Flanging Steel Plates Cold by Hydraulic Pressure.*

A pair of moulds were made to fit a hydraulic press, capable of exerting a pressure of about two hundred and fifty tons. They were so shaped that at one operation they would make a flange both on the outside and inside of an annular steel plate, and thus produce a double flanged annulus. A taper was given to the moulds, to facilitate the removal of the plate after flanging. There was a slight hollow, $\frac{1}{8}$ inch deep, formed on the annular face of the upper mould, and a corresponding rounding on the lower one, to flatten the face of the plate. Experience showed that in this mould, and also in the second mould, a depth of $\frac{1}{16}$ inch would have been sufficient.

The plates were Landore Siemens S.S. quality, $\frac{3}{8}$ inch thick. Their edges were beveled in the lathe to an extent of $\frac{1}{8}$ inch in the thickness on the inside, and $\frac{1}{16}$ inch on the outside edge; after flanging, a slight bevel suitable for calking still remained. Both the outside and inside circles were cut out in the lathe. These first moulds not proving altogether satisfactory, they were altered in shape, and turned on the working faces. The first plate was successfully flanged cold, with a pressure of about two hundred and fifty tons. In the second plate a little deeper flange was attempted, but it cracked at the inner flange. A plate of S. flanging quality was then annealed and tried cold; but it cracked in six places on the inner flange. A similar plate not annealed also cracked, but in one place only.

Some more S.S. plates were then ordered, specially for this work, and were flanged cold and unannealed. The first one cracked in the inner flange, but this was probably due to an attempt to get a very deep flange, standing up about $2\frac{9}{16}$ inches from the under side of the plate; the next, with a flange of about $2\frac{3}{8}$ inches deep, did not crack. The third cracked at the bend of the external flange, on the outside, showing a crack about three inches long nearly through the plate. A plate annealed for about four hours, and pressed when cool enough to be held in the hand, cracked badly at the inner flange. Two others, annealed for about sixteen hours, turned out quite sound.

A batch of twelve, heated in a plate furnace and cooled in ashes for forty-eight hours, were then flanged with perfectly satisfactory results, there being no sign of cracking even on the inner edge of the hole, where the best unannealed plates had shown slight signs of skin cracks, started, no doubt, by the roughness of the sharp edge. Another lot were annealed for about sixteen hours; but having had a thick layer of ashes over them, they were still warm when pressed. Out of four which were flanged two cracked, one slightly on the inner edge and one badly. The rest of these were put back to be carefully reannealed, and out of the fourteen twelve were sound.

In all these annealed plates the actual duration of the flanging process in the mould had been very short, from $\frac{1}{4}$ minute to $\frac{1}{2}$ minute. Another lot of twenty-one plates, thorough annealed, were now flanged, allowing the operation to extend over about $3\frac{1}{2}$ minutes; and at the same time the ragged edge round the hole was carefully filed off, so as to give no starting place for a crack. The result appeared to be satisfactory, as only two cracked, and those not badly. The approximate thickness of the edge of the external flanges was $\frac{13}{32}$ inch, showing an increase of $\frac{1}{32}$ inch; that of the internal flange was $\frac{5}{16}$ inch, showing a reduction of $\frac{1}{16}$ inch.

The average pressure required for the annealed S.S. plates was about two hundred tons. It would seem, as a general result, that for cold flanging, involving compression only, as on the outer flange, these plates, even of the lower or S. quality, are perfectly trustworthy, even unannealed; as only in one case did a crack appear in the external flange. But for flanging involving considerable stretching of the material, as on the inner flange, only S.S. quality will do at all, and the slightest irregularity in the metal will cause a crack. The results showed that this might be expected in from ten to fifteen per cent of the plates.

* Communicated to the Institution of Mechanical Engineers by Messrs. Easton and Anderson.

Native Potatoes.

Native potatoes have been discovered in Arizona by Prof. Lemmon. They were found in a cleft of one of the highest peaks north of the Apache pass, under a tangle of prickly bushes and cacti. Eager to know if the Solanum found was bulb bearing, he carefully uprooted the little tuber, which proved to be an undoubted representative of the true potato family. According to the researches and reasonings of Humboldt, this was the location to look for the home of the species from which our first potatoes sprang. In May last, Prof. Lemmon again set out in search of more specimens, choosing the Huachuca Mountains as his point for exploration.

These mountains have two peaks over 10,000 feet high, with sides furrowed into deep canons, those of the north-east being filled with trees, among which are maple and ash. In July last he discovered the potato plants he was searching for on the southwest side of the range, hidden among the rich bottom soil of a dell in a high valley. A few plants of the white species were found in full bloom, and farther on blue blossoms were found. The white flowered specimens formed tubers on shorter subterranean stems than the blue ones. The blue flowered potato plants sent off their runners from 18 inches to 2 feet. July 12, they were in full bloom.

