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Improvement in Apparatus for Tanning Leather.

It is a well-ascertained fact that the thorough rousing of the liquor in tan vats, during the progress of tanning, greatly accelerates the process and secures uniformity in the product proportionably to the thoroughness with which this detail is attended to. The old method of doing this, technically called "handling," is the most laborious of all the work done in a tannery, and when performed in the best manner possible, often leaves much to be desired in the quality of the leather.

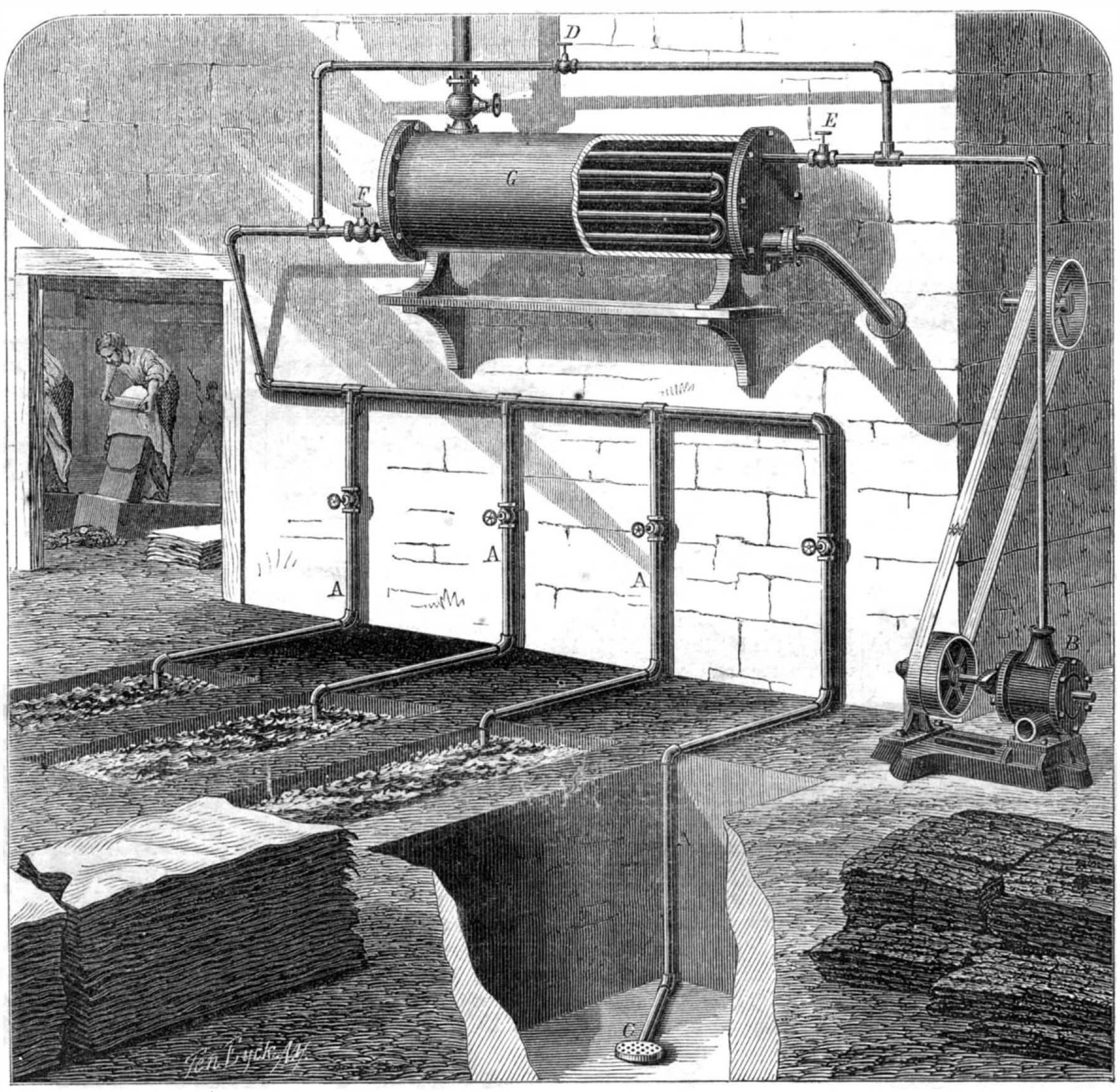
For tanning small hides revolving perforated drums have been employed, rotating in vats containing the tan liquor, and this method, although expensive of power, has answered in the manufacture of inferior qualities of leather from sheepskins, etc., for bookbinding, trunk-making, and other purposes where the best leather is not always required.

The improvement herewith illustrated will not only do the same thing more effectually with a far less expenditure of power, but is of such a nature that it can be advantageously applied to the tanning of any kind of hides, large or small.

The advantages claimed for this invention are, that it will save at least one fourth of the heaviest labor in tanning; that it will produce a more uniform and better quality of leather than any process hitherto employed; that it is equally adapted to liming hides, leaching tan, and other similar processes; and is very effective and economical in all these operations.

The hides are hung on slats, as close together as usual, in the vats containing the tanning liquors. Then the air is forced into the bottoms of the vats through a series of pipes, A, leading from an air pump, B, and there discharged through a distributor, C. Then escaping through the supernatant liquors, it causes therein violent currents and ebullition. This insures a regular tannage of the hides.

The inventor informs us that no spots or traces can be found throughout hides tanned by this method that have not received equal tannage, and that the surfaces of the skins, when the operation is performed, present a perfect, smooth, and unbroken grain hitherto unknown among tanners.



KAUFFELT'S IMPROVED ATMOSPHERIC TANNING APPARATUS.

In winter the air can be warmed by closing the cock, D, and opening the cocks, E and F. The air will then pass through a series of pipes inclosed in the steam cylinder, G, and heated to the temperature required—a process which will greatly accelerate the tanning, while it is totally free from the objections attending the use of hot liquors. In summer the cocks, E and F, being closed, and D being opened, the air does not pass through the heater, G, but enters the vat at the atmospheric temperature.

It will be seen that this adjustment, simple and cheap as it is, insures two very important requisites to speedy and efficient tanning; viz., the regulation of the temperature of the liquor to a nicety, and the thorough rousing of the contents of the vat; and we shall be greatly mistaken if it does not meet with a favorable reception from that very intelligent and enterprising class of men, American leather manufacturers.

Patented through the Scientific American Agency, July 13, 1869, by John E. Kauffelt, Shrewsbury, Pa., to whom communications may be addressed.

Surmounting Inclines.

If the inclines on railways could be so arranged that every ascending gradient should be preceded by a descending one, in other words, that the two should meet at the lower level, the impetus acquired in the descent would materially assist the subsequent ascent. There are, undoubtedly, some instances where this desirable result obtains, but they are, in all probability, occasioned more by accident or necessity, than by design. The steeper the incline, the greater must be the adhesion of the wheels on the rails. Hence the innumerable patents and inventions for accomplishing this purpose, which climaxed in the introduction of the middle rail and extra wheels. In one sense, weight and adhesion are synonymous terms, but to gain the necessary amount of adhesion by simply increasing the weight, would be to employ a remedy worse than the evil, as the difficulty is to get the weight itself up the hill. The experiments at Mont Cenis have quite thrown into the shade anything that has been done at home in the way of surmounting inclines, although we have, in latter days, distinguished ourselves in the art of making steep railway gradients to a degree that would have appalled our predecessors in that particular branch of engineering. A trial is to be made on the French side of Mont Cenis of the system of an Italian engineer, M. Agudio, for working sharp inclines on mountain summits. This principle has been employed for some years upon the Turin and Gênes Railway, and the experience gained during its application there has enabled the inventor to remedy the imperfections, correct the errors, and introduce those modifications and improvements which are indispensable to the success of every newly-tried mechanical invention.

Steep gradients are essential to the system of M. Agudio. He reconciles the differences of level by inclines of 1 in 10, and presses into his service the resources that nature has placed at his disposal, instead of employing means wholly artificial for accomplishing his purpose. The natural forces or motive power to be found in mountainous districts is utilized by hydraulic machines placed one at the summit, and the other at the bottom of the incline. From these the power is transmitted by the agency of steel telodynamical cables, working at a high velocity, to a locomotive, or, rather, locomotor, which is placed at the head of the train. As no boiler is required, the weight is very small in comparison with that of an ordinary locomotive, being restricted solely to that necessary to provide for the moving parts. At the same time, a certain amount of adhesion is absolutely indispensable, especially on inclines of the steepness already mentioned. In order to effect this, there is, first of all, the weight of the engine. Secondly, this weight is rendered more serviceable by being carried on eight wheels; and, thirdly, there are six horizontal wheels introduced, which, by means of springs, are caused to press against a central rail, similarly to the well-known Fell system. Powerful brakes are supplied to guard against contingencies in descending the inclines. A grant has been made by the Imperial Government of nearly £10,000 for carrying out this principle at Mont Cenis, and a similar subvention of the same amount has been given by the Italian Government. The particular section of the Mont Cenis Railway, to which this system is to be applied, commences at Lanslebourg, a station on the Fell road, crosses the river Arcq, and ascends the sides of the hill by nearly the same route as that occupied by the lines of telegraph. A succession of sharp curves from 450ft. to 900ft. radii, and an equal number of heavy gradients, bring the new section to the summit, where it rejoins the line of Fell. This route has been adopted by M. Agudio in order to demonstrate the great advantage of his system over others in use in similar arduous localities. The total difference of level between the starting point and the summit level is 2,296ft., and this is accomplished in a distance of 2·2 miles, whereas 7·5 miles is the distance required by Mr. Fell to rise the same hight. The length of line, and, *cæteris paribus*, the cost is, therefore, in the latter instance, about three and a half times that in the former. One of Fontaine's turbines constitutes the prime motor. It is fed by the waters of the Arcq, which are collected and stored in a reservoir containing 900,000 gallons of that fluid, the whole of which is capable of being run off and replenished six times a day, thus affording six ascents and six descents in the twenty-four hours. Each ascent will occupy about a quarter of an hour, and will of course be made without any interruption *en route*. The load taken up, will, in round numbers, equal sixty tuns. It is stated that the Fell locomotive requires an hour to perform the same journey, that is, so far as the difference of level is concerned, and conveys only one fourth of the load between the same termini. M. Agudio calculates that the ordinary passenger trains, which will weigh considerably less than sixty tuns, will "do" the journey in ten minutes. At the present day, when engineers have exchanged the old principle of adapting the road to the locomotive for the more modern practice of suiting the locomotive to the road, any proposed improvement in that direction is deserving of careful and impartial consideration.

THE LATEST ACHIEVEMENTS OF ENGINEERING SCIENCE.

Extract from the address of C. W. Siemens, F.R.S., before the British Association.

In viewing the latest achievements in engineering science, two works strike the imagination chiefly by their exceeding magnitude, and by the influence they are likely to exercise upon the traffic of the world. The first of these is the great Pacific Railway, which, in passing through vast regions hitherto inaccessible to civilized man, and over formidable mountain chains, joins California with the Atlantic States of the great American republic. The second is the Suez shipping canal, which, notwithstanding adverse prognostications and serious difficulties, will be opened very shortly to the commerce of the world. These works must greatly extend the range of commercial enterprise in the North Pacific and the Indian seas. The new waterway to India will, owing to the difficult navigation of the Red Sea, be in effect only available for ships propelled by steam, and will give a stimulus to that branch of engineering.

Telegraph communication with America has been rendered more secure against interruption by the successful submersion of the French Transatlantic cable. On the other hand, telegraphic communication with India still remains in a very unsatisfactory condition, owing to imperfect lines and divided administration. To supply a remedy for this public evil the Indo-European Telegraph Company will shortly open its special lines for Indian correspondence. In northern Russia the construction of a land line is far advanced to connect St. Petersburg with the mouth of the Amoor river, on completion

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of which only a submarine link between the Amoor and San Francisco will be wanting to complete the telegraphic girdle round the earth.

With these great highways of speech once established, a network of submarine and aerial wires will soon follow to bind all inhabited portions of our globe together into a closer community of interests, which if followed up by steam communication by land and by sea, will open out a great and meritorious field for the activity of the civil and mechanical engineer.

But while great works have to be carried out in distant parts, still more remains to be accomplished nearer home. The railway of to-day has not only taken the place of high roads and canals for the transmission of goods and passengers between our great centers of industry and population, but is superseding by-roads leading to places of inferior importance; it competes with the mule in carrying minerals over mountain passes, and with the omnibuses in our great cities. If a river cannot be spanned by a bridge without hindering navigation, a tunnel is forthwith in contemplation, or, if that should not be practicable, the transit of trains is yet accomplished by the establishment of a large steam ferry.

It is one of the questions of the day to decide by which plan the British Channel should be crossed, to relieve the unfortunate traveler to the Continent of the exceeding discomfort and delay inseparable from the existing most imperfect arrangements. Considering that this question has now been taken up by some of our leading engineers, and is also entertained by the two interested governments, we may look forward to its speedy and satisfactory solution.

So long as the attention of railway engineers was confined to the construction of main lines, it was necessary for them to provide for heavy traffic and high speeds, and these desiderata are best met by a level permanent way, by easy curves and heavy rails of the strongest possible materials, namely, cast steel; but, in extending the system to the corners of the earth, cheapness of construction and maintenance, for a moderate speed and a moderate amount of traffic, become a matter of necessity.

Instead of plunging through hill and mountain, and of crossing and recrossing rivers by a series of monumental works, the modern railway passes in zigzag up the steep incline, and conforms to the windings of the narrow gorge; it can only be worked by light rolling stock of flexible construction, furnished with increased power of adhesion and great brake power. Yet by the aid of the electric telegraph, in regulating the progress of each train, the number of trains may be so increased as to produce, nevertheless, a large aggregate of traffic; and it is held by some that our trunk lines even would be worked more advantageously by light rolling stock.

The brake power on several of the French and Spanish railways has been greatly increased by an ingenious arrangement conceived by M. Lechatelier, of applying what has been termed "Contre vapor" to the engine, converting it for the time being into a pump, forcing steam and water into the boiler.

While the extension of communication occupies the attention of, perhaps, the greater number of our engineers, others are engaged upon weapons of offensive and defensive warfare. We have scarcely recovered our wonder at the terrific destruction dealt by the Armstrong gun, the Whitworth bolt, or the steel barrel consolidated under Krupp's gigantic steam hammer, when we hear of a shield of such solidity and toughness as to bid defiance to them all. A larger gun or a hard bolt by Palliser or Grüson is the successful answer to this challenge; when again defensive plating, of greater tenacity to absorb the power residing in the shot, or of such imposing weight and hardness combined as to resist the projectile absolutely (causing it to be broken up by the force residing within itself) is brought forward.

The ram of war, with heavy iron sides, which a few years since was thought the most formidable, as it certainly was the most costly weapon ever devised, is already being superseded by vessels of the Captain type, as designed by Captain Coles, and ably carried out by Laird Brothers, with turrets (armed with guns of gigantic power) that resist the heaviest firing, both on account of their extraordinary thickness, and of the angular direction in which the shot is likely to strike.

By an ingenious device, Captain Moncrieff lowers his gun upon its rocking carriage after firing, and thereby does away with embrasures (the weak places in protecting works), while at the same time he gains the advantage of re-loading his gun in comparative safety.

It is presumed that in thus raising formidable engines of offensive and defensive warfare the civilized nations of the earth will pause before putting them into earnest operation, but if they should do so it is consolatory to think that they could not work them for long without effecting the total exhaustion of their treasuries, already drained to the utmost in their construction.

While science and mechanical skill combine to produce these wondrous results, the germs of further and still greater achievements are matured in our mechanical workshops, in our forges, and in our metallurgical smelting works; it is there that the materials of construction are prepared, refined, and put into such forms as to render greater and still greater ends attainable. Here a great revolution of our constructive art has been prepared by the production, in large quantities and at moderate cost, of a material of more than twice the strength of iron, which, instead of being fibrous, has its full strength in every direction, and which can be modulated to every degree of ductility, approaching the hardness of the diamond on the one hand and the proverbial toughness of leather on the other. To call this material cast steel seems to attribute to it brittleness and uncertainty of temper, which, however, are by no means its necessary characteristics. This new material, as prepared for constructive purposes, may indeed be both hard and tough, as is illustrated by the hard steel rope that has so materially contributed to the practical success of steam plowing.

Machinery steel has gradually come into use since about 1850, when Krupp, of Essen, commenced to supply large ingots that were shaped into railway tires, axles, cannon, etc., by melting steel in halls containing hundreds of melting crucibles.

The Bessemer process, in dispensing with the process of puddling, and in utilizing the carbon contained in the pig iron to effect the fusion of the final metal, has given a vast extension to the application of cast steel for railway bars, tires, boiler plates, etc.

This process is limited, however, in its application to superior brands of pig iron, containing much carbon and no sulphur or phosphorus, which latter impurities are so destructive to the quality of steel. The puddling process has still, unless the process of decarburization of Mr. Heaton takes its place, to be resorted to, to purify these inferior pig irons, which constitute the bulk of our productions; and the puddled iron cannot be brought to the condition of cast steel except through the process of fusion. This is accomplished successfully in masses of from three to five tuns on the open bed of a regenerative gas furnace at the Landore Siemens Steel Works, and at other places. At the same works cast steel is also produced, to a limited extent as yet, from iron ore, which, being operated upon in large masses, is reduced to the metallic state and liquefied by the aid of a certain proportion of pig metal. The regenerative gas furnace—the application of which to glass houses, to forges, etc., has made considerable progress—is unquestionably well suited for this operation, because it combines an intensity of heat, limited only by the point of fusion of the most refractory material, with extreme mildness of draft and chemical neutrality of flame.

These and other processes of recent origin tend toward the production, at a comparatively cheap rate, of a very high class material that must shortly supersede iron for all structural purposes. As yet engineers hesitate, and very properly so, to construct their bridges, their vessels, and their rolling stock of the material produced by these processes, because no exhaustive experiments have been published as yet fixing the limit to which they may safely be loaded in extension, in compression, and in torsion, and because as yet no sufficient information has been obtained regarding the tests by which their quality can best be ascertained. This great want is in a fair way of being supplied by the experimental researches that have been carried on for some time at her Majesty's dockyards at Woolwich, under a committee appointed for that purpose by the Institution of Civil Engineers. I have also pleasure to announce an elaborate report by Mr. William Fairbairn on this subject. In the meantime excellent service has been rendered by Mr. Kirkaldy in giving us, in a perfectly reliable manner, the resisting power and ductility of any sample of material which we wish to submit to his tests. The results of Mr. Whitworth's experiments tending to render the hammer and the rolls obsolete by forcing cast steel, while in a semi-fluid state, into strong iron molds by hydraulic pressure are looked upon with great interest. But, assuming that the new building material has been reduced to the utmost degree of uniformity and cheapness, and that its limits of strength are fully ascertained, there remains still the task for the civil and mechanical engineer to prepare designs suitable for the development of its peculiar qualities. If, in constructing a girder, for example, a design were to be adopted that had been worked out for iron, and if all the scantlings were simply reduced in the inverse proportion of the absolute and relative strength of the new material, as compared with iron, such a girder would assuredly collapse when the test weight was applied, for the simple reason that the reduced sectional area of each part, in proportion to its length, would be insufficient to give stiffness. You might as well almost take a design for a wooden structure, and carry it out in iron by simply reducing the section of each part. The advantages of using the stronger material become most apparent if applied, for instance, to large bridges where the principal strain upon each part is produced by the weight of the structure itself, for, supposing that the new material can be safely weighted to double the bearing strain of iron, and that the weight of the structure were reduced by one half accordingly, there would still remain a large excess of available strength in consequence of the reduced total weight, and this would justify a further reduction of the amount of the material employed. In constructing works in foreign parts the reduced cost of carriage furnishes also a powerful argument in favor of the stronger material, although its first cost per tun might largely exceed that of iron.

Cider and the Cider Manufacture.

The season for the manufacture of cider is at hand. As it is an important product, and many a good crop of apples is wasted in making an inferior quality, simply from want of a little practical knowledge, the following hints from the *Working Farmer* will be found seasonable and sound:

"In general, we may say that the same principles that govern the manufacture of wine hold good in making cider; for cider is merely wine made from apples instead of grapes, and deserves the name of wine certainly as much as the fermented juice of currants, raspberries, and other fruits that we dignify with this name. To be more particular, no good cider can be made from unripe fruit. We should laugh at the man who should undertake to make wine from green grapes. It is just as foolish to make cider from green apples. Sugar is essential in all fermentation. As fruit matures, the starch is converted into sugar; and only when mature is the fruit fit for eating and conversion into wine. Providence has made all unripe fruit unpalatable, so that neither man nor beast should be tempted to eat it in its green state. In unpropitious seasons the vine grower adds sugar to the expressed juice of his grapes in order to supply the deficiency of saccharine matter and perfect the fermentation; and few if any of the grapes of New England contain enough sugar to make good wine without this addition. Cane sugar, however, never gives a flavor equal to that naturally produced in the fruit. The nearer to perfect ripeness, therefore, we can bring our apples, the better will be our cider. We have tried adding sugar to the juice of apples, and find that it improves the quality of the cider as much as it does wine. If sugar is added to the juice of any fruit, it should be of the purest kind. It is a common mistake to suppose that the flavor of Muscovado sugar will work off during the vinous fermentation; it is continued even into the acetous fermentation, and deteriorates the quality of the vinegar.

"As a second rule, no rotten apples, nor bitter leaves, nor stems, nor filth of any kind, should be ground for cider. The winemaker who seeks a reputation for a superior article looks well to the condition of his grapes before he allows the juice to be expressed. We do not like to eat rotten apples; and they are no better for drink than for food. No wonder that a prejudice should exist against cider in the minds of those who have seen the careless way in which it is sometimes made. We have heard it called, and not inaptly, the expressed juice of worms and rotten apples. Perhaps, if we could see the process of manufacturing cheap wines, our prejudices against them would be equally strong. There is no economy in such carelessness. If cider is worth making, it is worth making well; and then with a good conscience we can ask a good price, and be sure of getting it too; for a good article is always in better demand than a poor one.

"Much cider is injured by being pressed with musty straw. In this respect, the little hand mills have the advantage, for they require no straw; and there is little straw so bright and and clean as to be totally free from dust and an unpleasant odor. We very much question whether straw is of any advantage in the large power mills. It doubtless aids in conducting the juice, but it also absorbs not a little; and the danger of a bad flavor from it is so great that we should discard it altogether. The press can be made small, and of birch or some other hard timber, that will not contaminate the cider. Two presses are really necessary for each mill, so that the pomace can be exposed to the air in the one while it is being pressed in the other, and thus acquire a deeper color

"Perhaps the most essential requisite for good cider is the cask in which it is to be preserved. Few old cider barrels can be cleansed so as to be fit for use again. We have seen them soaked in running water for days, and still retain the seeds of putrefaction. Fresh slacked lime we have found one of the best disinfectants; but we prefer a new oak barrel or one in which whisky or alcohol has been kept. We have heard linseed-oil barrels recommended, as the oil will rise to the surface and prevent rapid fermentation. They are good for those who like them. We prefer to shut off the air at the right time with a good tight bung.

