crown sheet; if there is, it must be removed. Salt water deposits scale very fast (we have some in our possession over two inches thick, being a part of the lining formed in the boiler of the steamship *Cahawba* some four or five years since), fresh water not so quickly; in all hard water, however, there is more or less lime, which acts injuriously by forming a base to which the other salts and minerals, held in suspension by the water, adhere. Some engineers remove the scale by a pick hammer made for the purpose; they are not very efficient and are dangerous tools in the hands of inexperienced persons. Another plan to remove scale is to produce a sudden heat by a train of shavings or turpentine in the flues and fire-box when the boiler is cold; the expansion of the metal cracks the parasitic coating, and is supposed to remove it in sheets of greater or less size. This method works tolerably well, but cannot be relied on in all cases; it is also dangerous as being liable to burn the boiler. The best way to remove scale without harm to the boiler is to take either slippery elm, flaxseed, or any other mucilaginous seed or bark and throw it into the boiler; by some peculiar action, which we are unable to solve, the scale is loosened and comes away in large pieces, and may then be removed through the hand-holes. We have tried the slippery elm with success in many cases, and it has never failed us.

If the stay and socket bolts of the water-spaces leak, they must be taken out and replaced; they are beyond remedy. The flues, by which the heat is arrested in its passage and imparted to the water, should be as clean as possible, and ought to be swept every week; dust and cinders accumulated in them check their conducting power, and the temperature in the smoke-box will be much higher than it ought to be if they are neglected. So also with the deposits in the fire-box from the grate. Many ignorant engineers permit a stratum of ashes to lay around the edges of their grate bars and the water bottoms, supposing that leakage is prevented thereby. We desire to inform such slovenly persons that the leaks have been caused in the first place by this very practice; doubtless they apply the poultice on the principle that "like cures like;" at all events it is a nuisance that should be stopped. So also with the water bottoms and legs of the boiler, keep ashes and water away from them and they will last longer. If leaks occur, stop them in a legitimate way; send for a boiler-maker and have them caulked, though an engineer should be capable of doing such work himself. It has been asserted that horse dung, slippery elm, flock and other fibrous or flocculent matter would stop leakage in a steam boiler. This may be a convenient practice, but it is an empirical one; a leak in a boiler is evidence of weakness in that part, the object is not to cover it up, but to strengthen it, and this can only be done by caulking or by renewing the seam with another sheet.

Finally, in reviewing this subject, let us assert that although the origin of steam-boiler explosions cannot be positively stated, we know that certain causes produce certain effects, and that neglect and carelessness have no business any where in mechanical matters, much less ought they to be visible about steam generators. Boilers should be clean inside and out, and strong as well. It is of no use to put on dabs of putty to hide leaks, or to fill a boiler half full of horse manure for the same purpose. Make a radical cure, take out the bad part and replace it with a new one; if the cocks leak—the blow-off or gage—grind them in and make them tight. The blow-cock too often runs away with fuel that no one thinks of; it permits the heated water to dribble out, little by little, this water has to be supplied by other, less hot, thus incurring a needless expenditure. Stop it. Grind the plug in tight. Take care of the safety valve, and don't have it sticking fast, or corroding, or leaking, try it everyday; load it properly and use it properly and it will do good service, but not otherwise. How many engineers are there in this city or in others that will conform to the above rules—reliable and standard ones, and proved by actual practice and experiment?

PENNIES.—People who pay a premium for pennies are perhaps not aware that the United States Mint at Philadelphia will exchange any quantity of cents at par for Government currency.

BREECH-LOADING versus MUZZLE-LOADING GUNS.

An interesting communication on the above subject, on another page, deserves general perusal. The differences in the general construction and use of muzzle-loading and breech-loading fire-arms are pointed out, but so far as it relates to their comparative efficiency, all the questions involved have not been presented. At short range the old smooth-bore American musket, with a cartridge containing one ball and two buckshot, was more destructive of life, in battle, than the rifled musket. For general service, however, the latter is esteemed the best, because it is more accurate at longer ranges. Our correspondent asserts that the accuracy of a gun depends mainly on the weight of the barrel and the finish of the bore; and as a breech-loader can be furnished with a barrel like that of a muzzle-loader, he concludes it must be far more efficient, as it can be loaded and discharged fifteen times faster.

It is indeed self-evident that if a breech-loading rifle can discharge all its bullets as accurately as a muzzle-loader and fifteen times more rapidly, it must be fifteen times as efficient. But here lies the doubtful point. The weight of the barrel and the finish of the bore are not the only elements of accuracy in a rifle. We have heard first-class marksmen, who had tried all kinds of breech-loading and muzzle-loading rifles, assert that the former were not reliable—they could never trust them in shooting a string of shots. Three reasons have been given for the superior accuracy of muzzle-loaders. First, a rifle will not shoot accurately unless its bore is kept clean. When loading at the muzzle, the cartridge or the patch carries down the residue of the former charge, cleaning the barrel and giving the bullet a more free passage out. In a breech-loader the bullet carries the residue or dirt before it, thus impairing its free and equal egress. Second, the bullet must be perfectly centered and fitted in the bore when it is loaded or it will not carry straight when discharged. It can be perfectly centered and swedged, if required, at the muzzle and rammed down accurately, so that its flight may be trusted. In the breech-loader this cannot be so perfectly accomplished. An exception to this may be claimed for the chambered breech-loading rifles. Third, muzzle-loaders are not liable to leak at the breech; but in breech-loaders the flash of the charge in the face of a marksman renders his aim unsteady—he becomes liable to shut his right eye and dodge when he draws the trigger. We have seen this exemplified in the use of the earlier Sharp's rifles. Copper cartridge cases obviate leaks at the breech, but they are too expensive for use in the army, and a good fire-arm should be capable of use both with and without a cartridge. Unless a rifle can be trusted for accuracy, the rapidity with which it can be loaded and fired is of but secondary importance. Breech-loading rifles are more complex in their construction than those which load at the muzzle; still soldiers may keep them in good condition with very little more care. If the conditions of accuracy belonging to muzzle-loaders and a perfectly close fit in the breech were supplied to them, they would be far more efficient and desirable. We have understood from verbal reports that the large number of breech-loading rifles furnished to the sharp-shooters in our army have not given satisfaction. Reliable information on this subject would be instructive, because rifles, like machines, can only have their relative merits fairly tested by actual service for a considerable period of time—not by a few trial shots.

