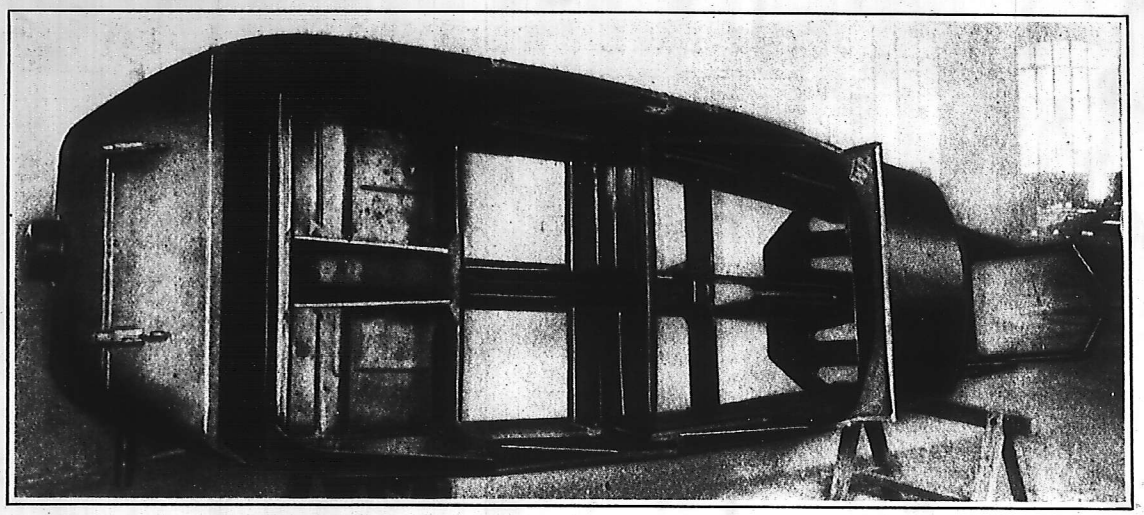


Fig. 1—A completed body on its side so as to show the unit construction of the body and frame

Automobile Body and Frame Combined in a Single Unit

By J. A. Lucas

The unusual construction of the Lancia body, which involves reinforcements and a tubular sub-frame for the engine, combines a number of original features and methods

UNLIKE the general construction of automobiles where the chassis is built on which to mount the body, the Lancia design combines them both in one unit. Instead of a deep channel frame with cross members, the lower part of the body itself is so constructed as to form the frame, while the splash guard in front, the foot board, the back of the front seat and the floor construction of the rear compartment, form the cross bracing of what takes the place of the frame.

A general idea of the construction can be had from Fig. 1 which shows a completed body that it must be remembered also includes the frame. As will be seen, the body is one unit from the radiator shell at the front to the spare wheel carrier at the rear and includes rear-axle housings, which are shown in place. Details of the longitudinal bracing that takes the place of the frame will be shown later. This view, however, shows the way in which the rear flooring, the back of the front seat and the foot board form substantial cross-braces in addition to the small cross-brace in front of the forward seat.

In Fig. 2 may be seen the underside of the front end with the two tubes that form a sub-frame, that supports the engine and the transmission. These tubes are welded at each end, the rear ends being supported by formed sheet-metal brackets riveted to the steel foot board. The tubes are carefully ground to size and are located in their correct positions by a fixture that holds them while they are being welded at each end. The importance of maintaining correct alignment of the engine and driving units necessitates great care in this part of the work, one of the last operations on the engine being to bore the supporting arms where they rest on these tubes. The depth of that portion of the frame forming the sill can be seen at *A*, while the center reinforcement can be seen at *B*. The malleable casting shown at *C* is riveted to the side for attaching the steering mechanism, which is also fastened to the tube on that side.

Starting at the beginning of the sheet metal work, we see in Fig. 3 a completed side with the door and other openings cut out. The sheet forming the side of the body is about $\frac{1}{10}$-in. thick. The front is at the left. The sheets are cut with rotary shears as in Fig. 4, the men becoming very expert in following the outlines and handling the sheets, which they do more rapidly than might be expected.

One of the first operations is to form the back end of the sheet on the concave block shown in Fig. 5. Here the sheet is clamped to the form by the curved channel, as at *A*, utilizing projections cast on the forming block for that purpose. The other end is held in position by the hook *B*. With the sheet clamped on the block, it is flogged into the desired shape by means of a heavy mallet, working it to the curve of the cast-iron form on which it rests. Needless to say, this work requires con-