"If it is desired to keep the cider in a state of must it can easily be effected by boiling it a little, and then bunging up the cask tightly. This is the canning principle; and if the cask is tight, the cider will be found as sweet at the end of the year as when first put up. We doubt whether the medicinal effect of such cider is as good as when it is allowed to ferment for a few days, and a little alcohol, and not a little carbonic acid, are generated. Whenever the cider arrives at the proper stage of fermentation—and the time for this will vary from a week to a fortnight, as the temperature of the weather may vary—the cask should be closed tightly, and all air excluded. Some say that a pound of mustard seed or a pint of horse-radish should be added to each barrel when the bung is driven, and claim that this prevents further fermentation. They may add a little pungency to the cider, but we do not see how they act to prevent fermentation; nor do we know how fermentation can proceed without air. Prof. Horsford, a few years since, suggested sulphate of lime to keep cider sweet. It certainly has this effect, but, at the same time, neutralizes the peculiar acid, on which much of the good effect of the cider depends. If, at the proper time, the cask is made air tight, or the cider is securely bottled, we much doubt whether any of these artificial ingredients are an improvement. If more color and richer body are desired, a quart or two of boiled cider added to each barrel will impart them.

"Cider, like every other blessing, must be used with moderation. As the sweetest things can become the sourest, so our greatest blessings can be perverted into great curses. We feel bound to speak well of a bridge over which we have crossed safely; and cider has bridged us over a severe attack of jaundice, and we find it an excellent aid to digestion. If the experience of others differs from ours, we shall not quarrel with them, but only agree to differ."

Manufacture of Sugar.—It is stated that experiments are now in progress in some French colonies to try, on a large scale, Messrs. Rousseau and Bonneterre's plan of converting the saccharine juice of cane or beet-root into a peculiar saccharate of lime, and to transport that salt, instead of raw sugar, for the purpose of refining. It is said that this compound is as hard as sand, and can be transported without the risk of damage and injury sugar is subject to, and be kept for any length of time

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OPERATIONS IN CUMBERLAND COAL---TO THE PUBLIC PRESS.

In the discussion which has for some weeks past occupied the public prints respecting the rapid, and, as it is alleged, unreasonable and unnecessary advance in the price of coals, the hardship imposed upon the consumers is ascribed to a monopoly or a combination of coal interests, which, ignoring every element of fairness and justice, seizes upon one of the primary necessaries of life, and speculates upon it, not only to the serious detriment of commerce and manufactures, but to the cruel disregard of the helpless poor.

Upon this *assumption* of facts a wholesale and indiscriminate assault has been made upon the coal interests of the United States, and both in the public papers, and by public meetings a demand has been made for the repeal by the next Congress of the existing tariff upon foreign coal; namely, $1·25 a tun, for the avowed purpose of punishing the capitalists, who, it is claimed, have sought to enrich themselves without regard to the necessities of the people.

The undersigned do not propose to enter upon the consideration of the tariff question, nor to make any appeal for special legislation. The English and Welsh coals cannot pay the freight across the ocean and compete with American anthracite or bituminous. They are now selling by the cargo at the minimum of $16 the tun, and even if the tariff of $1·25, gold, did not exist, their current price would be $14 or $15. They can be used therefore only by the very wealthy who can afford to pay for luxuries, and they in no way affect the question.

The Nova Scotia coals, it is well known, are not suitable for steam generating nor domestic purposes. They do not therefore materially interfere with the bituminous and anthracite coals, being imported mainly for gas manufacture, and if the duty were removed the effect would be not so much to injure the coal interests of the United States as to deprive the Treasury of a considerable revenue for the benefit, not of the public, but of the gas companies.

The coal which principally competes with anthracite, and is used in its stead, for all manufacturing purposes, is known in the market as "Cumberland," or "George's Creek coal."

The undersigned, representing companies mining this coal, whose principal offices are in New York, but with agencies in all the Atlantic cities from Baltimore to Portland, and in behalf of stockholders interested to the extent of upwards of twenty millions of dollars, make the following statement of facts, namely:

1. Out of 852,000 tuns of coal mined and shipped between the 1st of January and the 31st of July, 1869, from all the mines in Allegheny county, Md., the companies they represent have mined and marketed 622,000 tuns.

2. These companies have not, during the present season, entered into any arrangement, or combination, or understanding *of any kind whatever*, in respect to the prices of coal, which at the opening of the season were $5 at Baltimore and $4·75 at Georgetown, per tun of 2,240 lbs., delivered free on board; upon which figure no advance has since been made, notwithstanding the rapid increase in the price of anthracite and its great scarcity in the market. And here we state as a fact of general interest that, at no time within the last two and a half years has Cumberland coal varied from these prices to a greater extent than fifty cents per tun; although during the same period the price of anthracite has fluctuated nearly 100 per cent.

3. There have been no strikes at their mines, no advance in wages, nor any disturbance to the industry of the Cumberland coal region. The business has been conducted with entire regularity and without any complaint from consumers, upon an increased demand and production of about 60 per cent above last year. This healthy condition of business has enabled them to keep their coal in market at the prices named at the shipping ports and to deliver coal in the harbor of New York at any time, since the first day of May, at not exceeding $7·25 the gross tun, when discharged direct from vessel or barge to consignee.

4. While the Pictou or Nova Scotia coals (by the introduction of which after the duty shall have been removed, a millennium of cheap fuel is expected to commence) are unsuited for the uses already mentioned, it is well known that the Cumberland coal can be substituted for anthracite for domestic purposes, and is unequaled by anthracite, Nova Scotia, or English coals for steamship and railway purposes, and for the various manufactures of iron and glass. This fact, well known in this country, is published under sanction of the British Parliament in their Blue Book of 1866, entitled "Reports from Her Majesty's Secretaries of Embassy and Legation respecting Coal," page 151, as follows:

Nearly all American coal is of very excellent quality.

The anthracite gives out a very great, perhaps a somewhat dry heat, but it burns with a bright blue smokeless flame.

The soft bituminous coal is admirably fitted for open fireplaces, such as are used for wood, from its caking together in a solid mass. In evaporating power Cumberland bituminous coal holds the highest place among American coals, and is highly valued as a generator of steam for ocean steamers.

The Cunard line, for instance, use it exclusively. A curious fact showing this superiority of the Cumberland coal for steam navigation (see Taylor's coal statistics) was elicited some few years back, when the comparative speed of the Collins and Cunard lines was under discussion.

On a comparison of the time required to cross the Atlantic by these two lines of steamers, it came out that the Cunard line, steamers of British build, were swifter on the eastern passage than the Collins line, steamers of American build.

On the western passage quite the reverse took place.

Many sought to explain the difference between these vessels as to their respective superiority in their eastern and western passage by their different powers in going with or against the wind. When these steamers used the same coal (Welsh) the American ships proved themselves the faster, but they could not compete with English ships when these ships used Cumberland coal, for then they surpassed in speed the American ships using the anthracite coal.

In conclusion, the undersigned, feeling their responsibility alike to the owners of the vast interests committed to their care, and to the public—equally interested as the consumer of this product of prime necessity—appeal for the confirmation or criticism of this general statement to the great steamship lines sailing from this port, to the principal railway companies of the Eastern and Middle States, who are entirely familiar with the premises, and to the great manufacturing interests which have used the coal in all parts of the country; and in the consciousness that they have acted fairly, considerately, and forbearingly toward the people, they claim for the Cumberland coal interests the just judgment of an enlightened public opinion, so that, at least, they may not be sacrificed because of alleged misdeeds with which they have no connection and for which they are not directly or indirectly responsible.

BORDEN MINING CO.—By William Borden.
CONSOLIDATION COAL CO.—By C. H. Dalton, President.
CENTRAL COAL MINING AND M'F'G CO.—By Harry Conrad, President.
AMERICAN COAL CO.—By G. P. Lloyd, President.
CUMBERLAND COAL AND IRON CO.—By Wm. M. Richards, President.
HAMPSHIRE AND BALTIMORE COAL CO.—By E. S. Bolles, Vice-President.

New York, August 10, 1869.

Mode of Working the French Cable.

A few of the members of the Scientific Association, which closed its session at Salem last week, have been making a visit to Duxbury, the terminus of the newly laid French Cable. What they saw is pleasantly told by the Boston *Advertiser*, from which we make the following extracts:

"In an old but well preserved clapboard mansion of that quaint old town were found the headquarters of this new and wonderful highway. The visitors were cordially welcomed by the manager, Mr. Brown, and were at once brought into the presence of the flitting, flame-like image which indicated, in symbols, on a graduated screen, the thoughts working at that instant on the other side of the Atlantic. Interpreting the fitful tremor of the image, or line of light, one inch in length, and one eighth of an inch in breadth, the youthful interpreter, who did not look the wizard that he was, calmly read, for transcription by his assistant, a message in which occurred, at intervals, the words 'New Orleans'—'Citizens'—etc., etc. While inspecting the apparatus the members of the party received the following message fresh from France, sent expressly to them:

"'TO DUXBURY, FROM BREST—Time 5:20 P.M.,
[Paris Time.]

"'The company present their compliments to the gentlemen assembled at Boston, and hope to be able to send them news of the great international boat race that will be gratifying to both nations.'

"The usual rate of transmission is about ten or twelve words per minute. Looking for the mechanism by which these wonderful results were obtained, the inquiring visitors observed, on their right, placed on a marble pedestal, a medium-sized spool of silk-covered copper wire, said to consist of several thousand turns or convolutions, in the center of which spool, suspended by a single silkworm fiber, was a minute mirror attached to a little magnet made from a piece of watch spring. From a lamp, properly placed and shaded, a beam of light was thrown upon this mirror, and from the mirror was reflected, two hundred times enlarged, upon the graduated screen in front of the interpreter, the flame-like image already mentioned. In transmitting, from Duxbury to Brest, the operator, with his right hand, makes use of two keys or springs, one of which, being pressed, causes, at Brest, a deflection in a similar mirror, sending the image-flame to the right, while pressing the other key deflects the mirror at Brest in the opposite direction, sending the image to the left. Its indications are thus interpreted; a jerk or flitting once to the left and then once to the right denotes the letter *a*; a flitting once to the right and then three times to the left, denotes the letter *b*; and thus, letter by letter, the words are spelled.

"Passing into an adjoining room, the delicate instruments used for testing the electric conduction of the cable are shown among which are condensers and batteries, rheostats and shunts, bridges, switches, and plugs, and, crowning all, the wonderful astatic galvanometer of Sir William Thompson. But possibly it would weary our readers to tell of ohms and megohms, farads and megafarads, volts and microvolts, and all the terminology of conduction, resistance, electrostatic capacity, and continued electrification. It may, however, gratify them to learn that the insulation of the deep-sea cable, between Brest and St. Pierre, has more than doubled in efficacy during the short month which has elapsed since this cable was first committed to the embraces of Old Ocean—as is evinced by the fact that, soon after it was laid, the insulation resistance rose to 2300 megohms, and has since been gradually increasing until it is now 5000 megohms per nautical mile. This improvement in the insulation of the deep-sea cable is believed to be mainly due to the coldness or diminished temperature to which it is subjected at great ocean depths. The insulation resistance of the portion of the cable connecting Duxbury and St. Pierre is much less, namely, 1500 megohms per nautical mile.

"If one would inquire of a cable electrician—what is a meghom? he might, with propriety, be told that it is a million ohms. Should he still further inquire—but what is an ohm? a suitable reply would be, it is the yardstick of the electrician by which he measures the electric condition of conductors, and which may be represented by a round wire of pure copper one-twentieth of an inch in diameter and 240 feet in length, at the temperature of 60 degrees of the Fahrenheit thermometer; while a megohm, by which he measures the resistance of insulators, is a unit, the length of which is a million times as great."

The Want of Chemical Knowledge Among Druggists Illustrated.

A forcible illustration of the great lack of chemical knowledge among dispensers of medicines is found in the following case, an account of which is given in the *American Journal of Pharmacy*.

A correspondent of that journal informs the editor that a few months since he suffered severe personal injury by the explosion of the ingredients of a prescription composed of the chlorate of potassa, tannic acid, and oil of Gaultheria. The journal referred to says, "it appears that this mixture had been repeatedly dispensed without ignition, but on this occasion the physician called and requested double the quantity to be prepared, and the pharmaceutist accidentally used, on this occasion a new wedgewood mortar, with rough surface, first powdering the chlorate and then adding the other ingredients, and continuing the trituration—when a violent explosion occurred, injuring his hands and burning his face and eyes seriously. Our correspondent believed that the physician was aware of the explosive nature of the mixture, as he is reported to have said immediately afterward, 'that he knew that the mixture as ordered would explode,' he being the first physician called in. If this was true, it leaves an inference of motive in regard to the prescriber not to be envied. It would have been quite right to have given a caution to have saved himself from the charge of ignorance or design. Our correspondent, smarting under the effects, may be warped in his feelings toward the prescriber. With this we have nothing to do, but may embrace the occasion to offer to our readers, who are not posted in such matters, a caution, that any organic substance, having a large equivalent of loosely combined elements, like sugar, tannin, several of the glucosides, and other neutral bodies, should always be mechanically united with chlorate of potassa with great caution, and the chlorate should be powdered alone and then mixed with the other ingredients, separately powdered, on paper. Physicians, where they require such mixtures, and themselves are aware of the danger, are not without culpability if they prescribe at random, without due precaution, on the presumption that every dispenser is a thorough chemist. If, as is more frequently the case, they prescribe in ignorance of the incompatible character of the ingredients, they, of course, are not to blame. When such ingredients can be mixed without damage, every apothecary ought to be able to do it, yet ignorance of particular reactions, in such a case should not necessarily be considered unjustifiable ignorance. We have had this accident to occur under our own supervision, but the operator being aware of the liability, used precautions that enabled him to escape uninjured."

Liquid Glue.

The preparation of liquid glue is based upon the property of the concentrated acid of vinegar and diluted nitric acid to dissolve the gelatin without destroying its cohesive qualities. Dumoulin has given the following recipe. He prepares his "liquid and unalterable glue" by dissolving one pound of the best glue in a pint of water, and then gradually adding three and a half ounces of nitric acid of 36° Baumé. Effervescence takes place under generation of nitrous gas. When all the acid has been added, the liquid is allowed to cool.

Von Fehling has analyzed various kinds of liquid glue, the better kinds of which only became liquid by placing the bottles in tepid water; the more inferior kinds, however, were liquid at the ordinary temperature.

Russian glue—white, opaque, and solid at the common temperature—was found to consist of 35·6 per cent of dry glue; 4·1 per cent of sulphate of lead; 1·4 per cent of hydrated nitric acid; 58·9 per cent of water. Total 100 parts.

It may be prepared by softening one hundred parts of the best glue in one hundred parts of warm water, and then adding slowly from five and a half to six parts of aqua fortis, and finally six parts of powdered sulphate of lead. The latter is used in order to impart to it a white color.

Pale "steam glue" consists of 27 per cent of dry glue; 1·9 per cent of sulphate of lead; 2·5 per cent of hydrated nitric acid; 68·6 per cent of water. Total, 100 parts. It is prepared by dissolving one hundred parts of glue in double its weight of water, and adding twelve parts of aqua fortis.

Dark "steam glue" contained 35·5 per cent of dry glue; 3·5 per cent of hydrated nitric acid; 61 per cent of water, and can be obtained from one hundred parts of glue, one hundred and forty parts water, and sixteen parts of aqua fortis. This liquid glue exhibits a greater cohesive force than that prepared after Dumoulin's recipe. However, still better kinds of liquid glue or mucilage are obtained by dissolving gelatin or dextrin in acetic acid and alcohol.

MUCILAGE FOR LABELS.—Macerate five parts of good glue in eighteen to twenty parts of water for a day, and to the liquid add nine parts of rock candy and three parts of gum arabic. The mixture can be brushed upon paper while lukewarm; it keeps well, does not stick together, and when moistened adheres firmly to bottles. For the labels of soda or seltzer water bottles it is well to prepare a paste of good rye flour and glue to which linseed oil varnish and turpentine have been added in the proportion of half an ounce of each to the pound. Labels prepared in the latter way do not fall off in damp cellars.

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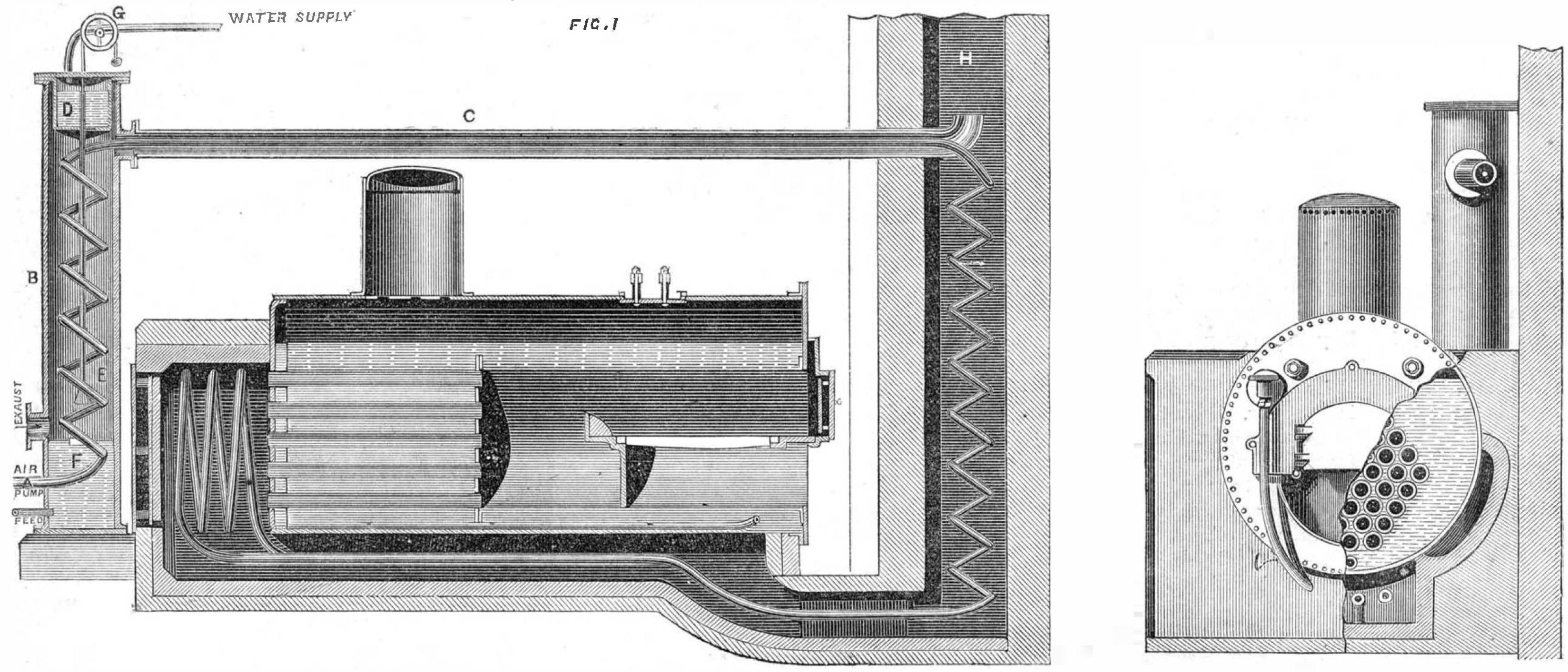
The Aero-steam Engine.

We illustrate herewith, from *Engineering*, the arrangements of boiler and air-heating pipe used in connection with Mr. George Warsop's aero-steam engine now being worked at Nottingham, and which was described in the paper read by Mr. Richard Eaton, before the British Association at Exeter, the middle of August, a review of which will be found in another column.

The pipe, A, through which the air is forced into the boiler by the action of the air pump is of iron and is $1\frac{1}{16}$ inches in diameter outside and $1\frac{1}{4}$-inch bore. On leaving the pump the pipe is first led to the heater, B, shown on the left of the engraving, wherein it is exposed to the exhaust steam. The heater consists, as will be seen, of a cast-iron cylindrical vessel placed in a vertical position and provided with two branches—one near the bottom and the other near the top—through which the exhaust steam respectively enters and escapes from the casing. At the top of the heater is placed a small cylindrical tank, D, exposed at the bottom and sides to the exhaust steam, and perforated around the upper part of the sides, so that in the event of its receiving an excess of water the latter may overflow and fall to the bottom of the heater. Through a stuffing box at the bottom of the tank there passes a tube with a rose, E, at the lower end, this tube being carried by a float, F, which swims in the water at the bottom of the heater, as shown, and, by means of a cord passing from the top of the tube, works a cock, G, which regulates the supply of water to the tank at the top of the heater. The action of this heater will be readily understood without further explanation, and we need merely add that it furnishes a steady supply of hot feed water at a temperature of from about 195° to 200°



WARSOP'S AERO-STEAM ENGINE---BOILER AND AIR-HEATING ARRANGEMENT

The air pipe, A, after leaving the heater just described, passes along the exhaust pipe, C, to the chimney, H, and descending the latter spirally, as shown, passes into the flue beneath the boiler. Here it is led backward and forward, as shown in the plan, and after making several convolu tions in the smoke box, is led back to the front of the boiler, where it ommunicates with a valve box, H (Fig. 2), containing an ordinary light clack valve. The object of this valve is to prevent water from entering the air pipe when the engine is stopped. From the valve box a pipe, J, is led down within the boiler to the bottom of the latter, this pipe being perforated at intervals on the upper side. The perforations are placed closer together at the further end of the pipe than they are at the end at which the air enters, and by this means an equable distribution of the air at the different parts of the boiler is insured.

The lengths of the various portions of the air pipe are as follows: In feed-water heater 12 feet; in exhaust pipe 13 feet 6 inches; in chimney and flues, including coils in smoke box and under boiler, 58 feet; total, 83 feet 6 inches. The total external surface exposed by this pipe is thus about $36\frac{3}{4}$ square feet.

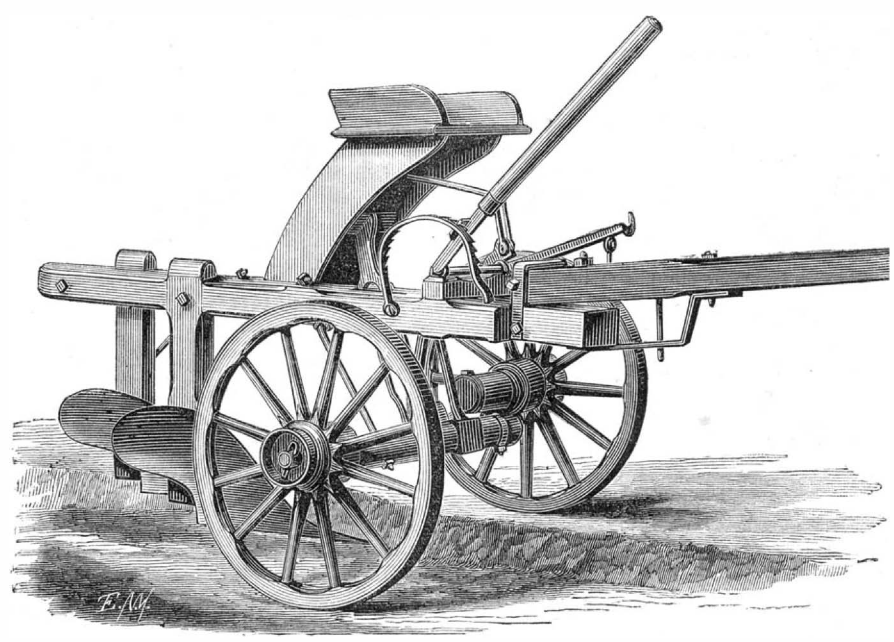
The principal dimensions of the boiler are as follows: Length 8 feet; diameter of shell 3 feet 6 inches; diameter of fire-box flue 2 feet 2 inches; length of fire-box and combustion chamber 5 feet; and length of tubes 3 feet. The tubes are 41 in number, most of them being $2\frac{5}{8}$ inches, and some of them $2\frac{5}{16}$ inches diameter. The total effective heating surface exposed by the boiler is about 130 square feet.

