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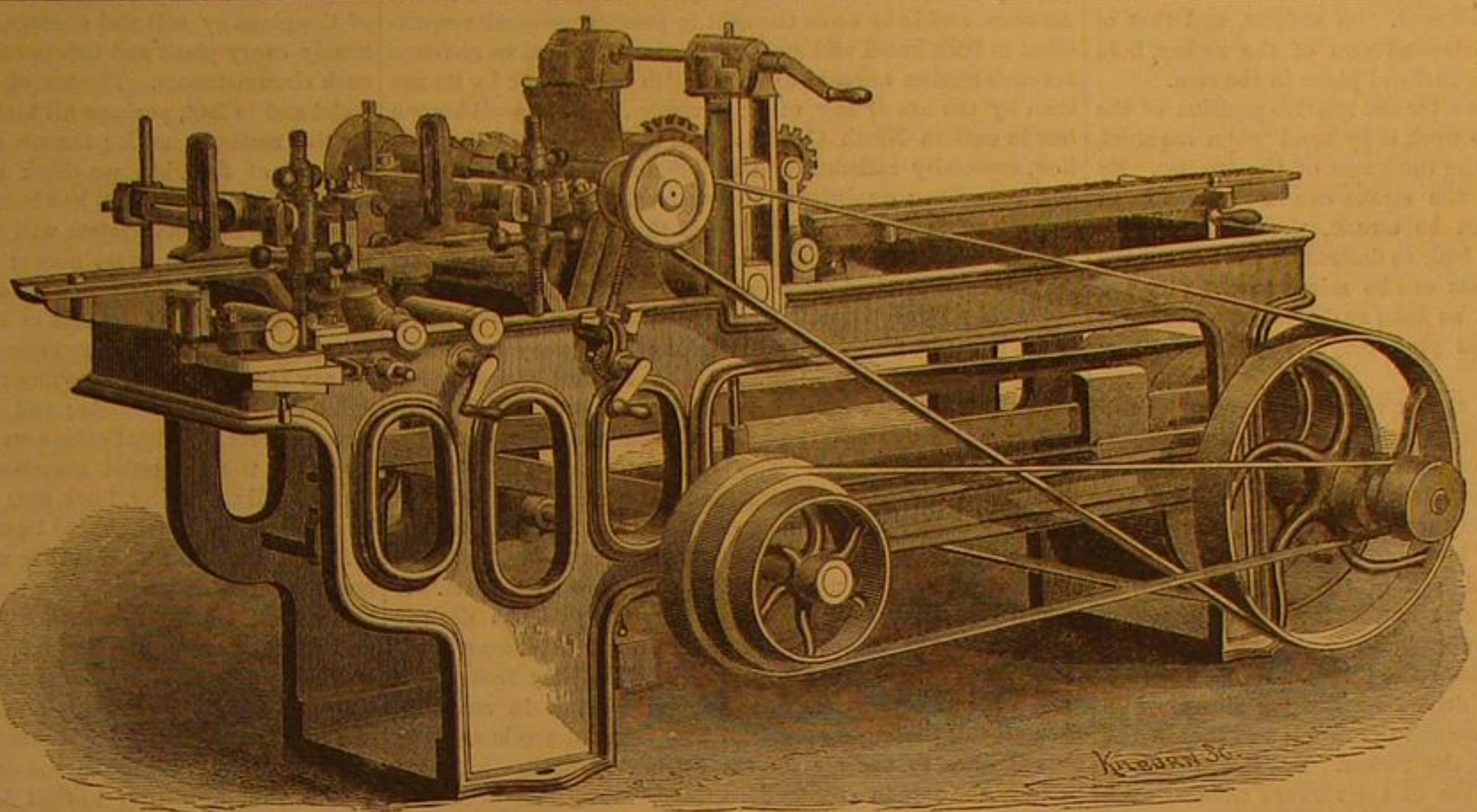
Wood Molding Machine.

Our engraving illustrates another important wood-working machine, manufactured by Mr. S. A. Woods, manufacturer of the wood planer, illustrated and described on pag 90, current volume.



WOODBURY'S PATENT MOLDING MACHINE.

In this molding machine, the side spindle frames are attached to, and are moved from one side of the machine to the other by means of a screw applied to each of the spindle frames which slide upon round bars, and are so constructed that by simply tightening a thumb or hand screw, which holds or clamps the cap of the box firmly to the bar, all side-tremble, or lost motion —backlash, is entirely obviated. This is considered a great improvement over any other method, as it is well known to practical men that much difficulty is experienced in this particular.

The top cutter-head is not covered up with cumbersome machinery, but can be approached from either side of the machine. The yoke or cutter-head frame, to which the cutter-head boxes are fixed, is turned down between the side pieces of the machine; thus it will be seen that the boxes are always in line with each other, leaving the head which holds the cutter-frame to be "got at" with wrenches, etc.

The under cutter-head frame is also set upon sliding wedges, so that it can be moved up and down at pleasure (without stopping the machine), by simply adjusting the wedges. This is done by means of a set screw applied at their ends.

Balance pulleys are used upon the top and side spindles, adding very much towards regulating the balance of the cutters, when they are not precisely of the same weight, and making a steady cut.

This machine will also match and work sheathing or flooring.

The under cutter-head is slotted, and the table through which the under cutters project can be enlarged so as to admit of the use of molding cutters. This is very convenient in rebating, beading, or "springing" moldings. The table is hinged, and can be swung one side, which allows the operator to "get at" the cutters to adjust and sharpen them.

The machines have three changes of feed and vary in size from 2,000 to 3,000 pounds, working 8, 10, or 12 inches wide.

The machines are very compact, and easy to adjust in all of their parts. A gold medal was awarded to this molding machine, at the Massachusetts Charitable Mechanics' Association Fair, 1869; and also first premium at the American Institute Fair, New York, 1869.

It is manufactured by S. A. Woods, of 91 Liberty street, New York, and 67 Sudbury street, Boston, Mass., to whom communications may be addressed.

Improvement in Steam Hammers.

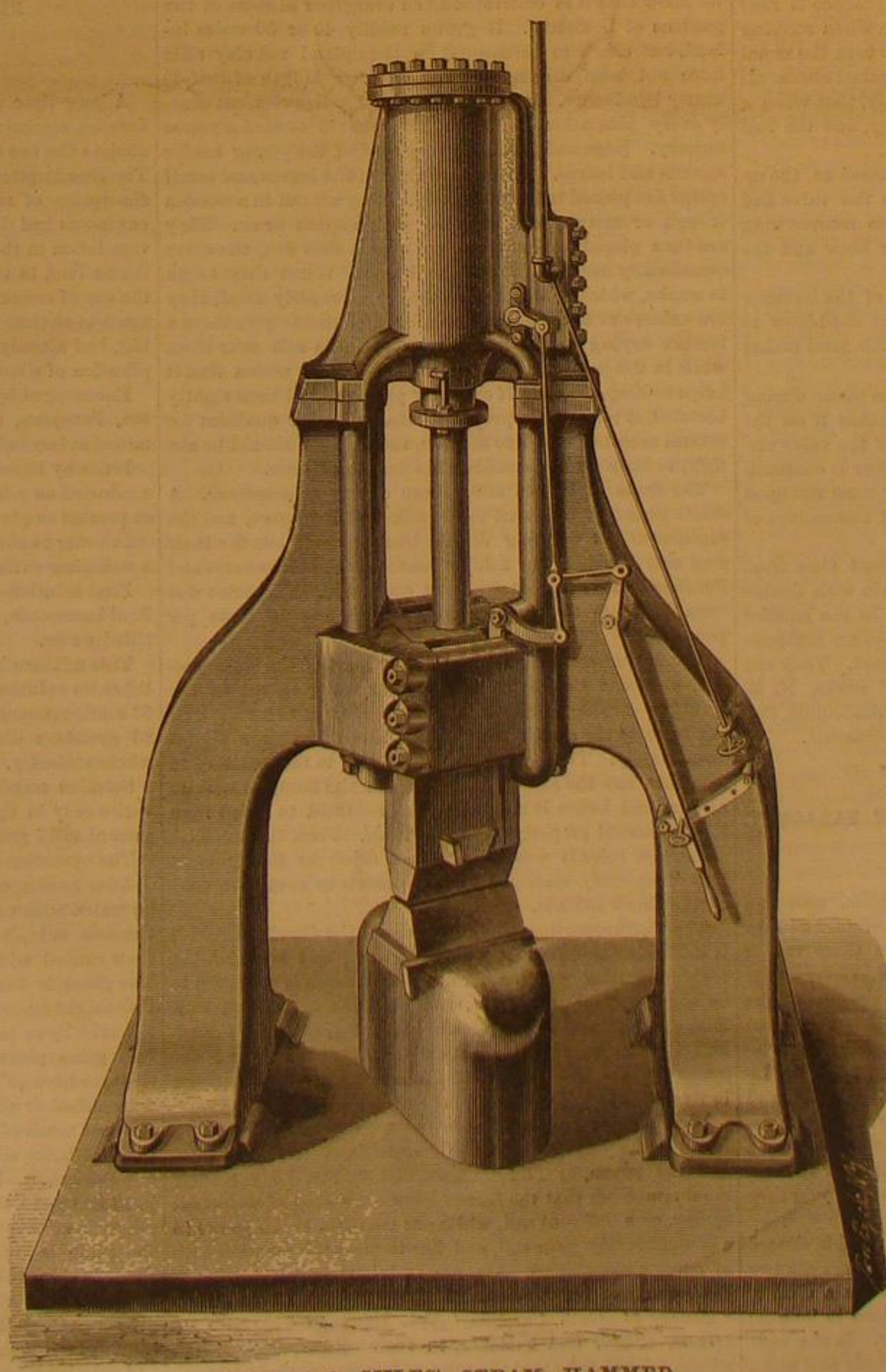
One of the most important instruments in the orginal manufacture, and, subsequently, in the multifarious forging of iron and steel, is the steam hammer. Any real improvement, therefore, which simplifies its construction and increases its efficiency, is sure to be acceptable to all who are engaged in this extensive branch of industry.

The most successful steam hammers hitherto, are of two well-known and distinct types, or classes, both of English parentage; namely, those whose "ram," or "hammer head," or "tup," or "drop" —by all of which names it is variously called—is guided by the frames or standards below the cylinder, in the manner originally invented by James Nasmyth, of Patricroft, and those in which the hammer bar or piston rod is guided by bearings on or in the cylinder itself, or above it, as designed by Robert Morrison, of Newcastle.

They are commonly referred to, for the sake of brevity, as hammers with guides and hammers without guides, the latter meaning those which are guided in the cylinder. They could be better designated, however, by the names of the inventors. Both Nasmyth and Morrison have had the usual host of imitators, and many important modifications and improvements have been made in the original forms and gearing, but the types have always remained entirely distinct. Each has its respective advantages and of course its advocates.

The Nasmyth system insures greater accuracy and less strain upon the working parts, while the Morrison design leaves the anvil more open to the workmen.

Our illustration represents an improved steam hammer manufactured by Messrs. Ferris & Miles, of Philadelphia, Pa., which combines in a great degree the security of the Nasmyth frame-guide with the convenient openness of the Morrison cylinder guide. It has also two valuable improvements for which patents are being solicited through the Scientific American Agency:



FERRIS & MILES' STEAM HAMMER.

The first relates to the arrangement or design. The second to the valve gearing.

It is well known that in the more generally adopted Nasmyth system the "ram," or "drop," being set flatwise and parallel with the frames, and guided by a rib or groove planed in or on them, it becomes necessary for most kinds of work to employ diagonal, or as they are technically called, "skew" dies (or bitts), whose corners, however, must fall within the edges of the ram whereby their area is much diminished as compared with that of the end of the ram.

It is to be remarked that ample "die," or "bitt," surface is a consideration of the first importance in steam hammers.

In this improved arrangement the ram itself, which is of oblong horizontal section, is placed diagonally to the frames, or "on a skew" and guided by them without either groove or rib. So that a plain oblong die of the full size and shape of the end of the ram can be keyed under it and will pass up through the guides. This gives at once the required "skew die," while at the same time it affords the amplest extent of die surface for any operation that can be performed under the hammer.

In consequence of placing it in this position the ram is only required to be made of the breadth and thickness corresponding to the largest die, and can be made much longer than usual without exceeding the proper weight. This obtains a greater bearing on the guides, which can therefore be placed much higher than usual above the anvil, leaving it nearly as unobstructed as in the Morrison system.

The anvil, which is of oblong section with semicircular ends, is also placed diagonally to the frames but at right angles with the ram. The portion above the floor is made perpendicular for convenience in shouldering down, and in forging a bent or crooked piece of work. The lower die, also of simple, oblong shape, is keyed directly across the top of the anvil; its face corresponding with that of the upper one, and its greatest length being the thickness of the anvil, which is equal to the greatest breadth of the ram, or nearly one half greater than can be obtained by the parallel arrangement.

The simplicity and numerous other advantages resulting from this double-diagonal construction, will be at a glance appreciated by all familiar with the operation of these machines.

The valve gearing is of the utmost simplicity. A rock lever or bell crank is pivoted on a stud in the frame, one arm of which, A, is connected by three links to the valve spindle, B, and hand lever, C. The other arm, partially hidden behind the guide plate, rests lightly against the face of the ram, but entirely independent of it and not attached in any way. An incline is planed in the full length of the ram (which is longer than the stroke of the hammer), in order to operate this rocker arm when the hammer is in motion.

The valve is perfectly balanced. Its weight, and that of the links resting on the horizontal arm of the rocker, hold the vertical arm against the inclined plane in the ram.

The hand lever serves to alter the relative position of the valve to the piston, so as to work it by hand when required, and to adjust the stroke to the thickness of the forging. By it the force and length of the stroke can be changed in an instant, a single blow can be struck, the metal can be squeezed upon the anvil as long as desired by the force of the top steam. The hammer ram can be raised to the very top of the stroke, held there as long as desired, then brought down gently or violently, as preferred, and by a slight gesture sent up again, etc.

A thousand blows can be struck all alike, or each one can be varied at will. It is always in gear for self-acting motion, while never out of gear for hand working. The two are parts of each other and inseparable.

The working of the self-acting motion is as follows: When the steam is turned on the hammer rises, the incline plane pushes outward the vertical arm of the rocker, which, of course raises the horizontal arm and with it the valve. The position of the hand lever determines at what point the steam is reversed from below to above the piston. When this happens the hammer descends, driven by the top steam, while the valve has only its own weight to lower it and that of the links and horizontal arm of the rocker. But this weight is partly counterbalanced by that of the rocker's vertical arm, and thus the descent of the valve is momentarily delayed—the ram gets the start of it and strikes the anvil before the piston takes steam under it.

A peculiar feature about it is that as the throttle is opened admitting more steam, while the force of the blows is increased in a regular ratio, their rapidity remains about the same or rather diminishes, so that in actual practice it runs rather faster when striking light blows than when striking heavy ones. This new feature gives time to turn the metal on the anvil, and avoids the complaint made against almost all steam hammers of the self-acting kind; namely, that when a full head of steam is turned on they run away, and the full power of the machine is therefore unavailable.

The *rationale* of it is, that as the steam is turned on, the up stroke quickens and gives more momentum to the valve and links upwards. It takes them a little longer to recover from this momentum and fall. Hence the slower blow and the greater force of it.

By the arrangement of the gear, the speed of the hammer can be varied while running from the slowest dead-blow to the quickest "pick-up" that the most insatiable steel maker could desire.

As the rocker glides easily upon the incline plane during the whole up stroke, and, at most barely overtakes it on the down stroke, no jar can come upon any part of the valve motion, nor can any lost motion affect it as the wear is constantly taken up by the weight of the parts. They must rest upon each other during the up stroke and they fall themselves of their own weight.

These hammers are manufactured of different sizes from 100 pounds up to 2,000 pounds. Some are made with double and some with single standards or frames. In the smaller sizes the hand lever is dispensed with, the links are differently situated, and a simpler arrangement effected. They can be seen in operation at the manufacturers' works, N. E. corner Twenty-fourth and Wood streets, Philadelphia, Pa., where any further desired information can be obtained.

[For the Scientific American.]

YAUPON TEAS OF CAROLINA--MATE OF PARAGUAY.

BY PROF. H. E. COLTON.

All along the Atlantic coast, south of Norfolk, grows an evergreen shrub tree, but in the greatest luxuriance and extent in eastern North Carolina. The people there call it Yopon, and from time immemorial its leaves have been used as a tea. The Indians thus used them, and the people of the colony planted by Sir Walter Raleigh, and their successors learned its use from them. Lawson, in his quaint history of the Carolina colony (1707), states that every spring the Indians would come down from the hill country to fish, and that it was also their custom to prepare a strong drink from the leaves of the "Ebpen" shrub, whereof they drank until they were made sick, and purged and vomited until their systems were cleared of all foul matter; thenceforth for the year they were free of sickness.

This plant belongs to the Ilex (holly) family, and is classed by some *Ilex cassena*, by others *Ilex cuponia*. There are two varieties; one bearing a red berry close to the main stem of the branch. This has a small leaf about one inch in length; the other has no berry, and the leaf is longer. In the rude parlance of the country they are classed as female and male. The leaves of the latter are those usually used for tea. In South America there are two similar shrubs, one classed *Ilex Paraguayensis*, the other *Ilex Songonha*. It has ever been our opinion that they are the North American plant altered by climate and soil, and careful investigation confirms us in this opinion.

The Yopon contains tannin and a volatile essence, but probably a smaller proportion of the first than Chinese tea. The Paraguay tea has about the same characteristics. Medicinally, the yopon is a sedative sudorific, and anti-febrifuge, and possesses greater invigorative powers than any Chinese tea, at the same time it leaves no feeling of exhaustion either in the system or the stomach; it is aperient, and, when taken in very strong and large doses, produces vomiting. These are exactly the qualities of the Paraguay tea. That tea is eagerly sought for and used by the inhabitants of South America, and is by some thought to possess properties equivalent to both bread and meat. Laborers required to undergo severe exertion are said to accomplish more work by its use than by the use of any other beverage. It is a well-known fact in eastern North Carolina, that the laborers of that section, especially raftsmen and sailors, find more nourishment and refreshing qualities in the yopon than in any of the imported coffees or teas. Captains of the coasting and sound vessels have told us that it had all the exhilarating effects with none of the bad consequences of spirituous liquors.

The *Ilex Paraguayensis*, from which the Paraguayan maté, or tea is made, grows in the interior of Paraguay and Brazil to the extreme hight of fifteen feet. Its full-grown leaf is from 2½ to 8 inches long, serrated, with flower and fruit on the stem at the foot of the leaf. The bark has a smooth surface and a grayish color. The tea is gathered mostly by the Indians, employed by contractors. The leaves are dried in rudely constructed kilns, then powdered and put in skin bags for market. The trade is known to amount to $2,000,000, or more per year. It is used mostly in the powdered state. A quantity of this, greater or less, according to the desired strength, is put in hot water and allowed to steep a short time. It is drunk through a tube called *bombilha*, from a cup with a cover. With ice it is a favorite drink in summer, even among the higher classes. The covered cup is used, as on exposure to the air the tea turns very dark—this is especially the case in strong decoctions.

The yopon, or, as Lawson calls it, yaupon, grows near the coast on a poor sandy soil. It is claimed that there are several distinct species of it, but we think the distinction is due to difference of soil. It is a beautiful evergreen, and is cultivated for hedges on some of the coast plantations. We have been told that it is also found on the Gulf coast, and we know that it is cultivated as an evergreen in some of the gardens of Louisiana. It grows readily 40 or 50 miles inland, but efforts to cultivate it on the upland red clay soils have not been successful. The extreme length of leaf is nearly two inches. It grows wild in large thickets, but nearly every plantation and farm has what is termed a yopon nursery. Hogs and cattle are very fond of the young tender sprouts and leaves. To prepare the tea the leaves and small sprigs are picked indiscriminately. They are put in a wooden trough or mortar, and chopped with a spade or ax. They are then placed in a covered pot over a slow fire, the cover occasionally removed to stir the leaves. When they begin to smoke, which indicates that they are properly dried, they are taken out and packed away for use. Some give them a further drying in the sun; others sprinkle salt over them while in the pot—this no doubt from a foolish notion that it helps to keep the tea. If carefully prepared and then tightly barreled, it retains its proper aroma and good qualities for several months; but, like all teas, the package should be airtight to keep for any considerable length of time.

The trade in it has never been of any consequence. A small quantity was sent to Norfolk and Baltimore, and the captains of the coasting vessels bought small lots for their own use. During the fishing season on the Albemarle and Pamlico sounds a great deal was consumed. The price was from 75 cents to $1 per bushel; about 5 or 10 cents per pound.

The leaves can be gathered at any part of the warm season, or if one chooses in winter; but tea gathered in the spring is considered the best. The made tea turns dark on exposure to the air; if very strong, this takes place almost immediately. This has been attributed to the roasting in iron pots, but the same effect occurs in the South American article, and hence it may safely be assumed to result from some chemical property of the tea itself. From this peculiar change of color it was called black drink by the Indians. It is erroneously stated by some botanists to have been used by the Creek Indians.

The Tuscaroras were the great tribe of the Carolinas, and it is in North Carolina that it chiefly grows, and in which the early historians mention its use. The name is supposed to be a corruption of Yeopim, from a tribe of Indians thus named, who lived in the section where it grows most luxuriantly. The supply is practically inexhaustible, and the growth of the tree can be indefinitely increased, as it grows in its native soil from a sprig set out in early spring.

We, perhaps, have not made out a clear case of identity between the yerba, or *Ilex Paraguayensis*, of South America, and the yopon, or *Ilex Cassena*, of Carolina. My readers must remember that the former grows in a land of perpetual spring, on a different soil, while our Carolina shrub grows in a comparatively poor soil, and has to meet the rough breath of many a northeaster. We are sustained in our opinion of the identity of the two plants by the Rev. Dr. Hanks, in his "History of North Carolina," Vol. II., page 218; also by Messrs. Kidder and Fletcher, in their "Brazil and the Brazilians." They state that the town of Paranagua alone exports every year a million dollars' worth of maté. I quote the following, with which they close their article on the subject:

"He found in this out of the way port of Brazil an American woman engaged in the delightful art of preparing *peijoes* and *toncinho* (pork and beans) for the natives and foreigners who patronize her establishment. In conversation with her in regard to the maté, she exclaimed, 'Why doctor, this is the same truck we use in Carolina to make tea.' Here was a most striking confirmation of the true conclusion of science."

Any person who will turn to this work will find still stronger confirmation in the general description of the Paraguay shrub, and the preparation of the tea. It is a matter to be regretted that the botanical characters of either have not been thoroughly investigated. We do not claim exact identity of the plants botanically, but the same chemical qualities of the prepared tea. We have stated our belief as to the alteration of the plant by soil and climate, and all are well aware that nearly every plant and tree is subject to such changes under such circumstances. The use of tea and coffee is an acquired taste, and in fact, perhaps all tastes are acquired, except that for the mother's milk; the use of yopon may be distasteful to some at first, but we think not more so than their first taste of Chinese tea. It has been said that any drink which affects the nervous system will become a popular drink. If this be so, yopon must sooner or later take a high place among infused beverages, as it has sedative qualities superior to any of them. At the risk of being laughed at for want of aristocratic taste, or for preferring a thing entirely American, we say that we prefer it to any tea, coffee, or stimulating or sedative drink that exists; and we know of remarkable instances of its beneficial effects on the decaying systems of the aged, and the shattered nerves of the feeble. One old lady used to tell us "Why, laws me, it's the greatest truck! it's kept me out of heaven these twenty years!"

Even admitting that it has no qualities superior to the best Chinese tea we get, only that it is as good, the question arises, why cannot this tea be made a new article of trade and commerce from the South? If the people there will not enter this new field, let Northern capital and enterprise occupy it. Once introduced, a ready sale might be found for it at 25 cents per pound, and if more carefully prepared, as high as 50 cents. It would be not only a source of profit but of benefit, and a blessing to that large class of our population who now drink those vile, low-priced adulterations called coffee and tea. The cheapness of the article detects the fraud. But if nature must have some such beverage, why not the truly beneficial yopon of the Carolinas?

[For the Scientific American.]

PLATINIZED LOOKING-GLASSES.

BY C. WIDEMANN.

NO. 1.

A long time ago the French sanitary commissions had founded a prize to reward the successful inventor who could obviate the use of mercury in applying tin to looking-glasses. The consumption increasing daily, the diseases caused by the absorption of mercury have increased in proportion. Many engineers had devised a remedy for these evils by successful ventilation in the extraction of the ore. The manufacturers themselves, in view of the disorders and sickness caused by the use of mercury in their works, encouraged every attempt made to obviate it, and, in 1836, the celebrated chemist, Liebig, had already called the attention of scientists to the application of silver on glass.

Encouraged by some successful experiments, Messrs. Drayton, Petitjean, and Tourasse, and lately, Mr. Brosette, obtained at last industrial results.

Little by little this operation was simplified, and is now conducted on a large scale. I shall describe the process used at present as giving the best results.

In order to obtain a silver coating on glass so as to obtain a reflecting surface, two liquids are used.

First solution—100 grammes, nitrate of silver; 62 grammes, liquid ammonia, from 870° to 880° density; 500 grammes distilled water.