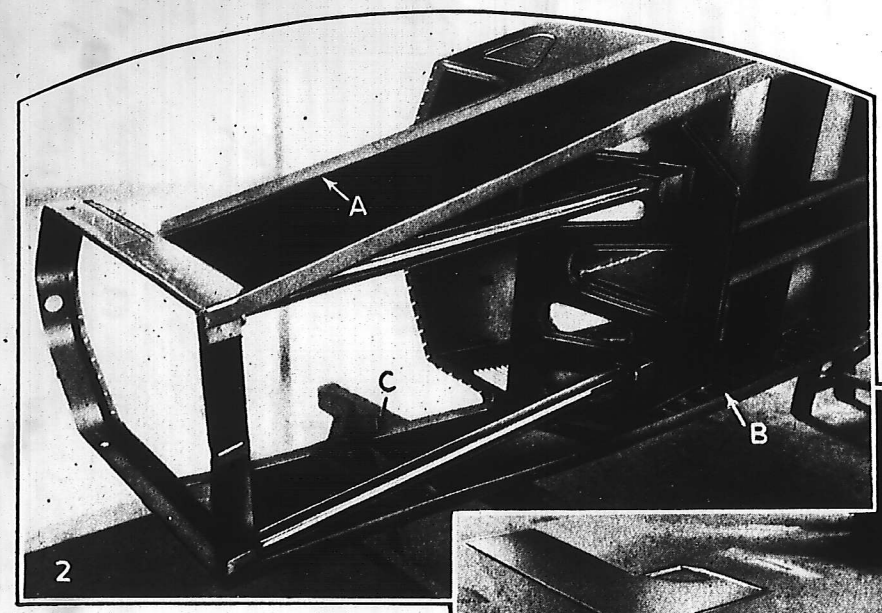


Fig. 2 — Front end of frame showing the tubes that are welded in place and form the bearers or sub-frame for the engine and transmission unit. These members act as stiffeners in addition to supporting the engine unit

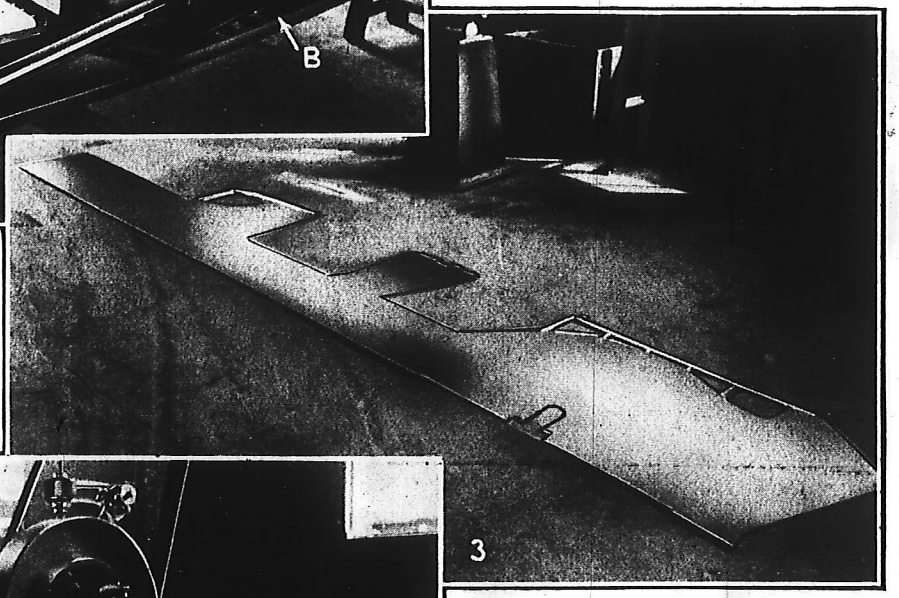


Fig. 3 — One of the side sheets after being cut out and ready for forming. The sheets are laid out by pattern or templet, and the cutting is done by both rotary shears and chisels

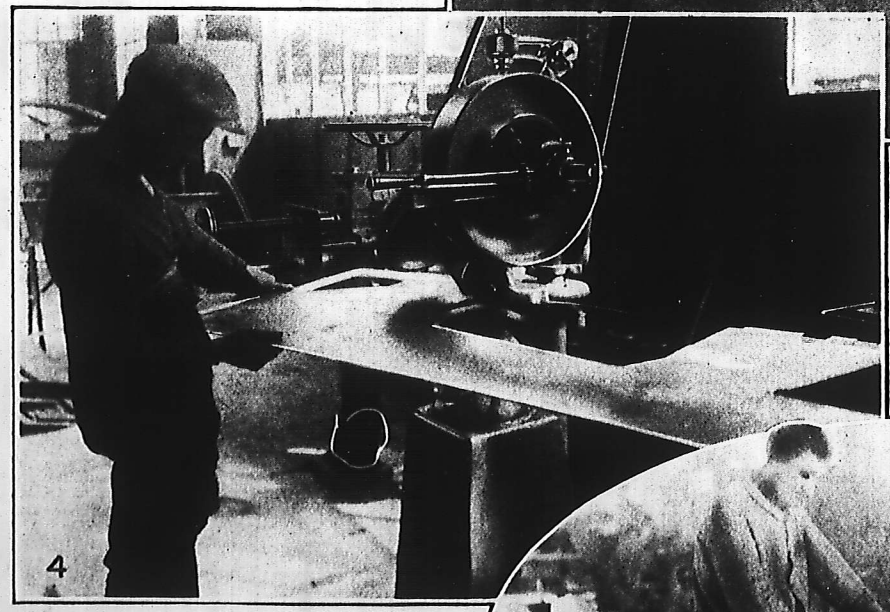


Fig. 4—Cutting out a door opening with the rotary shear. The operators become very skillful in following the layout and handle the work rapidly

