Correspondence

Gravity and the Pendulum.

MESSRS. EDITORS :—The Concord writer in the SCIENTIFIC AMERICAN of the 22d inst. denies the orthodox doctrine that the force of gravity is less at the equator than at the poles; or that the slower vibrations of the pendulum is caused thereby, but states that this result is owing to the greater distance from the center of the earth, giving a more acute angle for gravity to act on the pendulum. And that "a pound is a pound all the world round." Reply—The surface of the ocean is higher at the equator than at the poles, because the effect of the centrifugal force makes it lighter and the pound or its equivalent, the pint, partakes of the levity. An inverted siphon would afford an analogous case, where a column of heavy fluid in one leg should balance a longer column of lighter fluid in the other leg. The effective center of gravity for the pendulum is in no case at the center of the earth, as the writer supposes, but far short of that point.

T. W. B.

Cincinnati, Feb., 1862.

[We have received other letters since the above was in type, taking the same ground. We have been more pleased with the answers called out by the communication of our New Hampshire correspondent, than with any other series of letters that we ever received. They all exhibit an understanding of the subject, and are marked by the philosophic spirit which is the proper accompaniment of conscious knowledge. The only exception either to the intelligence or the fairness which we have noticed is in the columns of our esteemed cotemporary, *The American Railway Times*, which at the end of a captious article publishes this bit of nonsense. "What becomes of the center, or the amount of gravity, when the sphere is flattened? Is the total attraction of gravity annihilated by reducing the sphere to a disk? We believe on the contrary, that the gravity at the poles of the disk would be just the same as that at the center of the sphere, viz., the very maximum: and our reason for believing that is, because the center of the sphere and the poles of the disk are the same point."—EDS.

The Rifle Question.

MESSRS. EDITORS :—In your paper of the 8th inst. there are extracts from the English *Army and Navy Gazette*, on the subjects of rifle firearms and of the condemnation of the Enfield rifle. These extracts contain the following matter :—

"The late Lord Herbert, when Secretary for War, claimed a 'ten years' life' for the Enfield rifle; experience proves, however, that its longevity is even less than this, and practicians know full well that long ere that prescribed decade has run its course the weapon, owing to an inherent susceptibility to the abrasion of the bullet and the frictional action of the ramrod, especially toward the muzzle, where the grooves are shallowest and barrel weakest, ceases to be a rifle in all save name. Thus it is notorious that even at the Hythe school of musketry the Enfield rifles of 1853, and even of a more recent date, have had to be put aside as worn out and effete."

Now, in regard to this, insomuch as the preservation of rifled cylinders is concerned, I would recommend that a small piece of zinc be fixed in contact with them. By this means a galvanic current will be generated and corrosion in a great measure arrested. It is clear that friction must have a more prejudicial effect upon a rifled cylinder when the metal is in a corroded state than when it is comparatively free from rust.

I suggested to the British government that all rifled artillery and all rifled muskets in their service should be furnished with a galvanic arrangement for the purpose of preventing corrosion in the cylinders, and thereby preserving the grooves in a serviceable state long after the usual period, but, judging by the reply which I received, my suggestion was either not understood or not appreciated.

And it is not only artillery and rifles that may be preserved in this way. The principle may be applied to all iron or steel instruments or tools that are used in the arts of peace. I believe the application of it has already been made to certain steel instruments.

With reference to Mr. Charles Potts's views on the subject of combining rocket power with that which a projectile derives from its discharge in the usual way, I would state that I submitted the matter to the British government two years ago; it was sent to the Select Committee of Artillery Officers at Woolwich for consideration, and the report was unfavorable. I am still of opinion that when extreme ranges are required the invention would be of much moment, and I hope Mr. Potts will have it tested on a large scale, which I had not an opportunity of doing.

R. MYRTLETON.

London, Canada West, Feb. 28, 1862.

Anchor Ice.