This mixture is filtered and is afterwards mixed with 16 times its volume of distilled water, in which 7 grammes and 50 centigrammes of tartaric acid have been added, dissolved in 30 grammes distilled water, care being taken to stir the whole violently. This forms solution number one.

Solution number two is prepared in the same way, and varies only in the proportion of tartaric acid, which is increased to 15 grammes.

The operation of silvering is carried on as follows:

After having carefully cleansed the surface of the glass to be coated with very fine tin pulp and water, applied with a chamois skin, it is then washed over and left to dry. It is then rubbed with a dry chamois skin and with a fine rag. The glass is then laid on a wooden grate, and all the dust that might have fallen on it during the former operations is removed by an india-rubber cylinder dipped in distilled water. The glass plate is then laid upon an iron table, heated by steam to from 40° to 50° Centigrade; this table is covered with a varnished or oiled cloth. The plate being placed horizontally, as much of the solution number one is poured over it as the capillarity of the glass will retain (say almost 3 millimeters thickness) without running over the sides. In about 7 to 10 minutes the deposit takes place; and in about 15 to 20 minutes afterwards this part of the operation is at an end. The plate is then lifted upon one side and washed with a chamois skin, and luke-warm water is poured over it in order to remove the non-adhering dust which may have fallen during the process, which occupies about 25 minutes. The plate is then immediately replaced in the horizontal position, and solution number two is applied in the same way as the first. In 12 or 15 minutes after the operation the application is completed. The plate is washed carefully and dried, and a protective coat of paint, composed of minium, siccative oil, and spirits of turpentine is applied. After 4 or 5 hours the mirror can be delivered to the buyer. Galvanoplasty can be applied to coat this silver with a surface of copper as a substitute for the paint.

It has been noticed that an old solution of tartaric acid acts with more rapidity than a fresh one.

As it is, this process is still far from satisfying all requirements. The metallic surface of the silver is finer than that of the mercury tinning, but very often the operation fails without any assignable cause for the accident. Another great inconvenience is the action of the hydro-sulphureted vapors blackening the shining surface of the silver and destroying its reflecting property in a very little time. The locomotive headlight reflectors, manufactured by this process, being in constant contact with the smoke of coal, are generally destroyed with very great rapidity, even when protected by the minium paint and the copper coating.

As these defects manifested themselves, Mr. Dode, who for a few years had devoted his time and a small fortune to this important question, announced that his researches had met with success.

For twenty years this inventor has pursued his work with perseverance. Then the idea struck him to apply platina on glass. It is already known that the chloride of platina renders immense services in the arts. By its use porcelain manufacturers already coat wares requiring a metallic luster intermediate between silver white and steel gray. In order to obtain these results a concentrated solution of chloride of platina, mixed with essence of lavender, is applied on the varnish of the china to be coated. The object is then placed in the oven, very soon the platina appears with its metallic appearance, covering all the places where the composition has been applied, hiding the original color of the object, and possessing a brilliancy equal to that obtained by the burnisher.

It was a Prussian chemist, Klaproth, who in 1793 made this process known for decorating porcelain wares. Up to the past year platina had only been applied to decorate china and the application to coat glass in order to obtain a reflecting surface is due to Mr. Dode. Either the front or back of a platinized mirror is a perfect reflector.

Mr. Dode has adopted this metal as the one offering every advantage as it resists all the actions which destroy other metals. At first Mr. Dode platinized his glasses on the posterior surface; to this end he dissolved the platina in an equal mixture of nitric acid and hydrochloric acid. This solution evaporated to dryness was treated by diluted acetic acid; in this solution a certain quantity of amylic alcohol was added. The latter substance precipitates the platina and thus separates it from its aqueous part. The precipitate was then washed and this composition was then applied in a very thin layer on the back of the glass in the usual way. After a little while, exposing this glass in a dryer heated sufficiently to evaporate all the traces of amylic alcohol, the glass possessed a perfect brilliancy; but, unhappily, this coating had no more adherence to the glass than the old amalgam, and a varnish was necessary to prevent accidents that might happen by friction.

[For the Scientific American.]

GUATEMALA, ITS INHABITANTS AND PRODUCTS—ADVICE TO EMIGRANTS.

BY I. CANTINI.

Since the great civil war of America, the emigration from the Southern States to Central America, and especially to Guatemala, has been quite considerable, although the great expectations of the immigrants were not always realized.

Guatemala, which, under the government of its actual president, General Xerna, has enjoyed several years of peace and quietude, blessings which are but little known throughout the Spanish American countries, has been chosen by many for their new adopted country; these people having bought land and property with the intention of carrying on the sugar, coffee, and tobacco culture. Indeed, the laws of that state have, ever since the reign of Rafael Carrera, been so much in favor of foreigners, that there are several instances on record in which natives have acquired the citizenship of some other state, and thus lived as foreigners in their own country in order to enjoy the privileges of such, and to be exempt from military and other duties.

These advantages are, however, of value only as long as the country is not in a state of revolution; but if the latter should take place, it would be fortunate for the settler if he could pack up his coffee or sugar plantation and leave the country, for he will find but little protection on the part of the government from the herds of roving outlaws and revolutionists who swarm over the country, and take or destroy all they can lay hold of. This fact the immigrant ought not to lose sight of

For some time past, and at present, peace and prosperity are reigning throughout the republic; and there is every prospect for a happy future. Providence has emptied its cornucopia in a full measure all over the country, and an improving civilization and cultivation combine to make it a most desirable country for immigration. Those who intend to settle down in Guatemala, would do well, if time and money will permit them, to take a look at the country first before they buy any land. Many have gone there with the intention of cultivating coffee, sugar, or tobacco, without any knowledge as to the soil or climate. They have almost all failed in their attempts, and some of them have left again in disgust, if not wiser, certainly much poorer than when they came

Traveling throughout these Central American states is not expensive, though not always comfortable. What we understand by roads here, is there an object of illusion, and what might be called a good cattle-path here in the North, is there termed a "camino real," a royal road. The mountainous soil and the tropical rains are two great obstacles to the building of good roads. The ascents and descents through the range of the Cordilleras are precipitous and dangerous, the roads rough and narrow, and the privations often great. These "royal roads" do not permit any traveling in vehicles, except in the immediate neighborhood of the larger cities. Mules and horses are the only mode of conveyance. Ladies, or even men sometimes prefer to be carried on a chair by an Indian. This mode of traveling is, however, not advisable to very lively or fidgety persons. Imagine yourself sitting on a common chair, the back of which is attached by a strap, made from the bark of a tree, to the shoulders and forehead of the Indian who is to carry you, and who weighs not more than a hundred and twenty pounds, while his burden weighs a hundred and fifty, and often more; and yet he will carry you for four or five hours successively. You must, however, sit perfectly still in your chair; you may take a look at the passing scenery, but without turning your body or even your head; never attempt to sneeze or cough, else you or your carrier or both together will lose your equilibrium.

The natives possess a great strength for carrying, yet their strength lies only in the head, shoulders, and legs, and never in their arms.

While traveling through the country you are often startled by the sudden appearance of a caravan of these bare-footed Indians, each one carrying a heavy load of maize, cigars, indigo, cheese, or some other article of their commerce. They always travel in single file, one closely following the heels of the other; it is the same whether they are on the narrow mountain path or on the wider "camino real." Should you happen to be in want of any of their goods—which is but too often the case, especially articles of food—you will in vain offer them double the price which they will get in the capital of Guatemala, or other large city they are bound for; they prefer to get less for it and carry the heavy load of four hundred and more pounds a few days longer on their shoulders, in order to go to a city and there have a good time or spree on the few shillings which they get for their goods. They spend all the money on the spot, and then return to their mountain villages, talk over the good time they had during their visit to the city, until another crop has grown, and then the same journey with the same result is made over again. Happy people! they do not care to accumulate riches.

The coffee sugar and indigo planters of the interior have the greater part of their products carried to the sea-ports by the Indians. Their imported machines and agricultural implements are mostly landed at Ystapa, the main sea-port of Guatemala on the Pacific coast, whence they are transported on carts as far as the roads will permit such travel, and then they are carried over the mountains by the natives in a journey of one or more weeks. The Pacific sea-ports are preferred to those of the Atlantic; the roads leading from the latter coast are steep and difficult to pass, especially during the rainy season, while the Pacific coast, or "Costa Grande," is more sloping and much better adapted to the coffee culture than the former.

An impulse is given to the trade of this state by an annual fair, which is held in January in the town of Esquipulas. It is a place of pilgrimage, not only for the states of Central America but also of Mexico, and even South America; it is a "Holy Sepulchre of Palestina," a "Caaba of Mecca." A large crucifix in the principal aisle of the spacious church is the wonder-working effigy which vouchsafes to operate in behalf of true believers; and more than 80,000 persons have been known to assemble, some to assist at the solemnities others to attend the great fair, which is held at the same time, as is the case in all Eastern places of pilgrimage. The church of "our Lord of Esquipulas," is very rich, as many thank-offerings are given by the penitents, and when the government is in want of money, the "Lord of Esquipulas" is ready to make a loan, if the conditions are favorable. Those who have committed some great sin are ordered by the priests to make the journey to Esquipulas on foot, and the hardships of a pilgrimage to Mecca cannot excel those of Esquipulas.

The approach to the capital of New Guatemala is, to the traveler, a most imposing sight. The road leads through deep mountain gorges, that remind us vividly of some scenes in Switzerland; as we descend the mountain ridge, we see far before us the extensive fruitful plains and valleys, with here and there a modest-looking, one story dwelling house.

The never-dying verdure of the tropics is particularly charming on these hights. Whoever travels through these countries must be a lover of the beautiful in nature, otherwise he will find but little compensation for his laborious journey. He certainly should not be a "gourmand," for all he finds to eat are eggs, tortillas, some country made cheese, and beans cooked with garlic, the national dish of all the natives. The frugality of the natives is exemplary, and the stranger is more or less compelled to follow their example, which he will also find is much better for his health.

The houses in the city are only one story high, and built to resist as much as possible the frequent shocks of earthquakes. The streets all bear a look of desolation; the windows of the dwellings all open into the spacious courtyards, after the old Spanish fashion, which imparts a dismal aspect to the streets.

Many foreigners have established themselves in this healthy locality, the temperature being greatly moderated by the cool mountain breeze Though the depredations committed during the revolution under Morazan and Carrera are still fresh in the memory of the inhabitants, yet they have recovered from their heavy losses, and hasten to support all means for the development of education.

The agricultural implements of the natives and their mode of working the ground are somewhat primitive yet, and those who bring any innovations into the country are often laughed at; or if the novelty secures the approval of the Indians, they never fail to show their veneration.

Coffee and sugar are the staple articles of their commerce. The cultivation of indigo, once the main product of Guatemala, is annually decreasing. The coffee crop is often destroyed throughout large districts by night frosts. As the traveler advances from the coast towards the interior of the country, and ascends the range of the Cordilleras, he quite forgets that he is moving under a tropical sky. The temperature is moderate, the nights even cold. Everyone is supplied with a coarse, home-made blanket. The natives no longer sleep in hammocks as they do in the valleys and along the coast, and woolen clothes are worn by almost everybody. The climate is exceedingly healthy and invigorating, and this combined with the products and advantages of a tropical region, make some parts of the Central American states a perfect paradise.

The many languages spoken in the provinces are a great annoyance to the traveler through Guatemala. Twenty-seven separate dialects are known to exist, which differ so much from each other, that the members of one tribe are unable to understand those of their nearest neighboring province. Spanish is, however, the language of the law and government, and those who are able to speak it can easily make known their desires throughout the country. It is necessary, when arriving at a village or town, to seek the hospitality of the priests or *padres*, who, always kind and obliging, are here not only the spiritual advisers, but also the inn-keepers, guides, and provision-dealers. A word from the *padre* has a wonderful effect upon the natives, when often not even the money of the stranger could induce them to move a step to get him something to eat, or to serve him as a guide. Hospitality is, nevertheless, one of their redeeming virtues, yet it is but too often only an idle word; the people are poor, they have nothing to offer, not even a shelter. If they have two ears of corn, the stranger is always welcome to one. They never think of laying up provisions, even when the climate would permit it; nature is so abundant that all the year round fruit and blossoms are beside each other.

Two crops of maize can be gathered within one year. The bananas, which are the bread and potatoes of the tropics, are always blossoming, growing, and ripe on the same tree. Meat is a secondary article; the beef is tough, though cheap. The price of a pound of beef never exceeds six cents, while pork is nine cents, it being considered a greater delicacy. To a stranger this latter meat is particularly disgusting here. It seems as if the pigs were more omnivorous in the tropics than in the North. There is an abundance of game everywhere, though not always inviting to those unaccustomed to such delicacies; for example, a dish of monkey, or a stew of lizards or iguanas. But taste and dislike are often out of question, and the hungry traveler must generally take what is offered to him. A most excellent quality of cocoa beans grow throughout the country, which are hardly inferior to those of the Mexican province, Tabasco. In many places cocoa is a general article of food, taken to allay thirst and appease hunger, both at the same time.

The climate of the west coast is much more preferable to that on the Atlantic side, where malignant fevers are often fatal to the natives as well as the immigrants. The natives mostly object to our mode of curing fevers by the use of quinine. They agree that the medicine may be efficacious in the northern climate, but that it is too heating to the body in a tropical country. Their theory is not without some good foundation, and their own remedies are certainly less destructive to the human system than those overdoses of quinine, taken by foreigners to break off the fever.

It is essential for those who wish to make that country their home, to carefully select a place most adapted to their constitution, and above all things, to lead a life adapted to the climate. The natives give much good advice to new-comers, which, however, is not always followed; such as never to eat any kind of fruit after sundown, and never to expose one's self to the night air. On the other hand, the stranger should never, in his good nature, permit himself to offer good advice to a native; a last remnant of Spanish pride does not permit him to accept it without feeling insulted.

Americans go abroad to see the antiquities of Greece and Italy, or the ruins of Egypt; they are perhaps, ignorant of the fact that they possess works of ancient splendor on their own continent, which are not only as interesting as those of Egypt, but also quite similar in their construction. When the wonders of Italy and Greece, of Egypt and India, have become a little more hackneyed, then the curiosity-seekers may begin to turn their steps towards the ancient palaces of Central America, the sculptures and hieroglyphics of which speak of their former grandeur and magnificence.

A General order promulgated by the War Department provides that hereafter no volatile oils will be issued or used for illuminating purposes at military posts, and all varieties of coal oil will be regarded as volatile. In general, lard oil will be supplied for issues of oil authorized for the necessary illumination of military posts.

It is announced that all the disorder attending the strike of the workmen at La Creuzot, France, has been repressed by the troops, and that the strike is ended.

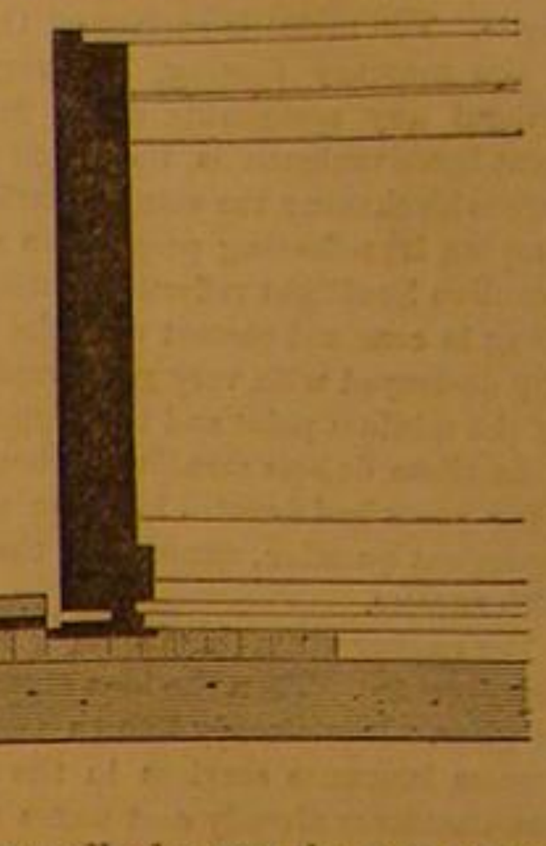
ENGLISH AND AMERICAN IRON-CLADS COMPARED.

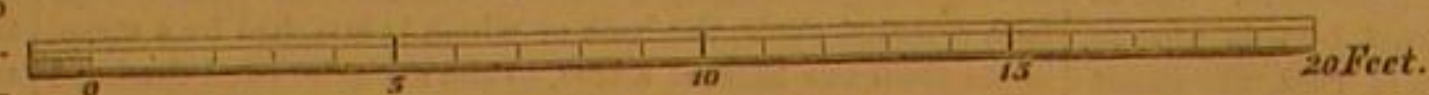
[From the Army and Navy Journal.]

The chapter on turret ships, and the tabular statement of the strength of armor-plating of the English iron-clad fleet, contained in Mr. Reed's recent work, "Our Iron-clad Ships," cannot fail to attract attention on this side of the Atlantic.

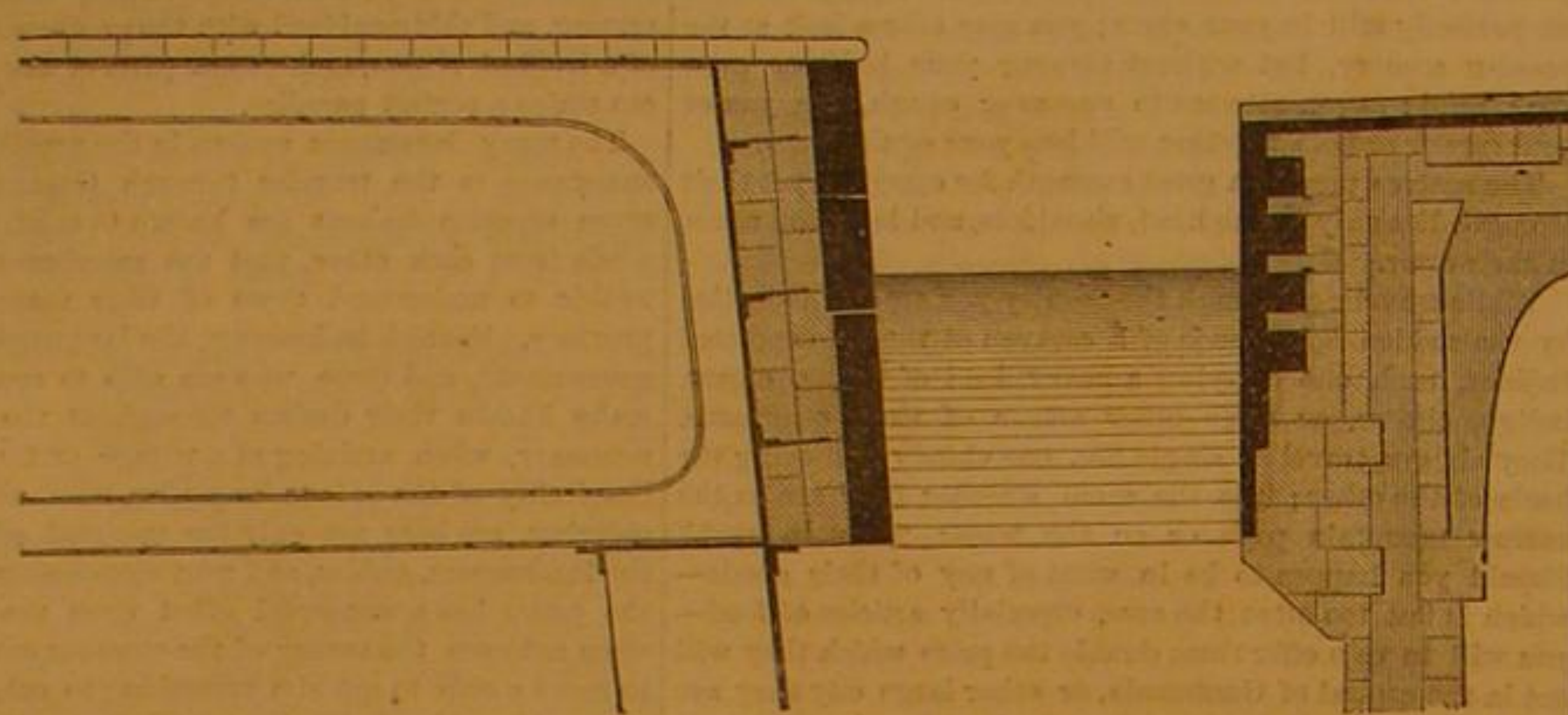
An examination of Mr. Reed's tables shows that the iron-clad fleet of England is by no means so formidable in point of armor as supposed. Not less than twenty-four ships, nearly all first class, are protected by only $4\frac{1}{2}$-inch armor plating; while, according to the dimensions specified in the tables, the *average thickness* of the solid plates of the entire iron-clad navy is somewhat under six inches. In view of this fact, it is to say the least, inconsistent on the part of Mr. Reed to contrast, as he has done, by pictorial representations, the side-armor of the *Dictator* with that of his last and strongest—not yet completed—vessel, the *Thunderer*, which is wholly unlike any other of the English iron-clad ships. The accompanying illustrations, drawn to scale with great exactness, furnish data which place the question of comparative strength in quite a different light from that in which Mr. Reed presents it, and enable us to judge accurately of the power of resistance of the boasted broadside iron-clads as compared with our monitors. We might with perfect propriety have contrasted the strength of our smaller turret vessels of the *Passaic* class, carrying eleven inches thickness of battery, with the English broadsides whose guns are protected with only four and a half inches solid plating, since fully one half of the entire fleet carries that light armor; but in order to present the question in an aspect more favorable to the English, we have selected the *Bellerophon* for comparison, her solid armor-plating representing the average thickness of the whole English armored fleet. We have, however, not followed Mr. Reed's example, of contrasting our thickest side-armor with that of the English average strength. Accordingly, we have placed the section of the *Dictator* against that of the *Bellerophon*, and the section of the *Kalamazoo* against that of the *Thunderer*.

KALAMAZOO.

