eleven hundred times finer than they are in the state in which Bethell employed them, and, of consequence, so much the more penetrating. In this state of extreme attenuation, the elements which preserve the wood are more readily admitted—the capillary action being greatly accelerated and made to thoroughly permeate the entire structure of the wood. At the same time the hot vapor opens the pores and expands the wood, so that a larger quantity of the oily compound is admitted. The pores being thus filled, the contraction which naturally results from the cooling process, seals them, if possible, in a still more effectual and lasting manner. The vast superiority of the Robbins process, as compared with that of Bethell, can only be fairly estimated by those who realize the immense difference between the effectiveness of water and steam in their relations to chemical action and mechanical force.

But we should fail in our attempt to comprehend the full value of this improvement were we to overlook other important considerations. It is to be observed that this process renders light and porous wood as solid and durable as the finest-grained timber, and perhaps equally well adapted to all ordinary purposes in the arts. In fact, it may admit of a question whether the most porous wood may not be made to last even longer than the wood that is least so, from the fact that it absorbs a greater quantity of the material on which its preservation is made to depend.

Wood, treated by the Robbins process, requires no paint as a means of protecting it from the ordinary action of the elements. Paint is, therefore, useless except for ornamental purposes; and even then, so much of it as is required to fill the pores is saved when the wood has been previously treated by this method, and this saving will doubtless cover the cost of the most effectual treatment under the patent.

It is, moreover, important to observe, that this process seasons the wood most effectually; and inasmuch as it thoroughly protects it from the influence of moisture, it follows, that wood so prepared is neither liable to swell, shrink, warp nor crack.

A just estimate of this last and most perfect process for preserving wood might suffice to startle every thoughtful man in the community. Experience proves that to insure the traveling public against accidents, resulting from decayed railroad sleepers, the whole should be removed at least once in five years. The present cost in the Middle States is seventy-five cents each; and it will be safe to assume the average price to be fifty cents throughout the entire country. Add fifty cents each to this, as the inevitable cost of removing the old sleepers, putting down the new, and replacing the rails, and it will be perceived that every new sleeper that is supplied involves an expense, in material and labor, of one dollar. As railroad ties are placed at an average distance of about two feet, it follows that 2,500 are required in a single mile. Hence, it costs about twenty-five hundred dollars ($2,500) per mile to remove the old sleepers and lay down the new ones. As there are 50,000 miles of rail tracks in the United States, it will appear that $125,000,000 are demanded to support the rails of all the roads in the country.

These figures indicate the enormous expense of a single renewal of the sleepers of all our railroads. If thus renewed once in five years, the inevitable cost, in the next twenty-five years, of the new ties for the roads already constructed, will amount to 625,000,000 of dollars! Now, it being demonstrated that sleepers, prepared by the process already described, will last a quarter of a century, the conclusion is inevitable, that the universal application of the Robbins process, to the ties of all our roads, would involve a saving—after deducting the cost of their preparation under the patent—of some 450,000,000 of dollars. Moreover, if the progress of the construction of such roads, for the next twenty-five years, should continue to be, at the rate it was during the six years next preceding the late rebellion, (2,000 miles per annum), the saving of money in railroad ties, and in the labor of laying them down, would not fall much short of 700,000,000 of dollars!

But the complete contrast between the Bethell and the Robbins processes, requires the presentation of another important feature. The wood prepared by Bethell was only fit for timber that was fashioned and adapted to the rudest forms and uses, such as railroad ties, the piles for bridges, wharves, etc., for the reason that the surface was left covered with the grosser products of coal tar. But as the Robbins process applies the same in the form of vapor, the wood is left clean; and after a few hours' exposure to the air, it is fit to be handled and used for any purpose in which elegant workmanship is required.

Apart from mere pecuniary considerations, the preparation of railroad timber by this process, is immensely important as a means of safety. A large number of railroad accidents occur in this country from the rapid decay of the sleepers. This is of course unequal, some of the ties rotting and giving way, while others remain in a sound state. This causes an oscillating and irregular motion of the cars, which sometimes throws the train off the track; it also occasions an unequal pressure on the rails, which are liable to break. The violent motion, resulting from the uneven surface of the track, causes unequal friction, and an undue strain on the axles, and on the flanges of the wheels, the breaking of which constitutes another prolific source of railroad disasters.*

The direct loss to our railroad corporations, in the destruction of property by such accidents, is very heavy; but it would be quite impossible to compute the still greater loss that is indirectly sustained. The fact cannot be disguised, that the seeming indifference of railroad companies to the public safety, has the effect to greatly diminish the travel. Multitudes who would make frequent excursions for pleasure but for a feeling of insecurity, now only venture from home when the pursuits of business or other circumstances imperatively demand it. Beside, if the distance be short, many persons use a conveyance of their own, when they might travel by rail at less expense of both time and money. It is a false economy that refuses to accept and apply a great improvement when once it is demonstrated to exist; and our railroad directors must be made to feel that it is even criminal to disregard such a discovery when it is known that the public safety demands its immediate adoption.

