

simply reducing its thickness and employing a covering of timber, cotton, woven wire-rope, yarn, or hemp in any form, rubber, wool, hair, or any other article which will produce the required effect; only in front of, instead of, as heretofore, behind the metal armor, as shown, and that vessels, in consequence, are much more sea-worthy, and are, in short, greatly improved. One iron-clad battery, at Greenpoint, the *Onondagua*, has been covered with this timber-facing outside of her regular mail, of four and a half inches solid plates, in exact accordance with the Heaton plan.

This invention was patented on the 14th April, 1863. Further information can be had by addressing the inventor, C. W. S. Heaton, at No. 200 Lewis street, New York, or W. H. Webb, New York city.

THE SLIDE VALVE.

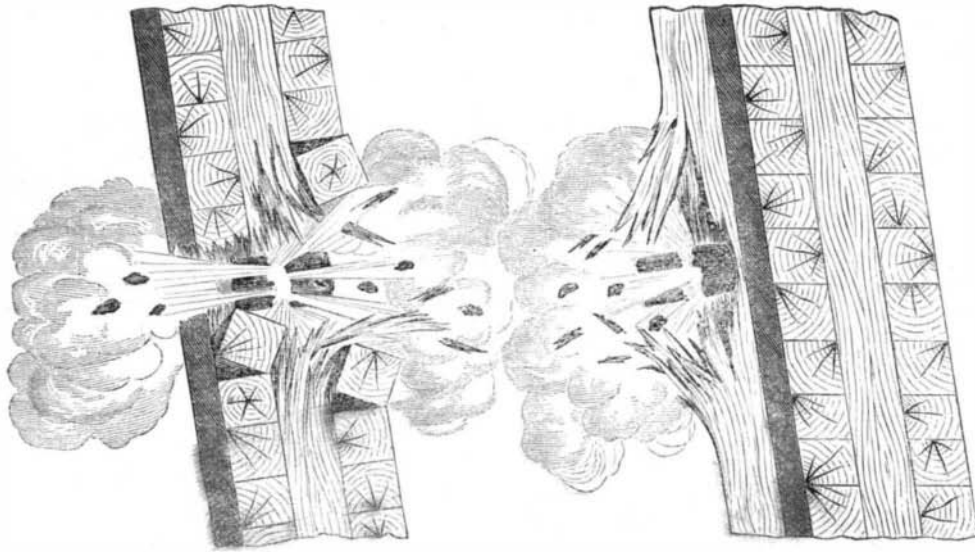
This most essential detail of a steam engine is very often badly constructed, set and run. The valve may be called the heart of the machine, and any derangement in its functions results in loss of money, power, and reputation of the builders and all concerned in running or erecting steam machinery. In many places we have noticed a disregard of the commonest principles connected with the designing of slide valves, and deem it our duty to point out some frequent errors, so that they may be detected and rectified.

When the lead on the steam side of the valve is open, the exhaust side is closed and the steam behind the piston cannot escape until the valve has traveled far enough to open the exhaust port, which is a greater or less distance according to circumstances. This is one and a very serious defect; a piston is not meant for a punch, and steam is of so subtle a nature that, give it but the slightest opening and it will rush through like lightning. To remedy the evil just mentioned, take the steam chest entirely off the cylinder, if possible, take up the valve, and with a square and a scriber mark off the width of the faces which cover the ports on the outside of the valve; pursue the same course with the ports on the cylinder; then replace the valve, make the connection with the valve stem, and turn the crank on the center; the relative situations of the steam and exhaust ports will then be apparent at a glance if the eccentric is properly set. The distance or amount of opening which is proper on the exhaust side of a slide valve varies with the effect desired to be produced, and also with the ideas of different engineers; some claiming that a small amount of lead should be given to the exhaust, so that a portion of steam will be retained in the cylinder for the piston to cushion against; thus producing an elastic vapor which reacts to advantage when the cranks are passing the center.