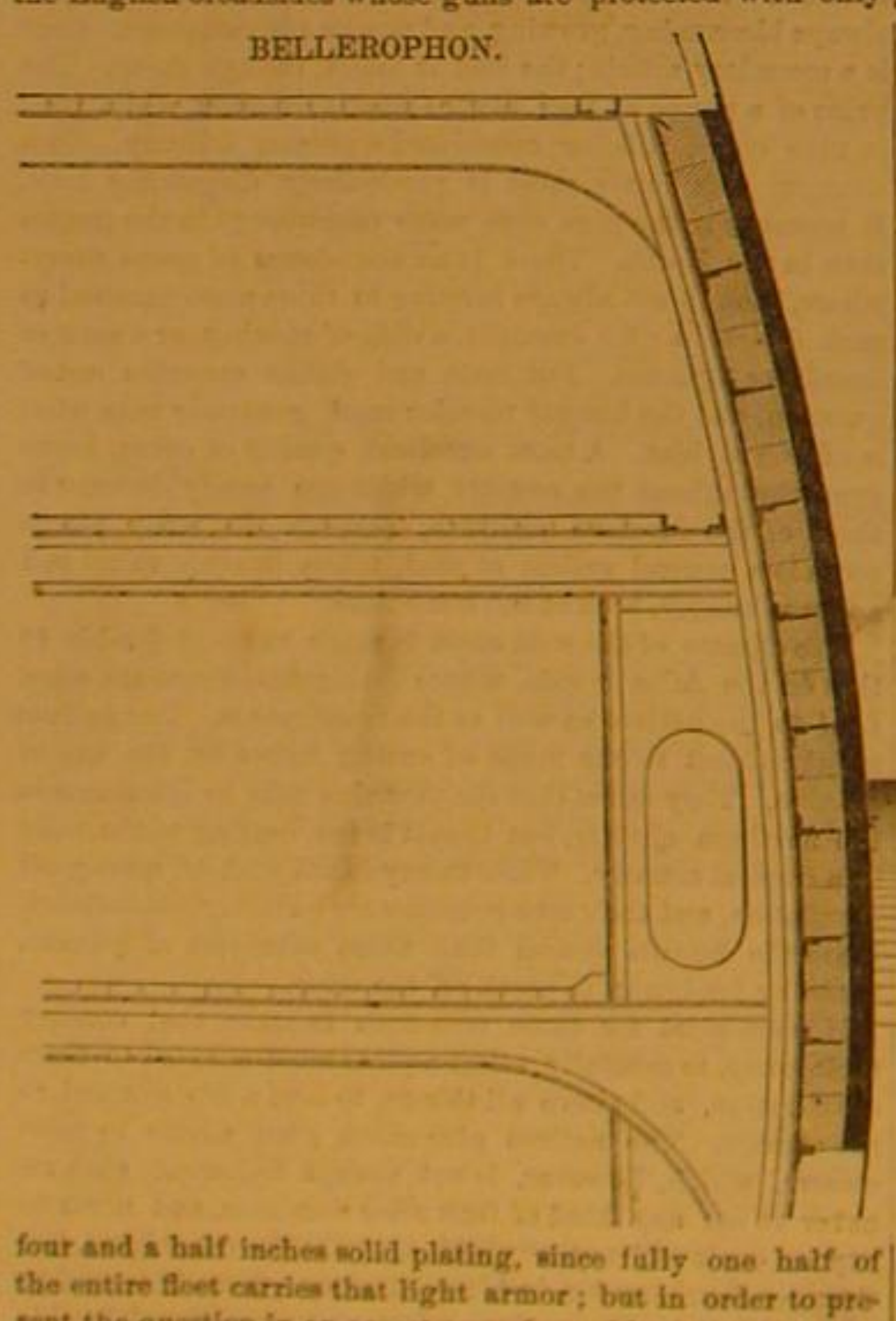




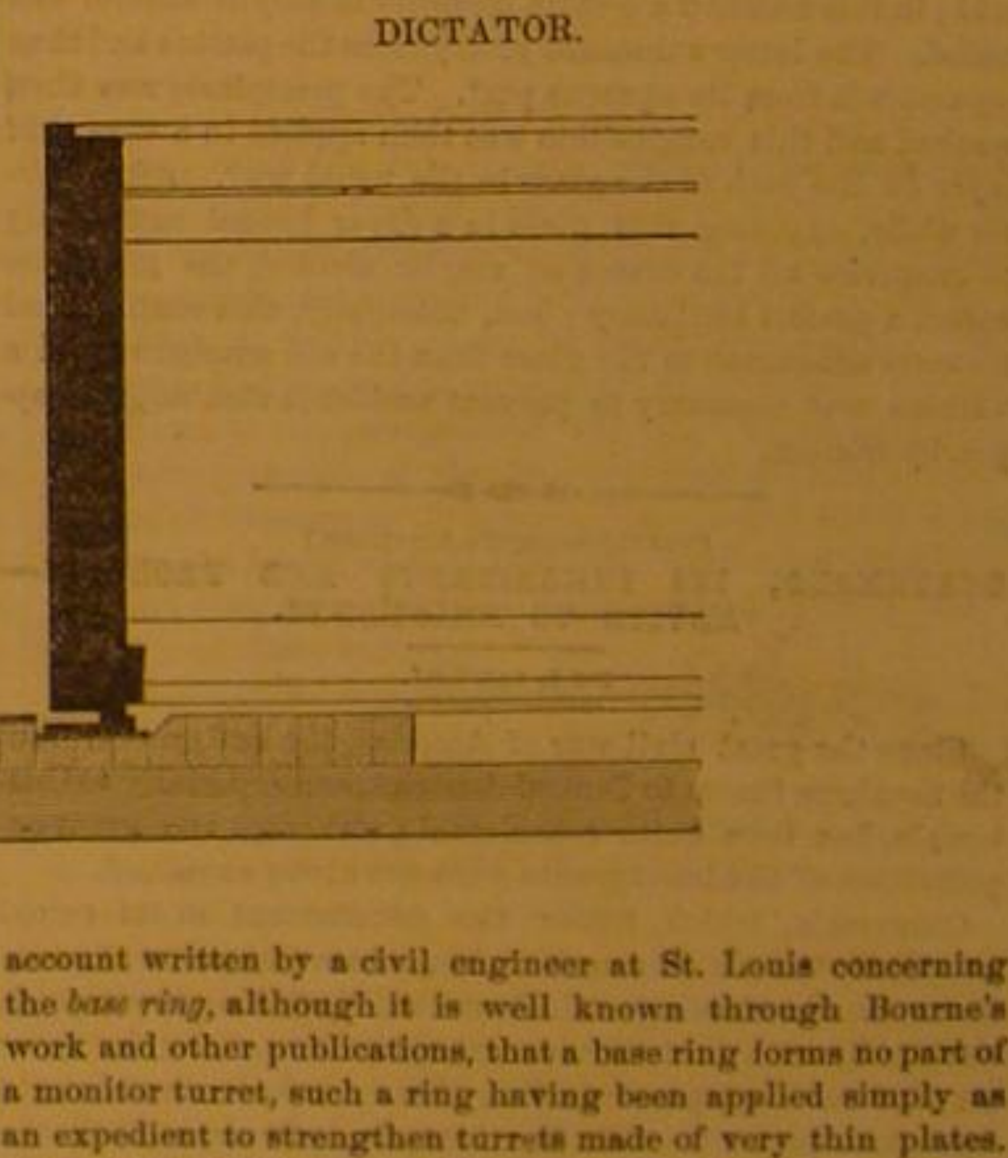
THUNDERER.

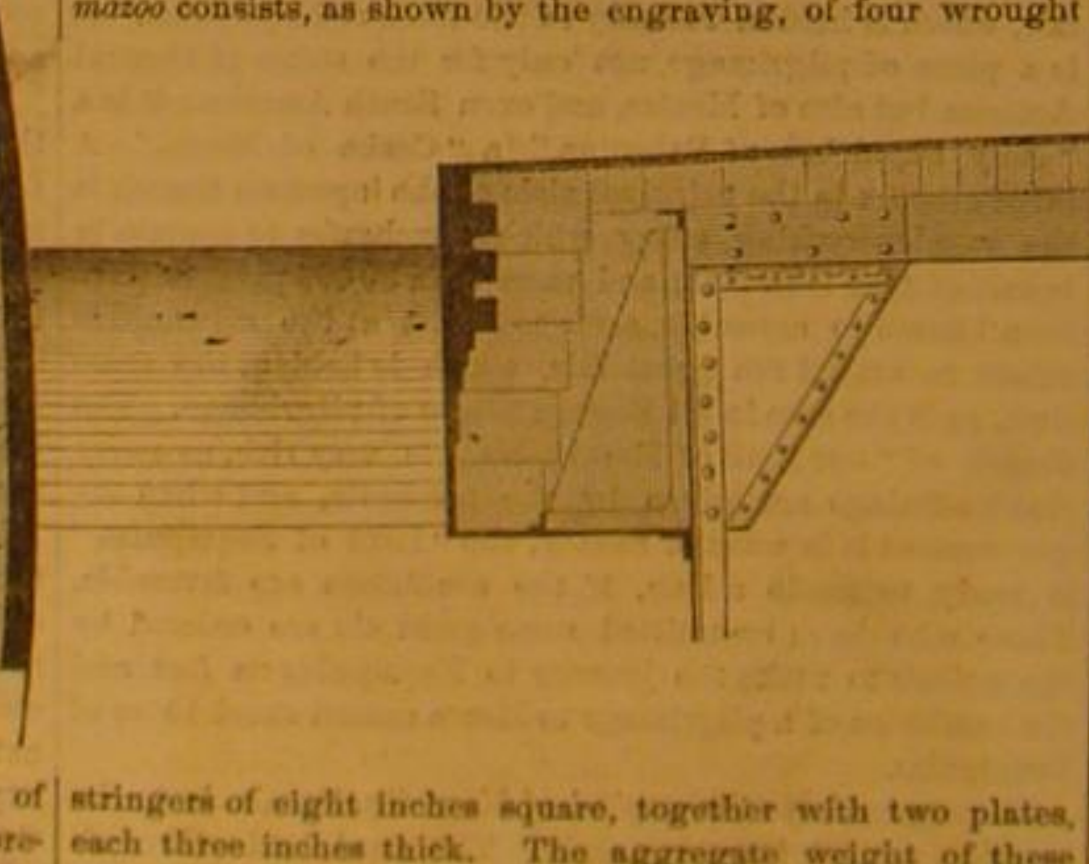


BELLEROPHON.



DICTATOR.





We cannot pass unnoticed Mr. Reed's deceptive method of keeping the strength of the battery out of view in comparing the resisting power of iron-clads. No one understands better than the constructor of the "breastwork monitor" *Thunderer*, the leading feature of the monitor system, the submerging the hull so nearly as to render the *side-armor* of but secondary importance. Besides, the side-armor of a monitor is not intended to protect the guns. We need scarcely urge that, under such circumstances, it is highly improper to exclude the battery from an illustration put forth for the purpose of imparting information as to the relative offensive and defensive power of broadside ships and monitors.

The sections of the *Bellerophon* and the *Dictator*, represented by our engravings, furnish conclusive evidence that the former could not successfully oppose the latter. The 6-inch plating, 10-inch wood backing, and $1\frac{1}{2}$-inch skin of the *Bellerophon*, offer protection so utterly inadequate to contend against turret guns of adequate power, worked behind fifteen inches thickness of iron, that no question can be raised as to the result of a conflict between these vessels, especially at such ranges as would prevail during harbor defense. It should be borne in mind, with reference to the side-armor, that during defensive operations, a monitor can almost invariably point the bow towards the assailant, in which case, apart from the protection which results from deep immersion, the angle of the armor of the bow is so accute that every kind of projectile will be deflected.

Respecting the inferior resisting power of a series of thin plates as compared with an equal thickness of solid armor-plating, we repeat what we have so frequently urged, that the superiority of the monitor over the broadside vessel is not affected by the difference of strength of laminated and solid armor. It is all-sufficient that monitors do carry turrets from eleven inches to fifteen inches in thickness, and that turrets of such enormous thickness are readily handled. The number of plates composing that thickness has obviously nothing to do with the principle. The weight being alike in both cases, all we have to do is to substitute solid for laminated plating.

Much has been said by English writers about the weakness of the wrought-iron armor-stringers placed behind the plates for the protection of the upper part of the submerged hulls of monitors. We readily admit that broad, solid plates are better; but our iron works during the war could only supply the stringers and the thin plates. It should be observed, however, that they fully answered the purpose, not a single life being lost within a monitor hull or turret during the protracted contest with fixed forts, notwithstanding that our adversaries had the advantage of steady aim and an accurate knowledge of ranges. The armor of the hull of the *Kalamazoo* consists, as shown by the engraving, of four wrought stringers of eight inches square, together with two plates, each three inches thick. The aggregate weight of these stringers and plates being the same as a solid plate ten inches thick, we have only to substitute such a plate to render the vessel's hull practically impregnable.

As our engraving furnishes precise data for comparing the armor of English and American iron-clads, and also points out very clearly the unsatisfactory character of the pictorial representations in Mr. Reed's work, we dismiss the subject of armor-plating and pass on to the chapter headed "Turret ships." We do not propose to criticise Mr. Reed's views with reference to the turrets applied to full-rigged ships, or his disparaging comparisons between Cole's turret ship the *Captain*, and the broadside ship *Hercules*; but we cannot refrain from observing that while his demonstration about the importance of an all-round fire is unanswerable and fatal to Cole's ship, he over-estimates the advantage of the "simultaneous fire of the *Hercules* in six separate directions," and commits a serious mistake in assuming that four guns in two turrets can only fire in *two* directions. If loading, aiming, and firing could all be effected in an instant, the argument would no doubt be sound; but such not being the case, the firing may alternate, viz., one gun may fire while the other is being loaded. By this method objects separated thirty degrees may be kept under fire as effectually as if two guns in broadside were applied. Evidently, the turret may be as well moved from a given position and returned to it, during loading, as to remain stationary. Indeed, reasons are not wanting why it is better to keep moving than remaining still. We have alluded to this subject to correct the general impression that both guns in a monitor turret must necessarily fire in the same direction. Mr. Reed deems the assumed necessity of firing both guns in the same direction to be a great disadvantage, and thinks that it "assuredly deserves the most serious attention of naval men."

No one who is thoroughly acquainted with the monitor system can peruse the chapter under consideration without arriving at the conclusion that the author of "Our Iron-clad Ships" possesses no accurate knowledge of the American monitor. He comprehends the general features of the system; he finds that by dispensing with freeboard and sails he can apply side-armor of such thickness as to insure impregnability and secure the advantage of an all-round fire; but he evidently is not acquainted with the mechanical detail of an American monitor, nor has he given due reflection to the subject, as will be seen from the following brief examination of his views and quotations. The chief constructor of the English navy thinks that our turrets "are especially liable to be driven out of their proper position by the spindle becoming bent when struck by heavy shot." The proposition that a weight of 200 tuns, kept in place by a vertical wrought-iron shaft of twelve inches diameter, should be driven out of position by a shot, is too absurd to demand refutation. In disparagement of the monitor turret, he quotes an erroneous account written by a civil engineer at St. Louis concerning the *base ring*, although it is well known through Bourne's work and other publications, that a base ring forms no part of a monitor turret, such a ring having been applied simply as an expedient to strengthen turrets made of very thin plates. Several other disparaging statements are quoted from the account published by the civil engineer mentioned, who has no personal experience on the subject other than building, to plans furnished, some small turrets for certain river boats, misnamed monitors. The readers of "Our Iron-clad Ships" also learn from the same source that the rotation of the turret is liable to be stopped "by the downward swelling caused by the impact of heavy shot." We have pointed out on former occasions, that this assumption is a gross mistake; that stoppage from such a cause is impossible, since the outer plating—comprising more than three-quarters of the entire thickness—does not reach the deck.

The central shaft of the monitor is also criticised, and Cole's plan of revolving the turret recommended. The chief constructor apparently does not comprehend that the settling of the deck does not affect a turret which, like a mill-stone on its spindle, is supported on a central shaft; while on Cole's plan such settling causes the rollers to recede from the base which they are intended to support. The views expressed relative to turning the ports away during conflict ignore the fact that the American monitors are provided with massive port-stoppers, which are always shut except at the moment of firing. The important circumstance is also wholly overlooked that the turret, during an engagement with a single opponent, is always kept in position by the officer in charge, the gunner having in fact nothing to do with lateral aim; he fires whenever the roll or elevation suits. Again, a *single-turreted* monitor, in nearly all cases, fires over the bow, obviously uninfluenced by the rolling, and but little affected by the state of the weather, as it happens but seldom that the ports are flooded when pointed towards the bow.

The assumed "bending" of the turret shaft is purely imaginary, as the following explanation will show. The deck ring which supports the base of the turret rests upon four bulkheads, all as deep as the vessel, two being placed transversely and two longitudinally. The tops of these bulkheads cannot be, and never have been, out of a true plane in our monitors with iron hulls. *Wooden* monitors, be it observed, are makeshifts, incompatible with the turret system.

As no constructor understands this better than Mr. Reed, why does he put before his readers, as a serious objection against the monitor turret, the statement of an inexperienced civil engineer concerning the settling of the deck of the wooden turret vessel *Miantonomoh?* And why does he advance as a point against the *system* the fact that the base of our wooden vessels had "coats round the turrets to keep them water-tight" while crossing the ocean? He knows that the turrets of the monitor fleet, exposed to the waves of the Atlantic during the war, were at all times ready for action. Those who saw the monitors during the gale off Fort Fisher, with their turrets half submerged, can estimate exactly the strength of the objection urged. In fine, the assumption that the joint between the base of the turret and the deck is liable to leak so as to endanger the safety of the vessel, is mere conjecture based on inferences drawn by those who are not correctly informed of the true cause of the foundering of the original *Monitor*—an accident wholly unconnected with any defects of construction.

Referring to the "breastwork monitors" *Thunderer* and *Devastation*, without masts and sails, we are of opinion that they will prove the most powerful ships in existence; but they are costly, first class iron ships, protected with solid armor, such as only England can produce at the present time, and they draw twenty-five feet of water. Our experienced naval officers well know that such vessels are not calculated for the defense of the several harbors, dock-yards, and maritime cities of this country; they know that the points to be defended are too numerous to admit of our employing such costly structures as the *Thunderer* and *Devastation*; and that the American monitor, with its impregnable turret, submerged hull, and light draft of water, is better adapted for our shallow waters.

The writer of the chapter on turret ships, apart from his erroneous views of the American monitor, appears to have forgotten what took place subsequently to Admiral Du Pont being relieved from his command at Charleston. The report of Du Pont that the monitors "are totally unfit for blockading duties" being quoted, it will be asked, why is the report of his successor, Admiral Dahlgren, omitted? The former was detached before he had time to become at all acquainted with the new system; while the latter, during two years, blockaded Charleston with the monitors so effectually that the Confederate stronghold was completely sealed. The report of the several commanders of the monitors during the first demonstration against Charleston, under Du Pont's command, is quoted as decisive against the monitor turret; but no reference whatever is made to the important fact that these officers were wholly inexperienced with them, and that the vessels were brought directly from the engine establishments to the enemy's batteries. Had the fleet not been brought into action again, the reference to the reports from the commanders during this their first essay would have been unavoidable; but what are the facts? Admiral Dahlgren afterward engaged the Confederate batteries, with these same monitors, nineteen times between July 18th and September 8th. The report of this experienced commander and accomplished naval artillerist concludes thus: "The battering received was without precedent. The *Montauk* had been struck two hundred and fourteen times, the *Weehawken* one hundred and eighty-seven times, and almost entirely with 10-in. shot."

New Railway Bridge.

The piers for the new railway bridge over the Connecticut river, at Saybrook, Conn., on the Shoreline railway, are now nearly completed. They are made in a rather novel manner, with a view to prevent damage to the wooden piles from insects.

A cluster of nine or twelve piles are driven as near together as possible, and around this cluster are placed sections of cast iron cylinders of the required diameter, until they reach from the hard bottom of the river to ten feet above high water. After these are in position, the intervening space between the piles and the inside of the cylinders is filled with a concrete of water cement and sand, so that, when finished, the structure is made as solid as one can well imagine.

The center pier of thirteen cylinders—five, eight in diameter, and eight, five feet in diameter—is the one on which will revolve the balance draw, with two openings for the passage of vessels on either side. The draws will be 120 feet in the clear, affording ample room for any vessel that will ever pass up the river to go through the draw. The draw-bridge proper will be of iron, 288 feet in length, and will revolve on a pivot in the center of the large pier, and will be supported by a circular track railway, and so geared that it can be opened or closed by one man.

Another Card from an Advertiser.

The Lamb Knitting Machine Company, Chicopee Falls, Mass., in sending a new advertisement, state as follows: "Please insert this advertisement on last page of your paper for three months. We are happy to assure you that in all of our extensive advertising, no other paper brings so many applications for further knowledge of our machine as the SCIENTIFIC AMERICAN; and one good thing is, it does not cease with the issue of the paper, for we now often get our notice cut out and sent us which was inserted over a year ago."

THE EAGLE CARPET STRETCHER.

Our engraving represents a new carpet stretcher, which, we think, will commend itself to every intelligent upholsterer. It gives a powerful leverage, at the same time being simple in construction, quickly and easily applied, compact, and portable. It does not injure the face of the carpet in putting it down.

It is only a trifle larger than the tack hammer; but a carpet can be stretched better and more strongly by it than anything of the kind we have yet seen. The detail in the margin of the engraving gives a good idea of the construction of the implement. The jaws, A, have goosenecks, pivoted at B. The points, C, engage with the floor when the implement is in use, and the power is applied at the handle, D.

The larger engraving shows the method of applying the tool. With ordinary stretchers the operator can only stretch the portion of the carpet between the point where he stands and the base boards. With this he may draw himself, furniture, or what not, along with it, as he has a good fulcrum on the floor, by the engagement of the points therewith.

In use the carpet is doubled back, as shown in the engraving. The jaws which are self-clutching, hold tighter and tighter as more power is applied to the lever or handle, D. The carpet being stretched is tacked temporarily back from the base board, and the edge being then released is turned down and permanently tacked to the floor. The temporary tacks are then withdrawn. The jaws thus come in contact only with the back of the carpet, and the face is not marred and torn as by the use of the old style of carpet stretcher.

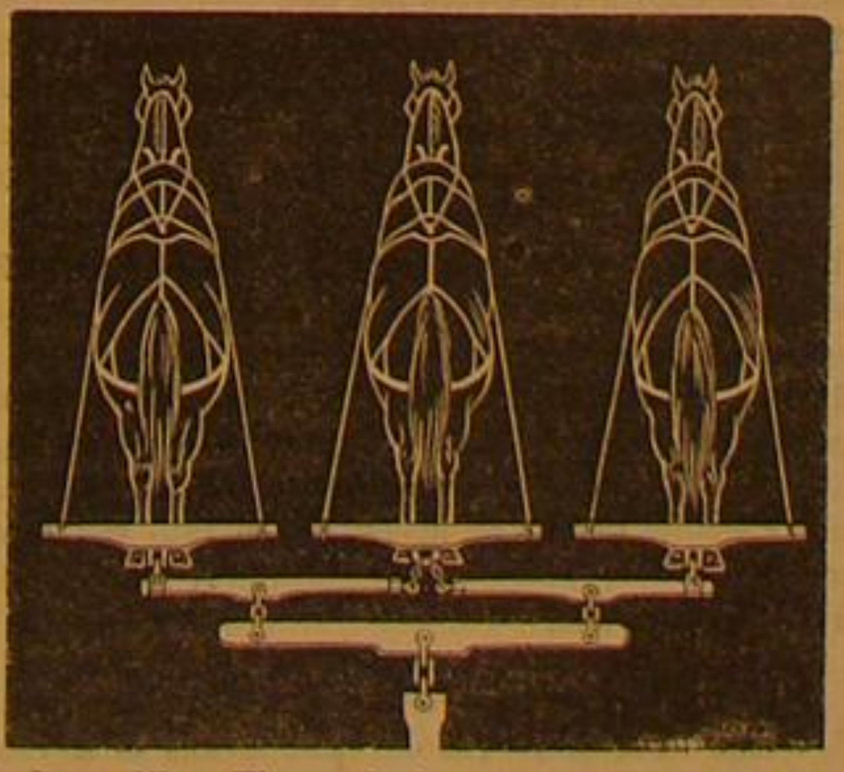
The instrument is excellently adapted for stretching canvas on the deck's of steamboats for painting, and for stretching webs on sofas.

The instrument has been in practical use about one year, and has, we are informed, given the most perfect satisfaction. The inventor, a practical upholsterer, states that those who use this tool, and thus become practically acquainted with its merits, will never exchange it for any carpet stretcher yet introduced to the public.

Patented, through the Scientific American Patent Agency, Feb. 8, 1869, by William Brown, New York city. Address for State or manufacturing rights The Whitlock Exposition Co., Nos. 35 and 37 Park Place, near Church street, New York.

HOW TO HITCH THREE HORSES TO ONE PLOW.

The diagram published in No. 2, current volume, showing how to hitch three horses to one plow, has received some severe criticism, which it doubtless deserves. It is stated that no equalized draft can be obtained by it, unless the horses draw equally, naturally. Nothing about the device compels



them to draw alike. The method proposed has, it is said, been tried in many portions of the country, and found of no value.

We have received several diagrams illustrative of ways in which draft may be equalized, one of which, as being the most practical, we give herewith. This will close the subject as we can give space to no more communications upon it.

The diagram explains itself sufficiently without description.

M. BOILLOT states that he filled jars with hydrogen and placed some sulphur in the same, and, having passed an electric spark through the latter, igniting and volatilizing it, that a perceptible quantity of sulphureted hydrogen was produced.

Correspondence.

The Editors are not responsible for the Opinions expressed by their Correspondents.

Steam Engines at the American Institute.

MESSRS. EDITORS:—The steam engine trials at the late Fair of the American Institute, has resulted in an unfortunate controversy between the competitors, and, as it at present stands, between one of the competitors and the judges.

We propose not to continue the controversy in which we have no interest, and in which we think the public has none, but to look at and discuss the causes of dissatisfaction, that we may, in case another similar contest takes place, avoid all questions that have arisen in the trial alluded to.

The rules published for regulating the trial were for the scientific engineer satisfactory, inasmuch as he knows that the measure of the steam in the cylinder is the measure of the power exerted by the engine. He also knows the quantity of water due to the steam, from which he calculates the cost of the power.

The engineer also knows that the water pumped into the boiler is unreliable, either as a measure of steam at the end of the stroke or power evolved; inasmuch as more or less water goes over to the cylinder in suspension with the steam, which is not power to propel the piston, but, on the contrary, tends to obstruct it. This was fully illustrated during the trial when the steam was notably wet, with the exception of some six hours during the second day.

To the public—to users of steam engines, who are accustomed to rate the cost of their power from the coal consumed, the steam test is neither understood nor satisfactory. Hence, the fuel consumed should have been accurately weighed and reported, and such deductions made as the actual steam indicated. This would have satisfied both scientific and purely practical men.

From the acknowledged ability and experience of the superintendent, an able and impartial report was expected by the exhibitors and others interested. While we fully accord to him impartiality, we cannot but regret that the circumstances which surrounded him rendered it utterly impossible to do himself or the subject justice.

His duties as the general superintendent of the whole exhibition, precluded the possibility of giving the special subject of the trial of the engines that undivided attention which its importance imperiously demanded; and it surprises us that the report has attained the high grade of respectability it possesses, considering also that he was almost entirely unaided by the judges.

The non-attendance of the judges is to be severely reprehended. By accepting the office they accepted the duties thereof, and could no more do it by proxy than could the judges of a court in a capital trial. It is true that men's lives were not at stake; but there was what men often value next to it—mechanical and professional reputation.

We have nothing further to say of the judges, but would suggest to the Board of Managers with all due deference, if future trials should be had, to make it a condition that the judges shall be present and assist, that the number shall be not less than five, and that at least three of them be practical men in the business, and the balance scientific men whose attainments, through study and observation, have fitted them for the office; men of these attainments, we are happy to know, are members of the American Institute.