SORGHUM CANE AND SUGAR.

Sugar has become one of the necessaries of common life in all countries. Hitherto its chief supplies have been obtained from cane cultivated in hot latitudes. The possibility of deriving sufficient quantities from a species of cane cultivated in mild latitudes, such as in our Northern and Western States, forms a subject of deep and general interest. The farmers in our fertile Western and North-western States have lately devoted much attention to this question, and from information with which we have been furnished, we believe it is proceeding toward a satisfactory conclusion.

Conventions of the cultivators of the sorghum cane and manufacturers of apparatus, sirup and sugar, have been held in various States, and the proceedings of these have been briefly noticed in our columns. At such a convention, held at Columbus, Ohio, it was asserted that the sugar of the Chinese and imphee canes was grape, not cane, sugar. This is an important feature of the case, because the latter sugar possesses more than double the sweetening power of the former. In order to solve the problem samples were sent to Mr. C. W. Wetherell, Chemist of the Department of Agriculture, in Washington. In his report on the subject, dated January 13, 1863, he says that he has examined two samples of the sugar (one from C. Cory, of Lima, Ind., and the other from J. H. Steel, of Ohio) by the microscope and with polarized light, and compared them with New Orleans sugar, and he has no hesitation in pronouncing them cane sugar.

A convention of sugar-growers was held at Adrian, Mich., on the 23d of January last, at which Mr. C. Cory presented the following report, which contains much practical and interesting information:—

Of the several samples of sugar noticed in your premium lists, two lots representing some fifty pounds of the same grade, were made purely of the common Chinese cane, the four other lots were manufactured from the new variety known as the "Otaheiten" or "Sugar Cane," and represents upwards of seventy pounds, produced from a half load, i. e., 1,264 lbs. of cane. The crop was grown on a rich prairie soil of sandy mould. It was planted about the 10th of May, and was much retarded by deep covering and by long, heavy rains, but grew rapidly during the middle and later part of the season. Lime, ashes and plaster were used in the hill during its early growth. About the first week in October the leaves were stripped and the cane carefully sheltered. On the 8th of the following month the tops of the stalks were taken off, and from five to six feet of the butts passed carefully through the mill, giving 57 per cent. juice and 43 per cent. bagasse. To the juice a small quantity of liquid lime was added to neutralize in part its acidity, and to aid in its defecation. It was then divested of its scum and other impurities, and concentrated to its requisite consistency, by being passed in a thin, transverse current over the intensely heated surface of our clarifying and evaporating pan. After which it was strained through a linen cloth, while hot, into shallow boxes, and deposited in a warm room with a view to its granulation. As an unusual thing in the case of our Northern canes, it commenced granulating during the process of evaporation, and within about twelve hours after its removal to a warm room, formed almost a solid mass of crystallized sugar. That this is veritable cane sugar, and not sugar, as sometimes hinted, of a bogus kind called grape sugar, we have the enlightening testimony of numerous witnesses, including dealers, refiners and chemists of noted ability.

Mr. Cory has sent us two samples of sugars derived from Chinese and Otaheite canes cultivated in the West. He says:—"The profitable making of sugar from these, especially the Otaheitan variety, recently introduced, will, I fully believe, soon be most clearly demonstrated." We have also received a communication on this subject from J. M. Moss, of Waverly, Iowa, which we will publish in our next issue. It is our intention to present all the practical information we obtain on the cultivation of the sorghum canes and the processes and apparatus for making the sirup and sugar, so as to furnish all who are interested with reliable knowledge on the subject.

Chinese Grass---Flax-cotton Cloth.

We have lately examined samples of a very beautiful fabric made of wool and cottonized Chinese grass, by L. W. Wright, No. 140 Devonshire street, Boston. The grass is bleached and reduced to what is called "the cotton state," at a cost of only three cents per pound. Mixed with a certain proportion of wool it makes cloth of excellent quality. The fiber is long and strong, and the cloth soft and fine. We believe that this new fiber is superior to common cotton in its application to such purposes. It can be dyed by the same processes as cotton and common flax. We are always gratified to chronicle the introduction and success of any new manufacture. We have been informed, also, that quite a number of factories in New England have lately engaged with success in the manufacture of coarse flax fabrics, such as burlaps, &c., which were formerly imported from Europe.

NEW ZEALAND.—The European population of New Zealand is stated by the Registrar-general at between 101,000 and 102,000 at the close of the year 1861, but it was impossible to ascertain with absolute accuracy the number of the gold-diggers. The increase of population in three years had been nearly 72 per cent.

FINE specimens of coal have been found in Indiana, and the inhabitants of that State are confident the deposit will prove to be a rich one.