1807, erected a linen mill in Ireland in which he used iron spur gearing. This was its first introduction into that country; it was cast by Edwards, of Belfast. In 1822 Mr. Williams patented, and brought out at his own expense, the Oldham feathering wheel, which was subsequently improved, and became known as the Morgan wheel. The City of Dublin Steam Packet Company owes its existence to Mr. Williams, in whose name the company was primarily made public. He also promoted the formation of a Transatlantic Steam Service, which, however, did not succeed of itself, but merged into the present Peninsular and Oriental Steam Company. Mr. Williams, at an early date, applied water-tight bulkheads to divide a ship into separate compartments. His last work, on "Heat and Steam," was completed when the author was in his eighty-first year, and while he was yet engaged upon the experiments of which the book was the result. In this work Mr. Williams originated the idea that water as such could have no other temperature than 328° deg., steam being the cause of any higher degree of heat. However much this theory may be open to dispute, and however easily it may even be disproved, it deserves credit for the care and earnestness Mr. Williams bestowed upon it. But its propounder has passed away, although his memory will long live in his works, and will long be cherished by the many to whom his urbanity and kindness had reached.—*Mechanics' Magazine.*

INCREASE OF EXAMINERS' PAY.

While we deprecate the enactment by the House of Representatives of the bill to tax inventors $10 upon appeals from the decision of the primal Examiners to the Examiners-in-Chief, or Appeal Board, as usually termed, we regret to learn that the bill to increase the pay of the Examiners, and adjust the pay of acting Examiners, has been defeated.

The expense of living, during and since the war, renders it indispensable to the attaches of the Patent Office that their salaries be increased, and we hope to see the bill, which is reported in another column, adopted, or some similar bill enacted, before Congress adjourns. The work of the Examiners also increases in the same ratio as the business of the Office increases, and there is no reason why they should not receive a proper reward for their industry.

Give the appointments to industrious and competent men, and pay them liberally for their services. Thus the Patent Office will sustain its reputation, otherwise it will be in danger of lapsing into the dormant state which characterized it under some of the early Commissioners.

Pay liberally, employ honest and energetic examiners—those who will feel it a disgrace to let their work get far behind—and the inventor's interests will be promoted and the industry of the country advanced. The Patent Office has already a large fund of its own creating, and the receipts of fees from inventors is considerably more than adequate to meet its current expenses.

We hope that Congress will see the propriety of increasing the pay of the Examiners, and of adjusting the pay of those who have acted as Examiners without getting the lawful salary, which can easily be done from the receipts of the Office without imposing an additional tax upon the patentee.

Above all things, however, do not levy a tax upon the injured party to pay the expense of reviewing and often reversing the erroneous decision of the primal Examiner.

Curious Properties of Magnesium Amalgam.

At a recent meeting of the Chemical Society of London Professor Wanklyn read a paper "On Magnesium," detailing some experiments made conjointly by himself and Mr. E. T. Chapman. The authors found the magnesium ribbon of commerce to be remarkably pure, which was proved by the quantities of hydrogen evolved during the solution of known weights of the metal in certain diluted acids. The behavior of the metal in resisting the attack of chlorine, bromine, and iodine, was pointed out, and also the very singular properties of the magnesium amalgam, which decomposed water with even greater facility than sodium amalgam.

Professor Abel mentioned an observation of his own to effect that magnesium filings might be fused with nitrate or chlorate of potash without immediately undergoing oxidation, and only at a very high temperature, and long after the oxygen had been freely evolved, did it seem possible to start the ignition and brilliant combustion of the metal. This tardiness was discovered in attempting to employ metallic magnesium for certain pyrotechnic purposes.

Inefficient Pumps.

An inquiry is now being made in England as to the cause of the loss of the *London,* recently wrecked in the Bay of Biscay with great loss of life. It would appear that this vessel was lost through inefficient pumps. She was not leaky, but finally foundered and went down from defective pumps. A correspondent of the *London Morning Journal* says:—

The ship *London* is said to have shipped seas, but she is not proved to have leaked. Then I asked why the water in her was not pumped out? The answer is, because there was not an effective pump. properly fixed, in the ship, so as to enable them when she shipped a sea to do so. In that case what was to prevent the vessel from sinking, when the weather continued rough and the seas were continually entering her? The best ship ever built in that case must go down.