We have only estimated the value of Mr. Robbins's process for preserving wood in its relation to a single use. And yet, wood is the chief material employed in the world's navies and merchant marine; in the construction of our dwellings, workshops,

*The great destruction of life by railroads in this country, is rapidly becoming a cause of national reproach. It is well known that railroad accidents are far less numerous in Europe, than in this country. Nor is the comparative infrequency of such disasters in England, France and Germany, altogether attributable to the superior construction of their railroads. It is due in no small degree to the fact, that their railroad ties are subjected to some process which renders them less liable to decay.

warehouses, carriages, fences, agricultural implements, and household furniture. The millions require it in fashioning the implements of toil; three-fourths of the products of the earth, and of all human industry, are inclosed in wood for preservation or transportation; the masses, in all countries, warm their dwellings and cook their food by its combustion, and the whole vast commerce of the world still rides on every ocean and sea in vehicles of wood.

The new process is equally applicable to wood in all its uses except for fuel. But we have no data from which a reliable estimate can be made of the immense saving which would result from its universal adoption.

In the engravings accompanying this lengthy article on preserving wood, the same letters of reference indicate the same parts as are referred to Mr. Robbins's patent, the specification of which we publish entire.

To any of our readers who may like to know Mr Louis S. Robbins's address, we would state that he has an office at No. 68 Broadway, New York.

FARMER'S CLUB.

The Farmers' Club of the American Institute held its regular weekly meeting at its rooms at the Cooper Institute, on Tuesday afternoon, Jan. 30th, the President in the chair.

THE WAY TO RAISE PEACHES IN COLD CLIMATES.

W. H. Sanborn, of Vandalia, Ill., sent a communication describing his method of raising peaches in latitudes too high for their successful culture in the usual manner. He had tried his plan for several years in New Hampshire with success. On setting out his young trees he cuts off the trunk one foot above the ground, and paints the wound with a stiff water-proof paste, made by dissolving gum shellac in alcohol. He then trains the branches out horizontally like the spokes of a wheel, and the vertical branches that rise from these he cuts back one-half in midsummer. During the winter he keeps his trees covered with straw or bog hay, allowing the covering to remain till the buds begin to swell.

TO KEEP MILK SWEET.

Mr. Kavanah, in reply to a question by a correspondent, said that milk may be kept sweet by keeping it in a clean room in company with fresh water. In some places it is customary to set tubs of water along the middle of the cellar, cave, or milk house, with an arrangement of pipes by which the water can be readily changed twice a day. It is found that this arrangement prevents the milk from being soured even by lightning.

THE BEST WAY TO MAKE A HOT BED.

Mr. Quinn described at length the latest and most approved plan among market gardeners of constructing hot beds. Some horse manure is moistened and piled up to heat about the 1st of January, and the hot bed is formed in the month of February, from the 15th to the 20th. A site is selected with a southeast exposure, and a trench is dug 3 feet in depth, 6 feet in width, and of any length desired. This trench is filled with horse manure—first, 18 inches in depth of cold manure, then 18 inches of hot, then 8 inches of cold, next a thin layer of hot, and finally a thin layer of cold; the whole being thoroughly trodden down, and just about filling the trench. A frame of rough boards is made of the same width and length as the trench, 2 feet in hight on the northerly side and 15 inches on the southerly side. This is set into the trench before the filling is completed, so as to bring the top of the frame just above the level of the ground. Fine, rich, mellow soil is filled into the frame on top of the manure to the depth of 8 inches, the seed is sown on the surface of this soil, and is covered by sifting fine earth upon it through a sieve. The frames are crossed at intervals of 3 feet by bars to support the sash—the bars having raised pieces in the middle, between which the sash slides up and down. The bars for the glass are laid in only one direction—across the frames—the glass being laid in the manner of shingles. Formerly 8x10 glass was used, but now the preference is given to 4x6—the sash bars being placed only 4 inches apart. The speaker thought it well to have the glass cut with the lower end rounded, in order to lead the dripping water to the middle of the panes. Tomatoes, cabbage and lettuce, requiring about the same temperature, and germinating in about the same time—from 48 to 60 hours—may be planted in the same frames; but peppers and egg plants demand more heat, and take some ten days to sprout; they must, therefore, be placed in different frames.

Mr. Bergen remarked that in his neighborhood it was not the practice to mix hot and cold manures, but to build up hot beds with one kind of manure.

Mr. Quinn, in reply, said that by using hot manure, and by transplanting three or four times, they were able to get tomatoes two weeks earlier than they could by using cold manure and by one transplanting. This is very important, as the earliest tomatoes bring $3 and $4 per basket, while he had sold thousands of baskets later in the season at from 10 to 18 cents per basket. Last year he sent to market 10,000 baskets of tomatoes.

