

FRENCH EXPERIMENTS ON RIVETING.<sup>1</sup>

A STUDY of the most elementary form of connection used by the engineer may not appear to offer anything in the way of novelty or scientific value, as a contrivance at once so old and so simple as a rivet seems at first sight not likely to afford much scope for an investigation considered as a unit apart. Indeed, the chief interest has rather been in the grouping and arrangement of rivets, and the analysis of their behaviour under stress when

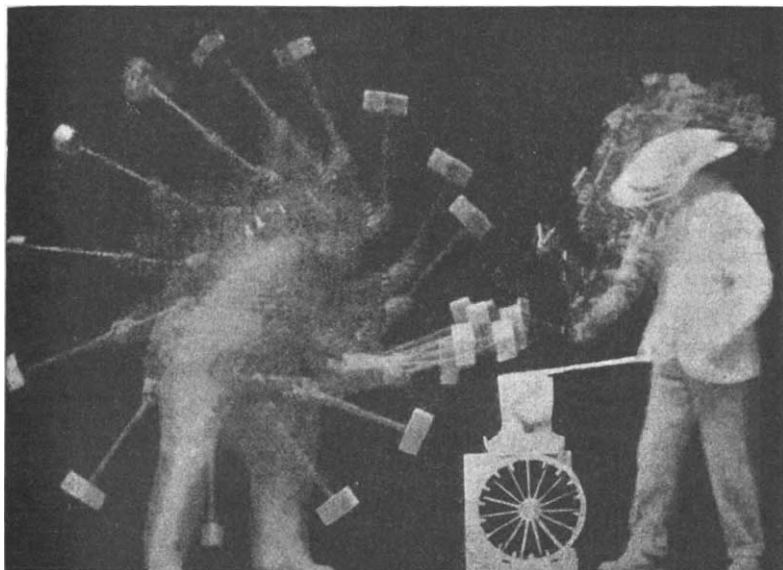


FIG. 1.—Composite photograph of a smith and striker for one swing of the hammer.

assembled in the various joints and connections used by engineers in boilers, bridges, and the like. In the present instance the author, keeping strictly to the simpler problem, has produced a memoir of great interest.

In the early pages the ordinary processes of hand riveting are described, and a series of measurements and photographs, after the manner of Marey, shows in an interesting way that the well-known preference

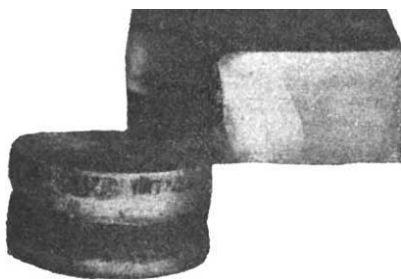


FIG. 2.—Punching from a thick plate.

of the striker for the full swing of the hammer for long-continued effort as compared with the short swing and greater number of blows is an instinctive solution of the problem of obtaining the maximum effect for the effort exerted.

The section following traces the growth of riveting machinery, and describes the characteristic effects produced when steam, air, or water is employed as the

working fluid. Specimens of riveting obtained from various types of machines are noteworthy as showing that the shank of the rivet does not, as a rule, bear against the plates, and that eccentricity in the rivet head is common even in the most favourable circumstances. The essential difference between riveting by hand and that produced by a riveting machine is made clear by photographs of sections of rivets at different stages of their formation, the surfaces being prepared by polishing and etching in the usual way. The superficial effect of a blow, as compared with the squeeze of the pressure machine, is apparent in all the illustrations shown in the memoir.

The interesting question of the pressure required to produce the head of a rivet is taken up, and the various circumstances which influence this are the subject of much experimental study. These include the influence of temperature, the chilling of the metal by the die, the influence of the time in which the head is formed, and the effect of an excess of material in the shank, whereby waste material is squeezed up and forms a ring round the rivet head proper.

In addition, the diagrams drawn by the recording gear give precise information as to the work done on the rivet when the time of formation of the rivet-head is varied; they also show the effect of the cooling in drawing the plates together.

A detailed examination of the strength of the rivet gives special attention to the behaviour of the head and the way it ruptures under stress, and as a result a form of head is recommended having a radius of 0.86 the diameter of the rivet and a height of two-thirds the diameter.

The author, all through, has made great use of photographs of sections of pieces of material, but without magnification, and it seems possible that this side of the investigation would have yielded still more interesting results if it had included a detailed examination of the sections under the microscope.

As an instance of this, the accompanying figure shows the well-known form of punching produced from a thick plate, in which the characteristic sharp edge appears near the middle of the depth. Sections of such punchings would be well worth examining under the microscope, and, in fact, the possibilities of further research, with the microscope pressed into service, seem well worth consideration.

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## BIG GAME PRESERVATION.

A BLUE-BOOK containing correspondence relating to the preservation of wild animals in Africa was issued at the close of 1906, and sets forth ten years' official work in the British Empire, and in the dominions of other European nations in Africa, for the preservation of wild animals.

The Bluebook is not a satisfactory example of careful printing. It is extraordinary that before being issued, apparently from the Colonial Office, the proofs should not have been submitted to a zoologist for revision and correction. The names, in

<sup>1</sup> "Étude expérimentale du Rivetage." By Ch. Fréminet. Pp. 145; 183 figures in text. (Paris: Society for the Encouragement of National Industry, Rue de Rennes, 1906)