In evidence it came out that this vessel had a pump sufficient to throw over 4000 gallons of water per minute, or 70 hogsheads. This pump, then, was sufficient to keep the water out clear, or even if she had a hole in her side large enough for a man to get through. Then, what became of this pump? was it worked? I conclude not, for this reason—it was connected with the ship's engine, and useless. Then, I say, this pump was not a fit one for a ship with 300 living beings on board. If the fire had not been put out, this engine, like all others, would be likely to be broken down in bad weather, and if the ship was making water and shipping seas she was bound to sink, as the pumps would then be useless We are next told she had a donkey engine on deck, and a pump attached, but not a word was stated in evidence as to what quantity of water it would throw out per minute; but it did come out that oven this pump was not worked on the first day. Then, I ask, what was done to clear the ship of water? Why, a comedian, the only energetic man that appeared to be in the ship, attempted, with the assistance of the passengers, to bail her out with buckets, and not a sailor came forward to assist them. No further explanation is wanted to prove that the ship sank with all her living freight for the want of effective pumps. Had she good pumping gear there would be no danger of the ship sinking. All this has been lost sight of through all the examinations. It was stated that the donkey engine was put to work the next day, but nothing said as to what quantity of water it threw out, which is evidence that this engine, like the good-natured passengers, were only attempting to dip out the sea with a limpet shell. I am aware it is easy to find fault, but I will not be contented with that, I will do my best to show those in power what ought to be done in all ships that carry passengers—first noticing, in all my experience I never saw a ship with good pumps and properly fixed. I have here to call the Lloyds agents' attention to these points, and tell them that eight-tenths of all the ships that founder is from want of effective pumping powers. It is to be proved that the *London,* and likewise many other vessels that sank in the same storm, had no means of taking out the water but by buckets, and that amounts to little or nothing. I say, without fear of contradiction, that every large ship that goes to sea, whether built of iron or wood, should have one or more powerful donkey engines fixed upon the deck, with the fires so protected as to keep the water from extinguishing them. The engine, or engines, should either be fixed, or movable on tramroads, and connected to the pumps by belts, and worked so as to throw over 2000 gallons of water per minute. One of these pumps in the ship should be connected with the ship's engine, to be used if the engine was all right; if not, let the donkey engine drive one or two pumps at full speed; if it only threw out 1000 gallons of water per minute it would have saved the *London.* This may be proved by the quantity of water in the ship, which sunk her. Then, I say, a third pump should be placed in all ships, to be worked by hand. I will suppose it to be a 10-inch pump, fixed with a good fly-wheel, this would throw out 1000 gallons per minute if well worked; if worked only sparingly or easy it would throw out 500 gallons per minute; this would keep the ship clear of sea shipped. I will pass the lazy sailors as useless men, and ask a watchful public if they think the *London,* with her noble passengers, headed. I say, by the brave comedian, would not have used this hand pump with their greatest efforts, and would have prevented the ship and themselves from going to the bottom of the Bay of Biscay? But few are aware of the effects of such a quantity of water to be removed at the rate of only 500 gallons per minute; if they had done this they would have saved themselves and the ship and cargo had they only kept the ship up for two hours longer there was a chance of some passing vessel picking them up.

It may be asked what is to be done with a fly-wheel on the deck of a ship? In answer I say, heave it down on the deck, and rig it up in quarter of an hour when wanted To prove what I say on pumping and engines, let those interested go down to Greenwich and look at an engine there on four wheels, driving pumps by a belt, and throwing out 4000 gallons of water per minute from the main town drain, at a cost of 1s. per hour. An engine well constructed on a ship's deck is not only useful to prevent the ship from sinking, but in case of fire it can be used to subdue it, and to save the vessel from such calamity—that is if it were provided with proper gear. What sane man would send a good ship to sea without means to work a single pump, when such an engine as that at Greenwich can be had at 1s. per hour? I should recommend two donkey engines on the decks of every large ship, as these engines do all the heavy work of the ship.

No pump should ever be sent to sea driven by a belt, for so soon as the latter gets wet it stretches and becomes useless.—Eds.

Razors.