Testing Bees'-Wax.

It appears that both yellow and white bees'-wax is met with in the trade largely adulterated with paraffine. In order to detect this, the following process is recommended by the *Chemical News*: 2 grms. of the wax to be experimented upon are placed in a test tube; and there is added a solution consisting of 1·5 grms. of solid caustic potassa in about 5 grms. of distilled water, and the mixture boiled, care being taken to shake the test tube now and then, whereby a thorough though not quite clear mixture is produced. When the fluid has cooled so far down as nearly to reach the point of solidification of the wax, from 6 to 8 grms. of light oil of petroleum is gradually added, and this thoroughly incorporated with the entire mass, so as to form an emulsion, from which, if well made, the light oil does not separate. Next, an excess of an aqueous solution of acetate of lead is added, which is mixed with the mass by stirring with a glass rod. The addition of this lead salt causes the separation of the light oil of petroleum, and in it will be dissolved any paraffine present in the wax. The same operation is twice repeated with the contents of the test tube, that is to say, petroleum is again and again added, and allowed to separate; the separated petroleum is placed into a retort, and the light oil removed by distillation. Pure yellow wax loses, by this process, from 14 to 16 per cent; but wax has been met with which lost 57 per cent in weight; the specific gravity of the residue of adulterated wax was 0·88. When it is desired to obtain the paraffine in a pure state freed from any dissolved wax, this may be effected by cautiously decomposing the wax supposed to be adulterated with paraffine, by means of fuming sulphuric acid, which does not affect paraffine.

Improvement in Truck Plows.

The object of this invention is to provide improvements in trucks of truck plows calculated to facilitate the management of the plows connected with them, in guiding and adjusting them so as to take more or less land, and also not only to regulate the depth of the furrow, but to enable the plows to be elevated entirely out of the ground when desired: also to enable the body of the truck to be leveled either when both wheels are running on the surface in making the first furrow, or in the subsequent running of one of the wheels in the furrow.



MICKELSON'S TRUCK PLOW.

The engraving is a perspective view of this plow from the mold board side.

The tongue is pivoted to the body of the truck by a vertical bolt, and extends rearward into a yoke, having set screws through the sides for swinging up against the sides to hold the tongue at any required angle to the body, so that the lateral draft of the plow may be governed in cutting wide or narrow furrows. These set screws hold the tongue rigidly in the position to which it is adjusted.

Another set screw regulates the hight of the front end of the tongue. The axle is made in two parts, hinged together, so that one part may, so to speak, roll around the other, and bring the parts supported to the same position of level when both wheels rest on the same plane, as when one of them is in the furrow. This movement is accomplished by a lever which is firmly attached to the inner of the two pintles which form the hinge uniting the two parts of the axle. This lever being depressed, the change in position is accomplished and maintained as long as desired by means of a hook which keeps the lever depressed.

The elevation of the plows, to adjust the depth of furrow, is provided for, by attaching the body of the truck to the axle by means of a rod bent so as to form a double link; the ends being connected with the axle, and the portion between the two arms of the link fitting in bearings to the rear and above the axle.

When these arms are made to approach the perpendicular over the axle, the body of the truck is raised, and of course the plows are raised with it. This movement is accomplished by means of a hand and a foot lever both attached to a rock-shaft, which by means of a third lever and a link, draws the frame forward towards the axle and raises it by the radial motion of the arms of the double link above mentioned. The parts are all strong and the implement is inexpensive to manufacture. Patented through the Scientific American Patent Agency, Aug. 10, 1869, by M. Mickelson, Ashland Mills, Jackson Co., Oregon. Address as above for further information

Mending Cast-iron Vessels in China.

The Chinese have a way of mending cast-iron utensils, says the *Journal of Applied Chemistry*, that is worthy of note. They frequently employ, for cooking purposes, round pots or pans of cast iron. Specimens of these have recently been sent to Dr. Percy, Professor of Metallurgy, at the School of Mines, in London. Such vessels are highly prized by the Chinese, on account of their thinness, as they require very little fuel to heat water to boiling. An attempt to manufacture them in Birmingham did not succeed, as they were too thick. The Chinese pots are very liable to crack and break, in consequence of the thin bottoms, and it is frequently found necessary to have them repaired by wandering mechanics, who carry their whole kit of tools on their backs, and call out as they walk the streets, "Any pots to mend! pots to mend."

These mechanics not only mend cracked wares, but also repair such as have holes an inch square knocked in them. The sides of the hole are filed and cleaned with brick dust, the pot is then inverted over a tripod, so that the hands can have full play upon the outside as well as inside. A crucible not larger than a thimble is taken, and a bit of cast iron put into it, and the iron brought to fusion by a charcoal fire in a furnace not larger than a goblet. The melted iron is poured upon ashes on a piece of felt, and introduced under the pot by the left hand, while it is pressed on the top by the right hand, also protected by felt and ashes. The protruding portions of the iron are filed and polished off, and the vessel is tested to see if it is water tight. The price for the job is from six to eight cents.

THE French Astronomer Royal is wisely making arrangements in good time for observing the transits of Venus, which will take place in the years 1874 and 1882. The event is one of considerable interest and value to scientific men, and it is therefore desirable that it should be viewed from those parts of the earth's surface where it can be best observed. The stations fixed upon for 1874 are Oahu (one of the Sandwitch Islands), Kerguelen Island (in the Indian Ocean), Rodriguez (a dependency of the Mauritius), Auckland (New Zealand), and Alexandria. Both the Admiralty and the Treasury have responded with alacrity to the appeal which has been made to them for funds, Mr. Warren De la Rue is of opinion that photography may be used with the utmost advantage in registering the transit.

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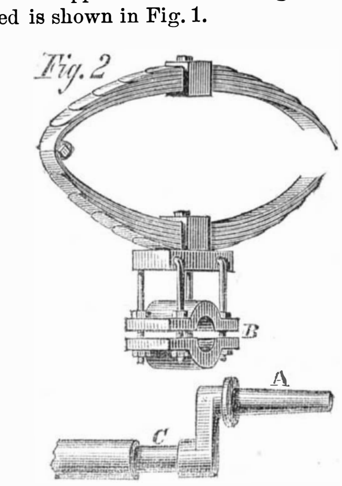
JACKSON'S PATENT OSCILLATING WAGON.

We not long since hazarded the opinion that there was great room for improvement in all sorts of draft vehicles, and the prediction that ere long such improvements would be at least attempted.

We now present to our readers an improvement which appears to us of value, and is equally applicable, in principle at least, to any kind of draft vehicle. Its application to horse cars, provided no insuperable practical difficulty should be met with in the attempt, would greatly lighten the severe labor of starting the cars, and thus relieve the much overtasked horses.

The object of the improvement is to permit a certain amount of motion in the body of the wagon and its load, backward and forward, relatively to the points of the road on which the wheels rest, so as to give greater ease to the horses in drawing and to those riding in it; while, at the same time, it obviates the rigidity of the parts of a wagon constructed in the old style, and thus takes away much of the shock and consequent liability to breakage.

These objects are accomplished by simply giving a crank angle to each end of the axles, and, instead of uniting the springs and boxes to the axles by rigid connections, resting the upper parts on turned journals fitted with boxes, as shown in detail in Fig. 2. The general appearance of a carriage with this improvement attached is shown in Fig. 1.



In Fig. 2, the precise method by which this attachment is made is distinctly shown where the springs are placed at right angles to the axle; but it is necessary to state that the position of the springs may be changed without in any way affecting the principle of the improvement. A is the ordinary journal upon which the wheel runs. B the box attached to the lower part of the spring in the manner shown in the engraving or in any other manner specially applicable to the particular vehicle upon which it is desired to put the improvement; and C the journal working in B.

At first glance it will be evident that the swinging motion thus secured in the axles, and the consequent oscillation of the body and load, will greatly relieve the structure from the shocks consequent upon the impact of the wheels against obstacles. How it would act to assist the horses in drawing the vehicle may not be so obvious. We will endeavor to make this plain.

The normal position of the cranks of the axles when the vehicle is at rest, is at the lowest point of the arc of oscillation. The draft is applied not to the axle but to the upper spring bar—or where springs are not used—to the parts supported by the box, B, Fig. 2; therefore the moment the horses start, the load is swung forward so that the journals, C, stand forward of the centers of the wheels; the distance to which they will move depending upon the amount of resistance which the wheel has to overcome. Now suppose the wheels to be so "blocked" that a team would be totally unable to start a wagon of ordinary construction, of the same weight and carrying the same load as the wagon under consideration. The team on this wagon is able to move the body and load while the wheels are standing perfectly still. The momentum of this load and the body is added to the strength of the horses when the real tug comes, and the obstacle is at once surmounted.

We are not only sure this is correct in theory, but we have proved it by experiment on the small model from which the accompanying engravings have been executed, by means of a cord and pulley, and observation of the weight necessary to overcome an obstruction, with the axles wired so that they could not oscillate, and also with them free. In the latter case, a given weight will draw the wagon over an obstruction placed a little in front of the wheels, which is wholly unequal to the task when the axles are held rigidly. If the principle is proved sound for large obstructions it must also be true for smaller ones, and therefore we think the inventor justly claims a lighter draft for this wagon than can be obtained with a fixed axle.

Collateral advantages are, diminished noise and the softening of all the motions of the vehicle. For farmers' wagons, trucks, traveling wagons, and specially for all vehicles without springs, we deem this improvement an important advance on the old mode of construction, while to those which employ springs, it will add comfort and durability.

This improvement was patented through the Scientific American Agency, April 6, 1869, by Samuel Jackson, 149 High street, Newark, N. J., at which place he may be addressed for further particulars, and where the improvement may be inspected.

Steam Agriculture.

The following from the letter of a correspondent to an English agricultural paper, is worthy of more than a passing thought. The public does not yet begin to comprehend the part which steam is now performing in the industries of the world. Much less the magnitude of its future.

"It is a fact," writes this correspondent, "that I am now harvesting my *fourteenth crop* under steam culture.

"It is a fact that Nos. 1 and 4 heavy lands are bean-growing on seed bedscosting only 7s. 3d. an acre; that they are strong in straw, well corned, free from fly or blight, and ripening well, unlike many a crop now growing upon shallow, horse-worked land, that may be seen to be weak in straw, full of fly, and dying a premature death.

"It is a fact that my Nos. 2 and 3 heavy lands are wheat-growing on seed beds costing only 6s. 9d. an acre; that they are strong in straw, full of corn, and ripen well; together they are the best I ever had on this land in my life.

"It is a fact that these four fields will give me an average of full 40 bushels per acre, and it is a fact that under horse culture (having a dead fallow every fourth year) they did not average over 20 bushels per acre, one year with another.

"The next fact to be looked to is, what do our best farmers on such soils get now-a-days under horse culture? Mr. Whitworth, of Willen, a mile from here, is a good farmer under horse culture. He occupies three farms—one where he lives, one at Woughton, only a mile from here, and one at Mursley, about six miles from here. To prove that he is a good farmer, let me tell you that he has made money by farming. Two years ago he bought with his earnings his Woughton farm for over £11,000; therefore I need not say any more on that point. On his Woughton farm he has six fields of plowed land exactly in character with my heavy land, on the same hill, and within a mile of it. This year three of his fields are wheat, one beans, one vetches, fed on and fallowed for next year, and the other clover, fed on, and is now being fallowed for next year. The worth of this feed for sheep, after paying all the expenses for seeding and shepherding, is but a mere trifle; I estimate it at 5s. per acre. Now, then, for the produce on the three fields of wheat and one of beans; it is not over 35 bushels per acre, or from an acre of each added together only 140 bushels. When divided by six, to spread the 140 bushels over the six fields, we find the average to be only 23⅓ bushels per acre; to which must be added 1s. 6d. as a share of the value after payment of expenses, for sheep-keep on the two fields of vetches and clover. I do not ask Mr. Whitworth's permission to make this statement, but I state it openly and fearlessly on behalf of steam culture against the best horse culture. Let him or any other man pull me back in the correctness of it if he can. I know that it is true, and I mean that the world shall know it. Had I taken bad farming for my comparison, the average would have been less than 23⅓ bushels, with 1s. 6d. for sheep-keep to be added per acre, against my 40 bushels per acre.

"I ask you to publish these few facts to help me to open the eyes of the landlords and farmers of England as to the use and value of steam power to culture, and in addition to what I have stated above, I will state here that my light land crops are excellent, without troubling you with particulars.

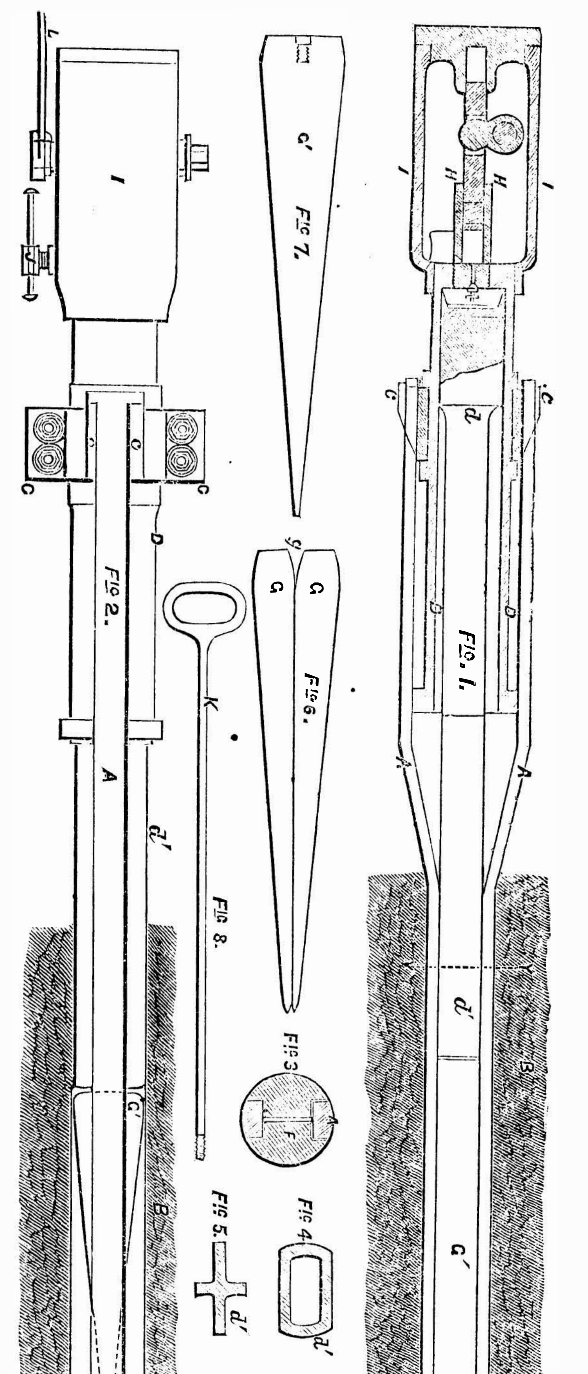
"I might have stated another fact, that this heavy land of mine always needed four good horses to plow it from 5 to 6 inches deep, which cost fully 14s. per acre; whereas by steam power I can now make an average seed bed for 7s. an acre year after year, and keep my land clean for corn crops every year."

Newest Coloring Matters.

A lecture has been given by Mr. W. H. Perkin, at the Royal Institution, "On the Newest Coloring Matters." Among the many interesting facts then put forward was the discovery of a beautiful blue color, by a German chemist, on treating rosaline with sulphuric acid. Unfortunately, it was not a "fast color." A dyer made many trials therewith, in the hope of turning it to account, but all in vain. He happened to mention his difficulty to a photographer, who, knowing that hyposulphite of sodium would fix a photograph, recommended the dyer to try that. The trial was made; when mixed with the hyposulphite, the blue became a beautiful green, and, better still, a "fast color." This was the origin of that brilliant dye commonly known as "Night green," because of its remaining unmistakably green in appearance when seen by artificial light. Let it be remembered that nearly all the new colors are extracted in some way from coal tar, that the first was discovered not more than thirteen years ago, and that the annual value now manufactured is £1,250,000, and it will be seen that in the industry created by these new products there is an admirable example of the results of scientific investigation. The best of it is that the field is inexhaustible; for many years to come it will yield a rich harvest of discoveries.

PREVENTION OF COLLIERY EXPLOSIONS.

Many of the most calamitous explosions in collieries have been clearly traced to the ignition of the fire-damp through the firing of shots; and in a still larger number of cases there



has been much presumptive evidence of the same cause having existed, although absolute proof was wanting.

The *Mining Journal* of London, from which we extract the substance of the present article, refers, as a corroboration of this statement, to the Edmunds Main Colliery explosion, which, it will be recollected, resulted in the loss of 60 lives, and which actually occurred through the blasting operations; and at the Oaks colliery, only a few miles from it, where some 324 were killed, and in regard to which little doubt is entertained by practical men that it was to the firing of the

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shot at the steps to the back workings, that the fearful casualty was due. Now, that the use of gunpowder does very much facilitate mining operations, is beyond question—the power is easily applied in the desired position, and the amount of work done with a given expenditure of manual labor is sufficiently large to satisfy the workmen. But, valuable as blasting agents are, in ordinary cases, it can be readily understood that, to explode gunpowder in the immediate neighborhood of so explosive a gas as that of fire-damp is, to say the least, anything but a safe operation, more especially when conducted, as it is in coal mining, in a comparatively small and inclosed area, from which escape is practically impossible. It cannot, therefore, be surprising that the desirability of abolishing the use of gunpowder in coal mining should have been acknowledged, or that so competent an authority as Mr. Geo. Elliot, M. P., for Durham, in his excellent address to the North of England Institute of Mining Engineers, should have pointed to the discovery of a means of superseding gunpowder in collieries as one of the most important that could be made.

Messrs. Jones and Bidder, of England, have made an invention, illustrated in the accompanying engraving, intended for breaking down coal, slate, and other minerals, without the use of powder. Instead of the usual blast, two or more wedges are caused to be driven consecutively by hydraulic or screw power between the surfaces of the substances to be broken down. The arrangement of apparatus for this purpose may be variously modified, but by preference they employ apparatus constructed as follows: Two tension-bars or rods, either formed of two separate pieces or of one looped piece, are inserted into the hole cut in the coal or other substance, the outer ends of which bars are connected to the cylinder of a hydraulic ram or press, or to the framing, or screwed nut or boss carrying a screw spindle. Between the tension-bars, at their innermost end, is placed a clearance-box, and then two metal pressing blocks, between which is afterwards forced first a single wedge by the action of the ram of the hydraulic press, or of the screw spindle; the ram or screw spindle is then withdrawn, and a second wedge is inserted, either between the one side of the first wedge and that of one of the pressing blocks, or the first wedge may be made as a split wedge, and the second wedge be driven between the two parts thereof. If requisite, a third wedge may, in like manner, be driven in, and so on until a sufficient wedging action is obtained to effect the breaking down of the mass desired to be removed. The wedges and pressing blocks may be formed either so as to cause the pressing blocks while expanding to retain at first a position parallel to each other by making those with inner inclined surfaces, similar to the inclined surfaces of the wedges, or they may be arranged so as to form from the commencement a gradually increasing angle with each other. The wedges can pass beyond the pressing blocks and into the clearance box, which thus allows them to impart a greater lateral motion to the pressing blocks than would be the case were the clearance box not employed; it may, however, in some cases be dispensed with when no great lateral motion is required. The ends of the tension bars are by preference made detachable from the hydraulic press for introducing the wedges consecutively. When the apparatus is worked by hydraulic power they prefer to construct the hydraulic press with the force-pump formed in one therewith or fixed directly thereto, and it may be constructed either with a closed receptacle containing the requisite charge of water for working it, or the water may be supplied through a suction pipe from a separate reservoir. This arrangement of apparatus may also be employed in some cases with effect with one wedge only, as by forming the pressing blocks parallel—that is, without inclined surfaces corresponding to those of the wedge, as heretofore proposed—they are enabled to obtain an expansion equal to the entire thickness of the wedge, instead of equal only to a small portion thereof, as would otherwise be the case.

The advantages claimed for the improved apparatus, in addition to the absence of the noxious vapors in the mine and the danger resulting from the use of blasting powder are—first, a great saving in the time employed in effecting the breaking down of the coal or other material, owing to the almost unlimited power which is available by their system, enabling them to break down at one operation far greater masses than can be effected by blasting; and, secondly, the avoidance of the great deterioration of the coal or other mineral which takes place when blasting powder is used, owing to the large quantities of small fragments or "slack" which are produced thereby.

In the annexed diagrams, Fig. 1 shows a part sectional side elevation of the apparatus; Fig. 2 shows a plan of the same; and Figs. 3 to 8 show details to an enlarged scale. Similar letters of reference indicate similar parts in each of the figures. A A are the tension bars of wrought iron, steel, or other metal capable of withstanding considerable tensional strain. These bars may either be formed of one piece bent round at *a* so as to form a loop, or they may be two separate bars connected together at *a*. These bars are inserted into a hole cut in the coal or other mineral, B, to be broken down in the manner shown, the ends thereof, which project beyond the face of the mineral, being widened out for the reception of the cylinder, D, of the hydraulic press between them, to which they are connected by T-heads formed at their extremities, being made to catch against lugs, *c c*, on a collar, C, secured to the cylinder. Before the tension bars are placed in the hole a clearance box, E, is first placed between them at the extreme end of the loop, after which the two pressing blocks, F F, are inserted, the sectional form of which blocks is shown more clearly at the enlarged section of Fig. 3; lastly, the two wedges, or the double or split wedge, G G, shown enlarged at Fig. 6, are introduced between the bars, A A, so that their points just enter the small interstice between the pressing blocks. The parts A, E, F, and G thus put together are then inserted into the hole in the material, B, and the hydraulic press, D, is connected to the bars, A A, as above described. The press, D, has a plunger, d d^1, the front part, d^1, of which projects between the tension bars, A A, as shown, and is formed either as shown in enlarged cross section at Fig. 4, or as at Fig. 5. To the back end of the press, D, is fixed the pump, H, worked by means of the handle, L, and inclosed in the reservoir, I, containing the water required for working the press.