The blossoms were large, and the white flowered were of a creamy white color, with greenish midribs to its corolla lobes. The subterranean stems were not longer than those of our common potato. The blossoms of the blue flowered are smaller, bright purple, with pale white midribs to the corolla, with fifteen to twenty flowers to a head. They are found at an altitude of about 8,000 feet in Tanner's canon, and some of the plants were 2 feet high. Later in the season they produced potato balls of unusual size, comparatively speaking.

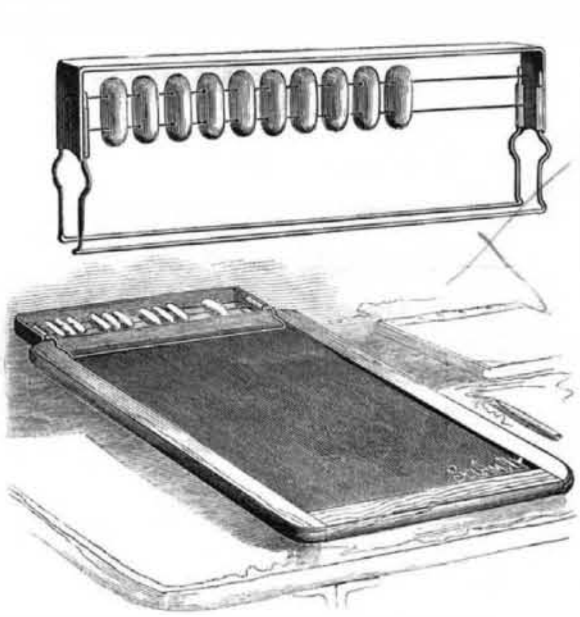
These native species of potatoes, which may have been and very likely are the original native stock from which all our potatoes now used have sprung, deserve a fair trial and careful propagation to develop them to the size now attained by our best potatoes. By the 1st of September the blue flowered plants formed bluish colored potatoes, oblong, about $1\frac{1}{8}$ inches long by half as wide, and a third as thick, with from four to ten unmistakable potatoes on each plant. The white flowered plants produced white potatoes, nearly round, from half an inch to 1 inch in diameter. These potatoes are unquestionably indigenous.

Still another variety was found near the summit of a peak 10,000 feet high, under the shade of fir, pine, and poplar trees, growing in soil kept moist during the greater part of the year by melting snows. Its nodding balls of ripened seeds were surrounded by golden-rods and brilliant asters. Their tubers were tinted with purple, and seed balls were either solitary or in pairs. Prof. Lemmon brought back with him over three quarts of these small potatoes, comprising the different varieties, besides some seed balls.

A hermit in these mountains, whom Prof. Lemmon interested in his discovery, has recently written him that in digging up the bed of an old pond he has secured a lot of these potatoes, perfectly white, as large as hen's eggs, which on being cooked tasted well, and have all the appearance of very fine potatoes. Various cultivators have manifested the utmost interest in Prof. Lemmon's discovery, and are making careful preparations to cultivate the specimens he has forwarded them.—*Pacific Rural Press.*

ABACUS ATTACHMENT FOR SCHOOL SLATES.

This invention is designed to facilitate the acquirement of the elements of arithmetic by young children. As is well known, in the best schools, those in which the method by



STEWART'S ABACUS ATTACHMENT FOR SCHOOL SLATES.

object teaching prevails, there is found a large abacus which is wheeled about the school-room, and a small one which is held in the hands of the teacher. The scholars, however, have heretofore been provided simply with pebbles or other loose counters, from which they have derived incalculable assistance, as in grouping the pebbles in order to illustrate addition, subtraction, etc., the eye of the young child assists his mind in forming just estimates of arithmetical quantities and processes. But the use of pebbles or other similar loose counters is attended with inconveniences. They take time and trouble in distributing them to classes and collecting them after recitations. They drop and make a noise, or they get mislaid, and confusion is created before they are found. Besides which they might prove a source of danger to children who have a habit of placing small objects in their mouths.

It is to obviate these difficulties that the "abacus attachment" shown in the engraving has been designed. The attachment is simply a set of counters strung on a wire or wires set in a frame which can be fixed to any slate in a moment, by means of spring brass wire clips. The frame can be of brass or wood, and the counters and wires as many as desired.

The abacus frame is of brass, and though light and graceful it is strong enough to outlast a dozen slates. At examinations it could, if desired, be instantly detached and laid aside. Not being a part of the slate frame, the destruction of the slate would not render it useless. It would simply be transferred to the next slate. It could be introduced into a school without inconvenience, as it can be made to fit any slate.

