HYDRAULIC RIVETING MACHINE.

It is now no unusual thing to have boilers in use at sea with plates of one inch and even upwards in thickness. Such boilers require to be constructed with rivets of sizes that cannot be satisfactorily set up by mere manual labor; and of late years, after many applications of steam and gearing for this purpose, hydraulic power has been employed with the best results.

The first thing that strikes an observer of this new process, is the entire absence of that most deafening noise, the usual accompaniment of ordinary riveting; and a little further attention will show that this absence of noise is its least merit. By the quiet, steady pressure, rivets are enlarged throughout their length, and fill up all roughness or irregularities inside the punched holes they enter, so that they remain firmly fixed, even when one or both of the heads are cut off, and must be drilled out altogether should it ever be necessary to remove them. The pressure not only forms heads on the rivets, and effects the above named compression, but it holds them up, and the plates also, close together, until the former are sufficiently cooled to bear the strain, and even draws the plates closer together by subsequent contraction.

Our illustration shows Messrs. McKay and Macgeorge's patent hydraulic riveter, which bas been for some time in use at the Millwall Docks Engineering Works, London. This machine is one of the most powerful of its class, and gives a pressure of 60 tuns upon the rivet, an amount abundantly sufficient for the largest class of boiler work hitherto required for marine engines. Above the machine stands a powerful traveling crane, from which boilers are suspended over it, their (ordinary) horizontal axis, of course, then being in a vertical position. Circular seams of rivets are brought to the machine by the simple process of turning the boiler round on a swivel, and vertical seams, by raising or lowering it in the usual manner with mechanical arrangements of this class.

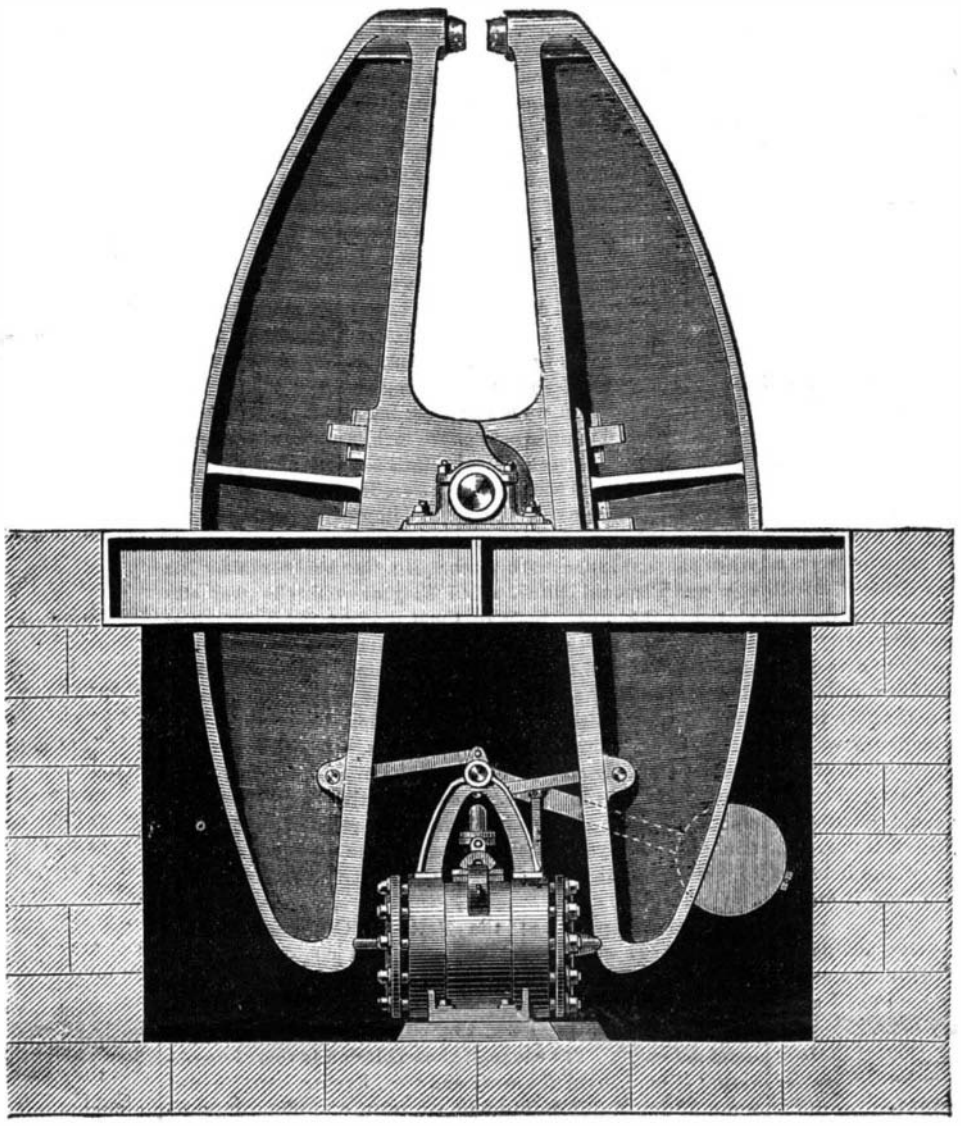
The pressure is derived from an accumulator, and it amounts to 700 lbs. per square inch in the present case. This pressure is only admitted into the large cylinder when the dies come in contact with the hot rivet, the slack being taken up by the action of a smaller cylinder. By this arrangement a considerable saving of power is effected; for if the large cylinder took its supply and moved the levers their entire distance by accumulator pressure, it is evident that great waste of power would ensue thereby, and in all direct acting steam-riveting machines this waste must come from the nature of their construction.

