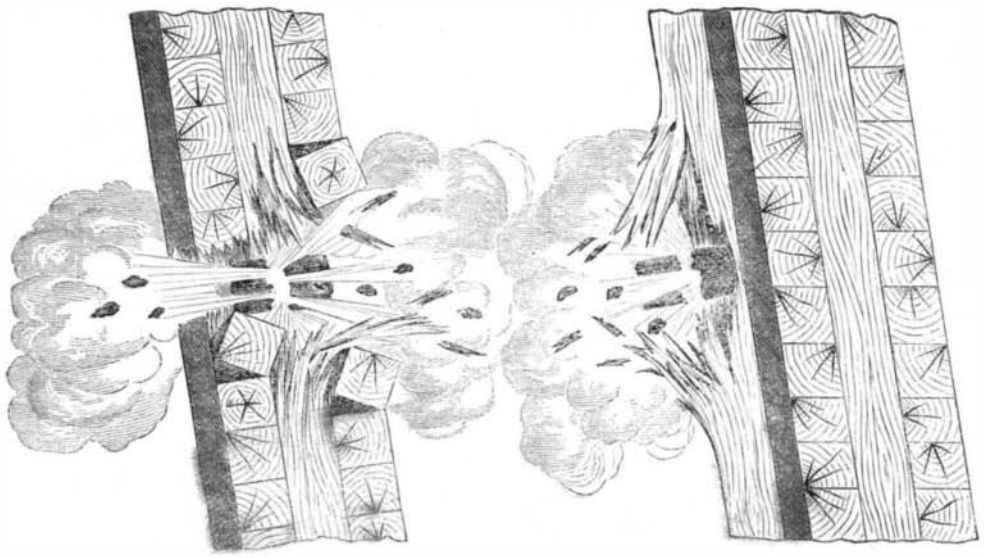
simply reducing its thickness and employing a covering of timber, cotton, woven wire-rope, yarn, or hemp in any form, rubber, wool, hair, or any other article which will produce the required effect; only in front of, instead of, as heretofore, behind the metal armor, as shown, and that vessels, in consequence, 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 possesses 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 pressure. 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.

GOLD 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 tun 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 obtainded 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 is 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 [illegible] may mention that each of the princesses possesses a beautiful sewing machine of the Wheeler & Wilson