section of the clip is the most intricate part of the operation, requiring three strokes of the punch, forming the part around a central die of the inner shape of this part. The dies used for this operation are double, parts c and d, on a base e, being stationary on the punch. The movable parts f and g are secured to the ram head. The middle fold of the part is formed between dies c and f, which take the blank and form the centre fold and upper two quadrants, leaving the ends of the blank parallel and projecting along the side of die c. The part thus formed is placed around die h, which is of the inside size of the finished member. The faces of dies d and g correspond to that of the partially finished part, which is slipped in place around the centre die h as shown. The right half of die d is not secured to the base e, but is located on it by guide pins, which permit of its motion within short bounds in line with the path of the ram. Behind this part, there is a hinged block, about ½ in. thick. Similarly, at right angles to it in die g, there is another hinged block set into the die under the spring clip shown. This hinged block is swung up for the first operation, the near arm of the blank being folded down along the side of die h. Lowering the hinge in g and raising that in d for the second pass,

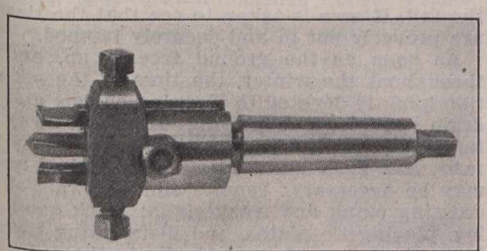


Fig. 1.—Special Boring Tool for Removing Staybolts.

causes the other arm of the blank to be folded down over the first one, completing the forming operation.

The several holes in the three parts are then drilled in the jig on the left in fig. 1, the four pins in which represent the four superheater tubes. The inner member of the clip is lipped in between the four pins, and the two holes drilled through the drill holes in the upper central pin, the lower central pin taking the drill thrust. The central holes of the lower part of the clip are drilled by placing the part on the upper round pins, with the centre under the central drill block. The end holes in both the bottom and straddling sections of the clip are drilled by slipping in between the upper and lower round pins on either side, with the end bearing on the lower squared pin, holding the part against one of the round pins to locate. This jig was first made to overcome the trouble experienced early with the drilling of these clips when they were drilled from marks. A slight error in laying out would result in either the holes not mating, or else a loose fit. A good tight fit in the completed set is most essential. The parts are secured together with small screws, the several parts being held together during the assembly by a special clamp.

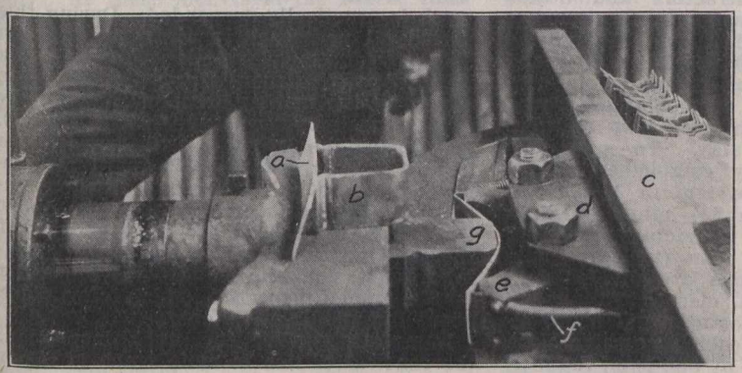



Fig. 2.—Forming Straddle Member of Superheater Tube Clips.

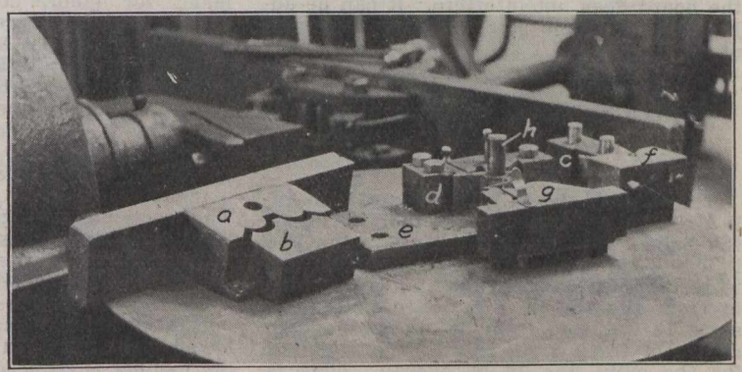



Fig. 3.—Dies for Forming Inner and Bottom Members of Superheater Tube Clips.