This is not entirely our view of the subject, nor do we wholly believe in it; a little reflection we think will show that cushioning is of doubtful advantage; as a measure of economy it is useless. In the extreme compression which occurs at the end of the stroke, the crank is in fact one arm of a toggle joint—one of the strongest mechanical agents known through which to exert force—and steam even of a high tension would be, or could be, raised still higher in temperature by the compression to which it is subjected, but even then it would exert a bad effect upon the live steam entering from the boiler. Of course we do not here condemn such cushioning as is absolutely necessary to safety; in locomotive or high speed screw engines, for instance, a certain amount of compression at the end of the stroke is essential to the safety of the machinery. The theory of compression is, however, a dangerous one, especially to novices in engineering, who are liable to overstep the bounds of science and cause loss where they intended gain. There is much more benefit to be derived from a clear field for the piston, or from the partial vacuum

which is obtained through large exhaust passages and properly set valves, than in all the fine-spun theories about cushioning, filling the passages with steam, &c.

In designing the outward form of slide valves there is a great deal of carelessness exhibited respecting the amount of surface exposed to the action of steam. Fillets are made unusually large, flanges extended unnecessarily, and extraordinary lap introduced, until the aggregate value of all the useless surface amounts to an addition of many hundred pounds pressure on the valve, when the steam worked is of a high pres-



sure. Every useless square inch of surface represents the amount of steam pressure in the chest added to the friction of the surfaces in contact, and these details are so great in large valves that it is important to save every sixteenth of an inch that can be subtracted from the valve, without injuring its proportions. The line of contact of the seat and valve, or the two faces of the same, should be as accurate as possible, and this detail requires close attention in order to make the valve work with economy. After an engine has been running for some time the seat acquires a glazed surface, which is very difficult if not impossible to cut with a file or scraper, and the proper way is to make the valve and seat true at first, and not trust to its wearing fair in time, although this method is often practiced. The valve should be surfaced true by the aid of a metallic face plate, where it is possible, and the seat should then be scraped from the valve. When the valve is put into the chest, the faces of both it and the seat should be carefully cleaned with a pocket-handkerchief, so that no grit or dust, even, can possibly remain upon either; as the smallest particle will in a short time ruin the faces by working seams or ruts through which the steam leaks. The balancing of slide valves should also be attended to; a portion, at least, of the pressure might be taken off with advantage, and the mechanical effect would be much increased thereby. A well-proportioned slide valve is a most excellent device; it is one of the simplest and most effective valves, when well made, and much study might be given to it with advantage.

COLD QUARTZ-MINING IN CALIFORNIA.

In currency gold is a medium of exchange; in commerce it is an article of barter, like copper or iron. Metals differ greatly in intrinsic value. Thus, an ounce and a half of gold is equal in value to about a ton of pig-iron. Being used so extensively for coin, and in the ornamental arts, gold always has been in great demand, and the country which yields it as a natural product, obtained at a moderate expense for labor, possesses great commercial advantages. The immense quantities of gold which have been shipped from America to Europe, have been like exports of copper, wheat and timber, exchanged for articles of clothing, cutlery, tea, coffee and sugar. Gold mining, like any other business, is profitable or unprofitable, according to the expense incurred in obtaining it. No metal is more universally distributed than gold. It is found in the sand of most rivers, and in nearly all alluvial deposits, and from these it can be separated by refined mechanical and chemical operations; but after all there are comparatively few sections of

the globe where it can be profitably collected. America is one of the few countries which possesses extensive rich gold fields—that is, localities where the metal is thickly distributed among alluvial deposits, or confined in comparatively large quantities in veins of quartz. Already immense amounts have been gathered from the “placers” of California; but the whole of the Rocky Mountain ranges, on the east as well as the west side, contain quartzose veins rich in metal, and these may be worked with profit for centuries to come. Not only California, but the Colorado Territory has become a gold-yielding country. We have obtained some interesting information on this subject from Messrs. Davidson and Pomeroy, of Davenport, Iowa; the former having been an engineer and explorer in the Rocky Mountains for thirteen years, and who is now in the Colorado Territory. We learn from a communication sent us, that the quartz of Colorado is different in some features from that of California. It is very rich in the precious metal, but it contains much sulphuret of iron, which prevents the mercury acting upon all the gold in the crushed quartz. It is

calculated that only about twenty per cent of the gold is obtained by amalgamation, and that there is a loss of about 80 per cent. in the tailings. Yet, although there is such a loss of gold, the Colorado quartz is so rich in the metal that mining seems to prosper amazingly. We learn that about \$20,000,000 will be the yield of the mines this year; which is extraordinary, considering the short period since they were opened. So important has the Colorado Territory become that a United States Mint has been erected at Denver City. A line of telegraph passes through the place, and there is a line of stages constantly running, making the trip in about six days between there and the railroad terminus on the Missouri river.