MESSRS. EDITORS :—Can you give me any information about what is called "Anchor Frost," particularly its formation? It is a subject upon which we converse once in a while, but we do not seem to get very near the truth of it as yet—why it forms at the bottom of the stream where it is most rapid, about mill wheels, &c. If you can give me any information on the above subject you would oblige me very much.

E. F., JR.

Westerly, R. I., Feb. 26, 1862.

[Water is most dense at a temperature of $39\frac{1}{5}°$ above zero of Fahrenheit's scale; consequently, when the water at the surface of a still lake or pond has been reduced to this temperature it sinks and the lighter water rises to the surface. This vertical circulation goes on till the whole mass is cooled to 39.2°, and then, as that at the surface grows lighter by becoming colder, it remains at the surface until it is frozen. If water continued to become more dense down to the freezing point, no ice would form until the whole mass was cooled to this degree, and the whole lake would be frozen. Its property of expanding below 39.2° is a most fortunate provision of nature to keep up the flow of rivers and prevent the accumulation of vast masses of ice, which would give us chilly springs, and might carry winter weather far into the summer. When water is violently agitated by being tumbled along in a rapid stream, or by being beaten by wheels, it is all exposed to the air and may thus all be reduced to the freezing temperature. In this case it freezes at the bottom as well as at the surface, and produces anchor ice.—EDS.

A Considerable Shower.

A correspondent writing from San José, California, says :—About six weeks ago we had a slight shower that lasted about three weeks, when it set into rain and has kept it up ever since. A rain gage, carefully kept and registered by Dr. Snell, of Sonora, Tuolumne County, shows that from the 11th day of November, 1861, to the 14th day of January, 1862, seventy-two inches of water fell at that place. This is sufficient explanation to all the world of the cause of our unprecedented deluge. It is also asserted by several persons on the Klamath river that the water at the mouth of Salmon, on the Klamath, was forty-two feet above the wire bridge, and the wire bridge being ninety feet high, makes it one hundred and thirty-two feet perpendicular. The river is narrow at this point, and the measurement was taken on trees above the bridge.

POWDER MANUFACTORY.—A powder manufactory is to be started in California by a company which has just been incorporated with a capital stock of $100,000. The war has raised the price of powder so that it can be profitably made in California, where there is a large and steady demand for it for blasting purposes. The charcoal employed is made from willow, which grows on all the valley and mountain streams there. Sulphur is very plentiful in many parts of the State, particularly in San Luis Obispo, Santa Barbara and Los Angeles counties, where vast beds of it exist, and it has already found its way into market. Saltpeter is also abundant at the head waters of the Pajaro river, in Santa Cruz county.

IN Austria the Danube had inundated a district of country in which no less than 80,000 persons were rendered houseless. Rain fell for four days, almost without interruption. Bridges and viaducts were destroyed, and the railroad service was nearly all suspended. Several towns were also inundated by the Danube, including Presburg and Pesth.

Iron-Clad War Steamers.

The Navy Department has issued proposals for the construction and equipment of iron-clad vessels for river and harbor defense. The following are the particulars :—

With the exception of those for the Mississippi river and its tributaries the proposed new vessels will be propelled by screws, those for the Mississippi river and tributaries may be propelled by paddle-wheels. The hulls will be either wholly of iron (which would be preferred) or of iron and wood combined, as the projectors may consider most suitable for the object proposed, but their sides and decks must be protected with an iron armature sufficient to resist the heaviest shot and shells

The vessels for the Mississippi river and tributaries are not to draw more than six feet water when fully equipped and armed, at which draft they are to be able to maintain a permanent speed of nine knots per hour in still water, and carry sufficient coal in the bunkers for six days' steaming at that speed. Their armament will consist of not less than six eleven-inch guns.

The vessels for harbor defense are not to draw more than twelve feet water when fully equipped and armed, at which draft they are to be able to maintain a permanent speed of ten knots per hour in smooth water and carry sufficient coal in the bunkers for seven days' steaming at that speeed. Their armament will consist of not less than from two to four eleven-inch guns.