It thus seems to solve the problem of providing a far more convenient and easily handled set of counters than has yet been placed in the hands of young children, and it incidentally relieves the teacher of an appreciable amount of trouble. This invention has been patented by Mr. Henry Stewart, 254 W. 9th Street, Erie, Pa.

The Berthoud-Borel Electric Cable.

Mr. G. J. Lorrain gives the following particulars, derived from a visit to the factory in Switzerland, where the cables are made:

The insulating material now employed is formed of oxidized linseed oil specially treated. Oxidized linseed oil: that is, linseed oil heated in contact with air until it assumes a gutta-percha like mass, has, I believe, been tried before, but as an insulating material it is far from perfect. By the Berthoud-Borel process, however, a very excellent and cheap insulating material is obtained. Linseed oil is gradually heated up to a temperature of about 610° Fah., and at a certain stage of the operation, which the workman recognizes by the appearance which the viscous mass presents, colophane treated with oil is added, and the operation continued till the desired consistency is attained. A firm, coherent, and elastic substance resembling India-rubber is obtained.

The most interesting and by far the most important feature in connection with these cables is the method of manufacture and the machinery employed therein. The cables are not manufactured first and then inserted in lead coverings. The process is almost entirely automatic; you literally see the wire passing into the machine at one end and issuing at the other in the form of a complete cable, protected by its lead sheathing. The lead is put on in a molten condition, and the cables can be made of any desired length, however long. When the cable is meant to be laid under ground, it is passed through the lead press a second time, receiving a second coating of lead, with a thin coating of gas tar between the two. Cables thus formed can be laid underground without being incased in iron pipes, and without further protection. The insulating material employed, as it is not effected by alternations of temperature, admits of these cables being laid in troughs along the curbs of the streets, and close to the surface.

A noticeable feature of the factory is its quiet and holiday aspect. This is due to the small number of workmen required to look after the machinery.

Crackled Glass.

The *Moniteur de la Céramique* gives the following description of Bay's process for making the new kind of glass which is smooth on one side and rough on the other—*Craquelé Indien*. The roughened surface of the glass looks as if it was covered with cracks, and this appearance is obtained by spreading over the surface of a plate of glass a thick layer of some flux or easily fusible glass that has been made fluid or pasty and mixed with coarser pieces. The glass is then put in a muffle or an open furnace and strongly heated. As soon as this flux is melted and the glass itself becomes red hot, it is taken out of the furnace and rapidly cooled. This flux or fused glass then cracks off from the other glass which was attacked by it, leaving numerous depressions in the latter resembling scales and irregular crystalline forms, crossing and intersecting each other and producing very beautiful effects when the light falls upon it. This fusible layer is cooled as rapidly as possible, either by a current of cold air, or by carefully sprinkling with cold water.

If some portions of the glass are protected from the action of the flux, the surface remains smooth there in striking contrast to the crackled portion. This can be utilized in making arabesque, letters, and other designs on a white or colored ground.

A similar crackled glass is made in another way, by strewing a coarsely grained flux on a cylinder of glass while still red hot, and then putting it back in the heating furnace until the flux melts. It is then rapidly cooled, either by sprinkling water on it or waving it back and forth. The layer of melted flux then cracks off and exposes the surface of the glass which has been corroded by it. The cylinder is then cut and spread out in the usual manner.

The Oldest Locomotive Engineer.

Frederick Lunger, who died at Davenport, Iowa, a few days ago, aged seventy-five years, is said to have been the senior railroad locomotive engineer in the United States. According to the New York *Tribune*, his first experience in that calling was in 1835, on the Albion, an engine built by George Stephenson and run on the old State road from Philadelphia to Columbia, Pennsylvania. He remained constantly at the work of "engine driving" until 1856, when he retired to farm life. In 1876 he was invited by the late Colonel "Tom" Scott to visit the Exposition at Philadelphia, and on his way there and back again to Davenport he rode in his old place in the cab, and handled the lever as skillfully as ever, thus literally working his passage, although his pockets were full of first class passes over all the roads.

Professor Palmieri.

The death is announced of Signor Luigi Palmieri, well known in connection with the observatory on Mount Vesuvius. Although better known as an observer of earthquake phenomena, Professor Palmieri was not unknown in the electrical world. *L'Electricité* says that we owe a simple form of electrometer to him, constructed on the same principle as that of Pelletier. He applied his instrument to the construction of an original apparatus, designed to discover the frauds perpetrated by the venders of olive oil in Italy. M. Palmieri had peculiar ideas as to the production of electricity. He thought that the condensation of the vapor of water disengaged large quantities of it.