MISCELLANEOUS SUMMARY.

HOW CHANGE OF SEX IS ACCOMPLISHED IN A BEEHIVE.—Carpenter informs us that in every hive of bees the majority of individuals are neuters, which have the organs of the female sex undeveloped, and are incapable of reproduction, that function being restricted to the queen, who is the only perfect female in the community. If by any accident the queen is destroyed, or if she be purposely removed for the sake of experiment, the bees choose two or three from among the neuter eggs that have been deposited in their appropriate cells, which they have the power of converting into queens. The first operation is to change the cells in which they lie into royal cells; which differ from the others in form, and are of much larger dimensions; and when the eggs are hatched, the maggot is supplied with food of a very different nature from the farina or bee bread which has been stored up for the nourishment of the workers, being of a jelly-like consistence and pungent stimulating character. After the usual transformation, the grub becomes a perfect queen, differing from the neuter bee, into which it would otherwise have changed, not only in the development of the reproductive system, but in the general form of the body, the proportionate length of wings, the shape of the tongue, jaw and sting, the absence of the hollow in the thighs where pollen is carried, and the loss of power of secreting wax.

ROYAL GOOD SENSE.—The Rev. J. C. Fletcher, describing his entertainment by that model Emperor of Brazil, Don Pedro II., writes: “The Emperor’s amiability itself, while the princesses are receiving such an education—practical and accomplished as would make all sensible parents in the United States rejoice, and desire that their daughters, too, might be so wisely trained. In reference to practical details I may mention that each of the princesses possessed a beautiful sewing machine of the Wheeler & Wilson

patent, and busy needle-music is heard in the palace each day at the appointed hour for such recreation."

ARSENIC AS A PREVENTIVE OF DISEASE.—M. Montigny, French Consul in China, in reference to the use of arsenic by the Northern Chinese, says they mingle it with their smoking tobacco. According to missionaries who have lived a long time there, tobacco free from arsenic is not sold. The same witnesses assured the consul that the arsenic smokers were stout fellows, with "lungs like a blacksmith's bellows, and as rosy as cherubs." The publication of M. Montigny's statement has called out a letter from Dr. Londe, who announces that some years ago, in the course of a discussion at the Academy of Medicine, on the agents to be employed to cure tubercular consumption, he told the assembled doctors that he had found but one successful means of combating this dreadful disease, and that means was the smoking of arsenic. The doctor re-affirms his commendation of this remedy.

SHODDY.—Many persons have heard of shoddy who do not know its nature and use. It is made from woolen rags, which are torn and cut up by machinery for the purpose of mixing the product with new wool, to be made into cloth and other woolen fabrics. Cloth made with a mixture of shoddy is inferior in strength to that made from fresh wool, because much of the old rags from which the shoddy is made is rotten, and has lost its original strength of fiber. Shoddy is employed very extensively in the manufacture of cheap woolen goods, which do not wear half so long as those which are somewhat higher in price, made of clean new wool.

SUCCESS OF DABOLL'S FOG SIGNAL ABROAD.—Daboll's fog trumpet, about which so much has been said, has at last, after persistent efforts by the inventor, been adopted by the English Government. Recent experiments made in England prove that this fog trumpet can be heard further than any others in that country. Steps are being taken to make an immense machine of this description, to be placed on Cape Race, where so many accidents have repeatedly occurred. We are pleased to hear of Mr. Daboll's success; he has shown the right spirit on this subject and pushed his claims with great energy for many years.

PORT-HOLES IN THE MONITOR TURRETS.—The holes for the guns in the monitor turrets are by some shops cut out of the solid metal; when the turret is completed, a boring head, provided with cutters like lathe tools is set on a shaft in a frame made for it, and brought into contact with the turret wall: when power is communicated to the boring head by a small engine the cutters soon make a large hole 15 inches in diameter. The plates are cut out; the iron is not removed bodily but in disks. Other shops punch the hole in each sheet before the turret is set up and then dress the aperture out neatly after all the plates are erected.