The press being put in action the plunger forces the double wedge G forward between the pressing blocks, F, thereby forcing these asunder in an angular direction, and, consequently, causing them to exert a powerful bursting strain upon the sides of the hole. By forming the inner surfaces of the pressing blocks inclined, corresponding more or less with the taper of the wedge, this first expansion of the blocks may be effected in a more or less parallel direction instead of angular. The object of the clearance box is to allow of the points of the wedges being driven past the inner ends of the pressing blocks, so as to effect an increased expansion of these ends; where this is not required the clearance box may be dispensed with. The double wedge, G, having been driven into the required extent, the press is detached from the tension bars, A A, which is effected by first opening a passage of communication between the reservoir, I, and cylinder, D, by means of the screw, J, so as to allow the water to flow from the latter back into the former, after which the press is pushed forward slightly, so as to release the T-heads of the tension bars from the lugs, *c*, whereupon the tension bars are sprung open and the press removed. Another wedge, G^1, shown enlarged at Fig. 7, is now placed between the tension-bars, A A, so that its point fits into the space, *g* (Fig. 6), formed between the two parts of the double wedge, G. To facilitate the correct insertion of the wedge, for this purpose a handle, K (Fig. 8) is screwed into the rear end thereof, which is removed when the wedge is in position. The press is then again attached to the tension bars, and the wedge, G^1, is forced in between the two parts of the double wedge, thereby effecting a still greater expansion of the pressing blocks; and in like manner one or more other wedges may be consecutively forced in, as indicated at Figure 2, until the accumulated pressure thus produced is sufficient to break down the mass of coal or other material operated upon.

The invention can also be modified so as to employ screw instead of hydraulic power. The arrangement of the tension bars and pressing blocks is similar to that used with hydraulic power; but the hydraulic press is replaced by a frame wherein is a slot with a worm wheel in it, fitting with a female screw thread upon a screw spindle formed with flat upper and lower surfaces, and passing through correspondingly-formed holes in the bosses of the frame, so that it can move through but cannot turn in the latter. In gear with the wormwheel is the worm, the spindle of which is carried by brackets on the frame, the ends of the spindle being formed to receive a ratchet lever for rotating the same. The ends of the tension-bars are formed with lugs, which catch behind keys bearing against other lugs formed on the frame, so that the frame is by this means connected to and disconnected from the frame by merely inserting the keys, and without having to spring open the tension bars. As the projecting ends of the tension bar may thus be made considerably shorter than in the previously-described arrangement, this mode of connecting the tension bars might with advantage be employed in that case also. By rotating the worm wheel by means of the worm the screw spindle is advanced, and is caused to force the wedge between the pressing blocks, as in the hydraulic arrangement.

Messrs. Jones and Bidder do not limit themselves to the precise details described, as these may, of course, be variously modified without departing from the nature of the invention. Thus, for instance, where only one wedge requires to be driven in, the arrangement may be reversed—that is, the wedge may be placed at the inner end of the tension bars, with its point facing the pressing blocks situated at the front end, and which are then forced in by the press so as to cause the wedge to enter between them, or the wedge might, in that case, be drawn forward by the press against the pressing blocks; but what they specially claim is—first, the construction and employment of apparatus for breaking down coal, slate, stone, and other minerals, wherein two or more wedges are caused to be driven consecutively by hydraulic or screw power between the surfaces of the material to be broken down, in such manner that the pressure exerted at one and the same point can thereby be increased at will; and, secondly, the arrangement of tension bars connected in a readily detachable manner to an hydraulic press or frame carrying a screw spindle, operating in combination with pressing blocks and one or more wedges.

Singular Case of Poisoning by a Fly.

We learn from the Troy *Press* that Captain Green, of that city, Deputy Inspector of Boilers and Assistant Engineer of the Fire Department, about a fortnight since (August 25), was bitten by a common horse fly, which had been feeding on carrion, and had communicated the poison. The wound was on his right hand, between the thumb and index finger, and he soon experienced considerable pain, which gradually increased. The bite was at first supposed to be from a mosquito, and treated accordingly by a druggist, and afterwards by a physician. The pain and swelling continued to increase, and erysipelas setting in, a surgeon was consulted and pronounced it a bite by a fly. Medical treatment has succeeded in placing Mr. Green out of danger, but it will be a long time before he can recover the use of his arm.

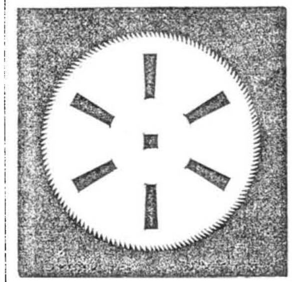
Correspondence.

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

The Oldest Circular Saw.

MESSRS. EDITORS:—I noticed in your valuable paper of September 11th an article entitled, "First Circular Saw," by Lemuel Read.

I have a circular saw in my possession which I obtained in the year 1827, and have kept it on account of its antiquity, as I was informed that it was the first circular saw ever forged in America. It was made in the year 1792 by Benjamin Bruce, of New Lebanon, N. Y. It is 12½ inches in diameter, and very different from saws in use at the present time, having an eye in the center 1⅝ inch square and six slots in the plate to keep the saw from heating when at work, thus the teeth are three to one inch, and filed about the same angle as a common hand saw. I am informed by an aged person, now living, that he came here in the year 1806, and there was at that time a circular saw in use for edging boards and sawing rims for spinning wheels, and had been in operation 3 or 4 years.



The idea of a circular saw for cutting boards was taken from a small saw first made of tin and used in a turning lathe by Amos Jewett, of New Lebanon, N. Y., a clock-maker; and he made use of it in cutting the teeth of wheels, which were V-shaped, for his clocks. I have conversed with him in my younger days upon the subject, but never ascertained the time to date his first experiment with circular saws. We have a large building standing in our village of which the covering and floors were edged and matched with circular saws in the year 1815 or 1816. So I think friend Read is not at the top in antiquity. GEO. M. WICKERSHAM.

Shaker Village, New Lebanon, N. Y.

[We remember to have seen and examined the Bruce saw a few years ago, when visiting the Shakers at New Lebanon. Friend Wickersham then called our attention to it as being probably the oldest circular saw in the country. If any of our readers can refer to one of earlier date we hope they will write us the particulars.—EDS.

Curious Antique Astronomical Watch.

MESSRS EDITORS:—The very interesting account in your paper of 21st August of the great astronomical clock of the Beauvais Cathedral, and also of the Strasbourg Cathedral clock, reminds me of an astronomical watch that I often delight to look at, which is no less remarkable in its way. A short review of its performances may interest your thousands of readers, as it is a curiosity of science and mechanism.

It is not one of those mere mechanical toys contrived to amuse the monarchs and other grown-up children of luxury of a century or two back, which, besides keeping incorrect time, when running at all, could be made (by touching certain springs or otherwise) to strike a bell or play a few bars of music, or display soldiers moving past a window in its face. On the contrary, this elegant watch, made in the highest finish and good taste, and without a tawdry ornament, is a perfectly reliable time-piece. It performs all its movements with the most accurate punctuality, showing the exact time of day, the hour, minute, and second, the month, the day of the month and of the week, the age of the moon, the moon's phases, the zodiacal and planetary phenomena of the present time, etc.

In outward appearance, it is a plain gold watch, with two enameled faces protected by crystals. Each face, with its own features, will be described separately. Its size is two and three eighths inches in diameter and about five eighths of an inch in thickness.

The principal face exhibits three dials, two smaller ones occupying opposite positions in the upper and lower halves of the greater dial. Above this face on the rim of the case, is the legend, in Roman capitals, "INCERTA EST HORA, AETERNA RESPICE," which may be rendered, *The hour is uncertain—look at things eternal.*

The outside edge of this face contains a circle divided into seconds, and traversed by an independent second hand once in every minute; while balanced on the same central point is another similar delicate hand which makes its circuit only once in two years! one end pointing to the months, the other to the twelve signs of the zodiac corresponding with each month in the year. The figures representing these signs are most exquisitely done in miniature, in black on the fine white enamel face, as is also the lettering of the names, in French, of the months.

The divisions and subdivisions of this and every other dial are spaced with geometrical precision, and the works perform their part so accurately that the point of each one of the twelve hands of this watch arrives at the proper instant exactly on or over its marked position, a proof of the superiority of the workmanship.

The upper small dial on this face has three hands pointing severally to the day of the month and the days of the week, in French, and their corresponding celestial bodies in the following order: The sun, the moon; the planets Mars, Mercury, Jupiter, Venus, and Saturn. The lower small dial on this face shows the hours and minutes in the usual manner of watches. Below this face, on the rim of the case, is the inscription, *Tempus rerum imperator*—"Time, the ruler of all things."

The opposite face of this superb watch presents the same general arrangement of three dials, but the larger dial is also divided into equal upper and lower parts, the latter

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enameled in black to represent night, with the moon, stars, etc. This dial is figured differently from modern dials, having 24 hours, 12 for the day and 12 for the night, with the subdivisions and hour and minute hands accordingly. On the case around the lower and dark half of this dial is the inscription, *Sapiens insipientibus sicut luna in nocte*—"The wise man to the ignorant is as the moon to the night." On the case around the upper half of the dial is engraved, in Italian, *Non vi son tenebre per chi creo la luce*—"There is no darkness for Him who created the light."

In the dark half of this dial is a smaller dial with hands showing the age of the moon, the moon's phases, and the day of the lunar month. The small dial in the upper half of this face has an index gage and pointing hand for regulating the grand movement, which controls the entire twelve hands and movements. Being also wound up as well as regulated from the outside, the works within are permanently closed from dust as well as excluded from prying and meddlesome curiosity, to which precaution we attribute its present perfect condition, being more than two hundred years old. The durability of watches when well made is very remarkable.

This valuable, complicated, and beautiful piece of mechanism is in perfect running order, and performs with astonishing precision in all its movements. It is a French watch, made by Robert et Courvoisier. It must have occupied many months, perhaps years, of time and labor in its construction, and though it is small and handy enough to be carried in the rich man's pocket, it is well worthy a high place in the cabinet of the gems of science and art. It is now the property of Mr. F. W. Chamberlain, 233 Hanover street, Boston.

F. H. F.

Steam and Hot-Water Pipes.

MESSRS. EDITORS:—In an article on the causes of fires in manufacturing establishments from steam pipes, etc., in your paper of the 4th inst., I notice the terms steam and hot-water pipes, are so commingled that one would suppose that they were so nearly alike as to produce the same results, the only real difference being a few degrees in temperature.

In a steam heater a portion of the water (at least that in the pipes) is converted into *steam* before the fixture operates, while a hot-water heater, properly constructed, is simply a circulation of water, filling boiler and radiators, warmed, but never reaching so high a temperature as to form steam, and working with the same pressure that is sustained by the lead pipes of the plumbing fixtures in our houses, consequently no more liable to explosion, and limited to a temperature of 200° at the boiler there is about as much danger of a plumbing job setting the house on fire as from a properly-constructed hot-water fixture.

My impression is, that in all the cases where hot-water pipes have been reported as producing the effects described they were in reality steam pipes.

To save the material requisite in the radiators for heating at a very low temperature is the inducement to use steam. If specifications for constructing hot-water heaters required that the requisite heat in the rooms warmed, say 70°, should be produced with not exceeding 200° at the boiler, there would be no such chemical action as Mr. Braidwood describes, or consequent danger from fire, not to mention the superior quality of heat obtained from surfaces at such low temperatures.

A SUBSCRIBER.

Baltimore, Md.

New Wall Covering.

MESSRS. EDITORS:—In the concluding remarks of Mr. Wight's paper on "Fire-proof Construction" in your issue of the 28th ult., the following remarks occur: "The stone slabs of Mr. Eidlitz are the only rigid material thus far used successfully with iron beams—they are doubtless the handsomest material that can be used for that purpose, but are open to the objection of being heavy and expensive"—it will be pertinent to our inquiry, therefore, to ask if there are any other rigid materials adaptable to this purpose, and possessing the desired qualities of lightness and cheapness. Further on, he remarks that "the cheapest material for wall covering in natural materials would be slabs of white marble, which would cost $1·50 per foot, and three coat plastering laid on iron lath $1·34 per foot." I would inform Mr. Wight that there is in use by the architects of the Southwest, a composition called by the inventor Lithomailite, produced by a method of hardening and marbleizing plaster of Paris, and giving it a high and durable polish. This, I think, is the desideratum in fire-proof buildings, with the material advantage over marble slabs and plastering, that it does not cost over one seventh the price of either of the above styles of finish. It can be put on walls or ceilings in ashlers to suit, at twenty cents per foot. An office 20x40—16 feet high, finished with marble slabs would cost for the walls alone $2,886, while both ceiling and walls could be finished in Lithomailite for $544. The imitations of precious marbles in it are inimitable. It is hard enough to shiver a door knob or key when slammed against it. It has the hearty indorsement of the leading architects of the South, and is the strongest and most elegant substitute for plastering that I have seen in a building during an experience of over thirty years.

G. W. LINCOLN.

Memphis, Tenn.

Explanation of a Curious Phenomenon.

MESSRS. EDITORS:—You are herewith offered an explanation of your "Curious Phenomenon," published a few weeks ago.

Subject: Jar cracked across the bottom. Jar leaks on hard, unpainted surface; is tight on painted surface.

A painted surface is tenacious; oil makes it more so. An unpainted surface is not tenacious; oil makes it less so. The former holds the jar together. The latter offered no resistance to the outward expansion of the bottom of the jar (caused by its own weight) and consequent opening of the crack.

Z.

Pittsburgh, Pa.

A Night Gun-Sight Wanted.

MESSRS. EDITORS:—Could not some one invent a contrivance for illuminating the sights of guns and rifles at night, so as to enable to shoot with certainty when dark? Everyone knows what difficulty attends taking aim with rifles when dark. Might it not be done by a small electric spark on each sight, produced by a miniature battery, concealed in the stock of the rifle or gun, and led to the proper place by a thin copper wire, covered with silk thread, and which could be removed or put on at pleasure?

I leave this idea to some inventive genius, and I have no doubt, by producing some simple and easy-managed contrivance, a patentee might make a good thing for himself and earn the thanks of many a sportsman and frontiersman, if not a glorious place in history.

FRONTIER.

New Mexico.

Railway Ties.

MESSRS. EDITORS:—In reading a recent answer to a correspondent in your paper, touching the life of oak railroad ties, stone ties, etc., a few practical thoughts, the result of 14 years' experience, suggested themselves.

The lasting of oak ties depends very much upon the manner of putting them down, and the condition of the wood at the time they are laid. Take a red-oak tie from the stump with all the sap in and it will not last *three years*; but if piled up and well seasoned before laying, it will last six years. The same remarks will apply to white oak.

There is often a great deal of carelessness on the part of the foreman of repairs in this particular.

Speaking of stone ties, I think the day is not far distant when wrought iron stringers will be used, broad on the surface, so as not to sink under pressure, and bolted together. There would be sufficient spring on such ties, and the rails can be thoroughly fastened to them. They would not present the rigidity of stone blocks, or fail in durability.

Belvidere, N. J. JACOB STONE.

Testimony of an Advertiser.

In a recent issue under the head of "Business Hints," we took occasion to speak of the value of the SCIENTIFIC AMERICAN as an advertising medium. We are frequently receiving evidences of the correctness of our statement from advertising patrons, an example of which we present herewith:

You are following my wishes. You may continue to advertise until I notify to the contrary. I have found during the short time I have had the cupola notice in your paper it has called the attention of iron founders to my improvement, and increased my orders and sales more than all the circulars I have ever sent, and I am compelled to believe and free to admit that the SCIENTIFIC AMERICAN is the best paper for mechanics to advertise in I know of. ABIEL PEVY.

Lowell, Mass.

(For the Scientific American.)

THE MANUFACTURE OF PLATE GLASS IN ENGLAND AND THE UNITED STATES.

BY THOS. LOCKWOODE.

It is curious to note, that while the glass manufacture in most of its forms has prospered in this country, and factories have multiplied almost without number, yet the manufacture of plate glass has been almost quite left out, and there is at present but one rough plate glass works in operation in the United States, and only one in process of erection.

We propose, therefore, to describe the processes connected with its manufacture in England, hoping that our efforts will be of some use, or, at any rate, will be of interest. There are at present six plate glass factories in England; namely, three at St. Helens, Lancashire—the British plate glass factory at Ravenhead, the Sutton Company, and the Union Company—one at Newcastle-upon-Tyne, one at London, and one at Smethwick, near Birmingham. The British company is the oldest established, having been in successful operation nearly 200 years, the manufacture having been introduced from Venice somewhere in the seventeenth century, and established at Ravenhead shortly after. Three of these British factories melt their "metal" in the Siemens furnace, a process which is also used by the works now in existence in Massachusetts. The process of melting and casting the glass may be familiar to some, but it will be new to most of our readers. The mixture was formerly melted for twenty hours in a pot or crucible, and then ladled out into another vessel called a "cuvette," which was placed by its side in the furnace. But this operation is now dispensed with, and the glass is cast direct from the pot after a melt of from fifteen to twenty hours. A description of one factory will necessarily be a description of all, and therefore we will give an account of the Birmingham factory from personal observations made at that establishment.

The casting house is a building of about one hundred yards long by twenty-five wide. The furnaces are in the center of the building and the annealing ovens are arranged along the whole length of the room on both sides. The pot room, mixing room, and coal sheds, are arranged conveniently around the outside of the building. The mixture being placed in the melting pot, by installments—three fillings being the usual number—is gradually melted down into a homogeneous mass; its perfect fusion is tested by dipping an iron rod into the pot, and drawing a portion of the metal out with it. When the metal is ready for casting, it is allowed to cool down for about an hour. The furnace is then opened and a pair of tongs arranged on wheels, is thrust into the furnace and made to clasp the pot, which is drawn out and placed on a carriage running on a railway to the casting table. The contents are skimmed until all the dross is removed, and the pot is then run up to the side of the table where it is lifted by a crane and tilted over on to the casting table, a large mass of cast iron, about twenty feet long, with side ribs to prevent the metal from flowing off. It is then rolled by a massive iron roller, and as soon as the plate is cool enough to admit of its being moved without crushing it, it is slid off into the annealing oven, which is just on the other side of the table. The table is also on rails, so as to admit of being moved from one oven to another. The plates, after being placed in the annealing ovens, are allowed to stay there, from a week to ten days—the longer the better. When taken out they are either taken to the grinding shed to be submitted to the second process or cut into proper sizes and sent away as rough plate, to be used as skylights, pavement, etc. The plate to be finished for lookingglasses, windows, etc., is then laid on a grinding bench, which may be briefly described as follows: The machinery is nearly all under ground, in a vault, which runs the whole length of the room. The driving shaft from the engine runs in this vault, and is supported by bearings between every bench. This shaft is horizontal and drives a vertical shaft by means of bevel gearing. The upright shaft carries a clutch for the purpose of starting and stopping the machine. The vertical shaft is in the center of the machine, the working part of which is ten feet square, and which has four corner shafts; each of the five shafts has a crank which, in turn, supports and moves a fly, which is literally a square of cast iron having long rods extending from it on both ends, which move with an alternate rectilinear motion, and with a kind of lateral swing at the same time. The glass is laid down and fixed with plaster, on firm stone tables, one on each side of this machine, and these connecting rods move runners over them at a rate of sixty revolutions per minute. The runners are composed of a wooden framework, faced with either iron plates, or with another plate of glass, and sand and water are thrown between the two surfaces by a boy until the whole is sufficiently ground. The Birmingham company have in operation twenty-six grinding machines, which turn out a total weekly product of upwards of twelve hundred feet of glass. It should be stated that after the sand grinding, emery of three different degrees of fineness is used before the plate is taken up. When the glass is fully ground it is raised up and taken to the smoothing shop, where it is smoothed. Formerly this operation was performed entirely by hand, the plates of glass being laid one upon another, having courses of emery running from No. 4 to No. 7 between them, and being plentifully supplied with water. This operation is very similar to grinding, but is a great deal finer and slower. It is now almost universally performed by machinery, the machine being on the same principle as the grinder, but with a speed of only fourteen revolutions a minute, whereas the grinder has sixty. When the glass is smoothed it is taken to the polishing shop, where the finishing process for window plate is given. In the polishing room the glass is again laid on tables and the polishing is performed by means of two bars, which run longitudinally over the glass, carrying blocks which are covered with felt; the table on which the glass is fixed by means of plaster, at the same time traveling, alternately from right to left, and *vice versa*. The glass, during the process, is sprinkled plentifully with a mixture of the red oxide of iron and water until sufficient polish is given, when the plate is taken off and taken to the warehouse, or, if required to be silvered, it is carried to the silvering room, where that process is performed. However, this process is so well known that it is needless to describe it. Large quantities of this glass are sold in the country and much of it is also exported. So much for British plate glass.

We will now turn to the American side and see what is the progress of plate glass there. Some fourteen years ago an attempt was made by a New York company, to commence a factory at Williamsburgh, N. Y., and one or two plates, were really cast, but the enterprise failed. A short time after a couple of window glass blowers and a few capitalists made the attempt at Chelsea, Mass., and shortly after at Lenox, in the same State, still in operation there, and the one alluded to above. It was attended with a large measure of success in the casting of rough plate. Some years ago they commenced experiments with a view to polishing, and a gentleman from Chicopee, in conjunction with some of the stockholders of the company, have patented an invention for that purpose, but from some cause or other they do not seem to be making much progress. Last year they commenced using the gas furnace of Siemens, and are still using it. For a long time the Lenox works was the only establishment of its kind in the United States, but now a rival is to appear on the scene. This is situated at New Albany, Ind., and is owned by Capt. J. B. Ford, a gentleman whose public spirit has done much for that city. He has already set in motion several founderies, glass and other factories, and last winter turned his attention to plate glass. He is about to commence its manufacture on a large scale, and the buildings for that purpose are far advanced towards completion. He expects to make glass by the middle of October. Mr. Bankard, one of the original plate-glass makers of Lenox, has been engaged by Capt. Ford to superintend the making of his glass. Capt. Ford intends to commence polishing immediately, on the European plan, and to effect this has ordered several machines from St. Helens, England, and has the services of an experienced glass polisher from that country. The word fail is not in Capt. Ford's dictionary, and this enterprise cannot fail of success.

As soon as this enterprise gets fully under way the readers of the SCIENTIFIC AMERICAN are promised a detailed account of the establishment.

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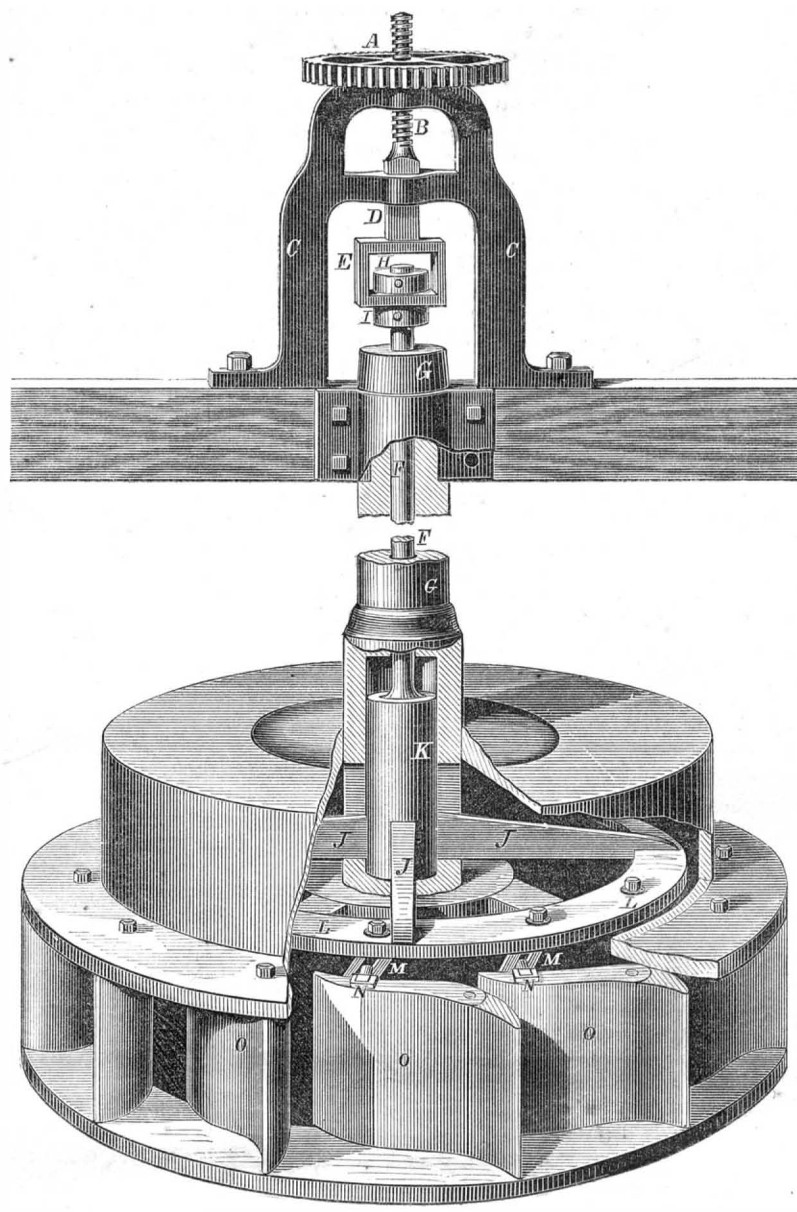
Improvement in Turbine Water Wheels.