Another point of great importance remains to be mentioned. It is the short time that was allotted to the trial. Being the last week of the fair, there was not time, nor half time to give the superintendent, even if he had nothing else to do and had been properly aided by the judges, an opportunity to do justice to such an important trial. The exhibitors had not time, if any occult or accidental defect should manifest itself, to correct or repair it. The public, too, has a right to complain of being deprived of the instruction in the use of steam and the steam engine, which an extended and properly conducted set of experiments would have afforded.

The character and reputation of the Institute suffers by these half-way experimental trials.

While we would not make these expositions for the money they would put in our treasury, *per se*, yet we would make all the money we could to expend in diffusing knowledge and stimulating improvements; and if we may judge by the crowds collected in the machinery department during the late short trial, we may safely say it was the most attractive and paying part of the exposition. And, had the experiments been continued for four weeks, it would have shown well on the credit side of the ledger, and given better satisfaction to all concerned.

A MEMBER OF THE AMERICAN INSTITUTE.

Burning Bituminous Coal.

MESSRS. EDITORS:—In Illinois the consumption of bituminous coal (or as it is better known, Illinois soft coal) is immense, and anything calculated to do away with some of its inconveniences will be of benefit to hundreds of thousands.

This coal is found in abundance in nearly every section of the State and is a most economical and convenient fuel, but it has its "drawbacks." With a poor draft considerable smoke escapes when the fire is being replenished, and its action upon various substances seems to be not that of pure carbon. I have never analyzed it, which perhaps I should do before addressing you upon the subject.

This nuisance *inside* our dwellings is entirely abated by having a strong draft which will carry up and discharge from the top of the chimney the unconsumed flaky lampblack. But where is it to be deposited? On our roofs, of course, and here lies our great trouble—our somber hued "skeleton." Once settled upon the roof, its apparent destination is the cistern.

Some one says, "Use Mosher's rainwater cut-off, which will conduct the first washings of your roofs on to the ground, and then allow your clean water to enter your cistern." A very good suggestion if we governed the rainfall; but in a dry season, when a shower would just suffice to wash the roof nicely, how could we make it available?

In sparsely settled neighborhoods this coloring of the water is scarcely perceptible, but in the large towns and cities it becomes a serious matter, as such water is really unfit for laundry purposes; clothes washed in it always looking *dingy*, not to say *dirty*. You will say, "Filter it;" but how? We have never been able to obtain a filter which would give us *clean* water and not also give us *hard* water.

I notice in the SCIENTIFIC AMERICAN you recommend Kedzie's filter for general use; but I am informed by a gentleman who has used one, that although he is able to obtain from it clear water, the "sudsing" properties are wanting or greatly impaired.

From my own observations, I am led to believe that we separate with our filters, not the *mechanically* combined "soot," but something *chemically* combined with the useful constituents of rain-water.

If you do not agree with me, and are of the opinion that any form or kind of filter will answer the purpose, will you please indicate it? or if you agree with me that the trouble needs a chemical remedy, can you not suggest some agent which shall destroy the combination and precipitate the "soot" in its original form?

If you find this impossible in the absence of sufficient data, perhaps some of your scientific readers, more competent than myself, will feel enough interest in the matter to make analyses and report through your columns the remedy.

Aurora, Ill. M. L. BAXTER, M. D.

[We publish this letter in full that those who have experience in the same direction may contribute if they can to help our Illinois friends our of their troubles. We advise the trial of alum, say 1 oz. to twenty gallons, as we are informed it has been successfully used to purify water in other districts similarly troubled.—EDS.

Hardening and Tempering Steel.

MESSRS. EDITORS:—In the SCIENTIFIC AMERICAN of February 5, I find an article upon "Solutions for Hardening Steel," upon which subject I should like to make a few remarks.

When heated steel is plunged beneath the surface of a liquid, as in the process of tempering, chemical changes affecting both substances are not unfrequently produced. The nature of such changes often renders a particular liquid peculiarly favorable for the production of steel of a certain hardness and elasticity. When pure water is employed hydrogen gas is set free by the action of the heated metal, which, at the same time, becomes covered with a film of rust. The preparation of hydrogen by this reaction is a common lecture experiment, and a red-hot poker may be employed by way of illustration. These changes do not take place, at least to any considerable extent, below a red heat, and may not consequently be active where the metal is dipped when at a comparatively low temperature. If, however, the metal has been more strongly heated, this surface oxidation probably occasions a partial removal of carbon from the superficial layers of the metal, producing a mild or softer variety.

This decarburization takes place at a low red heat in the preparation of steel by the Sheffield process of cementation; and though I am not aware whether any analyses of steel, before and after tempering, have been made such as definitely to decide the question, several experiments by the well known metallurgist, Dr. Percy, F. R. S., which will be found in his "Manual of Metallurgy," show that, in the process of tempering, the state and probably also the quantity of the carbon is decidedly changed.

As, therefore, the tempering heat is greatest where the hardest varieties are required, the employment of water is probably undesirable, as being in such cases prejudicial to the quality of the metal. The various oils and fats frequently used for tempering would not be open to the same objection, as the chemical changes produced in them are not such as to decarburize the metal.

When irons or steels are heated with animal matter containing nitrogen, and yielding ammonia by distillation, a portion of that element is absorbed by the surface of the metal, and, entering into its composition, produces great changes in its hardness and other properties. Thus, in the operation known as "case-hardening," iron is heated with leather shavings, horns, hoofs, or other such animal refuse. By this means a hardened surface is obtained, and as the metal is found to contain nitrogen, the phenomenon is doubtless due to the introduction of that element. In Sweden the surfaces of iron pile-heads are hardened by the introduction of arsenic. The metal is coated to the thickness of one tenth of an inch with arsenious acid (dissolved in hydrochloric acid) mixed with organic matter containing nitrogen, and is then strongly heated. The surfaces so obtained are undoubtedly hardened, and are said, but with what truth I have been unable to ascertain, to resist the action of the atmosphere and of water better than the unprepared metal.

A similar introduction of nitrogen is effected when nitrogenous liquids, such as urine or leather parings, are used in the tempering of steel; and in all cases the preference of a practical workman will, if real and well grounded upon experience, admit of verification by the light of scientific research.

In conclusion I would remark that the changes taking place in the process of tempering have, as yet, been but imperfectly investigated, and there is no doubt that their further study would not be devoid of scientific interest as well as of practical utility.

GORDON BROOME, F.G.S.,
Associate of the Royal School of Mines, London, England.

Mechanics' Fairs.

MESSRS. EDITORS:—I notice that the subject of the judges' decisions at the late exhibition of the American Institute, in your city, has received considerable attention in the SCIENTIFIC AMERICAN of late.

Not being particularly interested, I have not followed the discussion closely, but from facts within my knowledge, touching the acts of judges at a similar exhibition in this vicinity, I have no doubt that your remarks on the report of the judges referred to, were not only right and just, but eminently proper. I think it is quite time that the transactions on such occasions were called by their right names, and the community at large be relieved from the impositions practiced upon it by so-called judges at these mechanics' fairs. In the early days of these exhibitions, the promotion of the mechanic arts, by enabling the mechanics and inventors of the country to exhibit their productions to the public, and submit them to the examination of competent and *honest* judges, who should decide upon the comparative merits of the same, was the true and laudable object held in view. Then, judges' decisions were of value to the proprietor of the manufacture, and to the public. But following in the wake of political and other organizations, the mechanics' fairs of the present day, in most cases if not in all, are such only in name. Mercenary considerations are now the governing principles of such exhibitions, and judges' decisions are not only worthless in the majority of cases, but positively injurious to all concerned. Corruption stalks through all their departments, and judges sell themselves, not, perhaps, to the extent practiced by the corrupt politician, body and soul, but barter their judgments for gain, where they should be rendered free and unbiased.

At the late exhibition of the Mass. Charitable Mechanics' Association, in this city, cases of this character were not wanting. A gold medal was awarded for a certain machine, and after the award was made, the chairman of the board of judges for that department called at the place of business of the proprietor, and received a machine of that make free of charge; while another person connected with the Association demanded one for his influence in procuring the award, but failed to convince the party of the value of his services.

This is one instance, probably there were many more of a similar nature. I will not occupy your space with further comments at the present time, but would suggest to future managers of this institution that the next time they hold a fair, they advertise for proposals for the prizes, and distribute them according to the bids; as securing to the exhibitors a more equitable distribution, giving them all an equal chance for the highest.

I may have a word to say at a future time, in regard to the *character* of the judgments rendered upon articles on exhibition, and other matters relating thereto. G. L. B.

Boston, Mass.

English and American Steam Boilers.

MESSRS. EDITORS:—English boilers are made of $\frac{1}{2}$-inch and $\frac{5}{8}$-inch plate. Here they are made of $\frac{1}{4}$-inch and $\frac{3}{8}$-inch iron. The foreman in an English shop makes a templet for every new boiler, with the proper camber for the thickness and width of plate he is going to use; here a wooden strip saves that trouble, the camber is alike in all thicknesses and width of plates, and the warping of the old strip is inconsiderable!

It will be observed that in punching boiler iron the holes are rendered taper or wider at the under side than the top. In England, the wide side is put outside of the boiler, so that the rivet is partly countersunk. When the head is cut off, it is found to be tight in the hole. Here, the plates are bent so that the wide sides of the holes are outside; when the rivet-heads are cut off the rivets fall out.

In England the riveters always commence in the middle of the rings and work all the slack iron into the seams. Here the plates are riveted across the seams first, and all the slack iron which has to be left in the rings, to get them together, has to be puckered in as best it can.

In England, a man is placed inside a boiler to hold up the rivets and close the lap. Here a "lump" of iron holds up the rivets, and nobody closes the lap.

I have been shot at three times within the last twelve months, and wounded once, with these exploding tin-pot boilers, and I think it is getting time that a Christian community should ask for an investigation into these wholesale murders. A BOILER MAKER.

Indianapolis, Ind.

Electric Heat Applied to Industry.

MESSRS. EDITORS:—Through the means of a voltaic battery, a heat is produced in a metallic wire sufficient to bring it to a red heat, and even to a melting point.

I believe that this property could receive an application in industry. By having a metallic wire properly stretched, and heated by a regular or intermittent electrical current, a large log of wood might be divided. Some qualities of woods of South America, as the iron wood and nearly all the dye woods are cut into boards with the greatest difficulty; the saws or instruments have to be sharpened very often. With a set of wires all heated by the electrical current, the log would be divided into boards. As for the way of preventing the further combustion of the wood, I believe that very dry sand allowed to pass over the divided place as soon as the wire would have operated, would answer the purpose.

C. WIDEMANN.

Steam Rollers.

MESSRS. EDITORS:—It seems that New York and vicinity are having some experience in the use of the steam road-roller; and it appears from the facts we gather upon the subject that this machine is not yet out of the twilight of experiment.

We believe that there is now sufficient experimental knowledge upon the subject of steam machinery, as applied to locomotion, to produce a successful and standard machine for road rolling, as well as for general traction purposes.

One party condemns cog wheels and adopts the chain belt as the best method of applying the power to the traction wheel; another party rejects, with equal emphasis, the chain and adopts the cog wheel; another party rejects both chain and cog wheel, and is equally positive that a direct connection with the traction wheel, as in railway engines, is the best method. One adopts one cylinder with a fly wheel; another adopts two cylinders without a fly.

While we believe that much elaborate and costly experiment is unavoidable, in bringing such an important matter to a successful issue, we nevertheless believe that there is considerable needless floundering in the dark upon this subject.

It is quite evident that a steam locomotive, whether applied to road rolling or any other purpose, can never work very successfully with only one cylinder applied to a crank; it is equally evident that either of the methods we have just named, of applying the power from the piston to the traction wheel is the best for certain purposes, and that neither of them is, by any means, adapted to all.

For light and quick work on good level roads a direct connection with the traction wheel is the best. The two cylinders should be placed as closely together as possible. They may be cast in one piece, and be common to one steam chest or valve box. One traction wheel is sufficient. For indifferent roads and considerable elevations, and for light and medium purposes and quick motion, the chain, if properly made and applied, is preferable to cog wheels. The chain wheels should have the ratio of one to six, or more, according to the exigency.

Whichever differential device is used, whether chain or cog wheels, we believe in making considerable difference between the driver and the driven, reducing the cylinders to a minimum capacity, and working the pistons quite rapidly; in this way the framing and other parts may be much lighter, being subjected to less stress; and the whole movement is more equable and satisfactory. The teeth of the chain wheels should be large in the direction of their motion, and as thin in the other direction as is consistent with strength, and they should be cast in a "chill." The thimbles of the chain that act upon these teeth should also be cast in a "chill." The large chain wheel should be attached to the spokes or rim of the traction wheel, and so attached that it may be easily replaced by a new one. One permanent traction wheel will be sufficient in most cases; but the opposite wheel should be so fixed as to be engaged when necessary.

For such severe work as plowing, road rolling, or for draft purposes on common roads, we believe that cog wheels will prove, in the long run, far more economical and satisfactory than the chain, but the cogs should have less breadth and depth in proportion to their thickness than it has been customary to give them. There is hardly any danger of making the cogs too massive in the direction of their motion or thickness. The cogs should be cast on a "chill," and the large cog wheel should by all means, be fixed to the spokes or rim of the traction wheel or roller, instead of the shaft, and in such a manner that it may be easily replaced by a new one. We should make this wheel as near the size of the traction wheel as possible, and the pinion that drives it as small as is consistent with good service. This would bring the traction wheel more perfectly under control of the engine. Bevels and inside gears, or cogs, are more objectionable than the spur wheels for this kind of service. Z.

Damage to Trees from Borers.

MESSRS. EDITORS:—From what I have seen in this country, I have come to the conclusion that the borer will not trouble a healthy tree; but let any of our common fruit trees be neglected for a year or two and they will be full of these destructive insects. They don't attack the same part of the tree here that they do in the Eastern States. Here they go into the body, limbs, crotches, or any part exposed to the sun; in the East they go in near the ground where the tree has a bulge around it. What makes that bulge? Is it not the freezing and thawing, and the effort of the tree to heal the injured part? The trees here have no such bulge. Now it will not cost much for some of your fruit growers to experiment a little, by putting something around their trees to keep the frost from injuring them.

I think the borers serve a good purpose; for if the owner of a tree does not think enough of it to take care of it, let the worms have it.

If a pine or oak is cut down here and allowed to lie for six months or a year with the bark on, the borers will eat it half up. I don't know that they are the same kind that work in the fruit trees, but they have a family resemblance.

I. X. I.

Men of Progress.

MESSRS. MUNN & CO:—Please accept my best thanks for prize engraving, "Men of Progress," I am happy to announce its arrival in *good order*, and an ample repayment for procuring subscribers, whose papers come to hand promptly and regularly. And were it not for the tightness of the one thing needful in this mountainous district, I should sally forth and endeavor to procure another copy or two for complimen tary presentation. May every success attend your widely spread journal, and may her wings never grow less.

I am, gentlemen, yours truly,

Whitehall, N. Y. ROBERT IRWIN.

A Voice from the South.

The following letter is from a distinguished citizen of Mississippi, for whom we have recently taken a number of patents in this country and abroad:

MESSRS. MUNN & CO.,—*Gentlemen*: I have received all my European patents. You must allow me to express my sincere thanks to you for the manner in which you have conducted the whole business. I do, and shall, most cordially recommend you to all persons wishing to take out patents.

Fayette, Miss. D. HARRISON.

[It is a noticeable fact that the inventions submitted to this office from the South, exhibit a degree of novelty and practicability not formerly evinced from this section of our country. Whether it was the war that had sharpened the native genius of the South, or that these inventions emanate from Northern men located there, we are unable to state; but the fact is patent that many good inventions are coming from the Southern States.—EDS.

Another Case in Point.

J. L. Alberger, Treasurer of the Ransom Siphon Condenser Company, Buffalo, N. Y., writes us as follows:

"We are under obligations for the clear and perfect manner you have illustrated our invention in your issue of Feb. 12th. Letters are pouring in from all parts of the country, and we conclude that everybody reads and appreciates the SCIENTIFIC AMERICAN.

A JOURNEY WITH A RAFT.

From the Building News.

The timber trade of Germany has often been described, but few persons have gone down the great and little rivers with a raft, encountering the various obstacles of this awkward navigation, and entering into the enthusiasm of the crew, who are neither landsmen nor seamen, neither engineers nor sailors, but pilots and steersmen exclusively, who build their cabins as they go, and make their craft larger as the water it floats in deepens. We will not pretend to have made the voyage from the Black Forest to Amsterdam without a good many breaks, or, indeed, on the same batch of timber; but, having joined a woodland company at various points, and followed the trees of the mountains from their fall under the ax to the mighty saw mills of the Lower Rhine, we think a few sketches of our broken journey may be interesting to those who frame for use these gatherings from the German forests.

And, to begin, the ax-bearing population, which hews, and barks, and splits, is one of the most simple, regular, and devout in the whole world. It was a pleasure to be among them and their quiet, primitive, humble manners, as, in a state of independence, suggestive rather of a newly cleared settlement than of a region with a history older than that of most Roman camps, they offered the hospitality, made rich by welcome, of their sylvan dwellings—huts scattered apart, and not in villages—to the stranger, whose systematic inquisitiveness they are quite intelligent enough to understand. This agreeable novelty have we enjoyed, and, in describing it, premise that we are making a whole from a series of fragments.

First, among the firs that grow in gloomy masses from the center of Wurtemberg, across a hundred and twenty miles, and right through South-western Germany. In the earliest light of the morning, stalwart men, book and pencil in hand, are perambulating beyond all trodden paths, knocking at lowly doors, notching particular trunks, leaving messages and marks with the women and children—unless the last are already out collecting beech nuts or resin, and indicating thus the felling which is to be authorized during the day. These "masters of the wood," or stewards are, in general, fellows of Herculean mold, with skins like leather that has been tanned in Canadian tincture. Anon, the forest is alive, and clamorous with its own peculiar industry. The silver fir, one hundred and fifteen years old, so nearly as the surveyor may calculate, is coming down with an echoing crash. It is only pine, but we have seen it 130 ft. high, and nearly 7 ft. in diameter. In about two hours an average stem gives way, and swoops in a dead weight to the earth, there to be stripped of branch, bark, and foliage, which are burned or cut up as fuel, or converted into charcoal, while the "log" itself is prepared for transit to the sea—that is, if it be of proportions sufficiently noble. To be "Holland Wood," worth transport down, it must be 72 ft. long, and 16 in. wide at the narrowest extremity; but, being of this size, how to move it, until the carrying water current be reached? We saw this process four miles off the Euz, which is a prodigy of a stream. Fir trees, in parallel lines of three, are split, barked, smoothed, and soaked; then laid, like immense rails, down and round the slopes of the hills, conducted from the hewing ground to the banks of a river. When the river is full, and they are wet with rain, the lumber is laid upon them, and, impelled by a sudden push, away it glides, accumulating force in going—perhaps several miles; now leaping a precipice, then, shifting its course, and snapping like a match midway; again, getting into the dry bed of a torrent, which the foresters flush from an artificial lake, creating a tremendous cataract in half an hour; finally, arrested by dams or gratings before it commences the seaward journey, for the purposes of sorting and identification. Hitherto it has traveled alone, henceforth it is under guidance; and here, for a time, we join it.

Now, in order to appreciate this sort of experience, you must remember what the Euz is.

The Euz is a small river, issuing from the mountains about fifteen miles above Wildbad, very rapid, very noisy, very irregular in its course, exceedingly shallow, crowded by enormous boulders, and interrupted by countless cascades. The problem, which would seem insoluble, were it not constantly solved, is, how to manage down this boisterous flood a raft several hundreds of feet in length, composed of tree trunks, each being enough for a sea clipper's mainmast, fastened together by osier twigs, which is to vandyke when the waters vandyke, stop when they fall, take leaps with them, shoot all the rapids, turn all the corners, and find its way, now to the Neckar, and next to the Rhine, and so into the general timber trade of Europe. We can testify that the adventure, for those who attempt accompanying the timber, is not luxurious. It is half swimming and half running. You feel as if riding, without being used to it, upon a tender behind a locomotive. The logs will not lie together; you are ankle-deep, if not knee-deep, in the stream; a false step may involve a merciless contusion; your upper clothing, although hung on a post, is liable to perpetual wetting, and every now and then your companions change. Let us confess that, in the good hamlet of Calmbach we quitted the raft, weary for a while of its romance, and suffered that portion, at any rate, of the summer tribute from the Black Forest to the carpenters' shops of Europe to go upon its voyage unblessed. But, with a courage worthy of a better cause, we found ourselves, two days later, upon a like slippery and inconstant platform, which gradually grew longer and wider, until a more generous channel opened, and we left again on an inland excursion, only to rejoin on the Upper Rhine. Here the spectacle becomes a wonder. The raft resembles one of Sinbad's impossibilities; morning and evening it expands; it stops at a landing station, and lo! you might fancy that a town was on a tour, paying a visit to the village! It is no longer a raft; it is an island which you inhabit. Men are erecting huts upon it. There is one for you, with a bed and a stove, and a locker full of provisions. You go aft: nothing except the gigantic logs, trailing with the stream; you go forward, and only twelve helmsmen, with oars of Grecian shape, silent and steady, who will answer no question, but keep their eyes intent upon the piers of bridges, the quick curves, the well-known shoals, and with very good reason. For, supposing a timber raft to strike a bridge, the bridge would float away with it. Supposing it struck by a steamer, so much the worse for the steamer. Yet everything is not propitious to the "rafting master." A saying is current about him, that he should, before venturing, possess £30,000—£10,000 in the forest, £10,000 on the water, and £10,000 at the bank, to cover disasters. But that is an exaggeration. The commerce in timber is at once gigantic and profitable. It not only built Amsterdam—it built the very foundations upon which Amsterdam is erected; it supplies nearly the entire home industry of Holland; it is a source of competence to the poor, and wealth to the rich. The great rafting companies of Calmbach, Gemsbach, Phorzheims, Wolfbach, and Illbach, employ their thousand, and the demand continually increases. It would not be an adequate supply, were it not that the forest culture of this region is about as ignorant and faulty as can be conceived. A scarcity is, from year to year, dreaded, while the land under protection increases.

But we must go on with our raft. It is now a populous territory; it contains human abodes, magazines, altars, a Calvary, a miniature market, a dairy, and an overseer, who holds a strict eye over his inventory. We count beneath our feet 190 trees, all proper length and girth, loaded with shaped deals. Two or three nights spent—not, we confess, on the raft, but, more comfortably, ashore—aggrandise our raft, and the logs are beyond reckoning. The head man assures us, however, that they number about 6,000. The aggregate value is, at this time, about £4,000. Fresh raftsmen are on board; more skilful pilots are engaged; you tread an unyielding deck; the floor seems sound as mother earth itself. And, all the while, not a stick has been brought down except from a single district. We accept, gratefully, the help of a learned German economist, whose works have been gracelessly robbed by the guide-book makers in estimating the importance of this trade for one year:

575	oaks at....	30	florins each.
2,089	stems of Holland at..........	46	"
2,000	stems at.......................	23	"
800	do.	15	"
1,500	do.	12	"
25,000	stems of measured wood at..	9	"
121,935	of common wood at..........	3	"
4,696	sawing blocks..............	4	"
180,946	of deals at.....................	1	"
2,497	cords of fir wood for fuel at..	9	"
6,671	pieces of timber at..........	4	"

—in all, about £80,000 in round numbers. The prices of the year were for the cord of 144 cubic feet (firewood):—oak, 17s.; beech, 10s.; fir, 5s. For building:—4d.; 3½d., and 2d. a cubic foot. But in this estimate must be included the cost of the navigators, and, although they earn no more than sixteen pence a day, and this not all the year round, they are not to be lightly considered, arithmetically speaking. We have the bill of fare before us of a raft between the mountains and Dordrecht, and it reads like the *menu* of a city besieged. Cattle are actually kept and slaughtered on these mighty moving decks. Well, the company consumed in the interval we have mentioned, 5,000 lbs. weight of bread, 3,000 lbs. of meat, 2,000 lbs. of cheese, 50 sacks of dried vegetables, and 500 casks of beer. But then the voyage, only from Bingen to Dordrecht, though occasionally done in eight days, often lasts nearly as many weeks.