The vessels for coast defense are not to draw more than twenty feet water when fully equipped and armed, at which draft they are to be able to maintain a permanent speed of fifteen knots per hour at sea, and carry sufficient coal in the bunkers for twelve days' steaming at that speed. Their armament will consist of one or two fifteen or twenty-inch guns.

The guns of the vessels for harbor and coast defence are to train to all points of the compass, without change in the vessel's position.

The propositions must state the number of vessels subject to the election of the Department, which the party proposes to furnish complete in every respect, embracing armor plating, steam machinery, and equipments of all kinds, ready for service, excepting only the ordnance and ordnance stores and provisions The proposition must be accompanied by descriptions, specifications, drawings and models of such character that the work could be executed from them.

The place of delivery must be stated, the time within which the vessel or vessels are to be completed, and also the total sum to be paid for each.

It will be stipulated in the contract that one-fifth the total amount will be retained by the government until sixty days after the reception of the vessel, in order to give it a trial, the remaining payments being made with due regard to the proper performance and progress of the work; the contract will also embrace forfeitures for failure to perform the conditions specified.

The bids must be accompanied by the guarantee required by law, that, if a contract is awarded, it will be promptly executed; and the names of the parties who are to become the sureties to the amount of the face of the contract will also be stated.

The department will consider any other proposition that may be presented, in which the draft of water above named is not exceeded.

The department will be at liberty to accept or reject any or all the propositions.

All proposals must be sent to the Navy Department at Washington, not later than the 26th of March.

PROFESSOR ROGERS estimates that one-sixth part of the total produce of the coal mines of Great Britain is employed in generating force, which force is equivalent to that of 55,000,000 of men. Half an acre of coal, three feet deep, will yield 10,000 tuns, and this quantity is equivalent to the labor of 3,000 men all their lives. If we take the annual produce of the mines in Great Britain at 65,000,000 tuns, we have an equivalent to the force of 400,000,000 adult men.

SINCE General Burnside's army took possession of Roanoke Island, the supply of turpentine has increased. It is now selling at 95 cents per gallon in New York and is dull at this reduced rate.

Powerful Artillery—Iron Forts and Improvements in Iron and Steel.

The following interesting extracts are from the address of the new president, Mr. Hawkshaw, of the Institution of Civil Engineers, London:—

In a very few years, mainly in consequence of the labors of Sir William Armstrong and of Mr. Whitworth, the range of artillery has been doubled. The weight of the gun, in proportion to that of the projectile, has been reduced to one-half, and the capacity for powder of the elongated, as compared with the round shell, has been more than doubled. This great advance in the destructive power of cannon has rendered most of our old fortifications useless. New fortifications have therefore to be built, adapted to the longer range and greater destructive power of the new artillery. These fortifications require to be placed more in advance of the places to be defended, and to be constructed with very superior powers of resistance to those which hitherto have proved sufficient. The old walled towns, which were formidable enough in former days, would to-day, in case of a siege, afford little security to the inhabitants who dwell within them; the old defences, therefore, have to be removed, and replaced, where necessary, with those more suitable to modern requirements.

There are some cases in which forts may with advantage be principally, if not wholly, built of iron. I hope to see that material adopted for the superstructure of the large sea forts at Spithead, the construction of the foundations for which has been intrusted to me. There can, I think, be no insuperable difficulty in constructing iron forts so as to be impregnable to a ship's battery, though, in the absence of knowledge as to what may be the ultimate powers of guns, it is not easy at present to arrive at safe conclusions. The difficulty of doing the converse of this, viz., of building ships so as to be impregnable to the fire of such artillery as may and ought to be placed in the new forts, will be a problem not so easily solved.