## Staybolt Boring Tool.

The tool described in this article was designed by the writer to rapidly bore out old staybolts from locomotive boilers. The need for a tool of this kind was due to the fact that we were replacing the old-style bolts by the improved flexible type with which most locomotive shop men are familiar. The boring tool is driven by an air motor and the size of the holes bored

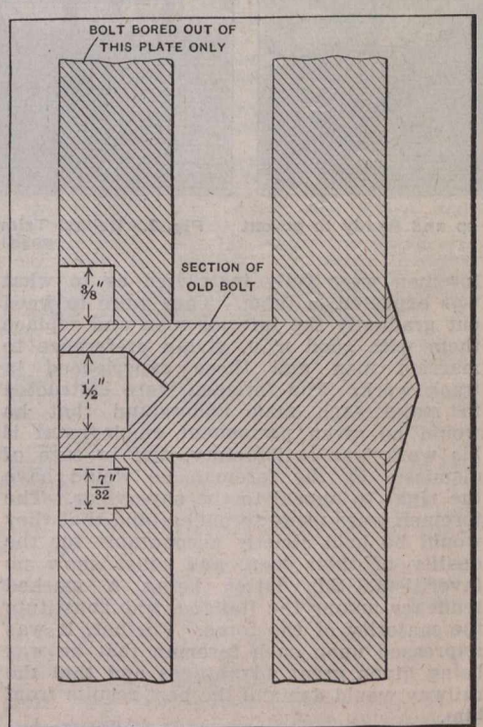


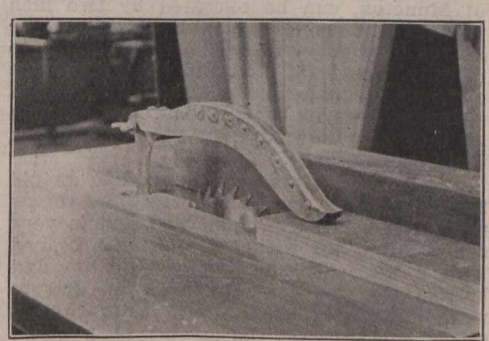

Fig. 2.—Section Through Boiler Plates, Showing Section Removed by Each Cutter.

is 1⅝ in. diam. Men who have had experience boring out staybolts with a twist drill used in connection with a ratchet and "old man," will readily understand the value of a tool of the form illustrated. An attempt was made to bore the holes with an ordinary twist drill driven by an air motor, but the result was unsatisfactory.

The cutters were made of Novo steel, which was annealed to provide for turning them to the required size, after which they were alternately backed off on the inside and outside to afford the required clearance. This backing off was performed by throwing the lathe jig in which they were held to be turned 1-16 in. out of centre in a plane at right angles to the faces of the tools, first in one direction and then in the other. Made in this way, the life of the cutters was quite satisfactory. One of the side cutters is 5-32 in. wider than the other, and referring to the cross-sectional view of the boiler plates, fig. 2, it will be seen that the smaller cutter works 1-16 in. in advance of its fellow. The purpose of this is to overcome the tendency of the chips to crowd at the point of the tool and fracture it. This boring tool gave very satisfactory results, producing clean-cut holes of exactly the required size; and its cutting capacity may be judged from the fact that chips up to 38 ins. long were produced.—W. Hall, Fort William, Ont., in Machinery, N. Y.

## Machinery Protection in the Grand Trunk Railway Shops at London.

The safety first policy on the G. T. R. has been extended very rapidly throughout the system, all conditions that tend towards unsafe practices being investigated from time to time, and remedies applied as required to eliminate or reduce the risks. In no place has the campaign been more successful than in the shops, as the conditions that there exist are naturally more amenable to improvement than on the road, as the conditions to be contended with are more or less constant factors.



Saw Guard with Adjustable Hood.

A number of the machines in the G. T. R. car shops, at London, Ont., have been studied and safeguards for each separate condition recommended. These are ingenious for the most part for their simplicity, requiring no complications that are liable to reduce the effectiveness of the device by making it easier to perform the operation without the guard than with it. The saw guard shown herewith is of the simple type in use on most of the machines. It will be noticed at a glance that while the device should prove most effective, it offers no inconveniences to the operator that are at all commensurate with its value as a guard.