The timber in charge of these hungry pilots was worth £24,000. It was one parcel out of many, representing a yearly value of nearly half a million sterling. And there are reasons for calling this Holland wood. Holland has no forests worth speaking of, but it is a wooden country. Its cities—Amsterdam and Rotterdam especially—are built upon foundations of German timber; German timber is the mainstay of its dykes, and the material of its bridges; it has sunk whole forests in the bog, and the mystery is how they last so long without decaying. We were present, the other day, when, to facilitate an experiment in drainage, a shaft was attempted to be sunk through the rotten soil of the Zuyder Zee, and the workmen came upon a structure of piles that had been buried for upwards of two hundred years. They were nearly sound, and had simply been coated with pitch. Again, the Dutch build above ground, as under, with the oak and fir of the Hartz, and it is a proverbial saying among them that, in the course of time, they shall require every tree growing upon a German hill. But this is mere boasting. For every log floating down to Dordrecht, ten are chopped up and burned, or converted into scantlings, for use in the upper country. There it is wanted in immense quantities for barrel staves and boats, for house building and railway works, for endless miles of palisading, and a thousand forms of industry, from fortification to toys, in which the German artificer employs wood. This, however, is only by the way. Our principal purpose was to give a notion of what a voyage must be, and is, to judge from fragments, on a river raft. Up in the valleys it seems at first incredible that you should succeed in making any way at all. The load appears too ponderous for the slim stream of water to carry; every moment, while the force of the current continues strong, it threatens to get wedged in between the banks; now its tail hangs among tremendous boulder stones, while the foremost part is entangled in deviousness, out of which all methods of escape are invisible; then, after a few rainy hours, comes down a rush from the mountains, and the unwieldy mass, taking a fresh start, is guided along with indescribable dexterity, the men maneuvering with a perfect knowledge of every twist and shallow, every turn and obstruction, all the way. But, for any one unused to the navigation, it is a ridiculous series of small dangers and mischievous slips, there being no formidable depths, and the only real perils consisting in getting a fall with a weight so gigantic rushing down behind you, or in crossing the course of a rapid, and being dashed against the timber. On the Rhine, where the decks are, in a way, solid, there is no more difficulty in treading them than in pacing the *Great Eastern*; but here, on the Euz, the hold is like that on a greasy pole, and the transitions from one rate of speed to another are amazingly embarrassing. You might fancy yourself, for an hour, gliding through a trout pond; then the water is artificially raised by means of weirs and sluice-gates; suddenly, an escape is allowed, and masts enough for a dozen East Indiamen go tumbling away together with a furious clamor, the pilots never flinching or doubting; but the poor, daring passenger, of whom they make no account, staggering about, and clinging here and there in utter helplessness—for him it is bliss to enter on a broader and more regular stream. But for him, also, there are privileges. He can go ashore; he can follow the course of the raft at an easy distance; he can get together a few planks and make an unsteady and rising-and-falling floor for himself; and he may feel perfectly sure that, in the event of risk, there will be plenty of hands held out. But, for all that, it may not be the wisest thing for the Princess of Wales, coming to Wildbad for a cure, to float knee-deep on a raft, when rheumatism is her malady, and Wildbad exactly the place to exasperate it—on a raft.

Adventures of a Diamond.

The Sancy diamond is for sale at a jeweler's in Calcutta just now. Here is the account the jeweler gives of it: "This diamond is of an almond shape, and weighs 60¾ ruttie. The stone was found on the body of the Duke of Burgundy, and was afterwards, in 1470, bought by the King of Portugal. He afterwards sold it to Nicholas de Barly, Baron de Sancy, from whom it derives its name. Sancy sent it to the King as a present by the hand of a servant, who, being attacked by robbers, swallowed the stone, and after his death the stone was found in his body. It finally came into the hands of James II., of England, who sold it to Louis XIV. for 25,000*l*. Its almond form, completely facetted over (a mode quite unknown then or at any other time in Europe), indisputably proves that it was an Indian-cut stone. In the French revolution it disappeared for some time; some years later it was sold to Prince Paul Demidoff; and now, after a strange series of vicissitudes, finds its way to Calcutta.

MEN of genius have had so frequently to struggle under poverty, that certain individuals seem to think that in order to advance science it is necessary to keep the workers therein poor. We are told that the authorities of the South Kensington Museum, London—some of whom receive thousands of dollars annually for simply signing their names to papers they never even examine—are cutting down the emoluments of the science teachers. It is said that this course has caused great dissatisfaction among the teachers; but "dissatisfaction" we think is hardly the proper word; their pay was formerly so low that now they must be giving utterance to the last despairing groans of death from inanition.

THE rise of sap in trees and plants has been explained on the principle of capillary attraction, but M. Becquerel considers that electricity is an acting cause. A capillary tube that will not allow water to pass through it does so at once on being electrified, and he considers that electro-capillarity is the efficient cause of sap traveling in vegetable life.

Improved Photoscope or Panorama Album.

Photographs are now so common, cheap, and durable that it is desirable to have something more convenient than the common photograph album for their classification, preservation, and display.

The invention we herewith describe and illustrate is designed to do this permanently, and to that end is constructed of metal and glass only.

It is a sheet metal box with a glass top and bottom. Fig. 1 shows it in perspective as mounted on a suitable stand. The box is composed of two similar rectangular inclosures, one of which slides into the other. Across the middle of the interior of the box there is a partition composed of two pieces of sheet metal, one of which is soldered to one portion of the metallic case, and the other to its counterpart, as shown in the sectional view, Fig. 2. These pieces lap each other as shown in Fig. 2, and are so made as to leave the thickness of two cards between the glass and the edge of the partition.

To the under side, and at one end of the glass top and bottom, are cemented narrow strips of glass, extending from the end of the case to within a short distance of the partition, as shown in Fig. 1; the ends next the partition being beveled off.

At each end of the box there is a thumb-screw for adjusting the size of the box to any number of cards. These thumb-screws are turned down when the instrument is not in use.

A number of cards—always an odd number—being cut to fit the chambers formed by the middle partition; if we suppose—say twenty-five, to be put into the chamber having the glass strips above described on the bottom side, and twenty-four in the other chamber, the pile of cards in the former will be higher than that in the latter chamber, so that there will be one card above the partition. If now the box be lifted and slightly inclined so that the end having twenty-five

Fig. 1.

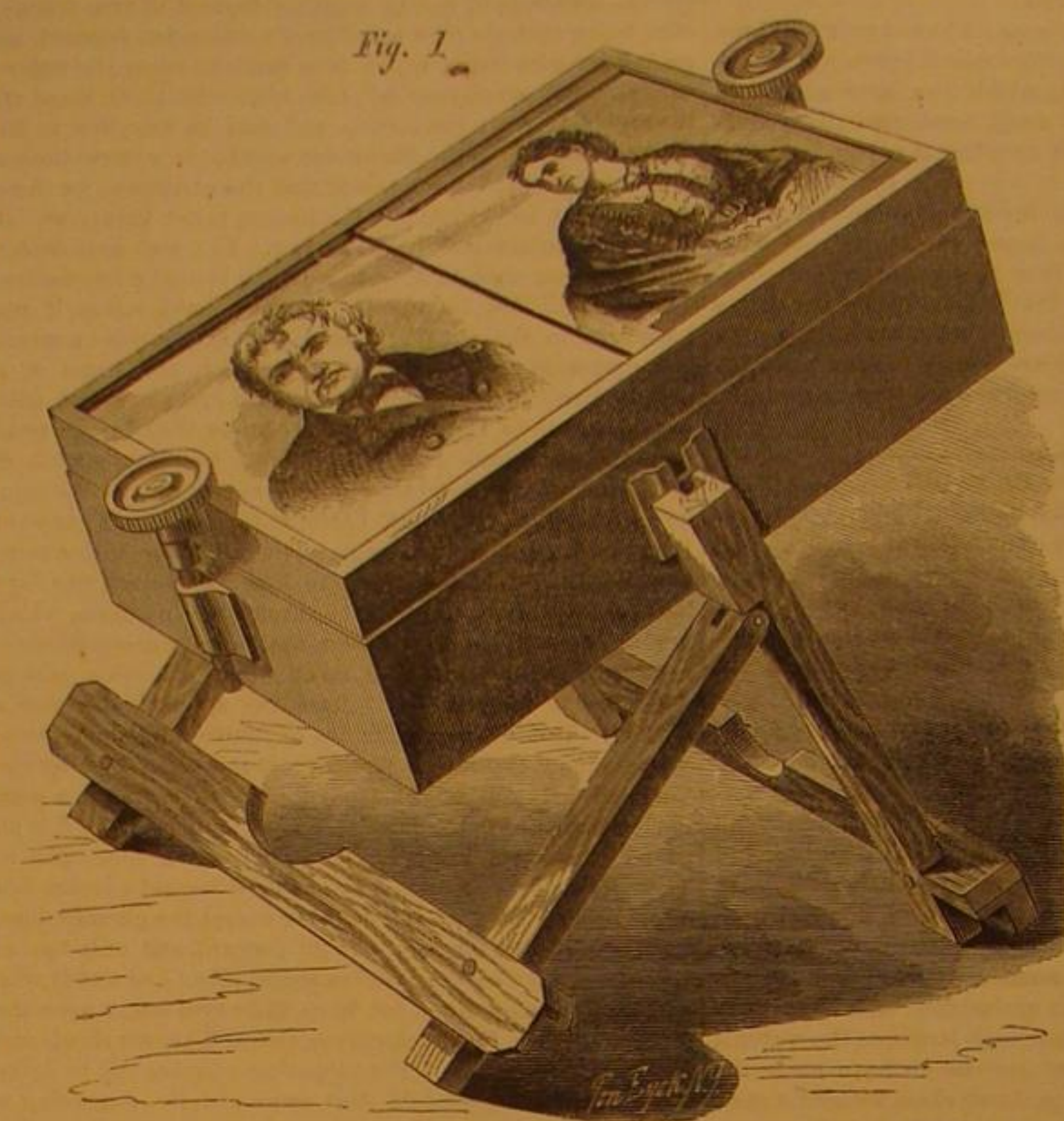
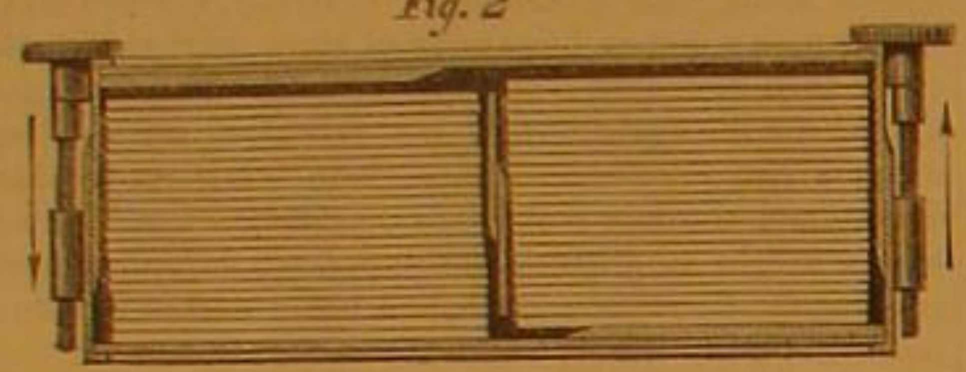


Fig. 2



BROWNLEE'S IMPROVED PHOTOSCOPE.

cards shall be uppermost, a card will slide across the partition on that side which is inclined under, and by turning the case so that the other end shall be uppermost, a card may be slid from the second chamber back again to the first, so that each card in the case may be successively brought to view.

The cards are each made up of two photographs with their backs pasted together, in such a way that a uniform thickness may be secured.

In order to do this the cards are sorted and arranged in small lots, until the proper thicknesses are secured. They are then numbered as a guide for pasting and also for catalogueing.

The instrument could be employed as a children's toy, using, instead of the photographs, letters or figures, or toy pictures. The cards might be made of sheet metal, and the same principle might also be extended to clock dials.

The stand which supports the instrument can be folded together so as to occupy very little space.

This instrument was patented, through the Scientific American Patent Agency, November 23, 1869, by George Brownlee, of Princeton, Ind., who will negotiate for the sale of the patent, and who may be addressed for further information.

The Hartford Steam Boiler Inspection and Insurance Company.

The Hartford Steam Boiler Inspection and Insurance Company makes the following report of its inspections for the month of December, 1869:

During the month, 341 visits of inspection have been made; 575 boilers examined, 492 externally and 192 internally; while 57 have been tested by hydraulic pressure. Number of defects in all discovered, 341, of which 30 were regarded as dangerous. These defects in detail are as follows:

Furnaces out of shape, 16; fractures, 34—1 dangerous; these too often result from urging the fires too fiercely, especially when "getting up steam" from cool boilers. Instances are known were furnaces or fire-boxes have been badly distorted by carelessness of this kind, and in internally fired boilers the tubes or flues heat more rapidly than the surrounding shell, and expand at a much greater rate. When boilers have been allowed to cool, the next time they are worked the firing should be slow and moderate at first, so that the heat may be diffused gradually, and the evil arising from undue expansion and contraction prevented as far as possible.

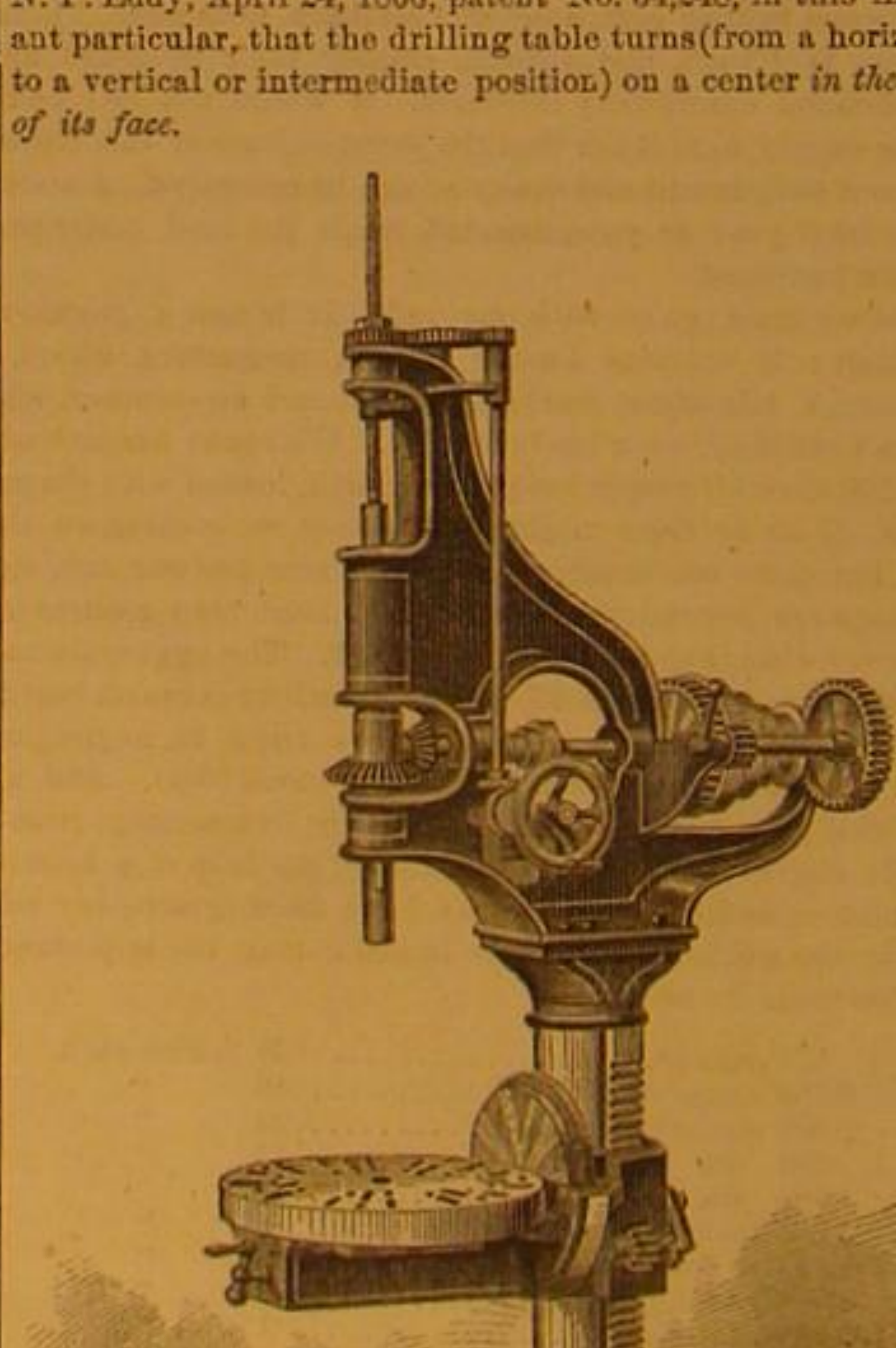
Burned plates, 33—4 dangerous; blistered plates, 36—5 dangerous; incrustation and scale, 73—7 dangerous; external corrosion, 19—3 dangerous; internal grooving, 5; water gages out of order, 8; blow-out apparatus out of order, 3—1 dangerous; safety valves out of order and overloaded, 22—4 dangerous; steam gages out of order, 40—2 dangerous, varying from 5 to + 25; boilers without gages, 2—2 dangerous; cases of deficiency of water 1—1 dangerous; insufficient staying, 2 cases.

Of the cases of external corrosion, one was found where the sheet was corroded for 2½ feet, so that a light tap of the hammer would penetrate it. This boiler was bricked in, and the evil arose from a leak in the joints. We not unfrequently find cases similar to this, though not in the same degree. Another case, two boilers were found with hand hole plates, bolt and yoke, completely corroded away, and the surrounding parts greatly weakened. These cases show the necessity of stopping all leaks about boilers at once; the work of corrosion is so insidious and one never knows the danger they may be exposed to. Two safety-valves corroded first in their seats, and need no comment to show that there was careless management.

Those who have the care of boilers cannot be too attentive to their duties. All the parts and appliances of the boiler should receive frequent and careful attention, and it should be the pride of every engineer and fireman to have everything in his care neat and in order.

IMPROVED PATENT VERTICAL DRILL.

This machine differs from the original drill, patented by N. P. Eddy, April 24, 1866, patent No. 54,248, in this important particular, that the drilling table turns (from a horizontal to a vertical or intermediate position) on a center *in the plane of its face.*



There are five different independent motions of the table; namely:

1st. Turning, as above described, for angular drilling.
2d. Turning on its own center while in any position.
3d. Sliding to or from the post.
4th. Raising or lowering on the post.
5th. Turning around the post to bring the work in place, or to be out of the way while using the platform table.

By means of these motions a piece of metal once fastened to the table can receive the drill in *any direction* without being removed from the table.

There is a small device in the top of the spindle for taking up the backlash and preventing a break when the tool comes through the bottom of the piece drilled.

These drills are back geared, have steel spindles, self-oiled bearings, and power feed.

The castings weigh from 1,500 to 4,500 pounds, and are sufficiently heavy and strong to prevent spring.

Specimens can be seen at S. A. Wood's machinery depot, 91 Liberty street, New York, and at Rhode Island Locomotive Works, Providence, R. I.

These drilling machines are manufactured by the Assonet Machine Company, at Freetown, Mass. Address Thomas G. Nichols, Treasurer.

Missouri Tin.

About two years ago considerable interest was manifested in regard to the discovery of very extensive deposits of tin ore in this State, and land owners and speculators were accused of having the "Tin Fever." Weeks and months were spent by prospecting parties, and all the tin lands that could be purchased at reasonable rates changed hands. One company was organized, and invested about $80,000 in tunneling the hill and in work preparatory to the erection of a furnace. But their work has been stopped for several months—whether from want of capital, or energy and enterprise, we are not informed. Meanwhile, they have discovered tin ore in California, which is said to be inferior to the Missouri ore, and we now see by a California paper, that "The first article of tinware manufactured from tin mined in the United States has just been completed in San Francisco."

Numerous assays have been made of this ore by chemists and assayers of national reputation, who have repeatedly stated *here* that the ore will yield from 3 to 5 per cent of pure tin; yet, when they reach the Atlantic cities, where the tin importers hold sway, they fail to find tin in paying quantities.

Chemical analyses and assays are not wanted now; but, instead, we need a furnace to smelt the prepared ore and produce the pigs and bars of tin. A test furnace need not be very expensive, and this question, if decided affirmatively, will be of the greatest importance to this city, State, and the whole nation, as the importation of foreign tin into the United States now amounts to from five to six million dollars annually, and is constantly increasing. Who can say that the practical investigation of this subject will not prove as satisfactory as the experiments in smelting iron with our native coals?—*The Iron Age.*

Recutting Files with Acids.

By request, we republish the recipe for recutting files with acids, as patented by Albert I. Ferguson, of Sharon, Pa.:

"The files must be thoroughly cleansed in warm water containing a small quantity of potash, which readily removes any grease or dirt from them. After the files are thus cleansed, they must be washed with warm water and dried by artificial heat. Next, place one pint of warm water into a wooden vessel, and put into it as many files as the water will cover. Then add two ounces of blue vitriol, finely pulverized, and two ounces of borax, well mixed, taking care to turn the files over, so that each may come in contact with the mixture. To the above mixture now add seven ounces of sulphuric acid and one fourth of an ounce of cider vinegar, which will cause the files to assume a red appearance at first, but they will, in a short time, resume their natural color. Then they must be removed, washed in cold water, and then dried by artificial heat. When dry, they must be sponged with olive oil, wrapped in porous paper, and laid aside for use."

WHO MADE THE CARDIFF GIANT.—T. Mohrmann, of 146 North Water street, Chicago, writes to the Chicago *Tribune* that he and an assistant cut the Cardiff giant from a block of gypsum provided for the purpose. He further states that George Hull, formerly one of the owners of the giant, agreed to pay $150 for the work, which he has neglected to do, and hence Mohrmann does not feel bound to keep the secret. He adds that both himself and the assistant spoken of, will make affidavits as to the truth of his statement.

A BALTIMORE gentleman has converted the roof of his stable and carriage-house into a garden for the purpose of growing ornamental plants. Water is conducted to the top of the building by means of pipes, for convenience of watering the flowers in dry seasons, and to supply a fountain which he contemplates erecting in the center of the garden. Many of the inhabitants of large cities would find a similar utilization of the flat roofs of buildings a source of pleasurable, healthful, and instructive recreation.

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Contents:

(Illustrated articles are marked with an asterisk.)

THE WATER WHEEL TESTS AT LOWELL.

The opinions we have already expressed in regard to the tests of turbine water wheels, made at Lowell last summer, have strong confirmation from letters received by us from exhibitors and others, cognizant of the facts in the case.

The announcement of the tests contained a general invitation to those who wished to exhibit the working qualities of their wheels, and it gave the impression that everything would be complete, open, and fair, and that each wheel would stand or fall solely upon its merits.

We are informed that the tests were not properly made. The apparatus for measuring the water delivered to the wheels was perfect at first, being constructed after the specific published directions of Mr. Francis; but the edges of the weir became much battered by the action of rubbish that passed over it, in consequence of draining the canal every night for repairs. This compelled the opening of the wheel-gates and also the flood-gates to allow *debris* to escape. The foundation of the bulkhead also became unsettled by the large volume of water passed through and under it, throwing the weir out of level.

We are further informed that the flume, or bulkhead, was not so constructed that the exact available head of water upon the wheels could be determined. No two wheels could be put in alike or occupy the same relative positions. Thus it was impossible to approximate similarity of conditions in the different tests. As one correspondent says, the experiments were, in this respect, mere "cut and try." In one case the water had to turn three right angles, resulting in a loss of two per cent of the head as ascertained by measurement, and of course also giving rise to commotion in the water which injured the effectiveness of the wheel to a greater or less extent.

Fault is also found with the friction brake used in the test, as being unreliable and treacherous. It is said that this brake did not allow the wheels to run steadily; that at times it would allow a wheel to move with a uniform motion, and then would suddenly stop motion altogether. It is stated that at best it would not hold the weight steady one second.

The following terms were prescribed for the test: The wheels should be the ordinary manufacture, and should give about forty-horse power under 14 feet, the cost of test not to exceed a stipulated sum.

Notwithstanding, wheels of various degrees of finish were brought to the test. There was no uniformity in size, some giving not more than eighteen-horse power. The expense, it is said, also exceeded the stipulated sum six-fold.

The apparatus was located on a canal already too small to supply the necessary water to the mills located on it. For weeks at a time there could not a drop of water be had for testing in the day time save a few minutes at noon; and the tests made after September were only such as could be snatched from time to time, at short intervals.

It seems that this incompleteness of the arrangements prevented the satisfactory performance of even preparatory experiments; and it is understood that only one public test was made.

It will thus be seen that the public has lost nothing by the suppression of any report of these tests.

IT is said that an English firm has recently fitted up the engines of a small steamer on Warsop's aero-steam principle ith highly satisfactory results.

THE WAGES OF MACHINERY.

"There are in the United States about thirteen millions of laboring *men*, *women*, and *children*. There are also a very large number of laboring *machines*. It is estimated that there is steam machinery in the United States equal to two million horse power, or more than fourteen millions of full-grown men. A large portion of this machinery works day and night. It is never sick, never idle, never goes on sprees, never strikes. It always works, when required, up to its full capacity, and never tires. It is not unreasonable to estimate the work of the machinery as equal to that of twenty-eight millions of full-grown industrious men. It is evident, therefore, that only one third of the work of the country is done by its *laboring men*, and two thirds are done by its *laboring machinery*. Is it not clear that the wages of the laboring machinery constitute a larger portion of the cost of manufactured goods than the wages of the laboring men? Would not a reduction of the wages of the laboring machinery go further to reduce the price of goods and facilitate competition than a reduction of the wages of the laboring men. Of course it would."

The above from *The Free Trader* is a fair sample of the ingenuity brought to the support of the doctrine of free trade; an ingenuity which expends itself in concocting sophistical arguments to mystify and delude those who have not the time or the facts wherewith to test their accuracy. We would only add a single word to the above quotation, and that at the very end of it, "*Of course it would not,*" is the way we would read it, and for the following reasons:

First, it does not follow that because machinery does the largest portion of the labor performed, that it does it at a greater cost than that of the aggregate manual labor of the country. There is no doubt that it does it at much less cost. It is not clear that the wages of laboring machinery constitute a larger portion of the cost of manufactured goods than the wages of laboring men.