Should it turn out that steel, or homogeneous iron, as it is sometimes termed, uniform in quality, and of double the strength of ordinary iron, can be manufactured in large quantities at a moderate price, and can be easily manipulated, then many things that are now with difficulty accomplished will be greatly facilitated, and some things which cannot be done at all, will be rendered practicable.

Bridges of greater span could be constructed. Screw shafts, crank-axles, and other parts of steam engines, at present of unwieldy size, would by its use be reduced to more moderate dimensions. There seems to be no limit to the size of guns, except that of the strength of the material, and the power of welding, forging and handling them.

We are, I believe, in the infancy only of discoveries in the improvement of the manufacture of steel and iron. Until lately, the nature of the demand for iron rather retarded than encouraged improvements in its manufacture. Railways consumed iron in vast quantities, and railway companies cared nothing about quality. They were driven to seek a tolerably good material for engine and carriage tires, but, as it respected the vast consumption in the shape of rails, they were implicitly guided by the lowest prices. As long as this system continued, it suited the ironmasters to manufacture a cheap article in large quantities, and they therefore gave themselves no concern to establish a better state of things. But heavy engines, high speed, and an enlarged traffic are gradually working a change. We are beginning to find that iron of the very best quality has hardly endurance enough for rails or locomotive tyres; that there is no economy in putting down rails which require taking up again in a year or two; and, in short, that the increased strains arising from the accelerated motion of railways, steamboats and machinery generally are necessitating a better material.

[The Scientific American has proposed and discussed this matter repeatedly, and Gen. Totten conducted an expensive series of experiments several years ago to test the thickness of plates required.—Eds.

Losses on the American Lakes.—The marine losses on the St. Lawrence and lakes during the year 1861, amounted in value to $302,625 on steamers, and $564,722 on sailing vessels and their cargoes. The number of lives lost was 116; that of last year 578.

Spring Car Wheels.

The *Leeds Intelligencer* has been writing a series of articles under this heading, and in one lately published says:—In the first of these articles we drew attention to the peculiarity of the railway wheel as differing from all others, and to the unsatisfactory working of a rigid wheel upon an uneven rail. The wear and tear which results to rail, wheel and axle is something enormous, and the discomfort of the motion most people can declare for themselves. It is, therefore, strange that when a remedy is offered for such a serious evil it should be obstinately rejected. We allude to a wheel invented by a sound engineer (and most vigorous writer), Mr. Bridges Adams, having springs, or rather a circular spring, between the tire and the body of the wheel, which breaks the force of the blows whether vertical or lateral. In other words the tire has a sufficient amount of "play" for it to yield to the inequalities of both the surface of the rail, and the side of the rail. The results are that the face of the tire and the face of the rail, which by mutual concussion now so rapidly wear out, are both saved; the flange of the wheel is no longer stripped off by the lateral projections of the rail; and as the wheels no longer jump, but roll, the train runs easily along with comparatively little vibration. It is a fact that by this invention an inferior and low-priced iron works perfectly well, and lasts beyond comparison longer than the hardest and most expensive metal on the old method. Its practical value is freely admitted, yet because juries exact such enormous compensation for injuries, if there be any departure from the established system, the companies really dare not introduce it. This, at any rate, is their excuse—how far prejudice and vested interests are concerned, we had better not inquire too closely. As regards safety no objection has been offered. Even if the tire should break, it could not fly off—a common cause of accident—but of this there is little danger even in frost, as the tire is put on cold, with the fibers of the metal in a state of rest, and uninjured, whereas the ordinary tire is strained on hot, with the fibers in a state of tension, and therefore of weakness. It has been in actual service, not for a few months merely, but for six years, on several lines, and applied to engines as well as carriages, and has stood the severest tests that could be applied to it. In fact the principle is scientifically correct, and therefore must answer. We may add that the original cost is less than the regulation wheel, while the wearing power is from 100 to 400 per cent greater, to say nothing of the saving to the rail, which is in similar proportion. Its economy is a consideration for shareholders, its comfort is a consideration for the public, and on any theory of forces the two combined should be powerful enough to overcome the *vis inertiæ* of directors and engineers.