Engineers as a class were the first to head the modern "beard movement" in this country; but many may like to read the following extract from a little work by Mr. Kingsbury, a practical razor maker, of Bond street:—"The edge of a razor, a pen-knife, and every other very keen instrument, consists of a great number of minute points, commonly called teeth, which if the instrument is in itself good, and in good condition, follow each other through its whole extent with great order and closeness, and constitute by their unbroken regularity its excessive keenness. The edge of such an instrument acts on the beard, the skin or anything else, not so much by the direct application of weight or force as being drawn, even slightly, along it; because by this operation, the fine teeth of which it consists pass in quick succession, in the same direction, and over the same part of the substance. My readers will be convinced of this if they will make the following experiment on their glove or their hand, as they like best:—Let them hold the razor either perpendicularly or obliquely, and press on it with some considerable force in a direct line from right to left, and they will have no great reason to fear the consequences. But let them move it from that direction, let them draw it toward them, or push it from them, in the smallest degree, in the gentlest manner. and it will instantly make an incision. When they have made this experiment, they will be convinced of the truth of what I have asserted, namely, that in the operation of shaving, very little weight and even very little force are necessary." Hence it follows that the best razor will have the teeth of its edge set almost as regularly as a good saw, and that the best test in buying a razor is to examine the edge by means of a strong magnifying glass. This also explains the good effect on the keenness of a razor caused by dipping it in hot water, which necessarily clears the edges of any small clogging substances.—*London Engineer.*

Petroleum as Steam Fuel.

An important addition has just been made by Mr. C. J. Richardson to his petroleum boiler at Woolwich Dockyard—steam pipes have been so arranged that the waste steam may be conducted to the grate and burnt; it rises upward through the porous material, and flashes into flame at the surface. The effect of the steam is described as marvelous. Upon opening the furnace door the smoky flame of the coal oil is seen; then on the hot steam—for he first superheats it—being turned on, the flame in an instant is twice the size, the smoke disappears as if by magic, and a brilliant, white, active flame completely fills the fire place, fire boxes, and tubes. Mr. Richardson writes to us that "the chief fault in using petroleum as steam fuel is the smoke it makes; if badly used it makes smoke and soot in large quantities; sufficient to shame coal—our English oils do this worse than the natural petroleum. When steam is mixed with the vapor, the oxygen absorbs the superfluous carbon of the oil from a gas which burns along with the hydrogens. The hot steam is, however, a more powerful agent than I expected. It found out every faulty joint and screw of the petroleum troughs, and turned the oil out. The three first days my time was entirely taken up making good the mechanical defects."

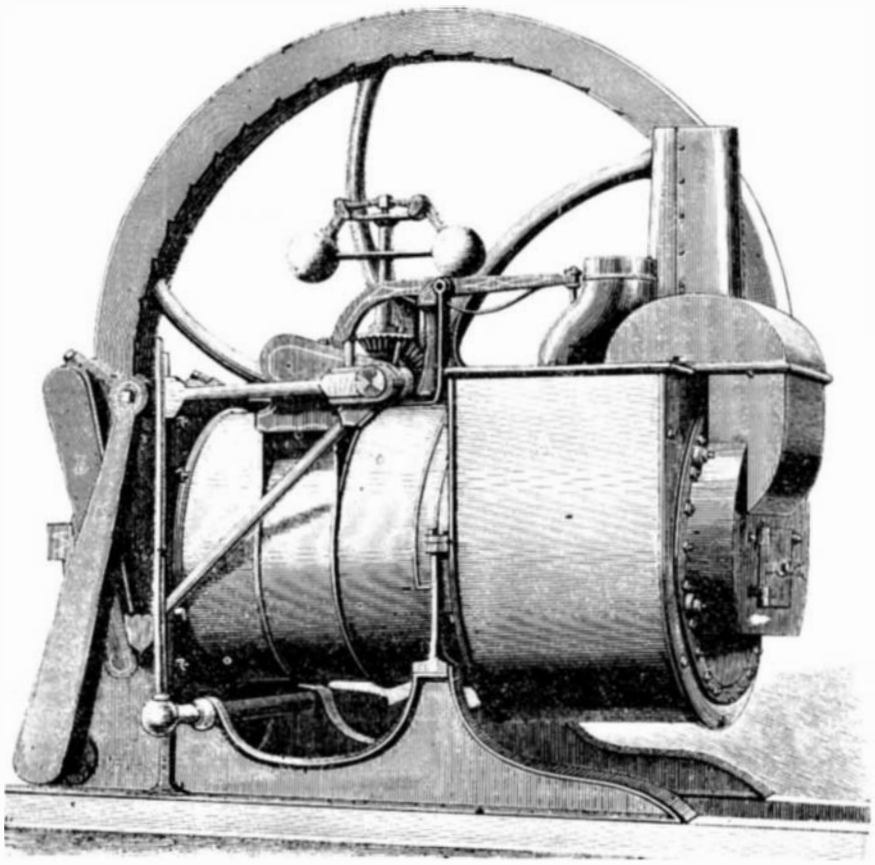
[The use of steam in connection with burning petroleum oil is one of the peculiar features of Stevens's patent and system, an engraving of which was published in the Scientific American, Vol. XIV., page 12.—Eds.