In 1860, the capital employed in the United States, in manufacturing, was $1,009,855,715. The wages paid for manual labor amounted the same year to $378,878,966. Twenty per cent of capital invested will, on the average, pay the entire current expenses of establishments driven by steam power, including the interest on the capital at seven per cent, repairs and depreciation, and exclusive of cost of the material worked and the manual labor employed.

We have purposely made a large average for steam-power manufactories. Where water power is employed the cost of running is much less, owing to the reduction in the fuel account. An average fully large enough for all kinds of power would be 15 per cent. Fifteen per cent of the total manufacturing capital above given would be $151,488,357, for the wages of machinery in 1860, as compared with $378,878,966—the wages of manual labor employed in the manufacturing business.

But the value of manufactured products was, the same year, $1,885,861,676. The wages of machinery was only a trifle over eight per cent of the value of the goods and wares produced. So that if, instead of demanding such enormous wages as the *Free Trader* would have us believe, the machines would be generous to the consumer, and work for nothing and repair themselves, the reduction in the price of goods thus secured would be only eight per cent.

But as the machines will not work for nothing and repair themselves, the free traders have determined on reducing their wages by a removal of duties on iron and coal. The cost of iron in the construction of machines made wholly of that material will not average over ten per cent of their selling price. So, provided that iron were to be obtained without any cost, machines could be thereby cheapened only one tenth, and as the interest on the first cost of machines, and the depreciation which eventually necessitates the purchase of new machinery are items in the entire wages of machinery, which perhaps may be estimated at ten per cent of capital invested, we find that the reduction in the cost of manufactured goods consequent upon the reduction of the wages of machinery caused by getting the iron for nothing at all, would be only one tenth of one half of eight per cent of the entire value of manufactured products, or two fifths of one per cent.

We have already said enough on the subject of the tariff on coal, about which there has been such a hubbub. There is no reason to believe that its removal would affect the price of coal in any appreciable degree.

This attempt to show that machinery is overpaid and that the workingman suffers thereby, deserves to be ranked with the attempt to prove that the tariff on salt—18 cents per 100 lbs.—must inevitably render the luxury of salt codfish inaccessible to the poor.

WASTE OF LABOR IN BUILDING.

Of all the painful sights we are called upon to witness in this day of steam engines, and labor-saving appliances, none strikes us as being so absurd and unnecessary as the waste of human toil in building as it is generally conducted. Hodmen crawling up long ladders with small burdens of bricks and mortar, carrying at each trip some sixty or seventy pounds of building material, with thirty or forty pounds of hod, and one hundred and sixty or more of flesh and blood—not to mention beer—seems something so foreign to this age of machinery that we should scarcely feel it more incongruous to see the stocks and pillories restored to our market-places.

If a huge beam or girder is to be raised, we see the crane, tackle, and steam engine employed, but the ordinary carrying is done by human legs. These legs, although they can do climbing passably, are certainly inferior in this respect to other legs designed by nature to make climbing a specialty. A ladder is a very serviceable appliance in its way; we however, believe it to be as hard a road to travel as ever the genius of man devised. The hod belongs to an ancient and honorable family of implements, but it does not seem the most agreeable companion in the world to clasp in affection ate embrace or place one's cheek fondly against.

Therefore we say down with the hod; let it take its place with the host of implements, on the tomb of which modern progress has written the epitaph—"PLAYED OUT."

Let us suppose the two side pieces of a ladder to be replaced by iron rails and the rounds by ties, and let us suppose some genius to conceive the happy idea of causing a locomotive to crawl tediously up this heavy grade, drawing after it a load of one third its own weight. What gibings, what laughter, what derision would such a scheme excite among mechanics! Yet we are importing annually large numbers of locomotives to do the same thing; only these locomotives run on the ties instead of the rails.

They do these things better in France. Either derricks are employed, or the brick and mortar carriers are used as stationary engines, rather than as locomotives. In passing a building in process of erection in Paris, one may often see a number of men stationed one above the other along a ladder, each of whom passes his load to the next above him, until the load reaches its destination. In this way a continuous procession of materials is kept up, and a large quantity may be elevated in a short time.

This is an improvement on the climbing process, but there must even in this way be an enormous waste of power. And this waste is not only useless, but so easily avoided that the continuance of the employment of human power to perform such rude work, is a disgrace to modern civilization. It can be demonstrated that a small one-horse power engine, with suitable tackle, and the employment of a single man to attend it, will do the work of six men at elevating bricks and mortar, at a cost of less than the wages of two men.

No mechanic who reads this will fail to see many ways in which this application of steam power could be advantageously made. The ladder might be replaced by a railway up and along which a car-load of bricks or mortar might be made to roll, which track might be joined to and made continuous with a horizontal track, by means of an easy curve at the summit, the whole being adjustable to suit the progressive hights of the wall as they advance towards completion. It would require little genius to adjust the detail, and the cost of building would be greatly lessened by dispensing with the hod carriers.

FRENCH EXPERIMENTS WITH LIQUID FUEL.

For more than ten years M. H. St. Clair Deville has been experimenting with mineral oils as fuel. *Comptes Rendus* and *Le Journal de l'Eclairage au Gaz*, have lately published some interesting facts in regard to these experiments, a *resume* of which is our present purpose.

The oils employed have been obtained from various natural sources, and the experiments have also included the heavy oil from the Parisian Gas Company's works.

The experiments have determined the following points: In twelve kinds of crude oils analyzed, there was found to be from 82 to 87·1 per cent of carbon, 7·6 to 14·8 per cent of hydrogen, and 0·9 to 10·4 per cent of oxygen.

The heavy oil of the Parisian Gas Company has a specific gravity at 32° Fah. of 1·044, and at 88° Fah. 1·007. It is of a dark brown color, and contains 82 per cent of carbon, 7·6 per cent of hydrogen, and 10·4 per cent of oxygen, nitrogen, and sulphur. Heated to 424° Fah., only 12·5 per cent volatilizes. It remains fluid at 12° Fah. A tun of it contains about 220 gallons, and its cost is about fifty francs per tun, or in round numbers ten dollars in gold, our currency.

The amount of carbon added to the hydrogen contained in this fuel, must make it a very powerful heat generating combustible. It has nearly the lowest expansibility of all the oils, its coefficient of expansion being 0·000743, and the lowest coefficient being 0·000652.

The most important experiments with the heavy oil were made with a locomotive of the Strasbourg Railway Company. This locomotive has uncoupled wheels and outside cylinders. Its weight is twenty tuns, and that of the tender is fifteen tuns. It has a heating surface of 72 square yards.

The oil was supplied to the furnace from a tank, being fed by its own gravity. An additional supply was carried on the the tender, wherewith to renew the supply in the tank as required.

The fire was kindled by lighting some shavings and sticks on the floor of the fireplace and at the same time admitting a small quantity of oil. A jet of steam was sent into the smoke pipe from the blow-off pipe of another engine to increase the draft. It took an hour and a quarter to get up steam, during which time 11 gallons of oil were consumed. It was shown, however, that by consuming 12½ gallons of oil, steam could be got up in two and one half hours, without assistance from another engine, but with the inconvenience of a large amount of dense black smoke.

On the first experimental trip it was found that a speed of forty miles per hour was obtained with a consumption of about 14 lbs. of oil per mile.

In a second experiment a train of 70 tuns was drawn at a speed of forty miles per hour, with a consumption of about 17 lbs. of oil per mile.

Subsequent experiments gave results not differing essentially from those mentioned.

The grate consists of 20 bars of iron cast in one piece, with channels for the oil to run down, and it is set perpendicularly before the furnace which is lined with fire brick. A separate cock supplies oil to each grate bar.

It is thus seen that with the heavy oil, steam can be got up in about the same time as with coal; the combustion of the oil is not specially difficult to control; and that the consumption of oil, as compared with that of coal, is only about one half by weight.

It is stated that the fire brick used to line the furnace suffered severely from the intense heat, but the effect upon the tubes, t c., of the engine do not seem to have been yet noted.

These experiments do not give much encouragement that liquid fuel will ever be adopted except in special cases. The price of such fuel could not be kept at its present figure were it in general demand for this purpose, and therefore its use would not probably result in any economy over that of the best coal.

THE ECONOMY OF STEAM ENGINES.

Many persons, using steam engines, fail to appreciate the value of inventions designed to produce economy of fuel. It is true that sanguine inventors and unscrupulous agents of stock companies often promise savings that cannot be realized in practice, but no one should condemn, wholesale, all devices of this character, because from lack of judgment he has been once deceived. Neither should he reject offered assistance because the promised savings are ridiculously large. All matters of this character should be decided on their merits. Some may be valuable though overrated.

The coal bills of a steam engine foot up rapidly, and a very small percentage of saving will pay for a great many improvements. It is easy to show that it is true economy to sell an old steam engine for scrap iron and purchase an improved engine at full market rates rather than pay for the extra coal required by the former. For instance, there are few engines working of the old style, regulating by the throttle valve, that furnish an indicated horse power for four and one half pounds of coal per hour. This is equivalent to say five pounds per hour for each net or effective horse power. An engine developing eighty net horse power would then require ($80 \times 5 \times 10 =$) 4,000 pounds of coal per day, or say 4,200 including banked fires at night. This for a year, or 300 working days, would equal ($4{,}200 \times 300 \div 2{,}000 =$) 630 tuns per year, which would cost, in many localities, upwards of four thousand dollars. Now, a new engine, with cut off adjusted automatically by the governor, of a size capable of furnishing economically eighty net horse power, costs from $4,000 to $4,500. So it is safe to say that engines constructed with no regard for economy, require yearly, for fuel alone, an expenditure of money equal to the first cost of a new engine. This would be true, also, in many places where fuel is cheap, if the original cost of the new engine were reduced by the sale of the old one, even for scrap iron.

From the above, then, it is evident that if the new engine saves only ten per cent of the fuel, this saving is continually paying ten per cent interest on the cost of the engine, while the work is being done the same as before. This is as good as most investments; but when it is considered that any engine, with modern improvements, will save thirty and even forty per cent of the fuel, as compared with the results above mentioned, the rate of interest becomes correspondingly large, and the engine is paid for by the saving in fuel in three years or less, or in four to five years when fuel is much cheaper.

Similar considerations apply with equal force to steam boilers, and to many of the details of construction of both engines and boilers. Any device that saves fuel saves money; and if it do not introduce complicated parts liable to derangement, it should be encouraged.

The simple feed-water heater is a good example of this, and saves on the average ten per cent of the fuel.

LIEBIG ON FERMENTATION.

Liebig has finally broken through the silence with which he has borne the attacks upon his theory of fermentation on the part of many chemists during the last ten years, and has come out with one of those exhaustive and convincing replies that recall the best days of his great intellect.

The reticence he has observed has emboldened some of the younger chemists to disclose weak points in their attacks, while others have looked upon the dead lion as a harmless creature, and have incautiously come too near his claws. All this small game is scattered like chaff before the wind with trifling effort, and the whole power and force of his argument is leveled at the French Academician and renowned champion of the new school, Professor Pasteur, of Paris.

For ten years Pasteur has had it his own way, and the views published by him have been fast gaining in popularity until they appeared destined to be accepted by a majority of scientific men everywhere. Liebig's paper is therefore a perfect bombshell in the camp, and as soon as the smoke has cleared up, and the fragments have been collected, we shall probably have about as nice a fight as has been witnessed among chemists for many a day. In the meantime we propose to give an analysis of what Liebig says in defense of his old theory of fermentation. It is difficult to make an abstract of so learned a paper, but we shall endeavor to render the subject intelligible to our readers.

Pasteur announced, nine years ago, as the result of his experiments, that Liebig's explanation of the action of yeast on sugar was entirely without scientific foundation.

According to Liebig, "a fermentable body is one which, by itself, or simply dissolved in water, does not undergo any decomposition, but when in contact with a putrescent body, is resolved into new products, or enters into fermentation. As fermentation is produced by the communication of motion from the atoms—not the molecules—of the putrescent body, to the atoms of the fermentable one, the process requires time; and the same is true of putrefaction itself. And as the ferment can only act so long as its atoms are in motion, so its power of exciting fermentation must cease as soon as its own decomposition is complete, and not before. Hence a given weight of ferment can only cause the fermentation of a limited quantity of sugar, or of any other fermentable compound."

On the other hand the views of Pasteur on fermentation are as follows:

"The chemical process of fermentation is essentially a phenomenon of life; it begins and ends with it; an alcoholic fermentation without simultaneous organization, growth, and development, that is, without continuous life, is impossible."

He regards fermentation as a chemical process accompanied by a physiological one; the duration of life of the ferment limits the splitting up of the atoms of sugar. Liebig says that there is nothing new in this view of the process. It was fully understood and explained by him in his chemical letters twenty years ago, and then, as now, he did not care to adopt it.

The action of ferments on fermentable bodies, says Liebig, is analogous to that of heat on organic substances. Their decomposition at high temperature is always the result of a change in the position of their atoms. Acetic acid is converted by heat into carbonic acid and acetone, just as sugar is split up by yeast into carbonic acid and alcohol; the carbonic acid resulting from the decomposition of the acetic acid contains two thirds of the oxygen, and the acetone all of the hydrogen, in the same way as the carbonic acid of the fermentation of sugar includes two thirds of the oxygen, while the alcohol contains all of the hydrogen.

The formation and increase of the yeast plant is dependent upon the presence and absorption of nutritious matter that develops the living organism; but in the process of fermentation there is an action independent of, and outside of, any products that the living organism can assimilate. The vital operation and the chemical action are evidently two phenomena, that in their interpretation ought to be considered separately.

To the opinion of Pasteur that the decomposition of sugar in the process of fermentation rests upon the formation and growth of the cells of the yeast plant, is opposed the fact that yeast will produce fermentation in a pure solution of sugar; and as yeast consists in the main of a substance rich in nitrogen and sulphur, also containing considerable quantity of salts of phosphates, it is difficult to comprehend how, in the absence of both of these constituents in the sugar, the growth of the plant cells can be promoted; and it would be equally difficult to explain how the beer yeast exerts the same decomposing action upon numerous other bodies as upon sugar.

Liebig has carried on an extensive series of researches in order to determine the action of yeast upon a great variety of substances, and he also cites the labors of the best chemists of Europe to show that his views of the action of yeast and leaven to produce fermentation is founded upon scientific principles, while the explanation of Pasteur is wanting in every element of theory and fact. It is so popular, not to say fashionable, to refer every vital action back to the formation of cells, and the building up of protoplasm, and to intimately connect life and matter together so as to gradually support the doctrine of spontaneous generation, that the publication of Liebig's great paper must be looked upon as a timely protest against the tendencies of the age. And it may serve as an intimation to younger men of science, anxious for fame, that the old methods of research are sufficient to furnish us with satisfactory explanations of the phenomena of nature without the necessity of having recourse to the supernatural or to the materialistic doctrines of the so-called protoplastic school.

The first part of Liebig's paper, which is all that has appeared, is devoted to fermentation; the second portion is to be occupied with the question of the origin of muscular force, and will be looked forward to by physiologists with great interest.

We shall not fail to inform our readers of the progress of the controversy, if anything practical grows out of it. A passage at arms between such men as Liebig and Pasteur cannot fail to attract the attention of scientific men everywhere, and it is not a little singular that the great German chemist should be ranged on the side opposed to the materialistic views so commonly attributed to his countrymen.

POSITIVE PHILOSOPHY.

The able exposition of the positive philosophy made by Prof. Fiske in his lectures at Harvard will do much toward clearing up many popular errors. As we have taken occasion once or twice to speak of those lectures in terms of commendation it may not be amiss to briefly state some of the prominent features of this system, premising at the outset that whatever we can say within the limits of an article like this must, of necessity, be of the most fragmentary and incomplete character. Evidently a system, the exposition of which in a university course of lectures compels the lecturer himself to condense to the exclusion of much almost essential to the clearest conception of his subject, cannot be discussed in a newspaper editorial. We shall therefore make no attempt at argument or illustration, and confine ourselves to giving, if possible, a glimpse of the fundamental principles upon which the system rests.

The first of these is the doctrine of the relativity of all human knowledge; by which is meant that all the human mind can either perceive or conceive, are the relations which do or may exist between phenomena.

Second, this system recognizes a limit to human knowledge and thought, and fixes the limit between the observation of relations and the attempted study of the essential nature of things.

It says you may find out the *how* of existence by experience and observation, but from the nature of the case it is impossible for the human mind to determine the *why*. You may perceive and classify phenomena, but the ultimate underlying causes you can never know because the human mind is incapable of forming any conception of such causes. You may see and feel the effects of what is called matter by the manifestation through it of what is called force, but both matter and force are merely names for the unknown and the absolutely unknowable. That these categories of existence are unknowable cannot, of course, be inferred from any knowledge of matter and force, since these are unknown; but from the constitution of the human mind, which cannot conceive the ultimate causes which these categories, matter and force include.

Hence it concludes that human study and knowledge must lie wholly this side of matter and force; must concern itself wholly with relations, manifestations, or phenomena; while the *noumena*, the ultimate causes, must remain a sealed book

Now as all phenomena may be made the subject of demonstration it follows logically that this test must be demanded by all thinkers of this school, for the establishment of all the *facts* of science, before any inferences are allowable. Before reasoning from an asserted phenomenon, it demands to *know* the existence of the phenomenon.

The positive philosophy maintains that whatever conflicts with our direct perception of relations cannot be admitted as true; as to conceive anything is to perceive clearly the relations it bears to other things, and the relations of its parts to each other. Thus no man can believe at one o'clock that at three o'clock it will be two hours earlier than at one o'clock; this conflicts with his direct perception of relations. Such a proposition is inconceivable, and therefore would be rejected as false by any sane mind.

But while the positive philosophy insists that fundamental facts shall be demonstrated (we use the term not in the mathematical sense) it does not exclude inferences from facts, or deny that there may be causes antecedent to all facts; it only denies the capacity of the mind to deal with such causes.

Finally, it makes a distinction between belief in the sense in which the term is most ordinarily employed, and *knowledge*, but upon this point we cannot do better than to quote from the third lecture of Prof. Fiske:

"A necessary truth is one of which the negation is inconceivable after all disturbing conditions have been elimnated.

"A belief of which the negation is inconceivable is necessarily true, within the limits of human intelligence.

"This test of inconceivability is the only ultimate test of truth which philosophy can accept as valid.

"By a singular freak of language, we use the word *belief* to designate both the least persistent and the most persistent coherence among our states of consciousness—to describe our state of mind with reference both to those propositions of the truth of which we are least certain and to those of the truth of which we are most certain. We apply it to states of mind which have nothing in common except that they cannot be justified by a chain of logical proofs. For example, you believe, perhaps, that all crows are black, but, being unable to furnish absolutely convincing demonstration of the proposition, you say that you believe it, not that you know it. You also believe in your own personal existence, of which, however, you can furnish no logical demonstration, simply because it is an ultimate fact in your consciousness which underlies and precedes all demonstration. So with the axioms of geometry. If asked what are our grounds for believing that two straight lines cannot inclose a space, we can only reply that the counter-proposition is inconceivable; that we cannot frame the conception of two straight lines inclosing a space; that in any attempt to do so the conception of straight lines disappears, and is replaced by the conception of bent lines. We believe the axiom because we must believe it.

"It is only in this latter sense in which the word *belief* is employed in the canon of truth above stated, and when Mr. Spencer says that a given proposition is inconceivable he means that it is one of which the subject and predicate can by no amount of effort be united in consciousness. Thus that a cannon ball fired from England will reach America is a proposition which, though utterly incredible, is not at all inconceivable; but that a certain triangle is round is an inconceivable proposition, for the conceptions of roundness and triangularity will destroy each other sooner than be united in consciousness. And manifestly we can have no deeper warrant for the truth of a proposition than that the counter-proposition is one which the mind is incompetent to frame. Such a state of things implies that the entire intercourse of the mind with the environment is witness in favor of the proposition and against its negation."

The reader must not, however, be led to suppose that with the disciples of this any more than in any other system of philosophy perfect agreement exists. So long as human minds differ in character, so long there must be differences in opinion, but the fundamental doctrine of the relativity of human knowledge is the foundation of the system, and is now very widely accepted by the best thinkers.

A MILE A MINUTE.

C. P. L. writes from Minnesota, asking "Are railroad locomotives, with six and one half feet drivers, capable of exhausting fast enough to allow them to run at the rate of one mile in a minute?"

This question opens an interesting and somewhat disputed subject. Locomotives with drivers smaller than those mentioned have, in exceptional cases, run as rapidly as a mile in a minute, with moderate loads. Such speeds are, however, uncommon in this country, and though a few locomotives were used a while here with drivers seven feet in diameter, they were all changed, and the prevailing size is now from five and a half to six feet for passenger traffic. In England, however, where the average speeds are higher, locomotives have been made with drivers nine and ten feet in diameter, and many are still running which are seven feet and upward.

In order to attain a given power a large driver requires proportionately large cylinders, and consequently great weight. The general introduction of the link with its incidental steam cushioning, and the more general understanding of the principles involved in balancing the reciprocating parts, have made it possible to greatly increase the number of strokes per minute made by locomotive engines. This permits the use of smaller drivers, but at the same time makes it difficult to obtain a desirable area of port to prevent excessive back pressure. A port area one tenth that of the cylinders give excellent results for a piston speed of 600 feet per minute. It is difficult to make the ports larger than this, for the reason that the length can scarcely be more than the diameter of the cylinder, and an increase of width involves tremendous wear on the valve and links; so occasionally the above proportion of port has been used for piston speeds of 1,000 feet per minute, and the attendant disadvantages are believed by many engineers to be less than in the system based on very large drivers.

SCIENTIFIC INTELLIGENCE.

PREPARATION OF STRONTIUM.

Benno Franz prepares larger quantities of strontium by decomposing strontium amalgam at a low red heat in a current of dry hydrogen gas. It is best to perform the reduction in an iron Rose crucible with a perforated cover. To prepare the amalgam, heat sodium amalgam in a saturated solution of chloride of strontium to 194° Fah. (90° Cen.), and repeat the operation several times. Collect the product and dry between layers of blotting paper. The amalgam of strontium is more rapidly decomposed than the corresponding sodium or barium compound, and must therefore be carefully sealed up until ready for use.

Prepared in this way, strontium is a faintly yellow metal, similar to barium, and can be easily hammered to thin leaves. It oxidizes in the air very rapidly; if held in the hand it evolves heat to such a degree that it soon becomes necessary to drop the metal. It burns in the air with intense light and remarkable scintillations. It fuses at a gentle red heat, and is not volatile at a clear red heat. The specific gravity of the metal is 2·4.

RED DYE FOR LEATHER, IRON, WOOD, ETC.

M. Pushner recommends picric acid for this purpose.

Dissolve 4 grammes picric acid in 250 grammes boiling water, and add, after cooling, 8 grammes aqua ammonia. For the second bath, dissolve 2 grammes of crystallized fuchsine in 45 grammes alcohol, and dilute with 375 grammes hot water, and finally add 50 grammes of ammonia. As soon as the red color of the fuchsine has disappeared, mix the two baths and immerse the articles to be dyed. For ivory and bone the bath ought to be made slightly acid with nitric or hydrochloric acid. On adding gelatin to the bath it can be used as a red ink.

RECOVERY OF OXALIC ACID FROM MADDER.

Madder contains considerable oxalic acid in combination with lime, which is set free by the hydrochloric and sulphuric acids employed in the extraction of the coloring matter. By conducting the acid after the removal of the dye into water saturated with milk of lime, we shall obtain a voluminous precipitate of the oxalate of lime. This can be again decomposed, by an equivalent proportion of sulphuric acid, and after filtering off the sulphate of lime, the oxalic acid can be recovered by evaporating in leaden pans and afterwards purifying by successive crystallizations.

IF THE EARTH WERE TO STAND STILL.

If the revolution of the earth on its axis were to be suddenly stopped, the temperature of everything would be raised to such a degree as to be incapable of existing in any other form than vapor. When a bullet strikes the target it becomes so hot that it cannot be held in the hand. Its velocity is at the rate of 1,200 feet a second, but what must be the heat produced when a body like the earth, moving at the rate of 90,000,000 feet a second is suddenly arrested! It would soon be converted into a sea of fire and all life would become extinct.

It is not probable that this catastrophe will take place in our generation, but as the light of the sun is said to be due to the combustion of worlds in its atmosphere, our time may sometime come to add fuel to the flames.

PURIFICATION OF GLYCERIN.

To purify glycerin which has been for sometime in use, add 10 pounds of iron filings to every 100 pounds of the impure liquid; occasionally shake it and stir up the iron. In the course of a few weeks a black gelatinous mass will collect on the bottom of the vessel, and the supernatant liquid will become perfectly clear, and can be evaporated to remove any excess of water that may have been added to it.

The employment of glycerin to improve the taste of wine is now very extensive. It is preferred to sugar for the reason it cannot be fermented. Hence the necessity of having a perfectly pure article.

OZONE.