The hydraulic cylinder, and all valves, levers, weights, etc., are placed in a pit below ground, clear out of the way of men working, and safe from frost or accidental injury. Of course the pit is covered over, and in winter carefully protected from cold; and where, as is sometimes the case, these machines stand practically out of doors, a precaution of this kind should never be neglected.

The upper end of the powerful cast iron levers which form the most conspicuous part of this machine are perfectly free from all surroundings, except only a conveniently placed handle for starting or reversing; this handle stands behind one of the levers, and therefore does not appear in the present illustration. These levers are so strong that any accidental blow given to them can do no harm; and the readiest access is obtained to every part of the machine. Steel dies are simply placed in bored holes, and naturally hold themselves there.

When all is prepared, and a heated rivet in position, a movement of the handle admits high pressure water to the smaller cylinder, the dies rapidly close upon the rivet, the self-acting valves admit water to the larger cylinder, and without noise or vibration, the work is done. The dull, heavy pressure crushes together the thick plates; and after holding them and the rivet together for a moment that the latter may cool, the pressure is released, the dies recede, another rivet is soon completed, and a boiler is finished with astonishing ease and rapidity.

The distance, from the center shaft on which both levers work to the dies or center of the hydraulic cylinder, is 6 feet in the present case; so that, after deducting the center bearing and wrought iron straps to carry the tensile strain, there remains a clear space of 5 feet for boiler plates, and this is found to be ample for the several classes of work for which this particular machine is used.—*The Engineer.*



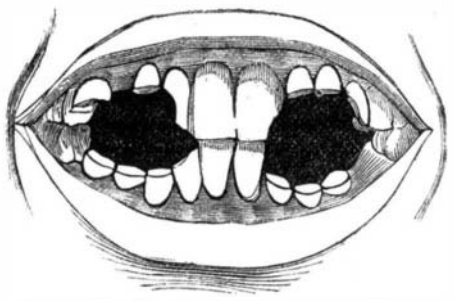
HYDRAULIC RIVETING MACHINE.

New Australian Trees and Plants.

Mr. Walter Hill, the Government botanist, has reported to the Queensland Secretary for Lands that his party have examined the banks of the Mulgrave, Russell, Mossman, Daintree, and Hull rivers, and have been more or less successful in finding suitable land for sugar and other tropical and semi-tropical productions. The ascent of the summit of Bellenden Kerr was successfully made by Johnstone, Hill, and eight troopers. At 2,500 feet in hight they observed an undescribed tree with crimson flowers, which excels the *poinciana regia, colvillia racemosa, lagerstroma regia,* and the *jacaranda mimosifolia.* At 4,400 feet a tree fern, which will excel in grandeur all others of the alboreous class. A palm tree at the same hight which will rival any of the British-Indian species in gracefulness. "On the banks of the Daintree we saw a palm tree cocoa, which far exceeds the unique specimens in the garden of the same genera from Brazil in grandeur and gracefulness. While cutting a given line on the banks of the river Johnstone, for the purpose of examining the land, an enormous fig tree stood in the way, far exceeding in stoutness and grandeur the renowned forest giants of California and Victoria. Three feet from the ground it measured 150 feet in circumference; at 55 feet, where it sent forth giant branches, the stem was nearly 80 feet in circumference. The river Johnstone, within a limited distance from the coast, offers the first and best inducements to sugar cultivation."

Effect of Pipe Smoking on Teeth.

Dr. Erich Richter, of Ula, Col., gives, in *Dental Cosmos,* the accompanying engraving of dental abrasion from the use of clay pipes. The patient, a miner, a native of Germany, addicted to smoking, could not refrain from it even while at work. It was his custom, while using the pick or shovel, to support the pipe between the canines and first bicuspids, and, when making heavy strokes, the pipe would move a little. After a few years he could close his teeth and still have room for the pipe.