GEMS OF COLORADO.—Among the rocks in that territory are found beautiful translucent quartz crystals, tinged with crimson and purple, and often classed as amethysts, amazon stones, beryls, opals in varieties, garnets and turquoise. On the plains are found the most beautiful and curious of agates, birdseye, cats-eye, moss and fortification. Sardonyx, jasper and malachite also abound. Here, too, are obtained fossils in great abundance. We understand that these precious stones are beginning to be kept for sale at all the jewelers' shops in the territory, and we wonder they have not yet found their way to New York.

A LARGE fly-wheel weighing 60 tons was recently constructed in England and put together in several parts; the rim was in four sections and the light arms and center were also cast separately; when finally adjusted it ran only one-fourth of an inch out of truth.

SOME of the English peasantry took the recent earthquake for a sign that the world was coming to an end, and packed up to emigrate to America, to avoid the calamity.

A BALE of cotton recently received by Wm. Pollock, of South Adams, contained a stick of yellow pine weighing 186 pounds, which at 90 cents per pound cost \$168 40.

THE steamer *Daniel Drew* has been cut in two, and will have fifty feet added to its length: this is one of the fastest boats that ever ran on the North river.

POWDER OF MILK.—The powder of milk, added to water, forms an agreeable drink, and an excellent substitute for milk:—Milk, two pints; water, one ounce; sugar, one pound. This mixture is then to be gently heated and constantly stirred. When it is three-fourths evaporated, the sugar is to be gradually added and the whole briskly stirred. After it is perfectly incorporated, the mixture is to be removed from the fire, poured into plates, and dried in an oven. When perfectly dry it is to be finely powdered and kept in well-stopped bottles. One or two teaspoonfuls is sufficient for a cup of tea or coffee.

INDIAN MUSLIN.—It appears that the manufactures in Bengal were formerly incomparably finer than they are at present; there was a sort of muslin called Abrooan, which was manufactured solely for the use of the emperor's seraglio, a piece of which costing 400 rupees or \$250, if spread upon wet grass, would have been scarcely visible. In the Nabob Alaverdy Khawn's time, a weaver was chastised and turned out of the city of Dacca, for his neglect, in not preventing his cow from eating up a piece of the same sort of muslin, which he had spread, and carelessly left on the grass.

BORING LARGE CRANKS.—In our large machine shops the shaft holes in heavy cranks are cut out of the solid metal by long-legged cutters set in a cast-iron head. These tools remove a central core from ten to fifteen inches in diameter. One side is run down first, the crank is then reversed, and the second cut started from the opposite side; when both cuts meet the core drops out, and the hole only needs a little trimming to be completed.

It is interesting to note that the school books lately published by the Austrian Government are printed on paper made of "corn shucks," or the leaves which protect the ear of maize. This material gives the page a yellowish color, which medical men hold to be less fatiguing to the eye than our snowy pages.

An explosion of detonating powder took place recently at the American Cap and Flask Company's factory, Waterbury, Conn., by which the lower part of the building was shattered. A returned volunteer named Edward Rush seized a bucket full of the explosive mixture and carried it out at the risk of his life.

WE hope our readers will not omit to notice the proposals for a steam car issued by a Cincinnati railroad company; the advertisement can be found on page 15 of the present number of this paper: the adoption of steam on city railroads is a thing urgently needed, and we are glad to see sufficient enterprise manifested to give it a fair trial.

EXPERIMENTS are being made in France with a new kind of rocket, which is to prevent the enemy from working at night. Besides giving a most brilliant light, illuminating a distance of 200 meters when let off, it offers the additional advantage of finally bursting like a howitzer, and carrying wholesale destruction into the hostile camp.

A PATENT has just been taken out in England for perforating the leaves of books and pamphlets after the manner of postage-stamp sheets. If the invention can be applied, all those who read will rise up and call the inventor blessed, as the necessity of using paper cutters will be removed.

A SCIENTIFIC expedition, led by the eminent north-country naturalist, the Rev. H. B. Tristram, of Great-ham, is on its way to Syria. The members will employ themselves several months in exploring the zoology, botany and geology of that interesting land.