This mysterious element appears capable of many uses, and a way to make it in large quantities and at reasonable rates, would be welcomed by a large class of manufacturers. At a recent meeting of the Lyceum of Natural History in New York, Mr. Loew exhibited a method by which it was claimed that ozone could be obtained in any quantity. He assumed that during a certain stage of the combustion of gas, ozone was generated which was afterwards destroyed in the upper part of the flame. By tapping the cone of light at the right point, we can draw off the ozone. This was accomplished by blowing through the flame of a Bunsen burner and collecting the product in a long glass jar. In this way sufficient gas was collected in the jar to show by its odor and by the usual tests that ozone was present. This method of obtaining ozone is entirely new, and if it should prove to be practicable, will be an important discovery.

It has recently been discovered that if picric acid be projected into a jar of ozone, an instantaneous explosion takes place. This is certainly a curious and unexpected reaction and may lead to new applications of ozone as an explosive agent for powders prepared for the purpose. The whole question of the existence and properties of ozone is still very obscure, and now that the author of the leading researches upon it, Professor Schoenbein, is dead, we must patiently wait for some new investigator to take up the subject.

PATENT OFFICE DECISIONS.

SEED PLANTER.

In the matter of the application of D. W. Hughes for the extension of letters patent granted to him for improvement in hand seed planters Nov. 29, 1869.—Applicant is the inventor of a cheap, simple, and useful device for planting seed by hand.

The novelty of this device is sufficiently established, and the utility is evident. During the seven years that applicant made use of his invention by manufacturing and selling the planters, he realized a net profit of some $12,000. It appears that a large number of machines have been manufactured without his consent, the royalty upon which, at the rates which he established would amount to about $12,000 more. If the seven years, during which time he received nothing from his patent, had been diligently employed, and proper precautions had been taken against infringers, the patentee would doubtless have been able to realize a profit of from between $50,000 and $100,000 from his invention. The years of the war were the harvest time of the manufacturers of agricultural implements. As stalwart farmers were metamorphosed into soldiers, wood and iron were transmuted into farmers.

The applicant now seeks an extension of his patent for seven years, in order to regain the seven lost years of his original term. It becomes important, therefore, to inquire how these seven years were spent. Since the patent was never sold, but has been, from first to last, in the hands of the patentee, the burden is on him to show that the benefit which he might have derived from the use of his invention during half of the life time of his patent was not lost through any fault or neglect of his.

Applicant was a machinist. He resided in Palmyra, Missouri, and carried on the manufacturing of these implements. In 1856, he sold of these planters 100; in 1857, 800; in 1858, 1,500; in 1859, 2,000. Here was a rapid increase of sales, and every indication of a growing and prosperous business. In 1860, however, applicant concluded to abandon this business, and to go into mining in New Mexico. This he did, leasing his patent to a firm in Palmyra for one year.

Upon the breaking out of the war, he returned to the States, to make some purchases for his mines. He appears to have made no inquiry after his lesees or their business; but shortly afterward, under pretense of a desire to communicate with New Mexico *via* Texas, he voluntarily went, by way of St. Louis, Louisville, and Nashville, to Memphis, Tenn., which city was at that time in the hands of the enemy. At that place he went to work in a gun factory, but presently departed for Jackson, Miss., where he was engaged "most" of his time "in making, altering, and repairing patterns of different kinds, such as cotton presses, machinery, ordnance stores, cannon castings," etc., understanding that he was, by virtue of his employment, exempt from conscription.

About six months before the taking of Jackson by the United States forces, applicant went to Montgomery, Ala. His principal reason for leaving was, that he "expected Jackson would be taken, and there would be some fighting." He adds, "I feared getting hurt." In Montgomery, he engaged in manufacturing machinery on his own account, and by his machinery making castor and peanut oil. Subsequently he manufactured artificial limbs. After the war, there being no more danger of getting hurt, he returned to Jackson, where he remained until 1867, when he came North, and in 1868 and 1869 again made and sold his planter.

Once, and once only, during the war, he attempted to leave the South. He walked up the railroad, how far he does not say, when, finding he could not, within the enemy's lines, exchange their currency for United States notes, he "turned back, and concluded to remain, until the war was over."

It is only necessary to state, in order to complete this story, that applicant's father and brother, finding this abandoned invention lying idle, took it up, upon their own responsibility, and manufactured about one thousand machines per annum, and made money at it, while the owner of the patent was turning gun barrels, and repairing patterns for ordnance stores and cannon castings, and manufacturing artificial limbs for his country's enemies.

He now asks that that country may be taxed for seven years more, to enable him to reap from this invention the profit which he lost while endeavoring, to the extent of his ability, to destroy the Government whose favor he invokes. The novelty of the demand to be paid, in this form, for his services to the enemy, is only equaled by its effrontery.

The extension is refused.

SAMUEL S. FISHER, Commissioner.

PAVEMENT.

In the matter of the application of Louis S. Robbins for letters patent for improvement in street pavements.—This invention is alleged to consist in a new form of block for wood pavements.

Before the invention of applicant various forms of blocks had been used, the purpose of which was to provide a channel between the blocks at the top, and extending about half way down, which should be filled with concrete, and, by interrupting the surface of the pavement, form a foothold for the feet of horses.

One of these forms was made by cutting a piece from the upper half of the block on opposite sides, so as to form a shoulder, and so that, when two blocks were abutted, the lower halves would be united to form a solid foundation, while a channel would be formed between the upper halves of double the width of the shoulder upon each of them. This was illustrated in Stead's English patent, and Perkin's rejected application.

Another form was that shown in the patent of Nicolson. Long blocks and short blocks were placed in alternate rows, so that the base was solid as before, while a channel was formed between the upper portions of the long blocks.

Applicant forms a shoulder upon one side of the block only. His block is one half of Stead's block, or Stead's block represents two of his placed back to back. He places the blocks in rows, so that he obtains the usual solid base and channel near the top.

In all these cases the concrete is poured into the channel or space between the upper portions of the blocks, and rests upon the solid shoulder; or, as in Nicolson's case, upon the top of the short block. The space between the blocks is, in Stead's case, in the center of the channel; in Nicolson's, on both sides of the channel; and in applicant's, on one side only.

Here are slight differences in construction, but identity of principle. All of these blocks accomplish the same purpose in the same way, or substantially in the same way.

This is not the case of a difference of form involving a new mode of operation. It is a mere difference in the mode of constructing a channel, which, when made, is of the same form as those already well known. The duplication of the shoulder in the block would not have been an invention, and I do not think the omission of one shoulder involves more thought, or a higher quality of thought, than the addition.

The decision of the Examiner-in-Chief is affirmed.

SAMUEL S. FISHER, Commissioner.

UMBRELLA.

In the matter of the application of R. O. Lowry for letters patent for improvement in umbrellas.—The applicant states as follows: "The object of my invention is to produce an umbrella that will neither absorb water nor lose its colors. To accomplish this, I first make my umbrella water-repellent and fast-colored, or either, by means of the application thereto of soap, or of soap and gelatin, in combination with alum, or sulphates, or acetates alone, or with salt or other substances having a saline quality.

"What I claim is, an umbrella having its cover made water-repellent and fast-colored, or either, by means of the application thereto of soap, or soap and gelatin, in combination with alum, or sulphates, or acetates alone, or with salt or other substances having a saline quality, as herein described."

The reference is to a provisional specification No. 542, of 1857, in England. As no patent was granted, the objection cannot be that the invention has been patented abroad, but that it has been described in a printed publication.

This invention was for an improvement in umbrellas, by the use of a peculiar fabric. "For this purpose the weft used is of single yarn, produced from dressed or hackled silk waste, dyed by preference in the hank, sliver, or rove. The warps are of cotton or linen yarn, by preference doubled, or what is called lace cotton yarn, suitably dyed. These warp yarns are put through a solution of what is known as aluminous soap, to give the same a resisting power against moisture."

Applicant, in argument, states that his process consists in treating the entire fabric first with soap, and afterward with alum, or sulphates, etc. In this way he claims that the soap becomes curdled, or a compound is formed insoluble in water, which renders the umbrella water-repellent. He argues that the aluminous soap referred to in the reference is so vaguely described as to be incapable of identification, and insists that if it was a soap as stated, it must have been soluble in water, and must have attracted the water instead of repelling it; that the language, "put through a solution of what is known as aluminous soap," in no way describes his process, nor could such manipulation have produced the result at which he aims.

There would be great force in this position if applicant had described his process in his application as he does in his argument. I am inclined to think that the term "aluminous soap" in the reference, does not import a treatment of the fabric first with soap and then with alum, nor do I believe the result of the two modes of treatment would be the same.

But applicant, in the actual description of his process, is as wide of the mark as the English specification. The substance of his entire description is that he makes his umbrella water-repellent by means of the application thereto of soap, in combination with alum. Now, would any one infer from this language that he meant to treat his umbrella first with soap, and then with alum? I think not. If sufficient alum were added to curdle the compound, before application to the umbrella, it could not be applied at all. The only fair inference would seem to be, that so much alum only was to be combined with the soap as not to destroy the quality of the article as soap; in other words, to use "aluminous soap" like the Englishman.

In view of this description of the process, I think the reference was pertinent.

The decision of the Board of Examiners-in-Chief is affirmed.

SAMUEL S. FISHER, Commissioner.

NEW BOOKS AND PUBLICATIONS.

A TREATISE ON ASIATIC CHOLERA. By C. Macnamara, Surgeon to the Calcutta Ophthalmic Hospital. London: John Churchhill & Sons, New Burlington street. Calcutta and Bombay: Thacker, Spink & Co.

This work is a large octavo, embodying conclusions drawn from fifteen years' experience and practice in the endemic area of cholera. The work commences with a definition and description of the disease, its various forms, and the modes by which it is transmitted. This is followed by an historical account of cholera, containing particulars of the most destructive epidemics on record, with their bearings on the etiology and mode of propagation of the disease. The geographical distribution of the disease is next given, with the countries hitherto exempt from it. The important subject of meteorological influences, as influencing or retarding the spread of the disease is next discussed, and forms a most interesting and valuable portion of the work. The characteristic features of Asiatic cholera, post mortem conditions of the bodies of those who have died at various stages of the disease, the etiology of cholera, and, finally, its symptoms and treatment are discussed at length. The latter discussion includes the consideration of preventive measures, based on the laws of communicability of cholera, quarantine, purification of water, and disinfection. This work is an important one, and will, doubtless, become an accepted authority upon the subject of cholera.

TOWNSEND'S FOLDING GLOBE. Patented February 16, 1869. Manufactured and sold by Dennis Townsend, Felchville, Windsor county, Vt.

This is a novel and ingenious invention and publication, designed to place a cheap and convenient substitute for the revolving globe. The surface is composed of ellipsoid segments, the edges of which are attached to each other by tapes, and the whole may be flattened together so that it may be placed within the covers of a book. When it is desired to use it by drawing upon small rings inserted at the poles the whole assumes the globular form, presenting to view seas, mountains, continents, and other geographical features of the globe.

NATURAL HISTORY OF THE HUMAN RACES, with their Primitive Form and Origin, Primeval Distribution, Distinguishing Peculiarities, Antiquity, Works of Art, Physical Structure, Mental Endowments, and Moral Bearing. Also, an Account of the Construction of the Globe, Changes of its Surface, Elevations of its Mountains, and Subsidence of Land; together with other interesting matter. Illustrated by Colored Plates of each Type. With numerous Engravings representing their varied forms. By John P. Jeffries. One volume, 8vo; pp. 380; cloth. Price, $4·00. Published by S. R. Wells, 389 Broadway, New York city.

This book contains a great deal of rare and valuable information concerning the history of our race, and in respect to which the mass of mankind know but very little.

THE MEDICAL ADVISER. A Full and Plain Treatise on the Theory and Practice of Medicine, especially adapted to Family Use. By Rezin Thompson, M. D., Member of the National Medical Association, and author of "Thompson on Fever," etc. Chicago: Jones, Jenkins & Co.

We have received from the National Publishing Company specimen pages of this book. It promises to be a hand-book of useful sanitary information for domestic use. It is to be illustrated with engravings representing parts of the human anatomy, botanical specimens, parasites peculiar to certain diseases, etc., and gives plain and simple directions for the treatment and prevention of ordinary diseases.

PHOTOGRAPHIC MOSAICS FOR 1870. Philadelphia: Benerman & Wilson.

We advise every photographer to supply himself with a copy of this admirable little book. It is a complete record of the progress made in the art during the past year, and contains many valuable recipes and instructions.

Recent American and Foreign Patents.

Under this heading we shall publish weekly notes of some of the more prominent home and foreign patents.

WOOD-BENDING MACHINE.—James W. Martin, Philadelphia, Pa.—This invention relates to a new and useful improvement in machines for bending wood, designed more especially for bending handles of umbrellas, parasols, and canes, but applicable to many other purposes.

STEAM ENGINE.—J. E. Culver, Hudson City, N. J.—This invention relates to a new high pressure engine, which can be worked either by steam alone or by water and steam combined.

COMBINATION TOY.—Robert Went, Williamsburgh, N. Y.—This invention relates to a new and useful improvement in a combination toy, and consists in operating (on two wheels which revolve on an axle) a revolving swing and revolving horizontal tables, both swing and tables being designed for any figures representing children, birds, or animals.

MACHINE FOR FORGING AUGER BITS BY MEANS OF ROLLS.—James Swan Seymour, Conn.—This invention relates to a new and useful improvement in a machine for forging or forming the tips or cutting ends of auger bits.

PUMP.—Morgan P. Hall, Gayville, Ill.—This invention relates to a new and useful improvement in pumps for raising water and other liquids.

SELF LOCK FOR BASEMENT GATE.—James A. Clark, New York city.—This invention has for its object to furnish an improved lock for basement gates, which shall be so constructed and arranged that it can not be opened from the outside of the gate and will always lock itself when the gate is closed.

SPOKE-SMOOTHING MACHINE.—Horatio Keys, Terre Haute, Ind.—This invention consists of an improved arrangement of apparatus for slowly moving the spoke held in centers at the end lengthwise along, and turning it in contact with a polishing belt moving rapidly across it, the said apparatus being guided by a pattern to move the spoke to or from the belt according to the variations in the shape of the said spokes, so that the pressure against the belt will always be the same and the effect thereby rendered uniform. The invention also comprises a certain means for reversing the movements of the spoke carrying devices, for moving the spokes longitudinally back and forth; also, certain means for throwing the spokes away from contact with the belt at the end of each longitudinal movement, and for automatically stopping the longitudinal movements at the end of the same in each direction.

FLOUR BOLT.—A. J. Dibble, Franklin, N. Y.—This invention consists in the substitution of coarse oil cloth at the tail end for the silk commonly used thereat for separating the tailings from the bran, and in the addition hereto over the said wire cloth and on an enl rged portion of the reel, of coarse silk cloth, such as commonly used in the place where the wire is placed in this case, so as to provide a space between it and the wire, and designed for the reception of the coarse bran or feed which will thus be separated from the hulls of buckwheat when grinding this grain, and be delivered into a receptacle over which the hulls are chuted and discharged to another receptacle, the object of which is to provide a bolt by which feed may be obtained separate from the hulls, which are injurious to animals, and which will, at the same time, be suitable for bolting the meal of other grain.

PACKING THE PLUNGERS OF STEAM PUMPING ENGINES.—John Clark, Harrisburgh, Pa.—This invention is intended to be an improvement upon the well-known Worthington & Baker steam pumping engine, and consists in the application of an adjustable packing, constructed so as to compensate for wear, to the central transverse partition of the barrel of such an engine, through which the plunger plays.

METALLIC ABUTMENT FOR BRIDGES.—A. Wheelock, Fort Wayne, Ind.—This invention relates to a new metallic abutment for bridges, constructed in a novel and improved manner.

NUT LOCK.—Maurice Langhorne, Washington, D. C.—This invention has for its object to prevent the turning back spontaneously of a nut after it has once been screwed on its bolt or axle as tightly as may be necessary in order to clamp the material through which the bolt or axle passes.

STEAM PUMPING ENGINE.—William H. Roberts, Mauch Chunk, Pa.—This invention has for its object to make the stroke of the piston of a steam pump uniform as to speed throughout.

KINDLING WOOD ELEVATOR.—James E. Kelsey, Brooklyn, N. Y.—This invention has for its object to furnished an improved elevator, designed especially for elevating kindling wood in the factory where it is prepared for market.

ADJUSTABLE PLOW BACK BAND HOOK.—John Seaman, New York city.—This invention has for its object to furnish an improved plow back band hook, which shall be so constructed that the length of the back band may be easily adjusted according to the size of the animal upon which it is to be used or to regulate the pitch of the plow, and which shall, at the same time, be so constructed that it will not become accidentally unhooked or catch upon the trace of the other horse.

RUBBER MOLDING.—William Miller, Boston, Mass.—This invention has for its object to furnish an improved rubber molding, which shall be so formed as to adapt it for use around windows, doors, etc., as weather-strips, to prevent the wet and cold from finding their way in around said doors and windows.

MEDICAL COMPOUND.—George V. Sheffield and John A. Sheffield, Northbridge Center, Mass.—This invention has for its object to furnish an improved medical compound, simple in its composition and preparation, and effective as a blood purifier, and a sure remedy for many diseases, such as scrofula, salt rheum, dyspepsia, liver complaint, worms, jaundice, etc.

SHINGLE MACHINE.—Wm. H. H. Palmer, Rockville, R. I.—This invention relates to certain improvements in that class of shingle machines in which the blocks to be cut are held in a rotating frame, and exposed to the action of horizontal circular saws. The invention consists in various details of construction, whereby the blocks are brought into the proper alternate inclined positions, and caused to be firmly clamped while being sawed.

SKEIN WARPING MACHINE.—Samuel Campbell, Palmer, Mass., and Duncan McFarlane, Troy, N. Y—This invention relates to a new machine which can be used to lay the yarn in skeins or in separate threads around the section-beam. The invention consists chiefly in the application of a traversing bugle or guide, which collects all the threads into a single skein, to apply the same to the section-beam. This bugle, however, and its appurtenances are removable, and when they are taken off, the machine may be used to apply the yarn in separate threads, as on the ordinary warping machine.

WHIFFLETREES AND TRACES.—J. V. Norton, Plainville, N. Y.—The object of this invention is to provide a convenient construction of harness, wherewith to connect the ropes of hoisting apparatus, such as derricks, horse hay-forks, etc., with the draft animals.

HARVESTER.—J. B. McCormick, Dayton, Ohio.—This invention has for its object to improve the construction of the kind of reapers which are so constructed that the grain may be bound before being dropped from the machine, so as to make them simpler in construction, and more effective and satisfactory in operation than when constructed in the usual manner.

SAW SET.—H. A. Harris, Center, Texas.—This invention relates to a new implement which can be used for setting the teeth of all kinds of saws, by hand, and without requiring any intricate machinery.

SPRINGS FOR CARS, ETC.—C. M. Banks, Roxborough, Philadelphia, Pa.—This invention will soon be illustrated in the SCIENTIFIC AMERICAN.

FEED CUTTER AND THRASHER.—Norman McLeod, Clio, S. C.—This invention relates to new and important improvements in the machine for which a patent was granted to the same inventor, November 10, 1868, No. 83,584, which said machine is designed for use either for straw or feed cutting, or for thrashing grain, and comprises certain improved arrangements of a feeding trough, feeding rollers, and revolving cutters, working across the end of the feeding trough, and in a large case for controlling the cut straw and delivering it through a spout.

NEEDLES.—Robert J. Roberts, 416 Broadway, New York city.—This invention relates to improvements in sewing needles, and consists in providing the said needles, which are commonly made of steel, which is very liable to damage by corrosion, with coatings of non-corrosive metal, such as gold, silver, copper, or tin; the said metals being applied to the needles after they have been otherwise finished, by the common and well-known methods of gilding, plating, or tinning.

Answers to Correspondents.

CORRESPONDENTS who expect to receive answers to their letters must, in all cases, sign their names. We have a right to know those who seek information from us; besides, as sometimes happens, we may prefer to address correspondents by mail.

SPECIAL NOTE.—This column is designed for the general interest and instruction of our readers, not for gratuitous replies to questions of a purely business or personal nature. We will publish such inquiries, however, when paid for as advertisements at $1·00 a line, under the head of "Business and Personal."

All reference to back numbers should be by volume and page.

W. M.—The Hudson River railroad is 144 miles long. There is a flagman for each mile, charged with the duty of examining the track after the passage of every train. It is one of the safest roads in the country. The resistance in moving a ton weight upon a level railroad is one four-hundredth of that load, or, say, 5 pounds. This is realized at slow speeds, and if the construction of track and wheels were mechanically accurate, the above resistance would be constant at all speeds. But so defective is the average construction that, at high speeds, the resistance is found to be 20 pounds and over. The reason why the Erie railway trains are so irregular, is because of the wretched condition of the track. The trains lose from two to five hours on the schedule time in passing over the whole length of the road.

R. C. P. B., of Pa.—No exact ratio between the diameter of a circle and its circumference has ever been discovered. The ratio of 7 to 22, is, however, near enough for many purposes.

A. S., of Iowa.—Annealing depends, like hardening, on molecular changes not yet fully understood. The why of many things cannot yet be answered.

S. W., of Ind.—Bricks do not increase in weight by the process of burning.

H. W., of N. Y.—A good rule in setting boilers in regard to the distance of the bridge walls, is to have the extremities of each 3 inches from the boiler. Then let the bridge walls retreat from the boiler uniformly, so that their distances from the boiler measured halfway between the extremity and the middle of the wall, multiplied into the entire length of the curve, shall give an area of 36 square inches for each square foot of grate surface for the first bridge wall, 24 square inches for the second bridge wall, and 20 square inches for the third. This when three bridge walls are used. In all cases the last bridge wall should be at the same distance from the boiler, so that if one is omitted it is the one giving the greatest area; if two, the ones giving the two greatest areas.

E. B., of Mass.—The Portland cement concrete made in the same proportions as the concrete for building, will make a good cellar bottom. There will be no danger of fire from the registers of a hot-air furnace, unless they are closed so that no air passes through. In such cases they may sometimes communicate fire to the surrounding woodwork. The registers of a furnace should never be all closed at once when a fire is burning. An iron tube well sunk near the foundations of a heavy building, would, we think, lit the water flow and demand were large, be apt to cause sinking of the foundations.

M. H. S., of N. Y.—The widths of belts to drive a given horse power depends on their velocity and the surface of contact of the belt with the smaller pulley. These data you do not give, therefore your question cannot be answered. We know no such wheel as a *pitch-back* water wheel. The power required to drive a saw depends upon many conditions not one of which you give. You might just as well ask "how large is a piece of chalk?" You ought to secure the services of a practical mill-wright if you wish to save money and time.

R. J. P. G., of N. H.—The nature of magnetism is not yet understood. Nobody knows why certain bodies are magnetic and others are not, or why bodies under certain circumstances become magnetic and again lose their magnetism. The most that is known is that magnetic phenomena uniformly occurs under certain circumstances. All beyond this remains yet a *terra incognita*.

J. S., of Pa.—The cement called "marine glue" will unite leather to gutta-percha and is impervious to damp. It is made by dissolving by the aid of heat, one part of india-rubber in naphtha, and when melted, adding two parts of shellac, and melting until mixed. Pour it while hot on metal plates to cool. When required for use melt and apply with a brush.

J. H. B., of Mass.—We recommend a wire of aluminum bronze as combining in the greatest degree the qualities of strength, ductility, and cheapness. We do not think it is made in this country, but if you understand wire-drawing, and have facilities, you can make it for yourself. The alloy is nine parts aluminum and ninety parts copper.

R. L. A., of N. C.—The old idea of caloric as a material substance pervading bodies and enveloping their atoms, has been long abandoned by scientific men. You will find more modern and philosophical views in the writings of Tyndall, Grove, Helmholtz, and many others upon heat. We respectfully decline your communication.

E. C. C., of N. Y.—Any well-tempered spring not overtaxed will retain its strength an indefinite length of time. No spring should have a load sufficient to permanently "set" it. Flat coiled springs are the most convenient for driving wheel work.

H. R. A., of Conn.—The spring and the weight are the only mechanical depositories of power which retain their power for indefinite periods, and when released expend it, if we except such as require chemical action to release their imprisoned energy.

C. D. S., of N. Y.—Tin and lead in equal parts makes a good soft solder. Easier of fusion is a solder made of equal parts of tin, lead, and bismuth. For soft soldering brass tinfoil may be used and makes a good joint. Care should be taken not to employ too great heat.

C. B., of N. Y.—An excellent cement to mend cut leather is as follows: 1 pound gutta-percha; 4 ounces india-rubber; 2 ounces pitch; 1 ounce shellac; 2 ounces of oil. Melt the ingredients together and use hot.

C. C., of N. Y.—The periods of artificial incubation of different kinds of eggs are the same as when incubation is performed by the parent bird.

B., of N. Y.—Ornamental iron bars with spiral or undulating lines, are made by rolling between a pair of rollers, the axis of one roller being set at an angle to the axis of the other

S. C. S., of Mass.—We know of no process by which you can make the rusty heads of screws bright again without injury to other parts of the screws, except by repolishing.

W. S., of Iowa.—Your letter and diagram of circles observed about the moon are interesting, but possess hardly enough novelty to warrant publication.

