of 3,333 lbs. hung over the pulley, and which weight we have taken in this case to represent the resistance of the train. So in the case supposed we have a pressure in opposite directions between the axle and its hind support of 6,667 lbs. when the crank is down, and of 13.333 between the axle and its front support, or the front of the axle box, when the crank is up, the effective pressure applied to the train being 3,333 lbs. in both cases, as already shown. In this case, therefore, the wear on the front side of the axle box and on one side of the axle, will be twice as much as on the back of the axle box and on the opposite side of the axle. This great excess of pressure and consequent wear on the front of the axle box, in running forward, has led many to suppose, without due consideration, that the axle is always pressing forward in its box when the engine is going forward. There is, therefore, a somewhat plausible foundation for the notion occasionally entertained among enginemen, that they can start a train with more ease when the cranks are up than when they are down. The pressure exerted by the steam directly against the axle is then greater, as we have seen; but the pressure on the axle, when the crank is down, is not only less, but it is in an exactly opposite direction; and were the wheels unconnected with the engine otherwise than by the connecting rods, they would be rolled backward instead of being pulled forward. But the pull of the engine at the draw iron is, as has been seen, the same when the crank is up as when down. Although we speak of the rail as the fulcrum upon which the forces exerted through the wheel are made effective, it will be understood that it is by the weight with which the wheels press upon the rails, and by their consequent friction, that a real fulcrum is obtained. As long as they do not slip, any motion in the wheels must carry the engine bodily forward, and it is necessary, therefore, that the friction of the wheels upon the rails be always at least equal to the greatest tractive force exerted by the engine. In the case which we have been considering, that of a single piston with 10,000 lbs. steam pressure, two feet stroke and six feet wheels, the greatest tractive effort is 3,333 lbs., and the friction of the wheels upon the rails must be at least equal to this. The constant tractive force is not, however, 3,333 lbs., as at the ends of its strokes the piston exerts no useful force whatever—the effect diminishing from mid stroke, where it is the greatest. The mean tractive force will, in this case, be 2,112 lbs.

TREATMENT OF CHOLERA.

It is the opinion of every physician who has had any experience in the management of this disease, that its preliminary or premonitory stages present opportunities for its almost certain cure, when the proper remedies are applied in time. It is well established that the disease commences in almost every instance with a *painless diarrhea*, which because of its painlessness, is apt to be disregarded or considered of no consequence, but when neglected runs rapidly into the more serious stage, accompanied with vomiting, cramps, feeble pulse and collapse. But if taken in its very outset, upon the first indication of diarrhea, the stage called *cholerine*, then the administration of appropriate remedies is almost sure to be successful in arresting its further progress.

At a recent session of the New York Academy of Medicine, at which the subject of cholera, its causes, progress, and treatment, were under discussion, Dr. John H, Griscom presented an elâborate paper, in which, among other matters, he gave a translation of an essay from the proceedings of the Academy of Medicine, of Paris, written by Dr. Worms, Physician-in-Chief of the Military Hospital of Gros Caillou. Dr. Griscom, who has witnessed every epidemic of cholera in this city, and had large experience in its treatment both in private and public capacity, considers the principle upon which the recommendation of Dr. Worms is founded as correct, and the success which appears to have attended it to be based upon sound physiological and pathological reasoning.

We give the essay alluded to, translated for the Scientific American from a French journal by Dr. Griscom, who for 28 years has been one of the physicians of the New York Hospital.

"The study of the numerous cholera epidemics which have visited Europe within the past 35 years has not been sterile; it has furnished science with matter of incontestible importance. One of its most precious gifts is the establishment upon a positive basis of its prophylaxis and its relation to public hygiene, in localizing the toxic element, its transmission by the matter of morbid dejections, and in signalizing as the most decided auxiliary of this poison, the emanations of animal and vegetable substances in a state of putrefaction, the gases from privies and from stagnant waters. Another ascertained fact, and not less important, is that sudden and severe attacks of cholera, without premonitory indications, are of very rare exception, and that in a great majority of cases, a characteristic trouble of the digestive functions, and simultaneously of those of innervation and circulation, always precede for some time, and announce the invasiou of the grave form of cholera.

"It is impossible not to admit that these prodromic or premonitory troubles (justly entitled cholerine), are the effect of the slow and gradual action of the toxic agent, which has not yet found either in the local circumstances, or in the individual predisposition, sufficient elements for its full extension, or the display of its full power.

"It is this preliminary phase of the malady, wherein the vitality has been, so to speak, only grazed, that the stomach does not yet refuse to receive and to absorb medicaments, which offers to the curative art its true field for the development of its power, and it is especially concerning the treatment of this premonitory phase that I ask the Academy to permit me to expose briefly the results of my observations.

"The ordinary practice in these cases consists in prescribing repose, diet, the use of warm aromatic drinks, some diaphoretics, and in the last place bismuth or opium, either pure or in the form of Dover's powder; but when the epidemic influence has become very decided, the employment of these means is far from being followed by success, and the success, when it is obtained, has often little duration; I have so often seen cholerine pass into cholera during the treatment by opiates, that in cholera times I cann t overcome the dread of opium.

