THE STATUE OF THE SUMERIAN KING DAVID.

BY EDGAR JAMES BANKS, FIELD DIRECTOR OF THE BABYLONIAN EXPEDITION OF THE UNIVERSITY OF CHICAGO.

The white marble statue of the Sumerian King David was discovered by the expedition of the University of Chicago while excavating at the corner of the ancient temple hill at the ruin known as Bismya, in Central Babylonia. Despite the discoveries of the fine old crematorium, the first that has come to light, and of the use of the arch in Babylonia as early as 4000 B. C., the finding of this ancient work of almost prehistoric art is one of the most interesting results of the expedition. When found it was lying upon its back, its head was missing, and the toes, which were broken from the feet at the time of its fall from the platform above, were lying just beneath it. The head was later recovered from another part of the ruin. In places, especially upon its face, is an incrustation of saltpeter, common to objects which have long been buried in the soil of Babylonia; other parts of the statue are as perfect as when it left the hands of its sculptor.

The statue is 88 centimeters high and 81 in the circumference of its skirt. The head is bald, the face beardless, the triangular eye sockets, to which ivory eyeballs were once fitted and held in place by means of bitumen, are now hollow. The shoulders are broad and square, the body thick and short, the well-shaped arms are free from the body, and the hands, according to the usual Babylonian custom, are clasped in front. The upper half of the statue is nude, and from the waist is suspended an embroidered or plaited skirt intended to represent heavy wool or fur. To give support to the statue, the bare feet are imbedded in the pedestal. Upon the right shoulder, the clearly cut inscription of three lines in the old Sumerian or pre-Babylonian language, reads as follows:

(The Temple) Eshar,
King Daudu (Daud = David),
King (of) Udnunki.

The name of the king is entirely new to Assyriologists. The names of the city and temple were first read upon the great stone of Hammurabi, recently discovered by the French in Persia.

The age of the statue is beyond doubt several centuries more than six thousand years; the approximate date of 4500 B. C. is fixed in several different ways.

First, the archaic character of the writing is that employed only in the inscriptions long antedating the early Babylonian king, Sargon, of 3800 B. C. The characters of the inscription are lineal and nearly hieroglyphic; the wedge-shaped characters were not yet developed.

Second, the statue when found was lying beneath the platforms of several reconstructed temples. The uppermost of the platforms contained bricks inscribed with the name of Dungi, of 2750 B. C.; beneath it was a platform constructed of the bricks of Sargon, 3800 B. C.; still lower were traces of several other reconstructions. The statue was beneath all of these, among the ruins of a temple built of small plano-convex bricks which all Assyriologists assign to the middle of the fifth millennium B. C.

Third, the style of the art, the triangular-shaped eyes, the nose forming a straight line with the forehead, the style of dress employed only at that particular period, identify it as belonging to the same age as the famous bas-relief in the Louvre and a statuette in the British Museum. The great Assyriologists of Europe assign the figures possessing these peculiar characteristics to about 4500 B. C., and no Assyriologist of repute, and who is acquainted with the earliest Babylonian art, would question the date.

The statue, fully 1,500 years earlier than any other from Babylonia, not only presents history with the name of a forgotten king; it is a perfect specimen of the most ancient art in the world, and opens a new chapter in the history of the earliest known people of Mesopotamia.

THE STATUE OF THE SUMERIAN KING DAVID, FOUND AT BISMYA, BABYLONIA, AND BELIEVED TO DATE BACK TO 4500 B. C.