Gut Strings for Musical Instruments.

Those tensiled strings, called catgut, which are largely employed for musical instruments and other purposes, are mostly made from the intestines of sheep, not the feline tribe, as is most generally supposed. The *Technologist*, of London, gives the following description of the manufacture of these strings. It says:—

The manufacture of musical strings requires a great amount of care and skill, both in the choice of materials and in the manufacturing processes, in order to obtain strings combining the two qualities of resistance to a given tension and sonority. Until the beginning of the last century, Italy had the entire monopoly of this trade, and they were imported under the names of harplings, catlings, lutestrings, &c.; but the trade is now carried out, with more or less success in every part of Europe. However, in the opinion of musicians, Naples still maintains the reputation of making the best violin strings, because the Italian sheep, from their leanness, afford the most suitable material; it being a well-ascertained fact that the membranes of lean animals are much tougher than those of high condition. The smallest violin strings are formed by the union of three guts of a lamb (not over one year old), spun together.

The chief difficulty in this manufacture is in finding guts having the qualities before mentioned, namely, to resist tension, and giving also good vibrating sounds. It is far more easy to arrive at the proper point in the making of harp, double bass, and other musical strings, and the manufacturer is not so much circumscribed in the choice of the proper material. The tension upon the smallest string of the violin, which is made of only three guts, is nearly double that on the second string, formed by the reunion of six guts of the same size.

In the preparation, the sheep's guts, well washed and scoured, are steeped in a weak solution of carbonate of potash, and then scraped by means of a reed cut in the shape of a knife. This operation is repeated twice a day, and during three or four days, the guts being every time put into a fresh solution of carbonate of potash, prepared to the proper strength. In order to have good musical strings it is indispensable to avoid putrid fermentation; and as soon as the guts rise to the surface of the water, and bubbles of gas begin to be evolved from them, they are immediately spun.

In spinning, the guts are chosen according to their size, combined with three or more, according to the volume of the string required, they are fastened upon a frame, and then alternately put in connection with the spinning-wheel, and submitted to the required torsion. This operation performed, the strings left upon the frame, are exposed for some hours to the vapor of sulphur, rubbed with a horse-hair glove, submitted to a new torsion, sulphured again, further rubbed, and dried.

The dried strings, rolled upon a cylinder and tied, are rubbed with fine olive oil, to which one per cent of laurel oil has been previously added. The oil of laurel is supposed to keep the olive from becoming rancid.

The gut strings employed by turners, grinders, &c., are made with the intestines of oxen, horses and other animals. These, cleared by putrefaction of the mucous and peritoneal membranes, and treated by a solution of carbonate of potash, are cut into strips by means of a peculiar knife, and spun in the same way as the musical strings. Lately, however, the vegetable parchment, as it is termed (which is ordinary paper steeped in sulphuric acid), has come into extensive use for this purpose.

The use of the raindeer-sinew for lashing and binding purposes on implements, &c., is common from Norway and Lapland, along the entire coast of Asia and America, even as low as 36° N. in Calfornia, and continued on the coast line up to the eastermost point of America, and again at Greenland. Sir E. Belcher, in "Transactions of the Ethnological Society of London," states he traced this custom of using the reindeer sinews continuously on the western coast as far south as the thirty-sixth parallel on the coast of California, where the Mexican Indians soak it and form it into layers, in which they inclose the wood of the bow entirely.

Tempering Bronze.

Bronze is a term usually applied to alloys of copper and tin, in contradistinction to brass, which is a compound of copper and zinc. Bronze has been longer known than iron. It was employed by the remote ancients for arms, swords, shields and almost every kind of cutting instrument; and also for works of art. A bronze compound of 93 parts copper, by weight, and 7 of tin, is harder than copper, and yet it is more fusible. This alloy can be tempered and rendered very hard by the very opposite process of hardening steel. The bronze is first highly heated, then cooled very slowly, when it becomes hard and brittle. The same treatment would render steel soft. In order to soften or anneal bronze it is heated to redness, then plunged into cold water, when it becomes so soft that it can be stamped in a die press.