E. C. A. of N. Y.—Black pins are made black by japanning. The japan is made by mixing drop ivory black with anime varnish. The pins are dipped in this and the coat is baked on in an oven.

G. C. H., of Mass.—We know of no cement which will unite leather while damp and hold it strongly.

B. H. H., of Ind.—Boilers do not always explode at the top Neither, in our opinion, do they burst from the generation of gas other than steam, which is a gas to all intents and purposes. Boilers may doubtless be sometimes strained almost to bursting by unequal expansion, but in the majority of cases steam does the work of destruction on boilers weakened by neglect or inherently weak from faulty construction.

W. D. Beecher, of Mass.—You should introduce your blower about half way between the bottom of the ash pit and the grate of your boiler furnace. If the blast is properly introduced into the chimney, provided the volume of air is sufficient, it will add about one half to the draft, but it will be much more efficient applied under the grate.

M. M., of Va.—Mink and other skins are dressed in this country before being made up. We presume this is done more or less by all large fur dealers, but we are not acquainted with any furrier that makes it a specialty.

R. A., of N. C.—A steam engine may be made to assist a water wheel when water is low by belting on to a pulley on the first line of shafting, but the water wheel would hardly take the place of a fly-wheel.

J. S. D., of N. H.—We cannot adopt your suggestion to star each new advertisement. All advertisers must be treated alike, and we wish our readers to read the advertising columns each week from beginning to end.

H. M. & Co., of Ohio.—We do not think that arching over your boiler with brick so as to lead the flame and heated products of combustion over its entire surface, adds directly to the danger of explosion, but by concealing leaks and hiding from view the condition of the boiler, it does so indirectly. Besides, as a measure of economy, it is not good practice to so set a boiler. It is well to cover the top of a boiler with some non-radiating substance, easily removed when necessary, of which felt is undoubtedly the best though more expensive than some other substances that will answer quite well. Sand or coal ashes are used often, and there are some patented compositions in market which are quite cheap, and which are more or less effective.

Business and Personal.

The Charge for Insertion under this head is One Dollar a Line. If the Notices exceed Four Lines, One Dollar and a Half per line will be charged.

Inventions Patented in England by Americans.

[Compiled from the "Journal of the Commissioners of Patents."]

PROVISIONAL PROTECTION FOR SIX MONTHS.

150.—LOOM FOR WEAVING.—Isaac E. Newton, Waterbury, Conn. January 19, 1870.

152.—NEEDLES AND NEEDLE ARMS FOR SEWING MACHINES.—Mary P. Carpenter, San Francisco, Cal. January 20, 1870.

Caveats are desirable if an inventor is not fully prepared to apply for a patent. A Caveat affords protection for one year against the issue of a patent to another for the same invention. Patent Office fee on filing a Caveat, $10. Agency charge for preparing and filing the documents from $10 to $12. Address MUNN & CO., 37 Park Row, New York.

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U. S. Patent Office.

How to Obtain Letters Patent FOR NEW INVENTIONS.

Information about Caveats, Extensions, Interferences, Designs, Trade Marks; also, Foreign Patents.

For a period of nearly twenty-five years, MUNN & CO. have occupied the position of leading Solicitors of American and European Patents, and during this extended experience of nearly a quarter of a century, they have examined not less than fifty thousand alleged new inventions, and have prosecuted upward of thirty thousand applications for patents, and, in addition to this, they have made, at the Patent Office, over twenty thousand preliminary examinations into the novelty of inventions, with a careful report on the same.

The important advantages of MUNN & CO.'S Agency are, that their practice has been ten-fold greater than that of any other Agency in existence, with the additional advantage of having the assistance of the best professional skill in every department, and a Branch Office at Washington, which watches and supervises, when necessary, cases as they pass through official examination.

CONSULTATIONS AND OPINIONS FREE.

Those who have made inventions and desire a consultation are cordially invited to advise with MUNN & CO. who will be happy to see them in person at the office, or to advise them by letter. In all cases, they may expect an HONEST OPINION. For such consultations, opinion, and advice, NO CHARGE is made. A pen-and-ink sketch and a description of the invention should be sent.

TO APPLY FOR A PATENT,

A model must be furnished, not over a foot in any dimension. Send model to MUNN & CO., 37 Park Row, New York, by express, charges paid, also, a description of the improvement, and remit $16 to cover first Government fee, and revenue and postage stamps.

The model should be neatly made, of any suitable materials, strongly fastened, without glue, and neatly painted. The name of the inventor should be engraved or painted upon it. When the invention consists of an improvement upon some other machine, a full working model of the whole machine will not be necessary. But the model must be sufficiently perfect to show with clearness the nature and operation of the improvement.

PRELIMINARY EXAMINATION

Is made into the patentability of an invention by personal search at the Patent Office, among the models of the patents pertaining to the class to which the improvement relates. For this special search, and a report in writing, a fee of $5 is charged. This search is made by a corps of examiners of long experience.

Inventors who employ us are not required to incur the cost of a preliminary examination. But it is advised in doubtful cases.

REISSUES.

A patent when discovered to be defective, may be reissued by the surrender of the original patent, and the filing of amended papers. This proceeding should be taken with great care.

DESIGNS, TRADE MARKS, AND COMPOSITIONS

Can be patented for a term of years, also, new medicines or medical compounds, and useful mixtures of all kinds. When the invention consists of a medicine or compound, or a new article of manufacture, or a new composition, samples of the article must be furnished, neatly put up. Also, send a full statement of the ingredients, proportions, mode of preparation, uses, and merits.

PATENTS CAN BE EXTENDED.

All patents issued prior to 1861, and now in force, may be extended for a period of seven years upon the presentation of proper testimony. The extended term of a patent is frequently of much greater value than the first term; but an application for an extension, to be successful, must be carefully prepared. Munn & Co. have had a large experience in obtaining extensions, and are prepared to give reliable advice.

INTERFERENCES

Between pending applications before the Commissioners are managed and testimony taken; also, Assignments, Agreements, and Licenses prepared. In fact, there is no branch of the Patent Business which Munn & Co. are not fully prepared to undertake and manage with fidelity and dispatch.

FOREIGN PATENTS.

American inventors should bear in mind that five Patents—American, English, French, Belgian, and Prussian—will secure an inventor exclusive monopoly to his discovery among ONE HUNDRED AND THIRTY MILLIONS of the most intelligent people in the world. The facilities of business and steam communication are such, that patents can be obtained abroad by our citizens almost as easily as at home. Munn & Co. have prepared and taken a larger number of European Patents than any other American Agency. They have Agents of great experience in London, Paris, Berlin, and other Capitals.

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COST OF APPLICATIONS.

When the model is received, and first Government fee paid, the drawings and specification are carefully prepared and forwarded to the applicant for his signature and oath, at which time the agency fee is called for. This fee is generally not over $25. The cases are exceptionally complex if a higher fee than $25 is called for, and, upon the return of the papers, they are filed at the Patent Office to await Official examination. If the case should be rejected for any cause, or objections made to a claim, the reasons are inquired into and communicated to the applicant, with sketches and explanations of the references; and should it appear that the reasons given are insufficient, the claims are prosecuted immediately, and the rejection set aside, and usually **Without Extra Charge to the Applicant.**

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The only cases of this character, in which MUNN & CO. expect an extra fee, are those wherein appeals are taken from the decision of the Examiner after a second rejection; and MUNN & CO. wish to state very distinctly, that they have but few cases which can not be settled without the necessity of an appeal; and before an appeal is taken, in any case, the applicant is fully advised of all facts and charges, and no proceedings are had without his sanction; so that all inventors who employ MUNN & CO. know in advance what their applications and patents are to cost.

MUNN & CO. make no charge for prosecuting the rejected claims of their own clients before the Examiners and when their patents are granted, the invention is noticed editorially in the SCIENTIFIC AMERICAN.

REJECTED CASES.

MUNN & CO. give very special attention to the examination and prosecution of rejected cases filed by inventors and other attorneys. In such cases a fee of $5 is required for special examination and report, and in case of probable success by further prosecution, and the papers are found tolerably well prepared, Munn & Co. will take up the case and endeavor to get it through for a reasonable fee, to be agreed upon in advance of prosecution.

CAVEATS

Are desirable if an inventor is not fully prepared to apply for a Patent. A Caveat affords protection, for one year, against the issue of a patent to another for the same invention. Caveat papers should be carefully prepared.

The Government fee on filing a Caveat is $10, and Munn & Co.'s charges for preparing the necessary papers are usually from $10 to $12.

Official List of Patents.

Issued by the United States Patent Office.

FOR THE WEEK ENDING FEB. 15, 1870.

Reported Officially for the Scientific American.

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99,744.—Pipe Coupling.—Wm. D. Alford and J. H. Pitkin, Cuyahoga Falls, Ohio.
99,745.—Cigar Machine.—William G. Ayres and Seth L. Cole, Brooklyn, N. Y. Antedated February 9, 1870.
99,746.—Cabinet.—Robert Bacon (assignor to himself and Joseph Lincoln, Jun., Boston, Mass.
99,747.—Washing Machine.—Fortune L. Bailey, Freeport, Ind.
99,748.—Fire-place Back.—J. I. Bard, New Orleans, La.
99,749.—Gripper and Gage for Printing Presses.—Henry Barth, Cincinnati, Ohio.
99,750.—Frame for Dyeing in Various Colors for Manufacture of Scotch Plaids, etc.—Charles Barton, Paterson, N. J., assignor to Dexter, Lambert & Co.
99,751.—Governors for Steam and other Enginery.—Joseph Bell, Cincinnati, Ohio. Antedated January 29, 1870.
99,752.—Boiler for Cooking Stoves.—Frank S. Bissell, Pittsburgh, Pa.
99,753.—Wash Boiler.—Charles D. Blinn, Port Huron, Mich.
99,754.—Air Pistol.—Reuben Brooks, Jun., Rockport, Mass.
99,755.—Folding Bedstead.—W. H. Buell, Laughlintown, Pa.
99,756.—Slate Frame.—Ebenezer Butler, Salina, N. Y.
99,757.—Bank Notes, Bonds, Revenue Stamps, etc.—George W. Casilear, Washington, D. C.
99,758.—Ruling Machine.—George W. Casilear, Washington, D. C.
99,759.—Gage for Paper-cutting Machines.—Cyril C. Child, Boston, Mass.
99,760.—Window Frame.—A. J. Cleveland, Baltimore, Md. Antedated January 31, 1870.
99,761.—Friction Clutch Mechanism.—Moses G. Crane, Newton, and A. M. Polsey, Boston, Mass., assignors to Wm. Smith Hall, Quincy, Mass.
99,762.—Safety Valve.—George W. Cushing (assignor to himself and Horatio Anderson), Chicago, Ill.
99,763.—Fruit Jar.—Wm. H. Daniels, Bryan, Ohio.
99,764.—Tobacco Box.—Charles Doering, Charlestown, Mass.
99,765.—Spring Bed Bottom.—Charles H. Dunks, Detroit, Mich.
99,766.—Hay Drag.—Daniel Eddelman and Amos Eddelman, Madison, Ind.
99,767.—Stirrup and Spur for Saddles.—Henry Fellows, Bloomington, Ind. Antedated December 20, 1869.
99,768.—Corn Sheller.—Daniel E. Field, Leaksville, N. C., assignor to himself and Collett Leventhrope, New York city.
99,769.—Gas-carbureting Apparatus.—John Gair, New York city, assignor to himself and Joseph J. Walton, Newark, N. J.
99,770.—Sleigh Knee.—John P. Garland, Newbury, Vt.
99,771.—Wagon Spring.—Lewis L. Gordon, Detroit, Mich.
99,772.—Mop-wringer and Scrubbing Brush.—Lewis L. Gordon (assignor to Richard W. Hutchinson), Detroit, Mich.
99,773.—Process and Material for Ornamenting Textile Fabrics.—Carl Gunther, assignor to Frederick Volkman, Berlin, Prussia.
99,774.—Car Truck.—Aaron Higley, Cleveland, Ohio.
99,775.—Shovel Blank.—George W. Jope, Pittsburgh, Pa., assignor to himself and Wm. Buntan.
99,776.—Elliptic Spring.—Frank Keeler (assignor to Tomlinson Spring and Axle Company), Bridgeport, Conn.
99,777.—Metallic Hearth.—Oliver Kells, Steubenville, Ohio.
99,778.—Sofa Lounge.—Charles Kurfiss, Louisville, Ky.
99,779.—Spring Bed.—Hermon W. Ladd and Geo. F. Ladd, Chelsea, Mass.
99,780.—Match Machine.—L. T. Luther, Oak Grove, Pa.
99,781.—Screw Driver.—William H. Martyn, Boston, Mass.
99,782.—Apparatus for Frizzling Cloth.—Schamu Moritz Moschcowitz, New York city, assignor to Wheeler & Wilson Manufacturing Company), Bridgeport, Conn.
99,783.—Sewing Machine.—Nicholas Meyers (assignor to Globe Sewing Machine Company), Buffalo, N. Y.
99,784.—Grinding Ax and Hook Combined.—Philetus W. Norris, Detroit, Mich.
99,785.—Fastening Handles to Cutlery.—Elias G. Ost, Shelburne Falls, Mass.
99,786.—Mechanism for Relieving the Pressure on Shuttle-box Swell.—Joseph Potter, Danielsonville, assignor to Geo. L. Lyon, Brooklyn, Conn.
99,787.—Compound Railway Rails.—Daniel R. Pratt, New York city.
99,788.—Beading Machine for Sheet Metal.—Charles H. Raymond, Southington, Conn.
99,789.—Oil Can.—Patrick Scanlan, Indianapolis, Ind.
99,790.—Spring Bed Bottom.—John L. Secomb, Detroit, Mich.
99,791.—Compound Propeller Pump.—Thomas Shaw, Philadelphia, Pa.
99,792.—Self-working Rotary Corn Planter.—John Simonton, Taylorsville, Ind. Antedated February 14, 1870.
99,793.—Furnace for Burning Edgings, Sawdust, etc.—Ira O. Smith, Muskegon, Mich.
99,794.—Engraving Machine.—J. Civilian Spencer, Phelps, N. Y.
99,795.—Tool for Making Splints.—Charles F. Stewart, Corunna, Mich.
99,796.—Fence.—M. Vanwormer, Troy, Ohio.
99,797.—Harvester Knife.—George J. Hardwell, Rutland, Vt. Antedated February 6, 1870.
99,798.—House Trimmings.—J. R. Webber, Morris, Ill.
99,799.—Scaffold.—George W. Wells, Lawton, Mich.
99,800.—Lubricator for Bearings of Shafts.—Peregrine White, Dixmont Center, Me. Antedated February 11, 1870.
99,801.—Stove for Burning Stumps.—Henderson Willard, Grand Rapids, Mich. Antedated January 29, 1870.
99,802.—Elevating Apparatus.—George G. Winans, Scranton, Pa.
99,803.—Drilling Machine.—Edward J. Worcester, Worcester, Mass.
99,804.—Fare Box for Street Cars.—W. H. Young, Chicago, Ill.
99,805.—Process of Welding Cast or Bessemer Steel.—John Absterdam, New York city.
99,806.—Mode of Covering Molds and other Articles with a Metallic Surface.—Joseph Alexander Adams, Brooklyn, N. Y.
99,807.—Paddle-wheel.—David Anderson, Philadelphia, Pa.
99,808.—Planing Machine.—Moses L. Andrew, Cincinnati, Ohio.
99,809.—Carriage-wheel Hub.—Simeon Atha, West Liberty, Ohio.
99,810.—Wood-turning Lathe.—Loring Atwood and Edward Ripley, Rutland, Vt., assignors to themselves and Baxter D. Whitney, Winchendon, Mass. Antedated February 5, 1870.
99,811.—Soap Mixture.—Jacob M. Austin (assignor to himself and Wm. Tash), York, Pa.
99,812.—Globe Valve.—J. W. Baldwin, Laconia, N. H.
99,813.—Spring for Railway Cars.—C. M. Banks, Roxborough, Philadelphia, Pa.
99,814.—Rotary Window Washer.—Gottleib M. Barth, Philadelphia, Pa.
99,815.—Sash Holder.—Charles Bean, North Providence, assignors for one-half to James Langley, Jun., Providence, R. I.
99,816.—Umbrella.—Charles Becker, New York city.
99,817.—Car Coupling.—W. W. Bell, Chicago, Ill.
99,818.—Railway Car Coupling.—Charles W. Benson (assignor for one half to Richard C. Waters), Frederick City, Md.
99,819.—Churn.—H. H. Bigard, E. H. Kellogg, and N. A. Prentiss, Fowler, N. Y. Antedated February 14, 1870.
99,820.—Combined Reel and Rake for Harvesters.—S. H. Bingman, Laurelton, Pa.
99,821.—Hoe.—L. L. Bond, Chicago, Ill.
99,822.—Gate.—C. S. Bonney, Syracuse, N. Y.
99,823.—Indigo Soap.—H. C. Borgner, Lebanon, Pa.
99,824.—Instrument for Dividing Circles.—M. Bowker and J. L. Stratton, Fitchburg, Mass.
99,825.—Handle for Cross-cut Saws.—E. M. Boynton, Grand Rapids, Mich.
99,826.—Clamp.—S. C. Bradley (assignor to C. E. Thompson & Co.), New Haven, Conn.
99,827.—Sash Holder.—E. K. Breckenridge, West Meriden, Conn.
99,828.—Bolt Work for Safe Doors, etc.—Martin Briggs, Rochester, N. Y.
99,829.—Table-leaf Support.—W. R. Briggs (assignor to M. G. Briggs), Boston, Mass.
99,830.—Plow.—T. E. C. Brinly, Louisville, Ky.
99,831.—Seal Lock.—F. W. Brooks, New York city.
99,832.—School Desk.—John David Browne, Madisonville, Ohio.
99,833.—Hay Tedder.—R. Bryson, Schenectady, N. Y.
99,834.—Bridle.—Mathew Hay Buchanan, Washington Co., Va.
99,835.—Grain Separator.—Hiram Burdick, Monroe, Wis.
99,836.—Washing Machine.—Oscar S. Burges, Sr., Battle Creek, Mich.
99,837.—Curtain Fixture.—T. Burgin, Rutland, Vt.
99,838.—Head Block for Saw Mills.—J. H. Burket, Findlay, and G. Burket, Bluffton, Ohio.
99,839.—Boiler Furnace and Flue.—W. H. Burns, Unionville, Mo.
99,840.—Teasle-grading Machine.—G. A. Burrough, Providence, R. I. Antedated Feb. 10, 1870.
99,841.—Slate Frame.—S. B. Bushfield, Jr., Parkersburg, W. Va.
99,842.—Washing Machine.—N. W. Calhoun, Upper Tract, W. Va.
99,843.—Warping Machine.—S. Campbell, Palmer, Mass., and Duncan McFarlane, Troy, N. Y.
99,844.—Blind Hinge.—C. B. Clark, Buffalo, N. Y. Antedated Jan. 5, 1870.
99,845.—Latch.—J. A. Clarke, New York city.
99,846.—Piston Packing.—John Clark, Harrisburg, Pa.
99,847.—Folding Bedstead.—T. G. Clifford (assignor to himself and W. B. Clifford), New York city.
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99,996.—Low-Water Indicator.—Robert Berryman, Philadelphia, Pa. Antedated Aug. 16, 1869.

99,997.—Sucker-Rod Coupling for Oil Wells.—Adam Good, Jr., Titusville, Pa.

99,998.—Circulating Tube for Steam Generators.—J. C. Stevens, South Norwalk, Conn.

99,999.—Hinge.—Timothy Smith, Boston, Mass.

REISSUES.

3,834.—Feed-Water Heaters and Filters.—James Armstrong, Bucyrus, Ohio.—Patent No. 81,971, dated Sept. 8, 1868.

3,835.—Manufacture of Cast Steel.—Wm. W. Averell, Bath, N. Y., assignee of Louis La Breche-Viger.—Patent No. 95,238, dated Sept. 28, 1869.

3,836.—Corn Planter.—Jas. Campbell and Wm. Campbell, Harrison, Ohio, assignees of Jas. Campbell.—Patent No. 54,642, dated May 8, 1866.

3,837.—Alcoholic Liquor from the Rhubarb Plant.—J. H. Deacon, Lumberton, N. J.—Patent No. 86,284, dated January 26, 1869.

3,838.—Surge Reliever.—J. J. Emery, Owl's Head, Me., for himself and E. R. Cheney, Boston, Mass., assignee of J. J. Emery.—Patent No. 94,950, dated Sept. 21, 1869.

3,839.—Apparatus for Scraping and Working Hides.—Henry Lampert, Rochester, N. Y.—Patent No. 60,636, dated December 18, 1866.

3,840.—Manufacture of Fertilizers or Guano from Fish.—Orazio Lugo, Baltimore, Md.—Patent No. 97,999, dated December 14, 1869.

3,841.—Railroad Station Indicator.—A. C. Rogers and Lewis Schaffer, Fort Washington, Pa., assignees of A. C. Rodgers.—Patent No. 95,046, dated Sept. 21, 1869.

3,842.—Manufacture of Hose, Tubing, and other Rubber Fabrics.—Junius Schenck, Brooklyn, N. Y.—Patent No. 90,397 dated May 25, 1869.

3,843.—Division No. 1.—Steam Heater.—Jos. Shackleton, Rahway, N. J.—Patent No. 87,301, dated Feb. 23, 1869.

3,844.—Division No. 2.—Steam Heater.—Jos. Shackleton, Rahway, N. J.—Patent No. 87,301, dated Feb. 23, 1869.

3,845.—Division No. 3.—Steam Heater.—Jos. Shackleton, Rahway, N. J.—Patent No. 87,301, dated Feb. 23, 1869.

3,846.—Seeding Machine.—W. A. Van Brunt, Horicon Wis.—Patent No. 9,4265, dated Aug. 31, 1869.

DESIGNS.

3,846, to 3,848.—Bottle.—G. J. Byrne, New York city. Three patents.

3,849.—Toy Steam Engine.—Walter Holt, Brooklyn, N. Y.

3,850 and 3,851.—Clock Case.—Elias Ingraham, Bristol, Conn. Two patents.

3,852 and 3,853.—Shade for Gas or Lamp Burners.—John Letchworth, (assignor to Hartell & Letchworth), Philadelphia, Pa.

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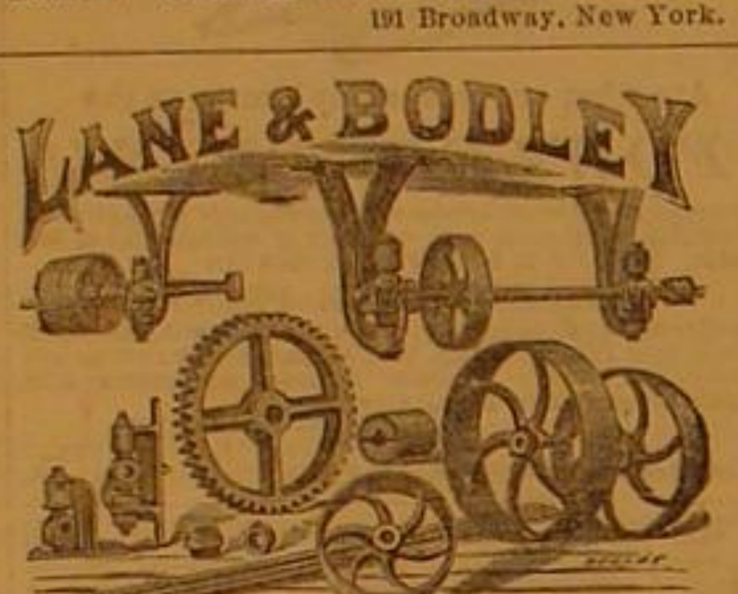

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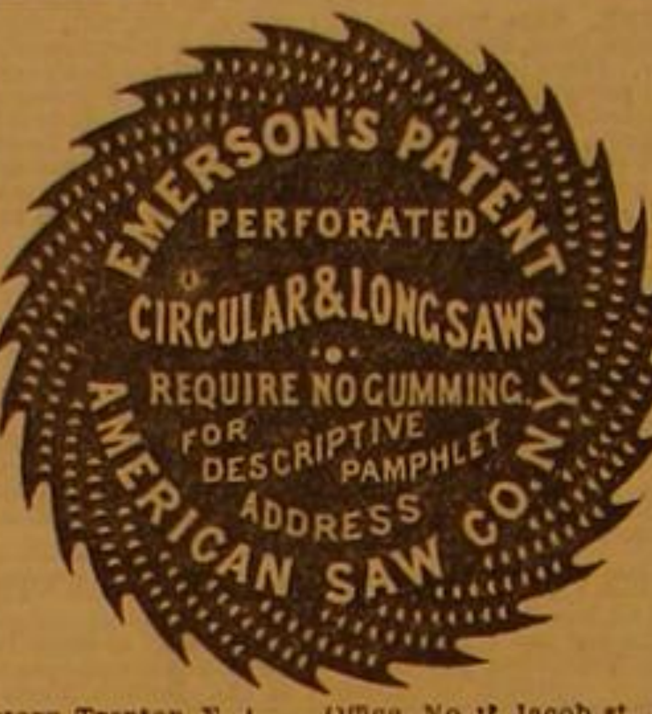

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