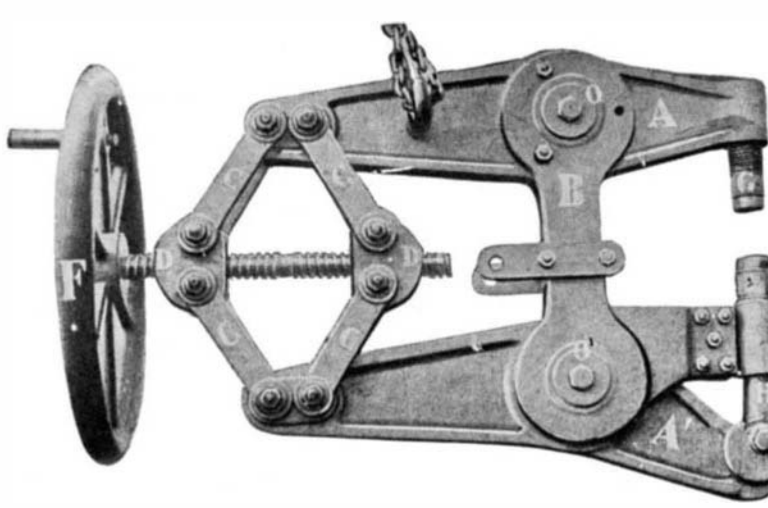
A HAND-PRESSURE RIVETING MACHINE.

BY DR. ALFRED GRADENWITZ.

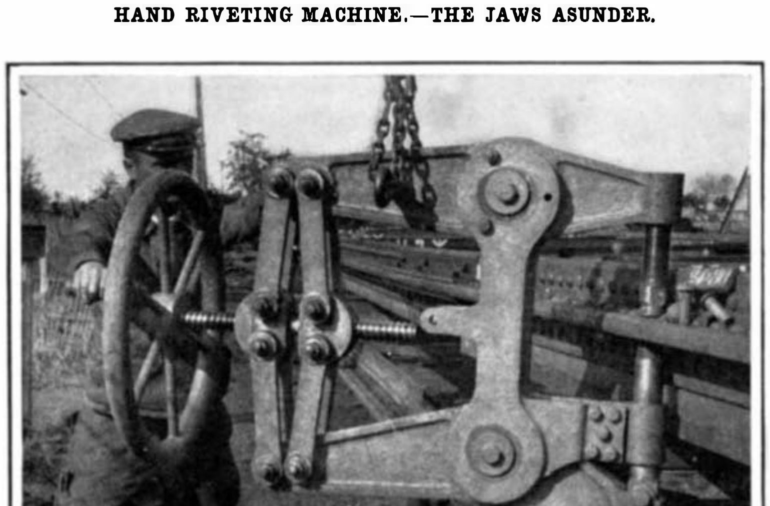
As a consequence of the unceasing development in the field of metallic constructions, which are being applied now to the most varied uses, the necessity of hydraulic, pneumatic, or electric riveting tools is becoming more and more urgent. In spite of the widespread use of these mechanical outfits, many rivets have still to be driven by hand-operated hammers. Such work is, however, rather hard, and especially in small shops are there seldom workmen of sufficient skill to be found. On the other hand, hammer-riveting has the inconvenience that the walls to be joined are not pressed together with sufficient force. The same drawback, by the way, applies to pneumatic riveting hammers, which, moreover, use up large amounts of compressed air. It may finally be stated that many delicate constructions undergo an unfavorable influence from the shocks produced by the hammer strokes.

The tool represented in the accompanying figures has recently been constructed by Mr. F. Arnodin with a view to obtain by hand labor, and without the aid of any mechanical force or any hammer, rivets as satisfactory as those obtained by hydraulic pressure or other mechanical means.

This hand-driven riveting machine consists mainly of two cast steel arms, A A', carrying at one of their ends and in front of each other the two stamps between which the compression of the rivet is to be obtained. The upper arm, A, being fitted with the counter-stamp, G, that is regulated by a screw, is bolted in O to two cast-steel cheeks, constituting a cross beam between this arm and the joint, O', of the other arm, A'. The stamp is connected to the latter by a holder, H, and slides in a guide rigidly connected to the cheek so as to be kept in an invariable direction with regard to the counter-stamp. The levers, A and A', are controlled by eight connecting-rods, C, made of steel, and which are coupled together by pairs and jointed on one hand to these levers, and on the other to bronze nuts, D, fitted with opposite threads. The screw, E, corresponding to this nut has likewise opposite threads and is controlled by a cast-iron fly-wheel, F, fitted with a handle.



