Erosion of Lead.

The erosion of lead, and even of type metal, by certain species of insects, is not generally known, and may be extremely mischievous. Not long ago it attracted the attention of the French Academy of Sciences, and several communications respecting it have been published with their proceedings in the *Comptes Rendus*. Of these the following is a *resumé*:—

In 1858 Marshal Vaillant exhibited to the Academy leaden bullets brought back from the Crimea, in some of which the larvæ of insects had excavated circular passages three or four millimetres in diameter, and in others superficial grooves. Inquiry was made through the Russian Ambassador, M. de Kisselef, whether similar erosion had been observed in Russia. M. V. de Motschulsky replied that nothing of the kind had been detected in the cartridges of the Russian army in the Crimea, and that the insect which had caused the injury appeared to be very rare in Russia, not having been discovered by Russian entomologists in the Crimea. It is stated to be very common in England, Sweden and Germany, and to occur in the Jura in France. It attacks silver firs and pines.

The insect which damaged the French cartridges was imported from France in the wood of the cases in which they were packed. All the excavated passages were originally circular in section, and those that were semicircular in section, that is, superficially grooved, were only segments, of which the other half was in the contiguous surface of other bullets or of the wood forming the sides of the cases. The passages were always open at both ends. Excavation was effected by the mandibles of the insect, the apparatus consisting of a saw toothed, and cut like a file. The insects do not eat the lead, but simply bore it out; and it was observed that their remains, after metamorphosis, had been carried downwards by the particles of the metal, reduced to powders, and dispersed on the outside through the cracks in the bottom of the packing case. The perfect insects did not attack the lead, but died in the passages, even immediately after their complete metamorphosis, as very often occurs with insects in general.

In 1833 Audouin exhibited to the Entomological Society of Paris, sheet lead from the roof of a building deeply grooved by insects. In 1844 Desmarest mentioned erosions and perforations of sheet lead by a species of Bostriche, and illustrated the fact by cartridges from the arsenal at Turin. Mr. Westwood, the well-known British entomologist, has recorded observations by himself on the perforation of lead by insects. M. Bouteille, curator of the Museum of Natural History at Grenoble, sent to the French Academy of Sciences, from the collection under his charge, specimens of cartridges gnawed by insects, which were found *in situ*, and the following report upon the subject was made by Marshal Vaillant, de Quatrefages, and Milne Edwards; the insect was *Sirex gigas*, a large hymenopterous species which, in the larva state, lives in the interior of old trees or pieces of wood, and which, after the completion of its metamorphosis, quits its retreat for the purpose of reproduction. As previously stated, it cuts its way by its mandibles, gnawing the woody substance or other hard bodies which it meets with in its course. Analogous perforations are made by the mandibles of the *Callidium saguineum*. The reporters add;—"If it is probable that it is always with their mandibles that coleopterous as well as hymenopterous insects thus attack lead or other hard bodies, it is not well established that it is always the desire of liberty which prompts them so to act. Indeed, in some cases, coleopterous insects have been seen to gnaw the exterior of similar bodies."

Reference was made to a paper by Antonio Berti on the perforation of leaden pipes by an insect named *Apate humeralis*.

Scheurer-Kestner, in 1861, communicated to the French Academy a notice of the erosion by an insect of the sheet lead of a new sulphuric acid chamber. The creature was caught in the act of escaping through the lead, having been imprisoned between it and a wooden support.

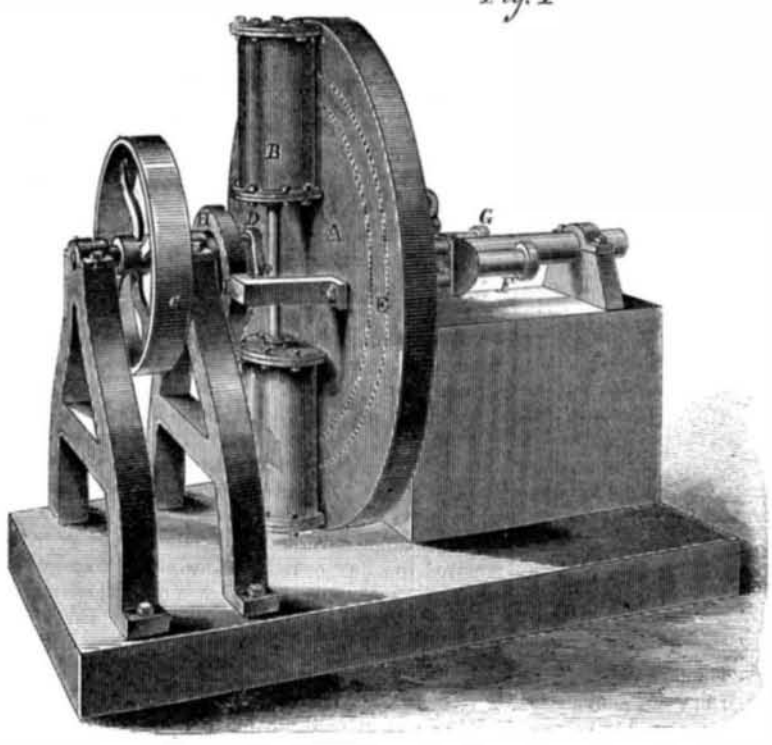
Perhaps the most interesting and important case of insect erosion is that of stereotype metal, which was communicated in 1843, by M. du Boys to the Agricultural Society of Limoges. Specimens riddled with holes were shown in illustration.—*American Annual Cyclopedia.*

Double-cylinder Revolving Engine.