"Beside, when this medication arrests the dejections, the stomach frequently remains embarrassed, and the patient feels no return of strength or appetite.

"On account of circumstances such as I have described, finding myself at the close of the epidemic of 1849 at the end of ordinary resources, I had recourse to a new and totally different medicine, which was mentioned in a letter addressed July 7th to the *Gazette Medicale*, of which letter I ask permission to reproduce a brief passage:— In the last of the month of June, when I was no longer charged with cholera service, it happened to me to receive on the 13th and 14th, seven men who had diarrhea, some of four and some of eight hours' duration. According to my habitual practice, I gave them an emetic (of two grammes of ipecac) and potions of two grammes of laudanum, also amylaceous and opiate lavements; but so far from seeing any amelioration follow this treatment, which had always succeeded with me in ordinary times, I must confess to an alarming aggravation; to the alvine dejections, which were frequent, vomiting was added; the evacuations assumed the choleraic character; the voice began to grow feeble and to diminish; the pulse became almost imperceptible, and the characteristic alteration of the face left no doubt of the nature of the affection.

"'This is one of those forms of cholera often met with among feeble subjects at the commencement or the end of epidemics. I immediately placed all these patients on the use of *mineral lemonade* (giving them a double dose of acid) and suppressed all other medicines. The effect was most striking; the very next day the countenances were ameliorated, the dejections were diminished, the skin became warm, and I found in place of a slender and almost imperceptible pulse, one well-developed and resistant, announcing a remarkable return of vitality. Three of these patients have left the hospital, and the other four eat from a half to three-quarters of their allowance.'

"This I wrote in July, 1849. Since that time in the visitation of cholera in 1853-'54, I have been enabled to apply to a much larger extent, in both the prodromic diarrhea and grave cholera, the method of treatment of which, in 1849, I had made but an insufficient essay. Its success so far as cholerine is concerned, has surpassed my expectations, the diarrheas, accompanied or not by vomitings, being arrested and cured with a promptitude altogether surprising. One may see, so to speak, the pulse rising, the skin becoming warm, the strength and appetite returning at the same time, and in a few days the patients finding themselves in a condition to return to duty.

"This result was so manifest that all the poor consumptives of my ward importuned for the same prescription of *mineral lemonade*, hoping from it the same efficacy for their colliquative diarrheas.

"Later still I have had occasion to prove the infallible fidelity of this simple means, and my most ardent wish is to see it in general use. I earnestly implore my honorable colleagues who hear me, not to regard me as influenced by an unreasonable enthusiasm, which would be wrong in a practitioner of my age; that they will suspend their judgment on the subject; the occasions for experimentation are not wanting at this moment, and I fear that they will become too numerous.

"Two, three, or at most four grammes [a gramme is about 15⅓ grains, troy measure] of sulphuric acid with a thousand grammes of water or a mucilaginous vehicle, with one hundred and fifty grammes of simple or raspberry sirup, makes a drink as agreeable and innocent as ordinary lemonade, and furnishes at the same time a medicine cheap, easy of preparation, and every where accessible.

"And when, as I have so often proved, my colleagues will have been able to convince themselves of the marvelous rapidity with which this lemonade arrests the evacuations, raises the pulse and the nervous system, warms the skin and gives to the patient the feeling of health, I doubt not that they will participate in the confidence with which its long usage has inspired me; as, moreover, these diarrheas are very evidently only an attenuated expression of the epidemic influence, they will naturally come to the conclusion that a medicament so powerful against cholerine, should not be indifferent in confirmed cholera.

"To repeat here the mode of my practice, in cases of prodromic diarrhea, and according to the greater or less gravity of the case, I add three, four, or at most five grammes of concentrated sulphuric acid to a killograme [a thousand grammes, equal to two pounds, eight ounces, one drachm and twenty four grains] of a sweetened decoction of salep.

"The patient takes every hour a glassful of this lemonade, and rinses his mouth two or three times after drinking it; it is seldom that four glasses are required. I permit the simultaneous use of white wines, or of champagne, but I expressly proscribe the use of beer, brandy, and alkaline mineral waters during the epidemic.

"As to confirmed cholera, my practice is almost equally simple. The patient is kept in the most complete repose. Shampooing is practiced only during the pain of cramps. Every half hour a glass of the lemonade (of from five to ten grammes of acid to a litre) [a litre is a fraction over two pints] is administered, taking advantage of the moment immediately after vomiting. He takes beside, at discretion, wine and ice.

"I think it useful to remark that the lemonade, which has a great power to suspend the alvine evacuations, produces a contrary effect upon the vomiting, increasing its frequency and duration; but this prolongation is not unfavorable, and is generally an indication of a happy termination."

Death of Mr. C. Wye Williams.

Men of science have been fast falling around us of late, and it is with regret we now add still another name to the list of those who have rested from their labors since the year began. Mr. Williams's name is too intimately connected with the principles of combustion, and his works are too well known, to need that we should point out seriatim all he has done. In fact, it is chiefly as an author that Mr. Williams is known, although he was a sound practical business man. He died on the 2nd inst, at his residence, the Nook, near Liverpool, in his eighty-seventh year. Mr. Williams was among the early mechanical improvers of mill work, having, in

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.