The accompanying diagram illustrates the effect upon the teeth. The left superior cuspid is worn down nearly to the gum, and looks as though it had been filed for pivoting and then polished. The pulp cavity is not exposed, but is covered with so thin a layer of dentine as to make the touch of an instrument painful. The other abrasions are all in the form of a segment of a circle, and are all highly polished. The second left lower and the first upper bicuspids have been extracted. The teeth are all free from caries, but discolored badly.

New Local Anæsthetic.

Some time since the *Medical Record* quoted from an American source a statement that if camphor be powdered by rubbing it in a mortar with a few drops of spirit, and an equal weight of chloral hydrate added, a liquid is produced which is a valuable local anæsthetic. Mr. Lennox Browne, writing to the *British Medical Journal,* confirms this statement, and says that it is of the greatest value as a local application in neuralgia. Mr. Browne, having employed it during several months, has found great and sometimes instantaneous relief to follow its application in every case. It is only necessary to paint the mixture lightly over the painful part and allow it to dry. The application never blisters, though it may occasion a tingling sensation of the skin. The compound has also been found of great service in the relief of toothache. —*Pharmaceutical Journal.*

Death Valley.

According to the recent expeditionary report of Lieutenant Wheeler, the Death Valley in California is a detrital sink of unique physical characteristics. This whole region presents a series of valleys or detrital plains, each entirely inclosed by the ridges of Cordilleras that are more or less distinct as a series of mountain masses. The Death Valley proper is one of the most remarkable of all known interior continental depressions, and has portions near the center of its axial line below the level of the sea, although far inland, and lying much to the north of the lower border of the great interior basin. It is the sink of the Amargosa river, which has its source in the areas of drainage formed to the south and east of Belmont, Nevada, traverses the desert of that name while passing southward, until, reaching lat. 35° 41′ 5″, it makes an abrupt angle to the west, and thence, at right angles to the north, reaches the point of greatest depression, a little less than 500 feet below the sea level, in the heart of Death Valley proper. This valley, of the ordinary oval form, is fully 70 miles in length, varying from 5 to 15 miles in width, surrounded by frowning mountains of volcanic and sedimentary origin, the Telescope range, rising higher than 10,000 feet. The line crossing this dismal area from the mouth of Death Valley cañon to the thermal springs in Furnace creek, presenting a labyrinthine maze of efflorescent, saline forms, creates at the level of vision a miniature ocean, the vibrations of whose contorted waves has a sickening effect upon the senses. The lurid glare, horizoned by the bluish haze radiated from the mountain sides, appears focussed to this pit, though broad in expanse. It seems, coupled with the extreme heat, to call for the utmost powers of mental and physical endurance.

The journey through the Valley of Death occasioned the utmost apprehension, evinced through the entire season. To this was added the effect of the fearful cloud burst experienced while among the Telescope mountains, to the west, and the absence of the guide who had ventured toward the northwestern arm of the valley, it was feared to return no more. The transit of 48 hours, in a temperature that remained at 117° Fah. at midnight, so exhausted both men and animals that further travel was rendered precarious.

Testing Dyes for Adulteration.

Red dyes must neither color soap and water nor lime water, nor must they themselves become yellow or brown after boiling. This test shows the presence or absence of Brazil wood, archil, safflower, sandal wood, and the aniline colors. Yellow dyes must stand being boiled with alcohol, water, and lime water. The most stable yellow is madder yellow; the least stable are anatto and turmeric: fustic is rather better. Blue dyes must not color alcohol reddish, nor must they decompose on boiling with hydrochloric acid. The best purple colors are composed of indigo and cochineal, or purpurin. The former test applies also to them. Orange dyes must color neither water nor alcohol on boiling; green, neither alcohol nor hydrochloric acid. Brown dyes must not lose their color on standing with alcohol, or on boiling with water. If black colors have a basis of indigo, they turn greenish or blue on boiling with sodium carbonate; if the dye be pure gall nuts, it turns brown. If the material changes to red on boiling with hydrochloric acid, the coloring matter is logwood without a basis of indigo, and is not durable. If it changes to blue, indigo is present.—*Dingler's Polytechnisches Journal.*

Phosphoric Acid on Oats.

E. Wolff describes water culture experiments in which the nourishing solutions, eight in number, supplied graduated quantities of phosphoric acid. The percentage of phosphoric acid in the dry crop varied with the amount supplied. When this percentage fell below 0·33 (with good field oats it is about 0·44) the amount of straw seriously diminished, but an increase of phosphoric acid above this point did not increase the straw. The corn, however, was greatly affected by an increased supply, and gave by much the largest yield when the phosphoric acid reached 1·11 per cent of the dry crop. The ash of the straw contained no silica, none having been supplied; its percentage of phosphoric acid was 4·4—18·9, that in the ash of field oats (silica deducted) being 9·1. In the ash of the corn, the phosphoric acid varied only from 37·7—43·9 per cent, the percentage in the ash of field oats being 41·3.