Bell metal, gun metal and statue metal are simply bronze—alloys of copper and tin. These two metals combine in almost every proportion. Bell metal contains 78 parts copper and 22 tin, and some makers add 1 per cent of antimony. Gun metal is composed of 8 parts copper and 1 of tin.

Speculum metal is a very hard bronze, which receives a very brilliant polish, and is employed for reflectors in telescopes. It is composed of 6 parts copper, 3 of tin and 1 of arsenic.

A flax manufactory, as we learn from the *Prairie Farmer*, is about to be erected at Chicago. Quite as good flax can be raised in Illinois and most of the other Western States, as in Ireland.

Improved Safety Guard for Steam Boilers.

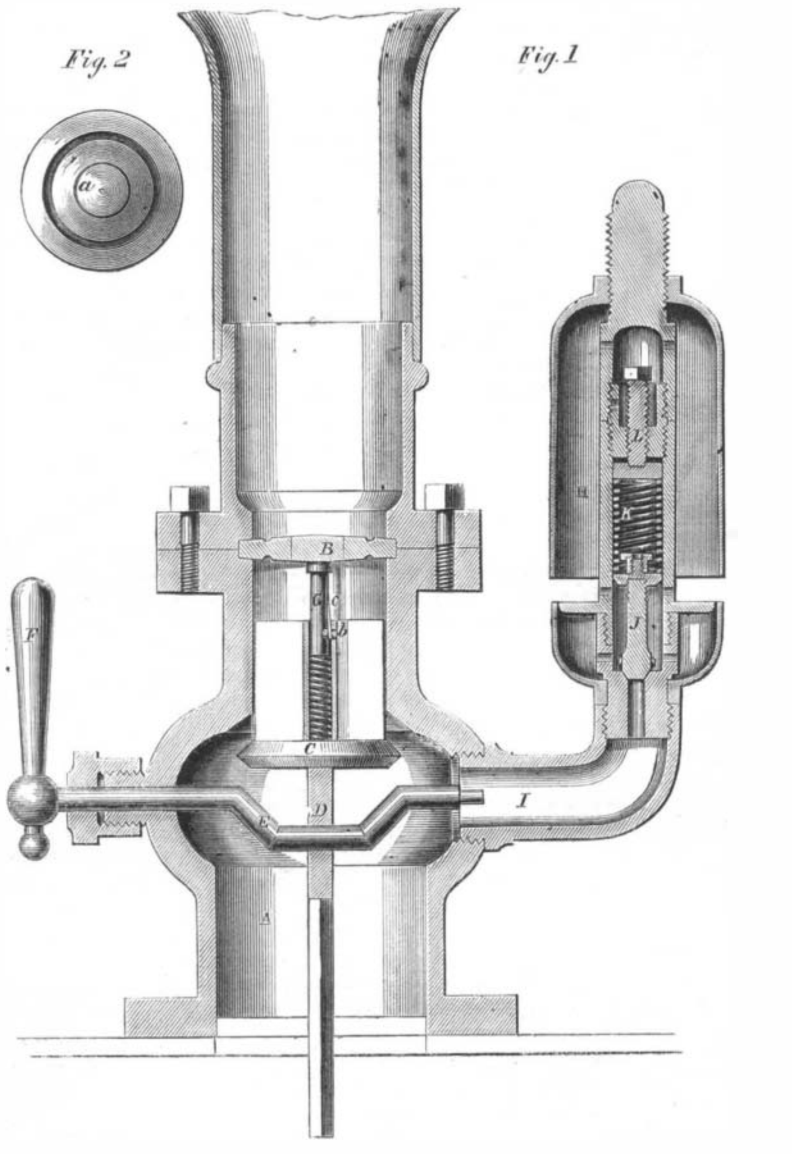
It is not strange that steam boilers explode. It is probable that few practical or theoretical engineers fully appreciate the strain which is exerted by the steam in boilers tending to tear them asunder. If we could see twenty loads of hay suspended from each end of a boiler, we could form some idea of the strength of metal necessary to resist the strain. But the steam is so completely hidden inside, and it is so silent and quiet, that we do not realize its herculean efforts to tear asunder the iron bands which compress it, and it is only when some portion of the metal gives way, and the ponderous boiler is hurled through the walls or roof of the building, away into the air, that we form any conception of the expansive power of steam. If we fully appreciated this power we should be surprised, not that boiler explosions occasionally take place, but that they do not occur far more frequently. That boiler explosions occur as seldom as they do is to be attributed, first to the great strength of iron, and secondly, to the care taken to prevent them. One of the devices adopted for this purpose is to make some portion of the boiler far weaker than the rest, and to so arrange the parts that when this weak portion gives way no considerable harm will result. The accompanying engravings illustrate a modification of this plan invented by George Mann, Jr., of Ottawa, Ill.