HAND RIVETING MACHINE.—THE JAWS ASUNDER.



HAND RIVETING MACHINE.—JAWS BROUGHT TOGETHER.

One of the two men required to operate the machine places the rivet in position, applying to it the counter-stamp, G, whereas the other operator sets the fly-wheel rotating rapidly. The lever, A', swinging round an immovable joint will transmit to the stamp an increasing force, which in the case of a riveting machine of 365 kilogrammes weight, may reach as much as 30,000 kilogrammes, owing to the storing of energy secured by the fly-wheel, which is sufficient to deal with rivets 26 millimeters in diameter.

The apparatus is conveniently suspended from a tackle by two rings screwed to the lever, A. A rivet of 26 millimeters diameter is as a rule completed in two minutes.

The apparatus is dismounted and remounted at a moment's notice, any connections being obtained merely by means of bolts and nuts. In some cases, and particularly in smaller shops, it will be found advantageous to install the machine permanently at some point of the shop, especially in the case of light work.

Dissimulated State of Acids.

M. Albert Colson recently made some experiments which seem to prove that certain acids are capable of remaining in compounds in a state in which they appear to be different from the usual condition. The solution of a metallic oxide in a dilute acid gives, as we know, a dissolved salt. This should keep the characteristic properties of such a salt. He finds, however, that the solution of chromic oxide in cold dilute sulphuric acid gives a variety of sulphate in which the sulphuric acid resists the action of reagents, while up to the present we obtain analogous bodies only by modifying ordinary salts by heat. Hydrated chromic oxide is formed by adding ammonia to chrome alum. The precipitate is green. It is dissolved in a small quantity of very dilute sulphuric acid and filtered from the excess of hydrate. The green solution has the formula $Cr_4(SO_4)_5(OH)_2$. It seems to be a constant body. In this case the sulphuric acid should be all precipitated by barium chloride. But only three sulphuric molecules are brought down, while the other two remain, so that the mixture only clears with great slowness and even then contains the elements of sulphate of barium. This is confirmed by thermo-chemical research. One molecule of $Ba\,Cl_2$ added to one of the pentasulphate gives off heat represented by 5,000 calories. This number rises to 15,200 calories with 3 $Ba\,Cl_2$, giving a deposit of 3 molecules of $Ba\,SO_4$, but it does not exceed 15,500 with 4 $Ba\,Cl_2$. The fourth molecule of barium thus has no appreciable action on the chromium salt. Thus we find that the combination of sulphuric acid and chromium hydrate gives rise to two different states—the ordinary saline state and the "dissimulated" state. The latter tends to disappear when the temperature is raised. Cooling below the usual temperature also modifies it. We cannot therefore say that it is due to the formation of a special salt.

It is probably difficult for the young men in our technical schools of to-day who are familiar almost entirely with mild steel and very little with wrought iron, to realize what a change came in engineering when the production of mild steel became a commercially reliable matter. When we look back at the way in which some of the vital elements of a big marine engine were made, we are almost inclined to wonder that the material was reliable at all. The difference between a large wrought iron shaft such as old Hughey Dougherty used to make at the Morgan Iron Works, and one of the mild steel shafts made at Bethlehem, is as great as could be imagined. Nearly the same is true of boiler plates. The young engineer of to-day would hardly know what was meant by a lamination or a "cold shut." The very method of manufacture made it necessary to use a large factor of safety in designing, with the result that the working stresses permissible were very low and the weight of machinery inordinately high. With the advent of mild steel and the introduction of careful and systematic testing, the designer had a material on which he could place absolute reliance so that the factor of safety could be greatly reduced. As a matter of fact the factor of safety has been reduced from 8 or 10 to 5, and sometimes as low as 4.5.