It is a well-known fact that whenever the flow of water through the buckets of a turbine wheel has its velocity diminished by the lowering of the head, a better result is obtained by diminishing the spaces between the buckets.

The writer has often descended, in such an emergency, into the wheel pit to adjust the buckets of one of these wheels which were supplied with movable plates at their outer border, held by set screws; a tedious operation and one requiring great judgment to perform with any approximation to accuracy.



NEWLIN'S IMPROVED TURBINE WATER WHEEL.

The invention herewith illustrated is intended to furnish a simple and ready means whereby the buckets may be adjusted as the head varies, either while the wheel is in motion or at rest, by hand, or by the action of a regulator.

Fig. 1 is a perspective view of a center discharge wheel with portions of some parts broken away to show better the construction of other parts.

The toothed wheel, A, has a female screw cut through the hub, which plays on the male screw, B, elevating it or permitting it to fall as desired, through an oblong opening in the supporting framework, C. The oblong opening fitting over the oblong shank, D, of the screw, B, prevents its turning on its vertical axis, while it is free to move upward or downward as the wheel, A, is rotated one way or the other.

The head of the screw, B, is a rectangular frame, E, through the lower horizontal part of which an opening admits a shaft, F, which descends through the hollow shaft, G, of the water wheel, to the interior of the water wheel. An upper and an under collar, H and I, are fastened to the shaft, F, by set screws, as shown in the engraving, so that F must obey the motion of the screw, B. The water-wheel shaft, G, rests upon the usual step at the bottom of the wheel.

The lower end of the water-wheel shaft, G, is slotted to permit the passage of horizontal arms, J, attached to an enlarged portion, K, of the shaft, F. The arms, J, with the circular frame, L, and slotted brackets, M, attached to L, rise and fall with the shaft, F, as acted upon by the screw, A. The slotted brackets, M, are inclined to the circular frame, L. In the slots of these brackets (one to each bucket) play pins, N, fastened by a screw bolt to the top edge of the buckets, O. The receiving, or outer ends of these buckets are fixed, being cast with the rim of the wheel; the inner, or discharging ends are movable, being pivoted to the fixed ends of the buckets in the manner of a rule joint.

The operation of the parts is as follows: As the wheel, A, is turned to the left or right, the shaft, F, is lifted or depressed, carrying with it the parts, J, K, L, and the brackets, M. The inclined slots of these brackets act upon the pins, N, and these being attached to the movable inner, or discharging ends of the buckets, open them or close them as desired.

The upper part of the rim is recessed to allow the motion of the pins, and at the same time to allow the top of the bucket to move closely to the rim. The pins are thus placed above the current of water and out of its way.

Fig. 2 shows a plan of the buckets, pins, and slotted brackets, when the buckets are pivoted to swing horizontally.

Fig. 2

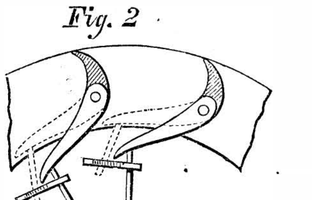


Fig. 3

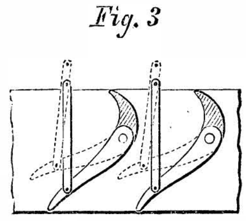


Fig. 3 is an elevation of the buckets when pivoted to swing vertically, showing an extension of the principle to wheels of this description. It will thus be seen that the improvement is equally applicable to turbines of all kinds, and not only does away with a great inconvenience but adds to their efficiency.

Patented, March 9, 1869, by Jesse Newlin, whom address for further information, care N. W. Newlin, 2203 Cherry street, Philadelphia, Pa.

THE SOIL, THE PLANT, AND THE ANIMAL.

How much stronger at every step becomes the likeness between the soil, the plant, and the animal; how much closer their connection, how much more indissoluble the union that binds them together. When dry bone is burned, the ash that remains behind amounts to two thids rits weight, and consists almost entirely of phosphates of lime and magnesia, which are so abundantly present in the ash of different varieties of grain This bone-earth must exist in the soil. The plant draws it from the earth by its roots, the cow eats it with the herbage she crops from the field, and parts with it again in the milk she produces to feed her young. The calf sucks the milk, and works up the phosphates it contains into the form of living bones, adding daily to their size and weight. Without bone our present races could not exist. It forms the skeleton to which the softer parts are attached and by which they are supported; but the life of the animal being at an end the bone as a living thing is discharged and falls to the earth, new plants taking up its phosphates again to send them forward on a new mission into the stomachs of other living and growing animals.

Improved Gas Process.

The *Evening Post*, of this city, reports that Professors Silliman and Wurtz have discovered a new and cheap method of producing a superior illuminating gas. The first step is to bring very highly heated steam into a clay retort, in which pure anthracite coal is burning. The coal is purely carbon; the steam, of course, consists of the same elements as water—that is, the two gases, oxygen and hydrogen. Now, the oxygen of the steam combines with the coal or carbon, and forms the gas known as oxide of carbon, leaving also the hydrogen gas free. These two gases are thus produced in equal volume. They are both easily combustible, and burn with an intense heat; although they give, when burning, hardly any light.

These gases are then mixed with the common illuminating gas, made by distilling bituminous coal. The mixture, it is found by experiment, forms a brilliantly-burning gas, which is better, in some respects, than the best of that with which our houses are usually lighted; for example, it is more permanent under exposure to severe cold. But the main advantage is in the saving of expense. It is plain that this method turns water, and the whole weight of anthracite coal used, into illuminating gas; while the old process yields in gas only the volatile part of the bituminous coal thrown off in distillation.

"Messrs. Silliman and Wurtz, assures us," says the *Post*, "that they are able practically to add fifty per cent to the amount of illuminating gas obtained from a given expenditure of coal, or, what is the same thing, to save one third of the fuel now used in making gas."

Street Crossing.—John Simpson of Cleveland proposes a a plan for street crossing by means of a bridge approached by double inclined planes instead of stairs, which are more easy of ascent, but the difficulty is still to be overcome. Property owners object to a bridge fronting their premises, and what is wanted, is some means of crossing that will take the place of a frowning structure above ground.

The Diffusion of Scientific Information.

In an able address delivered before the graduating class of the Cambridge Divinity School at the close of the summer term this year, John Weiss said a great many forcible and brilliant things. Among these, none has struck us as showing so exact an appreciation of the tendencies of the age as the following remarks upon the general diffusion of scientific information in a popular form, and the avidity with which this information is sought by the American mind.

"Human nature is learning to ask very intelligent and embarrassing questions, while its religious exigences are the same that they ever were, and have to be harmonized with knowledge. Here you may have been taught to gage and appreciate past epochs of spiritual development, and to note their connection with various mental states, and you have indulged religious feelings. But now you are about to discern, by contact with men in vital society, what is essential religion, in order that your service may be timely for this race and country. The past may be the soil that holds your roots, but not a ball and chain around the ankle. If you undertake to drag the dogmatic life of nineteen centuries across the face of the country, your traces will be marked by denudation of the fertility that would prefer your bold husbandry. You go forth to quicken the native germs that lie waiting to succeed the old crops, when decay or the ax shall clear the land. "Instead of the thorn shall come up the fir tree, and instead of the brier, shall come up the myrtle tree."

"Cheap publications of every kind spread the moods of the period far and wide. Their range passes through all the speculative forms, and all the emotions which the world at any time has known. The very richness is a cause of the distraction. Thought is unconsciously embarrassed as so many departments throw wide their doors at once, and display their collections. And there is no statement too scientific to resist the intentions of popular treatment. It is macerated, dissected, volatilized, put up in packages for the trapper and emigrant. Every condition of half knowledge appropriates it. People who are troubled with imperfect nutrition will snatch, at every railway station, a gulp of spectrum analysis, primeval man, the correlation of forces, spontaneous generation, social statics, Carl Vogt's impetuous atheism, Mr. Darwin's pangenesis, Professor Huxley's non-committal protoplasm, and the last message from the summer land.

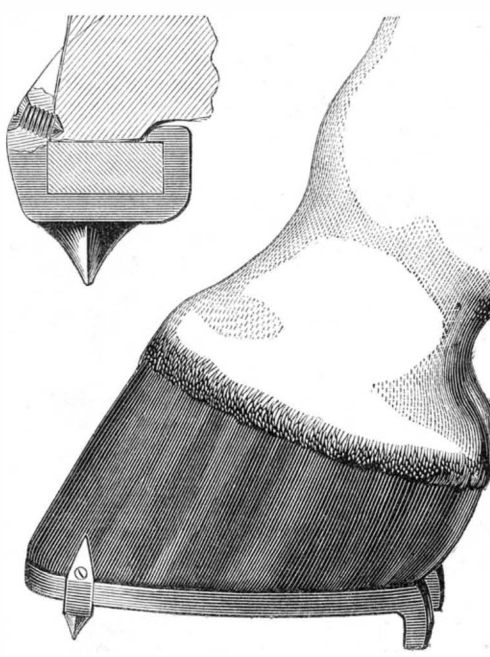
"The scientific mind is making the whole world at once its laboratory and auditorium; and among the hearers there is no distinction of person, color, sex, or previous preparation."

GODDARD'S DETACHABLE CALKS FOR HORSESHOES.

The object of this invention is to furnish a cheap, durable, and efficient calk, easily adjustable, which shall prove a protection against slipping, and shall bear entirely on the shoe, not injure the hoof, or cause discomfort to the horse when shod according to the method proposed.

The inventor claims that it will not cost as much as the blacksmith's charge for calking a shoe as now performed; that it will keep sharp and will prove a great saving of time, as every driver can adjust his own calks as he needs them.

The engraving illustrates the appearance of this calk when fastened to the shoe or the foot of a horse, and also gives a sectional detail showing the construction of the calk and the mode of fastening it to the shoe.



The shoe proper is of the ordinary form, minus the toe calk, in the place of which two of the adjustable calks are used, one on each side of the toe.

The calk is provided with two clasps, as shown in the sectional detail, one of which passes over the inner side of the shoe, and clasps down upon the top of the shoe on the inner side. The other passes upward across the outside of the shoe, and rests not only against the shoe but the outer side of the hoof. It is held in this position by a screw passing obliquely downward through the outer clasp till its point reaches and rests upon the top of the shoe. The calk is made of material best adapted to withstand wear, and of a form best calculated to give a firm hold to the foot in traveling.

This improvement was patented through the Scientific American Patent Agency, May 25, 1869, by Rev. Kingston Goddard, D. D., of Richmond, Richmond county, Staten Island, N. Y., who may be addressed for State, county, or shop rights

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NEW YORK, SATURDAY, SEPTEMBER 25, 1869.

Contents:

(Illustrated articles are marked with an asterisk.)

THE AVONDALE COLLIERY DISASTER.

On the 6th inst. the telegraph wires transmitted news throughout the land that appalled every heart; one hundred and ten men, the dispatch informs us, were buried in a mine at Avondale, Pa., the only source of egress from which was cut off by a merciless conflagration, and there was little, if any hope that a single man would be rescued.

The worst fears have been realized; the bodies of the miners have been found huddled together smothered, after making such futile efforts as lay in their power to isolate themselves from the poisonous gases which filled the mine.

The heart-rending details of this sad catastrophe have been given to the public through the daily press, and we will not dwell upon them. Liberal donations have been made for the relief of the bereaved families of the miners with a hearty promptness which speaks volumes for the philanthropy of the country.

It is due to the Delaware, Lackawana, and Western Railroad Company to say that its action since the occurrence of the accident has been all that ought to have been expected. We are sorry to say that we do not think the disaster need have occurred, and that it might have been prevented at a less expense than the company has incurred in its efforts to soften the blow to the afflicted survivors. Common-sense and humanity would seem to demand that men exposed to the perils of coal mining should not be forced to depend upon a single narrow avenue of escape, liable to be cut off at any moment by an accident of this kind.

It is evident that the method in which coal mining is conducted is behind the age. Gigantic enterprises in engineering are conducted to brilliant success in other departments, and yet year after year coal miners are forced to go down to suffocate beyond the reach of help, or to be suddenly struck down by some fatal explosion.

We are glad to see that the subject of averting these calamities is claiming the earnest attention of scientific investigators and engineers in England, and the heart-rending disaster at Avondale will not be an unmixed calamity if the lesson it teaches be generally heeded in this country. Our European exchanges inform us that Mr. H. Bessemer, the well-known improver of the manufacture of iron, has suggested a remedy which seems likely to avert explosions. Gas in incased burners having combustion supported by compressed air will give a very bright light for a long distance; and by these lamps being placed at intervals in the mine, the use of the "Davy" can be dispensed with. The gas is fed from the ground above the mine, and the great air pressure within the lamp will force out the products of combustion, so that the gases in the mine will not be able to enter and explode. In the talked-of tubular tunnel to connect England and France this idea might also be utilized. All that compressed air can do is as yet uncertain; for if it be without and within a man simultaneously, life is supportable, and the brightest light beneath the waters in diving explorations or the laying of submarine foundations is ever desirable.

One thing should however be insisted upon, that a single avenue of entrance and exit to a coal mine shall no longer be deemed sufficient, and the miners will be sustained by the public press in demanding that more ample means of escape be provided.

A method for preventing explosions in mines, ha ing their origin in blasting, will be found in another column, with an engraving illustrating the apparatus employed.

THE ADJUSTMENT OF HOT-AIR FURNACES.

We are in receipt of our annual crop of inquiries in regard to the proper adjustment of hot-air furnaces, which we will attempt to answer as briefly, yet comprehensively as possible.

The apparatus for heating buildings with hot air may be divided into seven parts; namely, the fire-box and flues in which combustion is performed; the chamber through which the air passes to be heated; the cold air pipes leading to this chamber; the hot air pipes leading from it to the registers; the registers which admit the air to or close it off from the apartments to be heated; the external registers or openings which admit the cold air; and, lastly, the registers by which the exhausted air is permitted to escape from the apartments to make way for the warmed fresh air which enters. We have here a complicated apparatus, each part of which is essential to the perfect working of the whole; and the wrong adjustment of any may defeat the end sought; namely, to heat and ventilate equally and perfectly all the apartments connected with the apparatus.

The fire box should be cast very thick and heavy, the better to guard against sudden fluctuations of temperature caused by neglect in firing, or an overcharge of coal. The grate should be sufficiently open to admit of a good draft, and the dampers should fit accurately. In many cases the damper communicating directly with the smoke-pipe intended to be opened only in kindling the fire, becomes warped by the heat, so that it can only be imperfectly closed, and much of the heated gases passes through it instead of the heating flues, and thus escapes without having the heat abstracted. The grate should be easily dumped without danger of falling down, as is the case with many ill-constructed furnaces, and the bottom dampers should fit as tightly as possible that the draft may be fully controlled. The outer side of the fire-box and flues should be whitewashed.

The chamber in which the air is heated should be of ample size in proportion to the capacity of the hot-air pipes which lead from it, and should *always* contain a vessel of water.

The cold-air pipe leading to the heating chamber is in most cases too small. We have often seen this pipe having a sectional area of only 72 square inches to supply a hot-air service, the aggregate sectional area of which was not less than 616 square inches; making all due allowance for expansion, the cold air pipe ought to be twice as large in proportion as this.

We have lately seen in an exchange a recommendation that the external openings of the cold-air pipes should be trumpet-mouthed. This was asserted to be a panacea against the effects of varying winds which often reverse currents of air and send the hot current out into the street instead of the parlor or library. We have tried this experiment and know that it will not do. The only thing that will do is a vaned hood, or cowl, which always presents its mouth to the current of wind, no matter from what quarter the wind is blowing.

The hot-air pipes leading from the furnace are apt to get clogged where the registers open in the floor, by servants sweeping all manner of rubbish into them, as dust, bits of rags, etc. This is not only an obstacle to the flow of air but renders the danger that your house may be burned somewhat imminent.

Where, as is often the case, the hot-air registers open out at right angles from the side of a vertical pipe, one over the other, the top room will get the better of the others, unless the supply of hot air be far more than the capacity of the upper register to discharge. The branch register pipes should not join the main pipe at right angles, but at an acute angle, the apex of which is at the junction of the two pipes. Even then it may be necessary to extend a chute or apron from the upper side of the lower end of the branch pipe into the main pipe, so as to partially intercept the ascending current.

Finally, the ventilators should be in the bottom of the room. In this case the hot air which enters the room pure rises to the top, while the foul and effete air settles to the bottom.

AERO-STEAM ENGINES.

Our readers are well informed in the history of the attempts which have been made to substitute air for steam as an expansive agent in engines. With the commencement of these efforts the name of Capt. Ericsson will ever stand as one of the earliest pioneer investigators, and, should the success which is now claimed for the combination of air and steam, applied to the same purpose, be fully realized, that share of the honor attending it will be due to him, justly claimed by those who help to point out the way by which others may mount to success.

To the mechanical engineer the paper bearing the above title, read before the British Association at Exeter, will be one of the most interesting of any of the able and valuable contributions to the transactions of that distinguished body. We can give only a brief review of this paper at this time, but we may perhaps refer to it again at a favorable opportunity.

The first part of the paper was devoted to a review of the data by which it has been satisfactorily established that not more than one tenth of the entire heat of coal is on the average utilized by steam engines.

The author, Mr. Richard Eaton, of Nottingham, England, then discusses the practical difficulties encountered in the effort to substitute heated air for steam, the principal of which is, as our readers are already aware, the effect of highly heated air upon such metals as may be economically employed in the construction of machines.

He then proceeds to give a brief history of the new Aero-steam motor, which avails itself of air expansion, using at the same time steam, which removes the difficulty above mentioned.

Mr. George Warsop, of Nottingham, as the son of an air gun maker there, was born with aerial ideas, and although his only education was received at a Sunday school, and he was sent to work at ten years of age, he turned that education to such good account that before he was twenty he had in leisure moments secretly constructed an air engine. Later in life it was his privilege, while a working mechanic in New York, during his engagement with Mr. Ericsson, to observe the weak points in the system of that highly gifted and persevering inventor, and after years of research to supply the deficiences by a marvelously simple system of mechanism which, as far as present experience goes, promises complete success by means which, happily for the cause of economy and progress, seem compatible alike with physical science and mechanical construction.

In the first attempts at practically carrying out the system, the arrangement adopted was an ordinary high pressure engine with vertical boiler as used where fuel is cheap. An air pump is added, which is put in operation by the action of the steam engine.

Thus, cold air is taken in by the air pump and is forced on in its compressed state through an air pipe, which, in the case before us is conducted first within the exhaust, then in a coiled form down the funnel of the boiler, then past the fire, and finally past a self-acting clack valve at the bottom of the boiler into the boiling water itself, rising naturally through the water, the air is intercepted and subdivided by diaphragms of metal gage. Thus a twofold service is rendered by the contact of the elements, the water becoming aerified and deprived of its cohesion and prompted to a free ebullition, while the air on rising above the water is saturated by the steam, and the two together pass on to their duty in the cylinder where saturation assists lubrication. The agitation of the water prevents scaling.

The machine thus constructed, but having two air pumps, and with cam motions applied to the valves as also to the poppet valves of the working cylinder, gave the following results, results which it must be admitted were sufficiently discouraging to have deterred the inventor and his associates from proceeding further in the matter, but for their faith in the intrinsic soundness of the system, and perseverance in carrying it to a practical issue. The work had to be done under disadvantages of various kinds, on inconvenient premises, which centuries back were a farm house standing within the ancient walls of Nottingham, and until the protection of the patent laws had been obtained, the original apparatus was carefully guarded in an unsuspected attic.

In this form of the apparatus the power obtained by the increased volume of the air forced in by the pump, did not compensate for that consumed in forcing it into the boiler. At the same time there were encouraging indications which led to further experiment. One of the air pumps being discarded, experiments were made with waste holes in the barrel of the other pump, to ascertain what proportion of air admitted to the boiler compensated for compression. It was found that about ten per cent of the effective consumption of fluid in the working cylinder gave much better results. At the same time the cam motions were discarded and the pumps left to their own unaided action. In this form it is claimed that a gain in work done by the combined air and steam engine was made of 42·5 per cent.

Here, although a very remarkable relative economy was apparent, it became obvious on consideration that danger of mistake would arise in assuming this economy as absolute, inasmuch as the duty performed, when contrasted with that obtained from engines of standard types, actuated by steam, was manifestly low, and it seemed probable that, as by judicious improvement in details, the duty was made to approximate more closely to fair steam engine duty, this relative economy might fall off considerably, inasmuch as there would be less margin to economize upon.

With a view of testing this point, and also for the satisfaction of railway engineers, of conducting experiments at locomotive pressures, a thorough remodeling of the whole apparatus was effected. The tappet motions were thrown aside in favor of the usual slide valve arrangement, working with a moderate amount of expansive action. The former wasteful vertical boiler was discarded in favor of a more economical one of the compound or Cornish multi-tubular description, so as to obtain a better evaporative duty from the coal consumed. The radiating surfaces of the cylinder pipes were re-clothed, and the feed water heated by the exhaust steam. Instead of exposing the air pipe to the direct heat of the furnace, as in the former case, the air became thoroughly heated on its passage from the pump to the boiler at a temperature of from 500° to 600° Fah., by being conducted through suitable coils and pipes through the exhaust steam in the heater, and the waste heat in the boiler flues and uptake.

When these changes were made a gain of 47 per cent over steam only, was claimed on an even pressure trial, and a gain of nearly 30 per cent on an open valve trial, a step in advance so huge that it staggers belief.

We shall watch future experiments in this field with the utmost interest in the hope that they may be successful, and that at last some decided progress in the conversion of heat into work has been made. Not that there has been no progress, but what has been made has been slow and painful, compelling, as it were, only a small fraction more of the heat which we know is constantly eluding us, to fall into line and do work. But 30, 40 per cent is something to make an engineer suspend his breath, aye, and his belief too, until the plain proof is before him that the results claimed are really

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secured. An illustrated description of this apparatus will be found in another column.