A cylinder, A, is bolted to the boiler, with which it communicates by a hole made for the purpose. This cylinder is closed by a metallic disk, B, which is made so much weaker than the boiler plate that it will be broken and blown out by a pressure of steam insufficient to burst the boiler.

The valve, C, is provided to close the passage through the cylinder, A, after the disk, B, is blown out and thus prevent the steam from blowing off while a new disk is being put in. The stem, D, of the valve, C, has a slot through which passes the bent shaft, E, having the lever, F, upon its end. It will be seen that when the lever, F, is turned up in the position shown, the valve, C, is open; and as the lever, F, is in sight, the valve, C, cannot be closed and the steam thus shut off from its action on the disk, B, without this dangerous arrangement of the parts being made manifest to any inspector of the boiler.

For further security, a fusible plug is introduced into the disk, B, formed of such alloy that it will melt at a temperature corresponding as nearly as may be with the pressure required to break the disk. A plan view of the disk with its plug, *a*, in the center is shown in Fig. 2.

To prevent the engineer from closing the valve, C, after the disk, B, has been introduced, a pin, G, is fitted into the upper part of the valve stem; this pin being of such length that while its upper end bears against the lower side of the disk B, its lower end will press against the valve and hold it open. But as soon as the disk, B, is broken, or as soon as the fusible plug in its centre is melted, the pin, G, will rise in the opening and allow the valve, C, to close. The proper length of the pin, G, is obtained by drilling a hole through it horizontally, and inserting loosely, a small pin, *b*, which is pressed outward by a spring, *c*, so that when the valve is open, the pin, *b*, will rest upon a shoulder in the valve stem, and prevent the pin, G, from being pressed farther into it. A spiral spring, *d*, presses the pin, G, up so as to bring the small pin, *b*, above the shoulder in the valve stem. When the disk, B, is to be replaced, the small pin, *b*, is pressed in to allow the pin, G, to sink down into the hollow valve stem out of the way.



MANN'S IMPROVED SAFETY GUARD FOR STEAM BOILERS.

Connected with this apparatus is a whistle to sound the alarm before the pressure becomes sufficiently high to break the disk, B.

An ordinary steam whistle, H, communicates with the boiler through the pipe, I, and cylinder A. The passage to the whistle is closed by the valve, J, which is pressed against its seat by the spiral spring, K. The tension of the spring, K, is adjusted to the pressure at which it is desired to sound the alarm by compressing it by means of the screw, L. As the head of the screw, L, is within the cylinder which surrounds it, it can be turned only by means of a key adapted to it, and this key may be kept within the control of the owner, or foreman of the works, where the boiler is in use, and thus it will be out of the power of the engineer to adjust the whistle to a higher pressure than that determined upon by the owner.