Rotary engines, in one form or another, have occupied the attention of inventors for many years, and changes in the form or details of them, with a view to render them economical and efficient, are continually being made.

The engine here illustrated is not a rotary engine, inasmuch as the pistons in such machines travel continuously in one direction, but this combines a reciprocating motion of the piston with a rotary one of the cylinder, and adds the weight and momentum of that detail to the force exerted by the piston.

Fig. 1



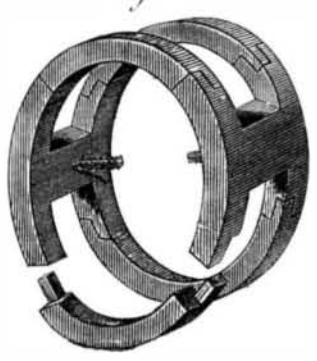
FOSTER'S DOUBLE-CYLINDER REVOLVING ENGINE.

The following description will render the principle and main parts familiar to the reader:—

The wheel, A, on which the cylinders, B, are placed, is set below the center of the shaft and pulley, C, half the length of the stroke. When, therefore, steam is admitted to the pistons, they, on being forced out, act against the crank, D, and turn the cylinders and wheel around.

The steam is let into the cylinders by the ports, E,

Fig. 2



shown in dotted lines through the steam pipe, F, and the exhaust pipe is at G. There are two branches to both of these pipes, and when steam is let into one, by turning a valve the engine revolves in one direction, and is reversed by admitting steam to the other branch. It is intended to have two sets of cylinders, or four in all, the piston rods crossing each other at right angles, and one pair of cylinders set further from the shaft in order to allow the rods to work on different cranks on the same shaft. The yoke, H, is fitted to a bearing, I, thus distributing the labor on the main shaft. By having four cylinders there is no dead center, and the force is continuous at all times.

Fig. 2 shows the packing rings, which keep the wheel steam tight at the point where the steam is introduced. These rings fit in a circular chamber behind the wheel, A, and are made in sections so that the entire chamber will be prevented from losing steam by the expansion of them in every direction. The cylinders are lubricated by a cup on the steam pipe. This engine, says the inventor, is particularly useful for propellers, on account of the ease with which it may be reversed and the velocity of piston it is capable of attaining. It is also claimed to be simple and efficient, and that two revolutions of the pulley are obtained from one reciprocating movement of the pistons.

A patent is pending on this engine through the Scientific American Patent Agency by Joseph L. Foster, of Virginia, Nevada Territory. For further information address him as above, Box 153. [See advertisement on another page.]

Cutting Hard Steel.

The Secretary of the Franklin Institute, Henry Morton, Esq., in a recent report says:—

We give, for the benefit of those interested in the experiment, the particulars of the apparatus lately constructed for the Franklin Institute, to repeat Perkins' experiment of cutting hardened steel with a soft iron disk rotating at a high velocity. A disk of steel, such as is used for circular saws, but annealed so as to be very soft, is mounted on a steel spindle, which carries also a three-inch cast iron pulley, and the whole is then carefully balanced until it will rest indifferently in any position, on two straight edges.

This spindle, etc., is then mounted in cast iron swiveled bearings. A belt, 2 inches, wide, on the pulley is driven from a 36-inch pulley on an ordinary shaft, which carries also a 10-inch pulley, to which motion is given by a 4-inch belt from a 48-inch pulley on the engine shaft. The engine was run 120 revolutions per minute, which would give, with every allowance for "slip," between 5000 and 6000 revolutions per minute to the disk. At this velocity the hardest files were cut like soft wood, with the production of a blaze of light and showers of sparks, without the least injury to the edge of the soft disk.

The constructors of this apparatus were kindly furnished by Mr. Joseph Saxon, of Washington, with a general description of the machine originally made by him for Jacob Perkins in London, and in the above mentioned apparatus this description was followed, except where the improvements of modern machinery, warranted a deviation. The most important of these deviations was in the use of cast iron swivel bearings. In these the mobility of parts necessitates an equal distribution of the pressure and friction, over the whole surface of contact, and thus renders possible the use of a material otherwise so unfit as cast iron. The friction is in fact by this means brought between the steel and oils, and in no respect between the solid surfaces, at any point.

AMERICAN ANNUAL CYCLOPEDIA.

The fourth volume of this great work, containing the register of the important events of 1864 is now before us. It gives a very full account of the operations of the army and navy, illustrated by maps and cuts, with the proceedings of Congress, public documents, obituaries of eminent persons, and other matters constituting a complete history of the year. It is a volume of 838 pages, full of reading, interesting at the present time, and of inestimable value for future reference. It is published by D. Appleton & Co., 443 and 445 Broadway, New York.