AMMONIA AND ITS USES IN THE ARTS.

Ammonia is, in many respects, a peculiar substance, and much might be said of its composition and chemical relations to other bodies. Our purpose is, however, in the present article, to give only a brief and popular account of its manufacture on an extensive scale, and to say something of its important applications in the arts.

Ammonia has been long known under various names, *aqua caustica*, spirits of hartshorn, sal volatile, and lastly, ammonia, from Ammonium, a district in Africa, taking its name from the Temple of Jupiter Ammon, the salts of ammonia having been formerly obtained there.

The production of ammonia is now very large and necessarily so, as the already large demand for it in the various arts is constantly increasing.

Ammonia has been made by the direct combination of the gases which compose it, namely, nitrogen and hydrogen, but this method has never been made profitable in its manufacture. It is most cheaply and extensively obtained as a collateral product in other manufactures.

It is one of the by-products in the distillation of coal in gas works, and also in the manufacture of boneblack. It has also been made under patent process, which consists in distilling a mixture of two parts of guano with one part of lime, or other caustic alkali, the gaseous ammonia being conducted into water which is thus saturated with it, forming a commercial *aqua ammonia*.

Several other patents have been granted on processes for manufacturing ammonia. One of these is a method for extracting ammonia from gas water. The gas water is put into a retort with slaked lime, and distillation performed as in the guano process.

An improvement was made and patented, 1838, for the production of ammoniacal liquor from gas water, which was a great advance on the old methods, as it enabled the product to be obtained in a concentrated form.

One of the most recent sources of supply has been found in the boracic acid manufactories of Italy, which formerly allowed enormous quantities to be wasted. It is now estimated that over one million pounds of ammoniacal salts are produced by these establishments.

In the beet-root sugar manufacture, large quantities of sulphate of ammonia are allowed to go to waste.

Ammonia has been proposed as a means of generating motive power, but the experiments hitherto tried in this field have not proved very successful, though the liberation of this gas from its salts, in a close vessel, may be made to generate an enormous pressure, and its ready absorption by cold water renders the application of the condenser perfectly easy. One of the obstacles met with in these attempts has been the difficulty of constructing cheap machines out of materials which are not chemically acted upon by this gas, but it still seems to us that the method might be advantageously applied to the generation of motive power under circumstances where steam is not admissible. We do not, however, believe it can be worked as economically as steam for many of the purposes for which it has been proposed.

Machines for manufacturing ice, employing liquid ammonia, have been constructed, on the principle, that when liquids expand into gases, they absorb heat from surrounding bodies. The same principle has, however, been more cheaply applied in the use of volatile hydrocarbons as a substitute for the liquefied ammonia. The details of these different machines are, of course, dissimilar, but the general principle of their operation is the same.

To specify the widely extended and various uses to which this substance is applied in the arts, would compel us to greatly lengthen this article. Suffice it to say, that it is one of those essentials to the present status of the industry of the world, the absence of which would be felt scarcely less than soda or sulphuric acid.

THE EXHIBITION OF THE AMERICAN INSTITUTE.

The fair of the American Institute was duly opened at the Empire Skating Rink, Third avenue, between Sixty-third and Sixty-fourth streets, on the 8th inst., and although things are yet in a somewhat chaotic condition—the department of machinery especially—the signs indicate a brilliant display. The confusion is not due to want of exertion on the part of the managers so much as to the dilatoriness of exhibitors.

None of the machinery was running at the time of our going to press, though there will be no long delay.

None of the departments was complete at the time of our visit; the art department being specially meager. There are one or two crayon portraits worthy of special notice, but beyond this and some excellent photographs, there was very little worth seeing.

The exhibition of the American Association of Wool Manufacturers is undoubtedly destined to be one of the most interesting and attractive features of this fair. The following mills are already represented: The Lawrence and Pacific Mills, Lawrence, Mass.; Hamilton Woolen Co., Lowell, Mass.; Wm. Duncan & Son's Mills, Franklin, N. J.; Eddy & Son's Mills, Fall River, Mass.; Lawrenceburg Woolen Mills, Lawrenceburg, Ind.; Hockanum Company, Rockville, Conn.; Harris Woolen Mills, Woonsocket, R. I.; Weybosset Woolen Mills, Providence, R. I.; Central Woolen Mills, Uxbridge, Mass.; Elba Woolen Mills, Providence, R. I.; Rock and New England Manufacturing Companies, Rockville, Conn.; American Mills, also of Rockville, Conn., Kernan and Helm, Utica, N.Y., and others whose goods were not yet displayed, and the names of which we could not learn. The goods in this department already on exhibition are such as to excite the pride of every one who has the prosperity of American industry at heart.

In the machinery department the only things which were arranged were two fine cases of saws, one from Hoe & Co., New York city, and the other from the American Saw Co., also of this city.

Passing from this department we observed a fine collection of agricultural machinery, which we will notice more in detail hereafter. Near this collection stands a beautiful show table of paints, exhibited by Devoe & Co., 117 Fulton street, New York. A great deal of taste is displayed in the arrangement of this table, and the samples of colors exhibited are very fine.

The soda-water fountain exhibited by John Matthews, of this city, is one of the most beautiful designs we have ever seen.

The silk department will attract much attention. Although necessarily much smaller than the exhibition of woolen goods, it is, considering the comparatively recent period since the silk manufacture could be ranked as an American industry, a very remarkable display. Among the establishments represented here we notice P. G. Gimraud, Paterson, N. J.; Frederick Bane, Schoharie, N. Y.; Dale Manufacturing Co., Paterson, N. J.; Cheeney Bros., Hartford, Conn.; W. H. Horstmann & Sons, Philadelphia, Pa.; J. S. Shafter, Paterson, N. J.; and the Oneida Community, of Oneida, N. Y.

We shall give more detailed attention to the various departments in future issues, and we congratulate the managers of the fair on their prospects of success. The exhibition will, undoubtedly, be one of the best ever held under the auspices of the American Institute.

On Friday evening the fair was honored by a visit from President Grant, who was escorted through the several departments by the Hon. Orestes Cleveland, Chairman of the Board of Managers. He spent considerable time in the woolen department, and he was apparently well pleased with the numerous beautiful products of American industry to be seen both there and in all the other departments of the fair. His presence created a great deal of enthusiasm among the large assemblage, and he was repeatedly cheered, while the band played "Hail to the Chief," and other appropriate airs.

AN EXAMPLE FOR YOUNG MEN.

The career of Gen. John A. Rawlins, the late Secretary of War, who paid the forfeit of life in the service of his country, is a striking illustration of the fact that honor and fame are open to all in this country who unite ability with ambition and integrity. Gen. Rawlins was the son of a poor charcoal burner, who resided at Guilford, Ill., and was compelled to follow his father's trade. In the mean time he was ambitious to rise above his humble position, and earnestly applied himself to the study of books, and was finally admitted to the bar at Galena, where he not only gained an honorable practice, but won a good name, and a host of true friends.

At the outbreak of the war, Grant discovered the sterling merits of this man Rawlins, and from that time they became inseparable friends and co-laborers in the nation's cause. Grant became President, and Rawlins was made Secretary of War —fulfilling all duty assigned to him ably and well.

He died poor, and the keen instincts of our people at once appreciate the character and services of such a man. He could have made himself rich through the many opportunities that came in his way as chief of Gen. Grant's staff, but, like his illustrious superior, he was above the temptation to abuse the confidence of a sacred trust—a rare thing in these days.

The widow and children of the noble Rawlins are left poor by his death, but a purse of $50,000 has been subscribed, or nearly so, in this city to relieve them from want. If republics are ungrateful the people are not.

RAINLESS DISTRICTS---FREAKS OF THE WEATHER.

In several parts of the world there is no rain at all. In the Old World there are two districts of this kind: the Desert of Sahara in Africa, and in Asia part of Arabia, Syria, and Persia; the other district lies between north latitude 30° and 50°, and between 75° and 118° of east longitude, including Thibet, Gobiar, Shama, and Mongolia. In the New World the rainless districts are of much less magnitude, occupying two narrow strips on the shores of Peru and Bolivia, and on the coast of Mexico and Guatemala, with a small district between Trinidad and Panama on the coast of Venezuela.

Per contra—the climate of the Khasia Mountains, which lie northeast from Calcutta, is most remarkable for the excessive fall of rain. An English traveler established the fact that in the month of August, 1841, there fell 264 inches of rain. This great rain fall is attributed to the abruptness of the mountains that face the Bay of Bengal and the intervening flat swamp 200 miles in extent. It is not easy always to account for the erratic conduct of the weather upon any established scientific theory, for it is asserted that there is a district in Siberia in which, during winter, the sky is constantly clear, and where a particle of snow never falls.

THE ROOT STEAM ENGINE COMPANY are placing in the Fair of the American Institute, one of their 120-horse power boilers, which is exciting considerable interest among steam engineers. For safety and economy of fuel, large claims are made by the manufacturers. The Company is now composed of some of our shrewdest business men, who have placed sufficient capital at their disposal to enable them to fill extensive orders.

THE HUMBOLDT CENTENNIAL CELEBRATION.

Alexander von Humboldt was born in the city of Berlin on the 14th September, 1769. The occurrence of the centennial anniversary of the birth of this great man was commemorated in his native city by the dedication of a national monument with appropriate ceremonies. In New York city also, a colossal bronze, representing him in the prime of life, was unveiled. Professor Francis Lieber delivered an appropriate address in German, followed by one in English by Professor Doremus. Numerous German singing societies took part in the celebration, and a banquet was given at Irving Hall.

It was generally supposed that Humboldt was little known and not much appreciated by the people at large on account of the fact that his works are so learnedly written that they can only be perused by one who is already in possession of a considerable amount of scientific knowledge. No supposition can be more erroneous than this. In the winter of 1827–8 Humboldt delivered in his native city, Berlin, a course of sixty-one lectures, commencing November 3d and concluding on the 26th of April. These lectures formed, as it were, the first sketch of the "Cosmos," published subsequently, and were especially arranged for the people at large, those that had not enjoyed the advantages of higher education.

Some scientists of an inferior rank would perhaps have considered it beneath their dignity to appear as teachers. Humboldt did not, though he was then Baron, Chamberlain, Councilor, and confidential adviser of the king.

The inhabitants of Berlin and Potsdam all knew him personally, and showed him as much honor as to a king. With a slow but firm step, the head slightly bent forward, one arm at his back, holding a pamphlet, he was often seen passing through the streets. Wherever he appeared he was received by tokens of reverent esteem, the passers-by stepping aside through fear of disturbing him in his thoughts, and one was often heard saying to his neighbor, "There goes Humboldt."

The following instance goes to prove what reverence even the lowest classes paid him. During the time of the revolution, in 1848, a troop of bristly fellows stormed his house, ignorant of the fact that they were in the residence of the great *savant*: "I have no weapons, my boys; I am an unpretending philosopher, and my name is Humboldt"—uttered a small, bowed, and white-haired figure. "Back!" called the commander of the troop, "this is our great citizen Humboldt; four men remain before his house to watch that no wrong is done to him."

The following sketch of this great man is from the pen of Dr. Francis Lieber:

Who has not enjoyed the pleasure of finding the spots on the chart of human progress where you put down your finger and say, here is Aristotle, and here again; here is Hildebrandt, here is the conquest of Constantinople traced even in the discovery of our continent, even in Descartes and Bacon; here are the causes and the effects of the University; and to trace the lines of civilization radiating in different directions, from point to point? And this delight we may enjoy when meditating on the period of which Humboldt was one of the most distinct exponents. We enjoy it even now, although he has left us but yesterday; for God allowed to him days so long that he passed into history before he passed away from among us. Humboldt died as old as Sophocles.

Humboldt received the living traditions of the great circumnavigator, Cook, through Foster, Cook's companion, and lived to gather facts for his Cosmos from the latest reports of the geological surveys of our States. He lived when Voltaire died, and must have grown up with many French ideas floating around him, for Humboldt was a nobleman whose family lived within the atmosphere of the Berlin court; and he lived to witness the great revolutions in literature as well in Germany as in France and England. He lived when Rousseau died (the same year that Voltaire deceased), and must have remembered, from personal observation, that homage, which even monarchs paid (at a distance, it is true) to the Contrat Sociale, and he outlived, by some weeks, De Tocqueville. He lived through the period of the American Revolution, was a cotemporary of Washington and Adams, and a friend of Jefferson. He lived through the French Revolution and the age of the classic orators of Britain. He lived through the Napoleonic era and the resuscitation of Prussia and of all Germany. He studied under Werner, with whom mineralogy begins, and knew Houy. He knew La Place, survived Arago and Gauss, and worked with Enke. He lived with Kant, and knew Schelling and Hegel. He knew Goethe and read Heine. He read "Gibbon's Decline" as a work of a living author, and perused Niebuhr, and later still praised Prescott. He grew up in the Prussian monarchy according to the type of Frederic the Great, and with the fresh reminiscences of the Seven Year's War, and left it changed in army, school, government—in every thing. He saw the beginning of the Institute of France, and lived to be considered by its associates as one of its most brilliant ornaments at its most brilliant period. He lived through the periods which distinctly mark the science of chemistry, from Lavoisier to Rose and Liebig. Humboldt was seventeen years old when the great king, perhaps the most illustrious despot of history, died so tired by the genius of his own absolutism that we cannot forget the words of the dying king; "I am weary of ruling over slaves;" and he lived through the whole period of growing popular sentiments and habits, of constitutinal demands, and revolutionary, fearful conflicts. He wore the lace and ruffle of the last century, and the more practical dress of our times. Yet no one ever heard from him any useless regret for what had passed and was gone. I have heard him speak with warmth of noble things and men that he had known, but not with gloomy despair of the present or the future.

What an amount of thinking, observing, writing, travel-

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ng, and discovering he has performed, from that juvenile essay of his on the textile fabrics of the ancients to the last line of his "Cosmos," which reminds us of Copernicus reading the last proof-sheet on his death-bed, shortly before his departure; or of Mozart, who, in his darkened room, directed with dying looks the singing of a portion of that requiem which he had in part composed, conscious that his ears would never hear its pealing sounds of resurrection. Let us, one and all, young and old, symbolize by the name of Humboldt the fact that, however untrue assuredly the saying is that genius is labor, it *is* true that the necessary co-efficient of genius and of any talent is incessant diligence. We are ordained not only to eat the bread of our mouth in the sweat of our brow, but to earn in the same way the nourishing bread of the mind. This is no world of trifling; it is a world of work; and Humboldt, like the Greeks whose intellectuality he loved to honor—whose Socrates loved to say: "Arduous are all noble things"—was a hard-working man—far harder-working than most of those who arrogate the name to themselves. He ceased to work, and to work hard, only when he laid himself down on that couch from which he rose no more.

I visited Humboldt at Potsdam in the year 1844, when he had reached, therefore, the age of seventy-five; for you know that he was born in that remarkable year of 1769, in which Cuvier was born, and Wellington, and Chateaubriand, and Napeleon—just ten years after Schiller, just twenty after Goethe. Humboldt told me at that time that he was engaged on a work which he intended to call "Cosmos."

I desire to show what interest he took in everything connected with progress. I have reason to believe that it was chiefly owing to him that the King of Prussia offered to me, not long after my visit, a chair to be created in the University of Berlin, exclusively dedicated to the Science and Art of Punishment, or to Poenology, as I had already called this branch. I had conversed with the monarch on the superiority of solitary confinement at labor over all the other prison systems, when he concluded the interview with these words: "I wish you would convince Mr. von Humboldt of your views. He does not entirely agree with them. I shall let him know that you will see him."

Humboldt and prison discipline sounded strange to my ears. I went, and found that he loved truth better than his own opinion or bias, and my suggestion that so comprehensive a university as that of Berlin, our common native city, ought to be honored with having the first chair of Poenology, for which it was high time to carve out a distinct branch, treating of the convict in all his phases after the act of conviction, was seized upon at once by his liberal mind.

Many of my young friends have asked me, as their teacher, and, indeed, many other friends have repeated the question—Was he not the greatest man of the century? I do not believe it is fit for man to seat himself on the bench in the chancery of humanity, and there to pronounce this one or that one the greatest man. If all men were counted together, each one of whom has been called in his turn the greatest of all, there would be a crowd of greatest men. Mortals ourselves, we should call no one the greatest. History is abstemious even in attributing simple greatness. But if it is an attribute of greatness to impress an indelible stamp on the collective mind of a race, and to give a new impulse to its intellect; if greatness, in part, consists in devising that which is good, large, and noble, and in perseveringly executing it by means which, in the hands of others, would have been insufficient, and against obstacles which would have been insurmountable to others; if it is great to graft new branches on the trees of science and culture, leading the sap to form henceforth choicer fruit; if the daring solitude of lofty thought and loyal adhesion to its own royalty is a constituent of greatness; if lucid common sense—the health and rectitude of our intelligence which avoids, in all direction, the Too-Much—is a requisite of greatness; if rare and varied gifts, such as mark distinction when singly granted, showered by Providence on one man—if this makes up or proves greatness, then indeed we may say, without presumption, that one of the great men has been our own.

That period has arrived to which Crœsus alluded in the memorable exclamation, "Oh! Solon, Solon, Solon!" And we are now allowed to say that Humboldt was one of the most gifted, most fortunate, and most favored mortals—favored even with comeliness, with a brow so exquisitely chiseled that, irrespective of its being the symbol of lofty thought, is pleasant to look upon in his busts as a mere beautiful thing; favored even in his name, so easily uttered by all the nations which were destined to pronounce it.

When we pray not only for the kindly fruits of the earth, but also, as we ought to do, for the kindly fruits of the mind, let us always gratefully remember that He who gives all blessed things has given to our age and to all posterity such a man as Humboldt.

The Cedars of Lebanon.

Mr. Jessup, an American missionary, has recently discovered several extensive groves of cedars in Lebanon. Of these there are three of great extent in Southern Lebanon. This grove lately contained 10,000 trees, and had been purchased by a barbarous Sheikh, from the Turkish Government, for the purpose of trying to extract pitch from the wood. The experiment of course failed, and the Sheikh was ruined, but several thousand trees were destroyed in the attempt. One of the trees measured fifteen feet in diameter, and the forest is full of young trees, springing up with great vigor. He also found two small groves on the eastern slope of Lebanon, overlooking the Buka'a, above El Medeuk; and two other large groves containing many thousand trees, one above El Baruk, and another near Ma'asiv, where the trees are very large and equal to any others; all are being destroyed for firewood.

New Style of Photographs.

The process is due to Mr. Charles Durand.

Put into a small mortar a teaspoonful of kaolin, add thereto about a quarter of an ounce of sensitive collodio-chloride, and well stir with the pestle until it becomes a smooth paste. Add to this three fourths of an ounce more of the collodion, and again stir, and pour the whole into a bottle with one or two drops of castor oil. Well shake, and place it aside until the coarse particles have subsided.

Edge a piece of talc or glass for about a quarter of an inch all round with dilute albumen, afterwards coat with the kaolin collodion, and dry by gentle heat, when the talc or glass, if placed upon a piece of white paper, will have the appearance of alabaster.

If the film splits, it should have a trifle more castor oil in the collodion; but the best remedy is to choose a more powdery collodion.

If the film is upon glass, the progress of printing may be examined from the back; but if talc be the medium used, it may be turned back in the same manner as when printing upon paper.

Tone, fix, and wash in the same manner as with an ordinary collodio-chloride print upon opal glass, and mount in a frame or case, to protect the picture from being scratched. It must not be varnished.

After three years' trial, the film has been found not to crack or leave the talc or glass after the picture has been once finished.

Many pretty effects may be produced by putting different colored papers behind vignettes produced in this way, as whatever color is placed behind the picture gives a delicate tinge of that color to the picture.

I may add that I have tried oxide of zinc in place of kaolin, and that it also gives a good effect, but not better than the latter. There is another point worth naming. For those skilled in the use of powder colors, here is the most delightful surface which can possibly be worked on. The surface has a tooth which *bites* the color most perfectly, and the purity of the white gives a rare delicacy and brilliancy to the applied colors. By skillful manipulation and some knowledge of flesh painting, an effect resembling a highly-finished miniature can be obtained. A good print produced in this way on mica, and backed, to give warmth, with cream or buff-tinted paper, makes one of the prettiest, cheapest, and most easily produced portraits for a locket which can be desired.—*Philadelphia Photographer.*

Editorial Summary.

TO REMOVE RUST.—A lady writing from Vermont to the *Hearth and Home* says that she accidentally discovered an easy way of removing rust from steel. She put a number of badly-rusted forks in a tumbler of kerosene oil, and after leaving them there some time, found that the rust had become so much loosened that it rubbed off readily. She says that she has since then used the oil to clean her knives and sewing machine. We suppose that many of our readers have already learned of the beneficial effects of oil on steel, but we give the correspondent's experience for the benefit of those who have never used it for such a purpose.

WONDERS OF SCIENCE.—Wonders of science never cease! Some years ago the opinion was expressed by a distinguished astronomer of Cambridge, England, that if the earth's atmosphere were but increased thirteen thousand yards in hight, so as to have an increased power of retaining the warmth poured upon it from outer space, we might do without the sun altogether, so far as our heat supply is concerned. More recently, by means of an instrument called the galvanometer, used in connection with a refracting telescope, it has not only been proved that the stars actually give heat to the earth, but the comparative amount of heat received from different stars has been, as it were measured.

DECAY OF IRON RAILINGS.—Every one must have noticed the destructive combination of lead and iron, from railings being fixed in stone with the former metal. The reason for this is, that the oxygen of the atmosphere keeps up a galvanic action between the two metals. This waste may be prevented by substituting zinc for lead, in which case the galvanic influence would be inverted; the whole of its action would fall on the zinc; the one remaining uninjured, the other nearly so. Paint formed of the oxide of zinc, for the same reason preserves iron exposed to the atmosphere infinitely better than the ordinary paint composed of the oxide of lead.

A CORRESPONDENT from Plymouth, Mass., kindly refers us to an article supposed to be the one alluded to by several correspondents lately, deprecating the use of night soil. It is on page 103, Volume III. of the New Series of SCIENTIFIC AMERICAN. Referring to the article, we find it to be a short extract from an exchange on the use of artificial manure called *poudrette*, made from night soil, and was so credited. It was copied by some other journal and improperly credited to the SCIENTIFIC AMERICAN. Having got started in that way, it has gone the rounds.

A BLIND man in Chicago has invented a tin lunch box, with a receptacle for cold coffee inside of it, and the whole thing is only 4½ inches wide and 9 inches long. The box is so constructed that when empty it can be conveniently folded together, like a thin book, and carried in the pocket.

M. JANSSEN, in a letter dated from Darjeeling, Sikim, British India, 22d May last, says that the spectra of some stars, which are rather ruddy colored when not disclosing the presence of hydrogen, do positively disclose the presence of aqueous vapor.

THE month so far has brought us a series of accidents and casualties, by land and sea, which will make it memorable. The damage done by the recent gale in New England, and the Avondale disaster, are the two most remarkable occurrences of this kind, but the number of minor accidents has also been very numerous.

THE *American Horological Journal* says that rings with settings likely to be damaged by heat may be soldered without injury if the part liable to injury be buried in a piece of raw potato.