This safety guard is designed especially for locomotive engines. It is easily attached, and prevents the engineer from carrying more steam than is needed to do the work, and thus not only diminishes the danger of explosions but also effects a saving of fuel.

The patent for this invention was granted through the Scientific American Patent Agency, June 18, 1861, and further information in relation to it may be obtained by addressing Thorn & Mann, Ottawa, Ill., or Henry Hise, General Agent, 441 Market street, Philadelphia.

Naphthaline Colors.

The following is the substance of recent remarks by the celebrated French chemist J. Persoz before the Academy of Sciences, Paris. He said :—

Starting from the fact established by us, that a mixture of commercial nitric and sulphuric acids, even in very variable proportions, will, when heated with naphthaline, readily yield colored products, we have naturally been led to examine the action of concentrated sulphuric acid on the various nitrogenized compounds of naphthaline.

This is a very difficult stu y, however simple it may at first appear, because the least changes of the condition under which the experiment is performed, exercise a sensible influence on the results. The dye principle formed, possesses the property of madder in dyeing with mordants; its color varies from red to blue, and passes through all the shades of violet.

The blue was only obtained accidentally; and we are unable to state the precise conditions of its formation, though it appears to be due to molecular change in the nitrogenized naphthaline compound, under the influence of a physical agent.

As the violet-blue tints are the most beautiful, we have devoted most of our attention to them, and have endeavoured to produce them. We soon found that binitronaphthaline, heated with sulphuric acid only, was best suited to our purpose. In his last communication to the Institute M. Roussin says :—"By making concentrated sulphuric acid react on binitronaphthaline, no reaction takes place. The binitronaphthaline is completely dissolved when the mixture is heated to 250°, and the liquid takes hardly an amber color. After boiling for a long time, the concentrated sulphuric acid began to react on this substance." Binitronaphthaline resists the action of sulphuic acid at a very high temperature, however, at about 300°; the color of the solution, at first slightly yellow, deepens more and more, becomes cherry-red, and finally brownish-red, beginning, at the same time, to disengage a small quantity of sulphurous acid.

The substance is then taken from the fire, and left to cool when it is poured into a proper quantity of water and boiled. The liquid, filtered whilst hot, is of a deep red color, and deposits part of the coloring matter in a flaky state. Alkalies change it to violet red; and even when cold, silk was easily dyed violet by it. After being properly saturated with alkalies, and finally with a little chalk, it dyed mordanted cotton tissues with different shades, varying from lilac to black. The lake alum, tin, and lead for a base, are violet; those with iron for a base, were olive, and sometimes reached to black.

This solution does not seem to alter even during any length of time, in presence of sulphuric acid; though, when in contact with air and excess of ammonia, it changes to brown in a few hours, depositing a black powder, which becomes blue dissolved in alcohol, and red in acids.

The black mass proceeding from the precipitation of the sulphuric solution by water, contains a large quantity of coloring matter, has a beautiful gold reflection, is very soluble in alcohol and pyroligneous acid; but very little soluble in water, ether, benzole, and bisulphide of carbon. It has many chemical analogies with alizarine. The dyed tissues bear brightening with soap.

With binitronaphthaline and concentrated sulphuric acid only, without making use of a reducing agent, a coloring matter may be obtained with marked analogies to alizarine in its chemical properties.

Gases Given Off by Plants Under the Influence of Light.—M. Boussingault has discovered, says the *Comptes Rendus*, that under the influence of direct sunlight, the leaves of aquatic plants give off a notable proportion of carbonic oxide and carbureted hydrogen. He thinks that this emanation of carbonic oxide may be one of the causes of the unhealthiness of marshy districts. The fact he points out is important, and the subject will, no doubt, receive further investigation.

The price of crude petroleum at "Oil City," Pa., is but six cents per gallon.