WE are indebted to Hon. P. H. Watson, Assistant Secretary of War, for a copy of the Report of the Secretary of War and also of the Commander-in-Chief Gen. Halleck.

Shelter for Sheep.

There is no season of the year when sheep are more liable to lose nearly all they have gained than during the fall and early winter; and if they do, there is an end to the hopes of a crop of wool. For the want of food has the effect of stopping the growth of the wool, and the moment the growth is stopped, the end of the fiber is completed; a change takes place, it becomes dead, in a manner analogous to the stem of ripe fruit, and a renewal of good feed after these months, and after the growth of the wool has been

once stopped, only prepares the skin to send forth a new growth that pushes off the old fleece, and causes it to be lost before shearing time. Nothing is more evident from this than that the economy of the wool-grower consists in keeping his sheep well fed during the early part of winter, and also well protected from storms; for it is plain from the fact that wool begins to grow, even on poorly kept sheep, as soon as the temperature of spring permits the animal economy to divert some of the supplies from being consumed in keeping up the vital organization, to the increase of the fleece, that heat has as much to do with the growth of wool as with the growth of plants. Hence we say give sheep protection at an early date.

NEW BOOKS AND PUBLICATIONS

THE NATIONAL BANNER. Published by Delphine H. Baker, 37 Park Row, New York.

This is a weekly journal, issued, as its prospectus says, for the purpose of creating a patriotic fund for the benefit of the sick, wounded and disabled soldiers and their families, by giving 50 per cent of all the subscriptions received for said paper to the maintenance and support of such fund. The enterprise is favorably looked upon by several members of Congress and other gentlemen, and the lady publisher has the support and good wishes of the most respectable portion of the community. The character of the paper is elevated, and the contents a miscellaneous compilation of the current items and topics of the day, interspersed with literature, religious matter, poetry, &c. The subscription price is \$1 50 per annum, half of which goes to the "Soldiers' Fund," and the other half to the maintenance of the *Banner*. It is also in contemplation to sustain a course of lectures in connection with the same object—the collection of a fund—and several eminent clergymen and others are named as lecturers, one-half the proceeds of which are to be devoted to the fund. This is a good opportunity for our readers to show their patriotism. The first lecture was given on Saturday, Dec. 12, at the Cooper Institute.

THE ILLUSTRATED ANNUAL REGISTER OF RURAL AFFAIRS FOR 1864.

We always receive this interesting annual with great pleasure. Nothing is better adapted to entertain and instruct farmers and all who take interest in matters about the farm-yard. The "Register" has been issued for ten years from the office of the *Country Gentleman*, at Albany, N. Y., by the publishers, Luther Tucker & Son, price 25 cents. The number before us contains a calendar adapted to the Northern States, also 130 excellent engravings, relating to the management of swine, road making, the dairy, fruit culture, the poultry yard, cheese making, and other subjects valuable to the farmer, gardener, and householder.

THE PHRENOLOGICAL JOURNAL.—This instructive periodical commences new volume with the new year. Those who desire to provide themselves with a most interesting and at the same time most intellectual fund of reading matter, should subscribe to this excellent periodical. The amount of engraved portraiture which appears in its columns is quite large, and of itself treble worth the cost of subscription. Fowler & Wells, 308 Broadway, New York.

Forests a Necessity of Fertility.

The value of forests to a country in retaining moisture is well illustrated by the late severe freshets of the Connecticut valley. The snow melts quicker in an open country, and is retained longer among groves. Formerly the Connecticut River and its tributaries were clothed with forests; now they are largely denuded, and we have reason to expect greater freshets than formerly. The present barrenness of Greece and Palestine, as contrasted with their former fertility, is similarly accounted for. Dr. Unger, a celebrated naturalist of Vienna, claims that the climate lacks its original moisture. He says that the hordes of warriors that have followed each other for centuries on that soil have burned up the forests, and every effort of nature to make restoration is subdued by a superabundance of goats. The population live on the products of the goats, and the goats crop every twig, thus bringing barrenness. If the forests should ever again grow, Dr. Unger thinks that fertility would be restored.