Rubidium has been discovered in coffee, tea, tobacco, grapes, and crude tartar. Coffee is richer in this metal than tobacco, but, as in the case with tea, yields no lithium. The spectrum analysis was the one used. No rubidium was found in cocoa or cane sugar.

Rockport, Mass., has almost a monopoly in the manufacture of isinglass. It is made from the sounds of the fish called hake, and the business is very active during the winter months.

Improved Caloric Engine.

From many parts of the country, correspondents are frequently writing to us requesting information on caloric engines and their adaptation to small manufactures. The engraving published herewith, represents the Ericsson caloric engine which has now been in practical use for many years, doing all kinds of work where only a moderate degree of power is required. The advantages arising from the use of such machines are that they are economical of fuel, use no water and can be worked by any one of common intelligence. They also warm the rooms in winter, thus saving the use of extra fuel for that purpose. They are entirely free from liability to explode and may be used on any floor of any building without increasing the rates of insurance. Many improvements suggested by a practical experience of ten years have been introduced, making them much more durable and efficient than when first offered to the public. For further particulars apply to the manufacturer whose advertisement is always to be found in our advertising colums. For a full account of what the engine is we quote from the report of an eminent consulting engineer who thoroughly investigated the subject for a firm in England who proposed to manufacture them He says:



ERICSSON'S CALORIC ENGINE.

"The plan of the caloric engine is good, as regards its fitness for obtaining power directly from the dry heat of incandescent fuel, being properly fortified against its effects. Its mechanical arrangement for transmitting this power is also excellent, the parts being well proportioned, and having the necessary provision for adjustment, and compensation for wear. The furnace, or heater, is a cast-iron chamber, and is within the cylinder, and being constantly exposed to the action of dry heat, it may be regarded as undergoing a gradual deterioration; it is accordingly so constructed that when unfit for use it can be expeditiously replaced with a new one. This operation, however, is by no means so frequent as might be supposed of a heater lasting from two to six years.

"The engine has a good machine-like appearance, and is principally composed of cast iron, the use of which material enables the manufacturer to get them up at a small cost.

"In determining the question of economy in the production of power by this machine, reference must be had to the steam engine, because in both, power is produced by the consumption of fuel, thus presenting for both a common measure of cost.

"But in addition to the matter of fuel, there are other considerations which should not be lost sight of in this comparison: Steam engines are exceedingly variable as to their economic results, being affected in this respect by a number of independent circumstances, such as the arrangement of the boilers and of the furnace, draft of chimney, proportion and set of the operating valves, etc. A great deal is also dependent upon the skill and faithfulness of the attendant. And it is in view of these circumstances that some steam engines cost twice as much as others to produce the same amount of power. It is also worthy of notice, as a well-established fact, that small steam engines consume more fuel accordingly than larger ones, while at the same time they require more care and manipulation to run them properly, especially in managing the boiler and water-feed. The caloric engine is entirely free from all such difficulties, requiring no attention whatever after starting, except the occasional supply of fuel, and a little oil to the bearings and joints, while the speed is as regular as the vibrations of a pendulum.

"I have examined a number of these caloric engines in operation, which were doing the work heretofore accomplished by small steam engines.

"They all gave complete satisfaction and apparently ample power for the purposes to which they were applied; but without experiment it is impossible to say what quantity of power they actually furnish respectively, but, judging by the appearance of things they all worked well and with surprising regularity evidently developing a much larger amount of power from a given quantity of coal than could be obtained from steam engines as at present constructed, of corresponding powers. And being such that they may be placed in any location from which a chimney may be reached, and not requiring water or skilled attendance, they are particularly desirable as a driving power for small manufacturers, who are thereby enabled to conduct their operations in the business parts of the cities, by occupying upper lofts.