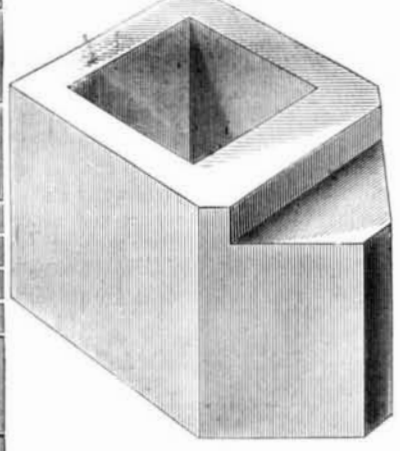
TACEY'S IMPROVED GANG SAW GAGE.

Much time and care have been expended in the accurate adjustment of gang saws. Every change in the thickness of the lumber requires a new arrangement.

This invention is intended to facilitate the operation of setting. With the gage holders once fixed in line in the saw frame, a number of changes can be readily made by any workman in a few minutes.

Fig. 1

Fig. 2



A reference to the engraving will show the simplicity and utility of the apparatus. It is claimed that two-thirds of the time of the mill and of the workmen is gained over the old methods.

The inventor uses eight gage bars with movable gages of different lengths for each; four to be in use at a time, and four to be prepared in advance for a change of saws. A proper combination of the various sized gages enables the operator to saw any thickness from one inch upward, varying by one-quarter of an inch.

Fig. 1 is a perspective view of a gage bar with nuts and gages. A is the bar, one inch square. B B B are nuts by which the bar is fastened in the saw frame. C is a nut which holds the gages firmly against the collar E. F is a collar fast to the bar, resting firmly against the gage holder in the saw frame. When the gage holders are once fixed in line, the collars, being of uniform thickness, will keep all the gages in line also. D is one of the movable gages which, sliding upon the bar, hold the saws in the gains in their beveled edges.

Fig. 2 is a perspective view of a movable gage for sawing inch boards, drawn full size.

For further particulars address James Tracey, Brewer Village, Penobscot Co., Maine.

Burning Smoke.

An apparatus for the consumption of smoke has been applied to the furnaces of the North British Rubber Works by a Huddersfield firm. The apparatus is easily managed; it consists of two sets of doors; the outer or closed door is in two halves, and opens from the center; the inner door, which works on the same hinge, is perforated with hexagon-shaped holes, and is meant to break up the volume of air going into the furnace into a sort of blast. This blast is counteracted upon by an opening for air underneath the furnace dyke, the door of which is regulated by a check rod. When the fire is charged with coal the outer door and the one under the fore dyke are left open, while the inner door is kept shut until the coals are well kindled, when the outer and under doors are closed, and the furnace goes on burning as if no apparatus were there. A pipe about one inch diameter, and perforated with holes, passes along the front of the ash pit, from which small jets of steam spread along the under part of the furnace bars, supposed to generate air and keep the bars from overheating. The introduction of the apparatus causes little or no alteration in the ordinary furnace, except the taking away of the usual doors, and the putting in others of the construction described. This apparatus, as applied to the fire openings of one great furnace at the Rubber Works, proves its efficiency in burning the smoke; though, as in all cases, the efficiency depends on the apparatus being worked properly by the person in charge of the furnaces.—*London Mining Journal.*

[The idea of generating air from steam jets is absurd.—Eds. Sci. Am.

Official Report of the Cattle Plague.

The return published by the Veterinary Departmet of the British Privy Council, for the week ending Dec. 30th, gives an account of the loss of stock by the disease, from its commencement in June to the end of the year 1865, as reported by the local inspectors. In England 48,964 animals were attacked during the whole period, and of them 11,142 were killed as a preventive measure, 27,177 absolutely died of the disease, 3,655 recovered from the attack, and 6,990 diseased animals were remaining on Dec. 30th, whose fate will be recorded in subsequent returns.

In Wales the disease was confined to the two counties of Denbigh and Flint, and the total number attacked was 2,287; of these 93 were killed, 1,565 died, 218 recovered, and 411 remained under observation.

In Scotland 22,298 animals were attacked; 2,998 of these were killed, 12,749 died, 3,172 recovered, and 6,381 cases were undetermined.

In Great Britain, therefore, the aggregate numbers stands thus—attacked, 73,549: killed, 13,931; died, 41,491; recovered, 7,045; and 11,082 (or 15 per cent of the attacks) are brought forward into the account for 1866.

An Invention Wanted.—The London *Times'* Paris correspondent says:—"A discovery has been made at Toulon, where the iron-plated frigate *Provence* is undergoing repairs, which shows the danger that menaces the entire iron-coated fleet of France. The *Provence* was fitted out for sea only 15 months since, and already a great number of her plates are nearly consumed with rust. The Director of Naval Architecture is of opinion that if a composition be not discovered to prevent the action of rust, the iron-plated fleet must be renewed every five years.

The First Step.—In the House of Representatives, on the 5th inst., Mr. Allison introduced a bill fixing a standard of weights and measnres corresponding with the French decimal system.