SALE OF MACHINERY.—We call the attention of our readers to the Auction Sale of machinery of the Spencer Repeating Rifle Co., advertised in another column. It is to be sold in Boston on the 28th of September.

THE loss of weight experienced by a rower through perspiration in a prolonged contest like that of the Harvards with the Oxfords is from four to eight pounds.

THE metal sodium is stated not to take fire on cold water, but this is incorrect. A small piece of the metal will not do so, but a piece the size of a nut will frequently ignite.

MANUFACTURING, MINING, AND RAILROAD ITEMS.

At Ottawa, Canada, there is great activity in the sawed lumber trade Nearly 40,000,000 feet are now piled up at the mills there.

The nickel ore at the Litchfield, Conn., mines will be worked as soon as workmen arrive from Germany. A furnace capable of reducing ten tuns of ore daily is just completed, and two others are building.

A dispatch from Central City, Colorado, states that the bullion shipments n the month of August amounted to $225,000. One company sold 20 tuns of gold ore for $100 per tun, to be shipped to England.

A trial has lately been made of a "steam omnibus" in Edinburgh, Scotland, and the experiment, as far as can be judged by the details given, appears to have been successful. As to the construction of the new vehicle nothing as yet is said.

An Atchison, Kansas, telegram says that the contract for the Nemeha Valley Railroad has been let, and ten miles will be completed by February 15, 1870, and the road will be finished to Pawnee City in eighteen months. This is an outrun of the Quincy and Keesville road, and diverts the business of Southern Nebraska to Chicago instead of St. Louis.

The receipts of internal revenue for July and August, this year, were $36,594,031·75, against $30,890,028·62 same months last year—an increase of $5,704,003·13. The receipts for the fiscal quarter ending September 30, 1868 were $38,735,863·08, and it is estimated that for the corresponding quarter this year they will reach $48,000,000.

It has recently been decided in this city that "Shipping articles" are invalid unless a five cent stamp is affixed for the signature of each sailor. The ground of the decision is, that the agreement is made between the master and each man individually, and that, therefore, one five cent stamp which was affixed to the articles under consideration, was insufficient.

The number of mechanics and laborers employed in the arsenal works on Rock Island at present is greater than ever before. They are classified as follows: Laborers, 600; stone-cutters and masons, 150; carpenters, 50; teamsters, 100; total number, 900. Until this month 700 was the largest number on the island. The August pay-roll will not fall short of $100,000.

The freight on wines from San Francisco to Chicago has been reduced to $4·50 per hundred pounds—one half of the old charge. It is said that this reduction was procured by the efforts of a committee of California wine-growers, who represented to the General Freight Agent of the Central Pacific Railroad that the previously charged rates had the effect of absolutely prohibiting trade in wines.

By the completion of the Western Pacific Railroad on Monday the cars travel continuously from the harbors of New York, Boston, and Philadelphia, to the harbor of San Francisco. Arrangements have been made for carrying through passengers and mails between Sacramento and San Francisco without transhipment inside of four hours. The earnings of the Central Pacific Railroad for August were $572,000, showing a steady increase in passengers and freight.

Professor Hitchcock says that the legislature of New Hampshire has recently inaugurated an examination of the rocks and minerals of New Hampshire in a manner reflecting great credit upon them. During its progress the bounds of the new go d field have been carefully traced out, extending in a narrow belt from Bellows Falls northwardly along the Connecticut river into the dividing ridge between Canada and Maine. The principal New Hampshire gold mine is at Lyman. The vein is fourteen feet wide composed chiefly of quartz, containing galena, ankerite and pyrites.

The British Consul at Chee-foo, China, reports that the wild silkworm is bred in large quantities by the country people of Shan-tung, and a great deal of wild silk is produced annually in the central part of the province, and in the vicinity of Tsi-nan-foo. The silk cloth made from this wild silk is used by the Chinese for summer clothing, is very strong, and wears extremely well. It is thought probable that the wild silkworm may be acclimatized in Europe, and attention has been drawn to it both in Italy and France. Chee-foo can furnish the eggs of both the wild and the domestic silkworms.

Feathers of ostriches and other birds, though naturally black, or dark gray colored, may be bleached by the following process newly discovered by M. Deflot. The feathers are placed for three or four hours in a tepid, dilute solution of bichromate of potassa, to which some nitric acid has been cautiously added. The feathers will then be found to present a greenish hue, owing to the oxide of chromium precipitated on the substance, and to remove this the feathers are placed in a dilute solution of sulphurous acid in water, whereby the feathers become perfectly white and bleached. Care is to be taken that the solution of bichromate be not made too strong; and that not too much acid be used, which would cause an irremovable yellow color.

Mechanical Engravings,

Such as embellish the SCIENTIFIC AMERICAN, are generally superior to those of any similar publication, either in this country or in Europe. They are executed by our own artists, who have had long experience in this branch of art, and who work exclusively for us. There is one pertinent fact in connection with the preparation and publication of an illustration in our columns, that needs to be better understood by inventors and manu facturers who often pursue a short-sighted policy in bringing their improve ments to public notice. They go to a large expense in printing and circu ating handbills, which few care either to read or preserve. Now, we undertake to say, that the cost of a first-class engraving, done by our own artists and printed in one issue of the SCIENTIFIC AMERICAN, will amount to less than one-half the sum that would have to be expended on a poorer illustration, printed in the same number of circulars, and on a sheet of paper in size equal to one page of our journal. A printed handbill has no permanent value. Thousands of volumes of the SCIENTIFIC AMERICAN are bound and preserved for future reference—beside, we estimate that every issue of our paper is read by no fewer than one hundred thousand persons. Parties who desire to have their inventions illustrated can address the undersigned, who are also prepared to send artists to make sketches of manufacturing establishments, with a view to their publication in the SCIENTIFIC AMERICAN
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Facts for the Ladies.

I have used my Wheeler & Wilson Sewing Machine ten years without repairs, not only for family sewing, but for all the stitching I could get to do, from the heaviest beaver to the finest muslin. In six months I made alone on the machine twenty-five coats, seven vests, ten pairs of pants twenty-four shirts, and a number of cloaks, etc. MISS L. HARRIS.

North East, Pa.

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; beside, 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.*

T. E. K., of La.—Timber may be rapidly seasoned by steaming, but it is unnecessary to do it under enormous pressure; in fact, high pressure, and, consequently, high temperature, are injurious to the wood. Sufficient vent should be allowed to keep the steam down to 212 degrees, which is hot enough. The steaming is carried far enough when the sap has been converted into steam and driven out of the wood. A few days exposure to the air after taking the timber from the steam box will render the wood fit to work. If the operation is performed according to these directions the steaming box need not be very strong; it should, however, be tight enough to hold the steam, which should, at least the greater part of it, escape as steam, not as water through the vent.

W. D., of N. Y.—The first complete electric telegraph of which we have any knowledge, was established in the year 1798, between Madrid and Aranguez, in Spain, by an electrician named Betancourt. This was, however, not at all on the principle of the modern telegraph, as electro-magnetism was not discovered till 1819. Wheatstone's telegraph was patented in England in June, 1837, and Morse filed his first caveat in October of the same year. To Morse is undoubtedly due, however, the credit of inventing a telegraphic alphabet which has ever since been universally used.

J. H., of N. Y.—To japan castings, clean them well from the sand, either in a "tumbler" or by other convenient means, then dip them in or paint them over with good boiled linseed oil. When the oil has become moderately dry, put them in an oven and heat them to such a temperature as will turn the oil black without burning. The stove should not be too hot at first, and the heat should be raised gradually to avoid blistering. The slower the change in the oil is effected the better will be the result. The castings, if smooth at first, will receive a fine black and polished surface by this method.

L. B., of Ohio.—You do not inform us whether you wish to construct your cistern above or below ground. If above ground, a wooden cistern made of good pine answers a good purpose; if below, brick laid in good hydraulic cement, and smoothly plastered with the same on the inside, answers a good purpose. Of all the filters we have tried, we like the working of none better than that of gravel and charcoal, effected by passing the water through two casks, one filled with fine gravel and the other with coarse charcoal powder.

T. B. McC., of Del.—The mineral you send is a poor specimen of graphite, or plumbago. It is composed chiefly of carbon, with which impurities, consisting of earthy matters, are mixed. Plumbago is principally used in the manufacture of crucibles and lead pencils, also for electro-plating, polishing stoves, castings, etc. The refining and preparing of the article for use is attended with considerable labor.

R. C., of Del.—We do not wish to open our columns to the discussion you propose.

J. B. C., of Mich.—You can set two 60-horse power boilers to run with a single furnace and grate, but the plan would not, in our opinion, be economical. To blow off one of two boilers thus set while the fire was maintained to keep up steam in the other, would be likely to lead to overheating the boiler. We advise building a separate furnace for each. This can easily be done so as to have the boilers stand side by side as you desire.

A. H. S., of Hayti.—The action of the sour cane juice upon iron pipes in scaling them, is a difficulty met with on all plantations. An old plantation engineer informs us that he used, when in Cuba, to scale the pipes by letting cold water into them while hot. We do not know that this would answer with you. Should it fail we are not aware of anything better than the old practice.

R. W. of Pa.—The depth of the artesian well of Grenelle, at Paris, is 1,791½ feet. Respecting the water, it was ascertained that it does not contain the least trace of air, and was for that reason considered unfit for use. To obviate this defect, the water descends from the top of a tower in innumerable threads, which exposes it to the air.

S. C., of Colorado.—Malachite is brought chiefly from a single mine in the Ural Mountains in Russia, and indicates the near presence of copper. Its value is estimated in weight at about one fourth that of silver. It is not at all probable that you have found malachite in your section.

H. T., of Mich.—So far as we are aware, the Norwegian cooking apparatus is not made in this country. It is sold in England to some extent, and appears to be a useful apparatus for the purpose.

E. H. S., of Mass.—Will forcing a cold blast into a chimney above the fire box increase the draft to the same extent and aid in combustion as much as though forced directly into the fire box below the fuel? —Answer, No.

W. P., of Oregon.—Patents have been obtained for sheep-shearing machines, but we are not aware that any of them have yet come into use. The field appears still to be open.

S. A. K., of Ohio.—We know of no cement that is generally and economically applicable to all cases where iron and stone are to be united.

Business and Personal.

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We desire to contract with patentees and capitalists for the manufacture of any useful and saleable machinery. Will share profits as part compensation. Our facilities for casting and finishing are unsurpassed. Address Stevenson & Sears, Machinists, Upper Sandusky, Ohio.

All Steam Engine Manufacturers send circular and price list to W. A. Helms, Shady Hill, Tenn.

Cockle dealers and consumers address, with price, Andrews & Godfrey, Greeneville, Tenn.

Manufacturers of small brass articles, such as tape lines, etc., etc., please send their address to G. H. Dean, 14 Catharine st., New York.

Wanted—A contract for the manufacture of specialties, either hardware or tools. C. N. Trump, Machinist, Portchester, N. Y.

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To Inventors.—Garrison's Model and Exchange Rooms, for exhibition of models and sale of rights, No. 5 Arcade Court, Chicago, Ill. We advertise new inventions extensively.

Wanted—To communicate with any party who has a practical knowledge of building and running a powder mill. Address "W," P. O. Box 5,692, New York city.

Send for a circular on the uses of Soluble Glass, or Silicates of Soda and Potash, fire and water-proof. Manufactured by L. & J. W. Feuchtwanger, Chemists and Drug Importers, 55 Cedar st., New York.

If you want the real oak-tanned leather-belting, C. W. Arny manufactures it. See advertisement.

Peck's patent drop press. For circulars, address the sole manufacturers, Milo Peck & Co., New Haven, Ct.

Excelsior Turbine Water Wheel.—The patentee of this superior wheel desires to enter into arrangements with millwrights and manufacturers with a view to having them manufacture and sell the cheapest, most durable, and powerful wheel used in this country. Full particulars given by circular. Address Isaac S. Roland, Reading, Pa.

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S. S. Pollard's celebrated Mill Picks, 137 Raymond st., Brooklyn.

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Materials for all Mechanics and Manufacturers, mineral substances, drugs, chemicals, acids, ores, etc., for sale by L. & J. W. Feuchtwanger, Chemists, Drug, and Mineral Importers, 55 Cedar st., New York. Postoffice Box 3616. Analyses made at short notice.

Ulster Bar Iron, all sizes, rounds, squares, flats, ovals, and half-ovals, for machinery and manufacturing purposes, in lots to suit purchasers. Egleston Brothers & Co., 166 South st., New York.

Mill-stone dressing diamond machine, simple, effective, durable Also, Glazier's diamonds. John Dickinson, 64 Nassau st., New York.

Leschot's Patent Diamond-pointed Steam Drills save, on the average, fifty per cent of the cost of rock drilling. Manufactured only by Severance & Holt, 16 Wall st., New York.

For solid wrought-iron beams, etc., see advertisement. Address Union Iron Mills, Pittsburgh, Pa., for lithograph, etc.

Machinists, boiler makers, tinners, and workers of sheet metals read advertisement of the Parker Power Presses.

Diamond carbon, formed into wedge or other shapes for pointing and edging tools or cutters for drilling and working stone, etc. Send stamp for circular. John Dickinson, 64 Nassau st., New York.

The "Compound" Wrought-Iron Grate Bar is the best and cheapest. Send for circular. Handel, Moore & Co., 12 Pine street. Post-office Box 5,669.

For sale by State or County the Patent Right for the best Cultivator in use. For terms address Isaiah Henton, Shelbyville, Ill.

Hackle, Gill Pins, etc., at Bartlett's, 569 Broadway, New York.

Recent American and Foreign Patents.

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

CHURN.—Miles Fisk, Adrian, Mich.—This invention relates to an improvement in churns, and has for its object to provide a dasher which shall, by one simple movement, throw the cream in different directions, the current produced by one set of radial wings being brought in conflict with the one next above, and so on successively.

CLOTHES RACK.—Andrew Harbison, New Castle, Pa.—The object of this invention is to provide for public use a neat, simple, cheap, and convenient clothes rack, so constructed and operating that it can be opened or expanded into different shapes to adapt it to different positions in the room, such as standing in a corner, near the stove, in an open room, etc.

ANIMAL TRAP.—C. Polley, Shelbyville, Tenn.—The object of this invention is to provide for public use a simple, cheap, convenient, and effective trap which, being set near the holes of burrowing animals, will destroy them with certainty.

PARLOR STOVE.—John H. Goodfellow, Troy, N. Y.—This invention relates to that class of coal stoves in which the gas is consumed by the introduction of external air.

PLOW.—W. F. Pagett, Springfield, Ohio.—In this invention the plow is constructed in a peculiar manner, and so attached to the standard and beam that it can readily and easily be detached and removed, and a simple cultivator tooth, scraper, shovel, or other form of plow, be attached and used in its place.

COTTON AND HAY PRESS.—J. J. Hines, Evergreen, Ala.—This invention is an improvement upon those presses in which toggle joint levers are employed to raise and lower the platen; and it consists in a novel and simple application of such levers in combination with the means for actuating them.

SEEDING MACHINE.—D. C. and G. W. Van Brunt and H. Barber, Horicon, Wis.—In this invention the construction of the frame is greatly simplified and better adapted for its purpose, and a novel method of holding the teeth is employed, whereby they retain their proper position when working in tillable soil, but yield to immovable obstacles.

WAGON BRAKE.—John Ludcke, Griffin's Corners, N. Y.—This invention relates to a new wagon brake, which is so arranged that the driver can, when he applies the brake, let go the lever without thereby releasing the brake.

MORDANT FOR DYEING AND PRINTING.—F. S. Dumont, New York city.—This invention relates to a new mordant for all kinds of dyeing and printing processes, which is made from the serum of the blood.

MODE OF FASTENING ARTIFICIAL TEETH.—E. C. Stone, Galesburg, Ill.—This invention relates to a new and useful improvement in the method of fastening artificial teeth to the plate when metal and rubber or vulcanite are used in combination; and consists in the use of staples passing through the plate and fastened without soldering.

EDGING TOOL.—O. W. Morley, Tarrytown, N. Y.—This invention relates to new and useful improvements in tools for "edging" or "scarfing" leather in the process of making harness, and for similar purposes, whereby accuracy in the width and depth of cut, as well as a great saving of time, is secured.

TABLE.—A. Belchambers, Ripley, Ohio.—This invention relates to a new and useful improvement in tables with folding leaves, and consists in the mechanical arrangement for supporting the leaf.

EXTENSION TABLE.—Charles P. Lentz, Poughkeepsie, N. Y.—This invention relates to new and useful improvements in extension tables, whereby that description of table is greatly simplified.

CULTIVATOR.—Job McNamee Baker, Fayetteville, Texas.—This invention relates to new and useful improvements in machines for planting and cultivating the soil, and consists in such a construction and arrangement of parts that the machine is adapted to all the purposes for which planting cultivating, and ridging machines are usually employed.

SOFA BEDSTEAD.—Adam Schwaab, New York city.—This invention consists of an arrangement, whereby the upholstered part of the back may be swung forward out of the frame, on hinged arms, and arranged alongside and in the same horizontal plane with the seat, to form a bed.

VEGETABLE CUTTER.—R. Hemenway, New Cassel, Wis.—This invention consists in the application, on a suitable bench, and between the table thereof, and a hopper above the table having transverse fixed knives across a passage through it, of a slide provided with a lateral two-edged knife cutting both ways, and a series of knives below the said double-edged cutter which receive the slices therefrom, cutting them into smaller pieces which are again cut by the fixed knives in the table below; the said slide is arranged to be worked either by one or two persons.

PLOW.—A. C. Judson, Grand Rapids, Ohio.—This invention relates to improvements in plows, and has for its object to provide a detachable cutter at the junction of the mold board and landside to facilitate removal for sharpening, also to provide an improved construction of same-wheel attachment and drawing attachments.

WINDOW AND OTHER BLINDS.—Stephen Hebron, Buffalo, N. Y.—This invention relates to improvements in blinds for windows, doors, etc., whether for outside or inside use, and consists in an improved construction of the same for the adaptation thereto of mosquito bars.

LIFTING FLATS IN SELF-STRIPPING CARDING MACHINE.—Benjamin Dobson and W. Slater, Bolton, England.—This invention consists in lifting the top flats by a bowl on the lifting wheel, acting on a curved surface on the slides, which are drawn down by springs as soon as the bowls have passed. By this means the top flats are rapidly raised and lowered again into their proper working place, and thereby better work is produced and time saved. Another part of this invention consists in the application of a ratchet wheel to the cross-driving shaft, and a catch to the radial arm, to prevent the said shaft from moving in the wrong direction.

CONE WHEELS AND CROSSINGS FOR RAILWAYS.—Hugh Baines, Lancaster, England.—This invention consists in forming car wheels with more than one tread so as to adapt them to tracks of different gages and in providing crossings adapted thereto.

STEAM GENERATOR.—James Stuart, San Francisco, Cal.—The object of this invention is to provide an improved arrangement for marine steam generating boilers, calculated to make a better application of the heat and to afford better facilities for working within the boiler, for repairing, etc.

WASHBOARD.—Wm. Bellus and C. Bowers, Fredonia, Ohio.—This invention consists in forming the metallic rubbing surfaces by placing a sheet of zinc, or other suitable metal, on a wood base and driving large round headed tacks through the same into the board, so that the round or oval heads, together with the sheet metal plate, form the rubbing surfaces.

TWEER.—J. W. Barron, Hillsborough, Ill.—This invention relates to improvements in tweers, and has for its object to provide an arrangement to simplify the labor of removing the slag and cinder from the fire, and for stirring the fire to enliven it, as is required, and which is now commonly done with a hand poker at considerable labor. The invention also comprises a weighted valve arrangement for opening, in case of explosion of gas in the air chamber to prevent damage to the same.

MULEY SAW MILL.—R. F. Wolcott, Claremont, N. H.—This invention relates to improvements in muley saw mills, and has for its object to provide an improved arrangement of the guides for the cross heads, to give the saw a forward oscillatory movement at the same time that the downward cutting action takes place; also, certain improvements in the adjustable guides for the sides of the saw; also, certain improvements in the "gigging back and feeding devices, and, also certain improvements in the friction feed apparatus calculated to facilitate the regulation of the friction.

CAR BODY ELEVATOR.—Reuben Wells, Jeffersonville, Ind.—This invention relates to an improved apparatus for elevating car bodies off the trucks for transferring them from one truck to another, as a means of transferring freight to roads of different gages, instead of unloading it from the cars of one road to those of another, the bodies being adapted to trucks of various gages; and tracks of various gages are placed over the apparatus. so that a car of one gage may be run upon the apparatus and have the body lifted off and suspended, until the truck may be run away and truck of another gage run under the body and the latter lowered upon it. The apparatus consists of elevating tables, preferably four in number, suitably adjusted to take under the four corners of the trucks, and resting upon four levers having fixed rests at one end, with their moving ends converging upon the vertical moving table of a hydraulic elevator, located centrally between the first-mentioned elevating tables, by which the latter are elevated or depressed to raise or lower the car bodies.

HAND TRUCK.—B. W. Tuthill, Oregon City, Oregon.—The object of this invention is to construct the frame-work of hand trucks of metal tubes, preferably of gas tubing, to be joined together in a cheap, simple, and inexpensive way, by which they can be readily made tight and taken apart for repairs.

MILL STONE DRIVERS.—D. B. Ritter, Glasgow, Ky.—The object of this invention is to provide improvements in the drivers used on the mill stone, spindles for imparting rotary motion, whereby they are adapted for applying the power more evenly on both sides of the spindle than can be done by the driver as now arranged.

CHEESE PRESSING APPARATUS.—James L. Sprague, Hermon, N. Y.—This invention relates to improvements in cheese hoops, and the followers for the same, and in the arrangement for connecting the screws of cheese presses with the followers.

PROPELLING WHEELS.—James S. Cunningham, New York city.—This invention consists in an improved arrangement of the buckets for governing their position while dipping and escaping from the water, and also for holding them against the resistance of the water.

WATER ELEVATOR.—D. A. Dunham, Pilatka, Fla.—This invention relates to improvements in devices used for raising or injecting water by a jet of steam, the object of which is to provide a more simple device than any now in use, and adapted for drawing water from the bottom of the vessels containing it, and it consists in a peculiar arrangement of steam and water conducting pipes with throat and water-receiving passage.

MILK HOUSE.—Fritz Schaller, Mattoon, Ill.—This invention consists in an arrangement, on a brick or stone base, of A-shaped sides and vertical ends, the sides being hinged at the base to swing open in a vertical plane, and the triangular ends being divided at the center and hinged to swing horizontally; the walls are made double, with spaces between, and provided with ventilating passages.

CYLINDRICAL HULLING MILL.—Charles S. Bailey, New York city.—This invention has for its object to furnish a simple, convenient, and effective hulling mill, designed especially for hulling cotton seed, but equally applicable to hulling other seeds, and which, while doing its work thoroughly, shall be so constructed that the knives may be easily, quickly, and conveniently taken out and adjusted.

DITCHING MACHINE.—James S. Anderson and James B. Cooley, Clark's Hill, Ind.—This invention has for its object to furnish a simple, convenient, and effective ditching machine, which shall be so constructed and arranged that it may be easily adjusted to cut a straight ditch for laying tiles, or a tapering open ditch, as may be desired.