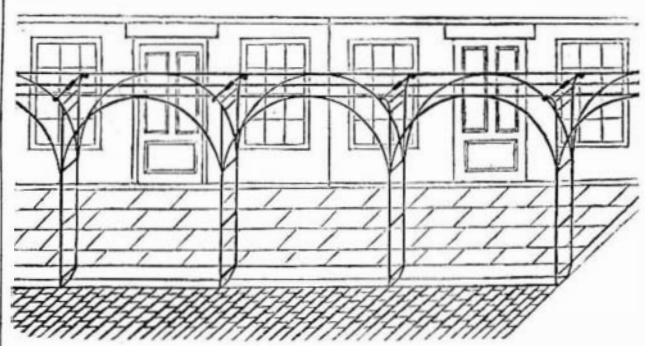
"No attention is required for them while running, beyond what is necessary to throw in a few coals occasionally, which is all that is required to keep up a constant and uniform motion—which considerations become of importance to those who require a small power only.

"As to the appreciation of this machine by the public, it may well be said that whereas it was a few years ago looked upon as a mere mechanical curiosity, it is now regarded and acknowledged as a reliable motive power."

Address Jas. A. Robinson, 164 Duane street and 136 Reade street, New York, for further information.

ELEVATED RAILWAY FOR STREETS.

We present herewith an engraving of a suspended railroad, which we copy from Gillespie's "Manual of Road Making," published by A. S. Barnes & Co., No. 51 John street. The arrangement was suggested by the late Charles Ellett, Jr., in 1844, for an atmospheric railroad. Prof. Gillespie makes the following remarks:—

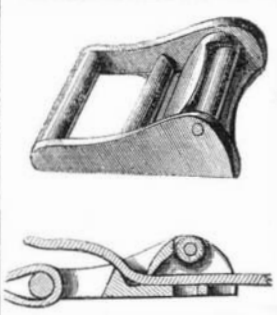


"A railroad worked by a stationary engine, would be the most convenient method of relieving the rush of travel through Broadway. The railroad track should be supported on iron columns, out of the way of carriages, as in the figure. These columns might be placed on the edges of the sidewalks, where now are the lamp and awning posts, and by extending over the gutter they would have a base of three feet. Their lower extremities should be set in heavy masses of masonry. At top they should spread outward, a foot on each side, which would give sufficient width for the railroad track. The columns should be set at distances of 15 or 20 feet, and connected by flat arches. There would be no flooring over the street, and the rails would intercept no more light than do the boards which now connect the awning posts. No locomotives, or even horses, would pass over the road; but an endless rope would continually run over pulleys, and light cars would be under the most perfect control, and could be attached to it, or disengaged, at will, and stopped more easily than an ordinary omnibus. At the upper end of Broadway, a stationary engine, or the water power of the Croton, would easily and cheaply keep up the circulation, which would pass up one side of the street and down the other. At each corner might be a platform, to which there would be a short flight of steps from the sidewalk, the ascent of which would be very easy; or a certain number of corner houses might be used as depots, so that passengers might step into the cars from their second story windows. As these cars would replace the omnibuses, the entire street would be left for miscellaneous travel."

FRYE'S BUCKLE

This buckle is one of that class which has no tongue, or rather no tongue which penetrates the strap, but in lieu of it a pawl or lever which holds the strap by jamming it between two contrasted openings.

Heretofore such buckles have been restricted to the use of straps of a certain thickness, otherwise they became inefficient. The inventor of this buckle claims that he has discovered a remedy for this trouble, and that straps of any thickness within reason can be used in it.



This is effected by making the pawl, A, of a different form from that commonly used. Instead of having the V-form it is made nearly flat, and is fitted with a short spur, B. This sticks into the strap and aids to draw the pawl to its seat, and also prevents any back movement from unbuckling it. No strain comes on the spur after the pawl is down to its seat. The entire patent is for sale.

A patent was procured on this invention through the Scientific American Patent Agency on Jan 23, 1866, by R. E. Frye; for further information address him at Manchester, N. H.

THE Chincha Islands do not exceed in extent two and a half square miles, yet for years past they have supplied guano to an average of four hundred ships per annum, the value of such cargoes in Europe being upward of £50,000.