PLOW.—Moses Tessier, Cairo, Ill.—This invention has for its object to improve the construction of plows, so as to make them more convenient, effective and durable, enabling them to be readily adjusted to run at a greater or less depth in the ground or to cut a wider or narrower furrow.

PLOW.—Henry Nolte, Lincoln, Ill.—This invention has for its object to furnish an improved plow, simple in construction, and effective in operation, for plowing and cultivating plants planted in rows, when of such a character or size as to require to have the soil turned about the said plants

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SAFETY ATTACHMENT FOR STREET RAILROAD CARS.—John Fogarty, Brooklyn, N. Y.—This invention has for its object to furnish an improved attachment for street railroad cars, which shall be so constructed and arranged as to prevent any person or thing that may be upon the track from being run over by the wheels, or from throwing the cars from the track.

FURNITURE CASTER.—C. G. Wilson, Brooklyn, N. Y.—This invention has for its object to furnish an improved furniture caster, which shall be so constructed and arranged that it will allow the table, or other article to which it may be attached, to be moved freely in any direction, and which shall, at the same time, be simple in construction, strong, durable, and not liable to get out of order.

CORN HARVESTER.—G. W. S. Bell, Talulla, Ill.—This invention has for its object to furnish an improved corn harvester, which shall be so constructed and arranged as to cut two rows at a time and deposit it in bundles upon the ground, and which shall be simple in construction, effective in operation, and easily guided when at work.

PLOW.—A. Boles, Kinder, Ind.—This invention has for its object to furnish an improved plow, simple in construction, strong, and durable, which may be readily adjusted for use as a single or double plow, and which may be attached to the framework of a buggy for use as a gang plow or cultivator.

CORN PLANTER.—Henry Baughman, Columbus, Ohio.—The object of this nvention is to provide for public use a simple, and convenient corn planter which can be worked by hand or other power.

WATER WHEEL.—P. H. Lamey and A. J. Beachell, Port Treverton, Pa.—This invention consists in making the outer part of each of the buckets of a water wheel a swinging gate hinged to the inner rigid part.

FLOATING VELOCIPEDE.—L. D. Bunn, Morristown, N. J.—This invention relates to a new floating velocipede, which consists of two floats or vessels, that carry a platform on which the axle of the propelling paddle wheel, that fits between the two floats has its bearings, and that carry each a rudder at the stern end. The two rudders are connected with each other, and by means of ropes or chains with the steering lever, so that they will be moved in the same direction, thereby insuring greater certainty of action.

DEVICE FOR PUMPING BY THE MOTION OF THE OARS.—Robert R. Spedden and E. Clifford Spedden, Astoria, Oregon.—This invention has for its object to pump a boat by the motion communicated to the oars in the operation of rowing.

CLOTHES DRYER.—T. C. Collins, Little Hocking, Ohio.—This invention relates to a new and useful improvement in apparatus for drying clothes, and consists in the construction and arrangement and combination of parts whereby the facilities usually afforded by clothes dryers are greatly increased.

IRONING BOARD.—D. E. Crosby, South Vineland, N. J.—This invention relates to a new and useful improvement in ironing boards for laundry use, and consists in so constructing the board that it may be adjusted to any ordinary table, and it also consists in attaching an additional ironing board o the main board.

OVEN.—Mrs. Clarissa Preston, Wheeling, W. Va.—This invention consists, first, in supporting the grates upon the doors of the ovens, whereby they may be withdrawn from the ovens when the doors are opened, and restored thereto when the doors are closed; secondly, in an arrangement of sliding grate, whereby it is prevented from falling from its supports when drawn out for the reception of the articles to be baked; and, thirdly, in certain arrangements of devices for handling the hot plates and pans.

Official List of Patents.

Issued by the United States Patent Office.

FOR THE WEEK ENDING SEPT. 7, 1869.

Reported Officially for the Scientific American.

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Patent Solicitors, No. 37 Park Row, New York.

94,463.—PROPELLER FOR VESSELS.—Adolphe Aubert, Nogent-Le-Rotrou, France.
94,464.—ANIMAL TRAP.—F. P. Baker (assignor to himself and J. R. Lowe), Boston, Mass. Antedated Sept. 4, 1869.
94,465.—COMPOSITION FOR WHITEWASHING.—James Baker, Ijamsville, Md.
94,466.—STOMACH BITTERS.—Moses Becker, Philadelphia, Pa.
94,467.—SEWING MACHINE.—N. P. Bradish, Jerseyville, Ill.
94,468.—SPOKE-TENONING MACHINE.—F. H. Brinkkotter, Callahan's Ranch, Cal.
94,469.—HAND CAR FOR RAILROADS.—H. L. Brown, Adrian, Mich.
94,470.—MECHANISM FOR HOLDING BOLSTERS IN SPINNING MACHINES.—E. S. Burlingame, Uxbridge, Mass.
94,471.—MANUFACTURE OF PIG IRON.—John Burt, Detroit, Mich.
94,472.—WEATHER STRIP.—H. W. Carew, Norwich, Conn.
94,473.—SCHOOL-DESK AND SEAT.—Aaron Chandler, Davenport, Iowa.
94,474.—STOVEPIPE THIMBLE.—E. C. Chapman, Lacon, Ill.
94,475.—APPARATUS FOR EMPTYING SUGAR KETTLES.—C. H. Collins and W. B. McClure, Alexandria, Va.
94,476.—GAS BURNER.—J. W. Cremin, New York city.
94,477.—STOVE-POLISHING BRUSH.—L. C. Crowell, West Dennis, Mass. Antedated Aug. 25, 1869.
94,478.—SEEDING MACHINE.—N. C. Dawson, Steele's Post-Office, Ind.
94,479.—PROCESS OF PREPARING GRAIN FOR MASHING.—F. W. De Spessbourg, Province of Normandy, France.
94,480.—HAY SPREADERS.—Norman Eaton, Woburn, Mass. Antedated April 14, 1869.
94,481.—COTTON CULTIVATOR.—Emile Enete, Catahoula, parish, La.
94,482.—REVOLVING CULTIVATOR.—W. A. Estes, South China, Me.
94,483.—DUMPING TUB.—J. S. Evans, Berkeley, Mass.
94,484.—WRENCHES FOR ELEVATING PUMP TUBES.—J. A. Fleming, Shamberg, Pa.
94,485.—DUMPING WAGON.—D. S. Gardner, Bristol, Md.
94,486.—EXTENSION-TABLE SLIDE.—S. J. Genung, Waterloo, N. Y.
94,487.—FOLDING BAGGAGE CHECK.—E. H. Graves, Chicago, Ill.
94,488.—COTTON GIN.—B. D. Gullett, Amite City, La.
94,489.—CORN PLOW.—Lewis Guthrie, Waterloo, Ind.
94,490.—DOUBLE CORN PLOW.—Lewis Guthrie, Waterloo, Ind.
94,491.—GANG PLOW.—F. A. Hill, Marysville, Cal.
94,492.—COATING IRON OR STEEL WITH COPPER OR BRASS, OR OTHER ALLOYS OF COPPER.—G. J. Hinde, Wolverhampton, England. Patented Feb. 26, 1869.
94,493.—ROOFING MATERIAL.—Benjamin Hinkley, Troy, N. Y.
94,494.—CAR VENTILATOR.—Robert Hitchcock, Springfield, Mass.
94,495.—PLASTIC CEMENT.—George E. Hopkins, Harwich, Mass.
94,496.—ANIMAL TRAP.—John Hughson, Buffalo, N. Y.
94,497.—CULTIVATOR.—John Lueth, Kankakee, Ill.
94,498.—STEAMER FOR AGRICULTURAL AND OTHER PURPOSES.—A. T. Manly, Buffalo, N. Y.
94,499.—WASHING MACHINE.—M. S. Marshall, Somerville, assignor to J. T. and J. S. Folsom, Boston, Mass.
94,500.—SAW FRAME.—Daniel Moore and Edwin Moore, Brooklyn, E. D., N. Y.
94,501.—WASH TUB.—Bernard Morahan, Brooklyn, N. Y.
94,502.—ANIMAL TEDDER.—Daniel Newton, Southington, Conn.
94,503.—RASP.—W. S. Nicholson (assignor to the Nicholson File Co.), Providence, R. I.
94,504.—HAND WEEDER.—A. F. Noyes and N. D. Beecroft, Bangor, Me.
94,505.—SLEIGH SHOE.—H. C. Overman (assignor to himself J. Q. A. Crossby), Chicago, Ill.
94,506.—CHURN.—R. D. Ozburn, Lena, Ill.
94,507.—PUMP.—Joel Patrick, Pitt county, N. C.
94,508.—APPARATUS FOR ASSAYING AND TESTING ORES AND METALS.—J. S. Phillips, San Francisco, Cal.
94,509.—PROCESS OF CONCENTRATING AND GRANULATING SACCHARINE LIQUIDS.—John Pickles, Wigan, England.
94,510.—CONSTRUCTION OF SHIPS.—David Pierce, Woodstock, Vt.
94,511.—PAPER-BAG MACHINE.—J. P. Pultz, Plantsville, Conn. Antedated Sept. 1, 1869.
94,512.—DEVICE FOR AIDING COMBUSTION IN STEAM GENERATORS.—G. W. Rawson, Cambridgeport, assignor to himself and M. Hittinger, Somerville, Mass.
94,513.—BRICK KILN.—James V. B. Remsen, New York city. Antedated Aug. 27, 1869.
94,514.—PRUNING SHEARS.—Wm. Richard, Clyde, Ohio.
94,515.—WASHING MACHINE.—M. A. Richardson, Sherman, N. Y.
94,516.—RAILWAY RAIL SPLICE.—B. Robinson, Boston, Mass. Antedated Aug. 21, 1869.
94,517.—PLATFORM SCALE.—Lyman M. Severance, Dixon, Ill.
94,518.—TREADLES FOR MACHINERY.—Jasper H. Singer, New York city.
94,519.—STAY AND GUIDE BAR FOR ELLIPTIC SPRINGS FOR VEHICLES.—J. E. Siegel and Eli Siegel, Reading, assignors to themselves and J. K. Herts, Lancaster county, Pa.
94,520.—BRAD SETTER.—C. E. Smith, Columbus, Ohio.
94,521.—CARRIAGE WHEEL.—T. R. Smith, San Francisco, Cal.
94,522.—TRUSS.—Henry Spillmann, New Orleans, La.
94,523.—GOVERNING DEVICE FOR STEAM ENGINES.—Peter A. Stewart, Lucesco, Pa.
94,524.—COMBINED KNOB LATCH AND LOCK.—W. H. Sullenberger, Harrisburgh, Pa. Antedated Aug. 25, 1869.
94,525.—RAILWAY CAR BRAKE.—J. W. Swales, San Francisco, Cal.
94,526.—MAIL BAG.—Z. T. Sweet, Davisville, Cal.
94,527.—CLOTHES DRYER.—A. L. Taylor, Springfield, Vt.
94,528.—RAILWAY RAIL CHAIR.—A. B. Thompson, Owego, N. Y.
94,529.—BRIDGE.—W. P. Trowbridge, Newtown, N. Y.
94,530.—RAILWAY CAR BRAKE.—Inglis Walker (assignor to himself and W. R. Barnard), Lynn, Mass.
94,531.—OVERSHOE.—A. G. Waterhouse, San Francisco, Cal.
94,532.—METALLIC ALLOY FOR FILTERING OILS, AND FOR THE MANUFACTURE OF PAINTS, CEMENTS, ETC.—James Webster, Birmingham, Great Britain.
94,533.—LAMP BURNER.—J. H. Weeden, Waterbury, Conn., assignor to Scoville Manufacturing Co.
94,534.—BRIDGE GATE.—Alexander Weide, Chicago, Ill.
94,535.—LANTERN.—Wm. Westlake, Chicago, Ill.
94,536.—LANTERN.—Wm. Westlake, Chicago, Ill.
94,537.—ATTACHMENT FOR COOKING STOVES.—D. N. Allard, Chester Hill, Ohio.
94,538.—GAS HEATER.—Boyd Allen (assignor to himself and S. C. Pratt), Boston, Mass.
94,539.—DITCHING MACHINE.—J. S. Anderson and James B. Cooley, Clark's Hill, Ind.
94,540.—HULLING MILL.—C. S. Bailey, New York city.
94,541.—RAILWAY CROSSING FOR CONE WHEELS.—Hugh Baines, Manchester, England.
94,542.—CULTIVATOR.—Job McNamee Baker, Fayetteville, Texas.
94,543.—TWEER.—J. W. Barron, Hillsborough, Ill.
94,544.—MACHINE FOR MAKING RAILROAD SPIKES.—John W. Bartlett and David P. Bosworth, Harmar, Ohio.
94,545.—APPARATUS FOR LIGHTING GAS BY ELECTRICITY.—Wm. W. Batchelder, Boston, Mass.
94,546.—CORN PLANTER.—Henry Baughman, Columbus, Ohio.
94,547.—RAILWAY CAR COUPLING.—R. W. Baylor, Norfolk, Va.
94,548.—TABLE LEAF SUPPORT.—A. Belchambers, Ripley, Ohio.
94,549.—CORN HARVESTER.—G. W. S. Bell (assignor to himself and H. C. Bell), Talulla, Ill.
94,550.—ICE PITCHER.—Wm. Bellamy, Newark, N. J.
94,551.—WASHBOARD.—Wm. Bellus and C. Bowers, Fredonia, Ohio.
94,552.—BLANK BOOT HEELS.—H. H. Bigelow, Worcester, Mass.
94,553.—CHAIR SEAT.—Osmore A. Bingham, Gardner, Mass.
94,554.—PLOW.—Abram Boles, Kinder, Ind.
94,555.—MACHINE FOR BREAKING THE LEAVES AND STEMS OF TOBACCO.—Nicholas H. Borgfeldt, New York city.
94,556.—SELF-CLOSING TELEGRAPH KEYS.—W. Clay Bowers, Wheatland, Iowa.
94,557.—CLAMP.—M. V. Brigham, Mannsville, N. Y.
94,558.—MODE OF CLOSING PAPER BAGS.—Morgan W. Brown, New York city.
94,559.—FLOATING VELOCIPEDE.—Lewis D. Bunn, Morristown, N. J.
94,560.—WARDROBE BEDSTEAD.—Sanford S. Burr, Dedham, and Levi Pierce, Charlestown, Mass.
94,561.—GRATE BAR FOR BOILERS.—David Byard, Sharon, Pa.
94,562.—CLOTHES DRYER.—Edward Carter, Rensselaer, N. Y.
94,563.—STOP COCK.—John C. Chapman, Cambridgeport, Mass.
94,564.—OIL CAN.—Charles Chinnock, Brooklyn, N. Y., assignor to I. Little Hyde, New York city. Antedated August 27, 1869.
94,565.—VELOCIPEDE.—Wm. B. Clark, Whitefield, Me.
94,566.—BALANCED VALVES.—Daniel Collins, Girard, Ala.
94,567.—CLOTHES DRYER.—T. C. Collins, Little Hocking, Ohio.
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94,668.—SAWING MACHINE.—Hiram Thompson (assignor to Richard Ball and E. P. Halsted), Worcester, Mass.
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94,672.—Camera Stand.—A. E. Turnbull, Upper Sandusky, Ohio.
94,673.—Hand Truck.—B. W. Tuthill, Oregon City, Oregon.
94,674.—Seeding Machine.—D. C. Van Brunt, G. W. Van Brunt, and Hiram Barber, Horicon, Wis.
94,675.—Cooking Stove.—N. S. Vedder, Troy, N. Y.
94,676.—Toy Velocipede.—N. S. Warner, Bridgeport, Conn.
94,677.—Sewing Machine.—Albin Warth, Stapleton, N. Y., assignor to himself and Eberhard Faber, New York city.
94,678.—Scroll-Sawing Machine.—R. M. Washburn, Burlington, Iowa.
94,679.—Boiler or Stew Pan.—William B. Watkins, Jersey City, N. J.
94,680.—Railway Car-body Elevator. — Reuben Wells, Jeffersonville, Ind.
94,681.—Dumping Cart.—M. F. Wickersham, Springfield, Ill., assignor to himself, Thos. Eckardt, H. F. Eldred, J.G. Law, T.Hutchinson, C. B. Hurd, C. Dresser, and D. Sherman.
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94,683.—Muley Saw Mill.—R. F. Wolcott, Claremont, N. H.
94,684.—Rotary Clod Fender.—John F. Woolley, Pleasant Ridge, Ohio.
94,685.—Hub for Vehicles.—J. P. Zeller, South Bend, Ind.
94,686.—Forced Feed Gearing in Seed Drills.—J. P. Zeller, South Bend, Ind.
94,687.—Device for Marking and Planting Corn.—J. P. Zeller, South Bend, Ind.
94,688.—Implement for Carpenters' Use.—Edward Gray, Oldtown, Me.
94,689.—Slate Roofing.—R. K. Kille, Mount Holly, N. J.
94,690.—Leather Cord or ·Rope.—O. I. Harrington and Elijah Weaver, Wood's Run, Pa.
94,691.—Shuttre Worker.—T. H. Bradley, St. Louis, Mo.
94,692.—Brace for Covers of Trunks, Pianos, etc.—Jules Roch, Rochester, N. Y.

REISSUES.

35,914.—Corn Planter.—Dated July 22, 1862 ; reissue 3,630. —James Armstrong, Jr., Elmira, Ill.
18,156.—Machine for Forging Nuts.—Dated Sep. 8, 1857; reissue 3,631.—George Dunham, Unionville, Conn., assignee, by mesne assignments, of Edward Paye and Samuel Hall.
47,938.—Apparatus for Oiling Wool.—Dated May 30, 1865; reissue 3,632.—B. A. Earl, Philadelphia, Pa., assignee of B. A. Earl and Henry Holcroft.
88,216.—Ore Crusher.—Dated March 23, 1869; reissue 3,633. —J. W. Rutter, St. Louis, Mo.
76,138.—Inkstand.—Dated March 31, 1868 ; reissue 3,634.—H. L. Andrews, Chicago, Ill.
34,413.—Sewing Machine for Boot and Shoe Sewing.—Dated Feb.18, 1862; reissue 3,635.—Charles Goodyear,Jr.,Francis Du Bois, Frederick Renaud, and H. T. Close, New York city, assignees of Augustus Destouy.

DESIGNS.

3,654.—Ornament for "Wilcox & Gibbs Sewing Machine."—S. P. Crins, Providence, R. I.
3,655.—Road Scraper.—J. C. Evans, Delaware, Ohio.
3,656.—Spoon or Fork Handle.—Chas. Osborne, Brooklyn, N.Y.,assignor to Whiting Manufacturing Co., New York city.
3,657.—Group of Sculpture. — John Rogers, New York city.

EXTENSIONS.

Inkstand.—Barnet L. Solomon, New York city, executor of Myer Phineas, deceased.—Letters Patent No. 1,652, dated Aug. 19, 1862.
Machine for Engraving Calico Printers' Rollers.—John and Thomas Hope, Providence, R. I.—Letters Patent No. 13,462, dated Aug. 21, 1855.
Sewing Machine Case.—F. A. Ross, New York City.—Letters Patent No. 13,499, dated Aug. 28, 1855.
Reaping and Mowing Machines.—Henry Waterman, Brooklyn, N. Y.—Letters Patent No. 13 512, dated Aug. 28, 1855.
Machine for Electrotyping.—J. A. Adams, Brooklyn, N.Y. —Letters Patent No. 13,516, dated Sept. 4, 1855.

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2,315.—Paddle Wheels.—L. W. Wright, Brooklyn, N. Y. August 2 1869.
2,355.—Expanding Rock Drill.—E. P. Gleason, New York city. August 6, 1869.
2,367.—Sower and Cultivator.—A. Newell, New York city. August 7, 1869.
2,391.—Manufacture of Iron and Steel.—T. S. Blair, Pittsburgh, Pa August 10, 1869.
2,407.—Hoop Skirt.—J. Mayer, Brooklyn, N. Y. August 11, 1869.
2,409.—Manufacture of Iron and Steel.—J. J. Johnston, Allegheny, Pa. August 11, 1869.
2,414.—Centrifugal Pump.—Wm. D. Andrews, New York city. August 12, 1869.
2,430.—Apparatus for Diminishing the Effects of the Oscillation of Vessels and for Preventing Sea Sickness.—L. D. Newell, New York city. August 14, 1869.
2,445.—Passenger Register.—H. H. Trenor, New York city. August 16 1869.
2,458.—Manufacture of Iron and Apparatus therefor.—D. Stewart Kittanning, Pa. August 17, 1869.

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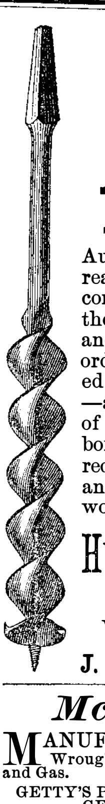

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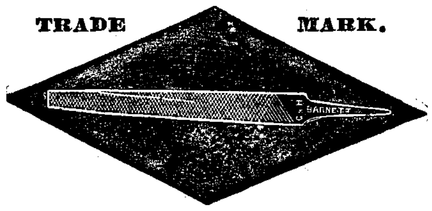

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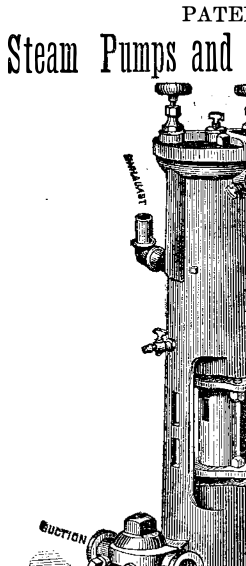

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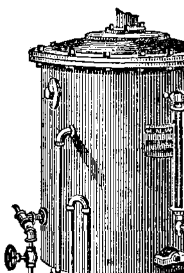

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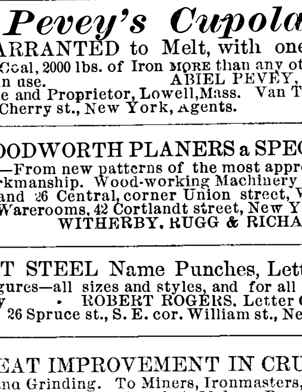

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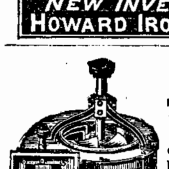

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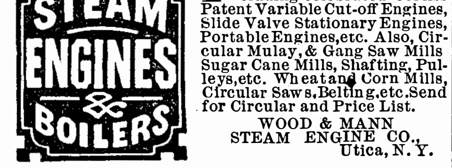

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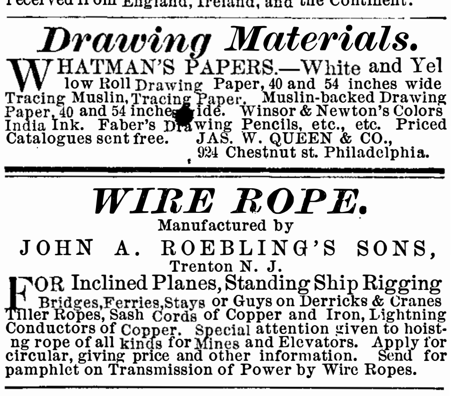

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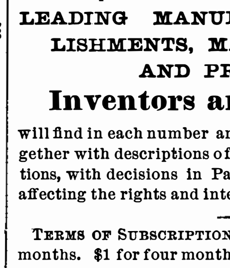

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