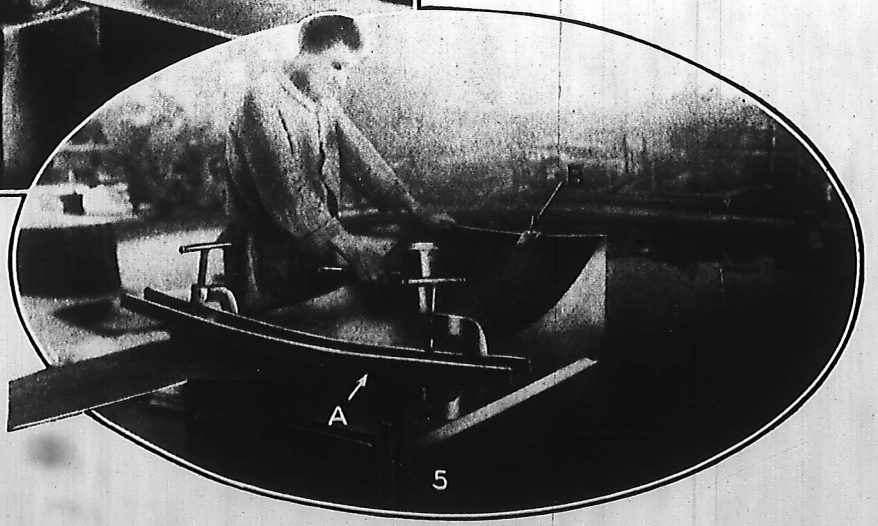


Fig. 5—Form in which the sheet is concaved before going to the long form shown in Fig. 6. The curved clamp conforms with the contour of the form, or die, and the sheet is shaped by flogging with the large mallet shown

Fig. 6—One of the iron forms over which the side sheets are clamped and the edges turned over while the sheet itself is made to conform to the desired contour.

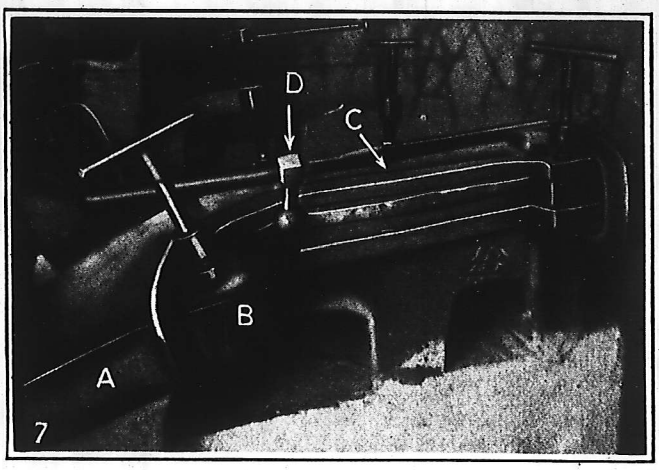


Fig. 7—A detail of the forming operation showing the cast-iron form underneath, the steel inserts which receive the wear, the way in which the metal is held around the openings to be formed, and the type of hammer used in drawing the sheet over the edge

siderable skill, as those who are familiar with the forming of sheet metal are well aware.

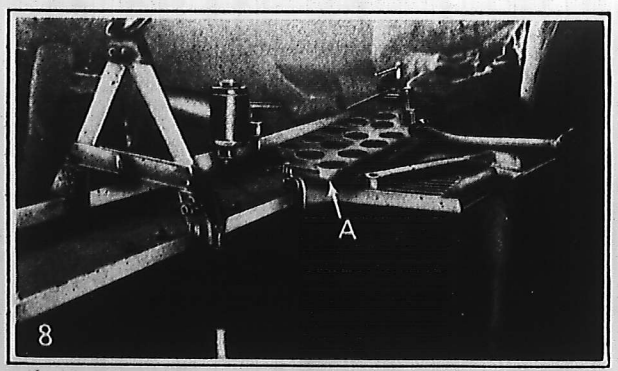
After the rear end has been curved, the sheet is taken to the large form shown in Fig. 6 where it is clamped at frequent intervals, using C-clamps to hold the upper forms, or straps, in place. The edges are turned down, using specially shaped hammers and the sheet is formed at all points before releasing it from the clamps. A detail of part of the form is shown in Fig. 7 which indicates the cast-iron base *A;* the steel inserts *B;* the long clamp and guard for holding down at *C;* and one of the forming hammers at *D*. The guard *C* effectively prevents the sheet from being marred by the hammer, as it presents only the portion that is to be turned over to the action of the hammer.

The method of securing sufficient stiffness in the lower part of the body is worthy of note. The stiffening of the central portion of the body is by the use of an auxiliary cupped-plate as shown at *A,* Fig. 8, the stiffener being welded to the body along its edge and also at the bottom of each cup. With the stiffening plate held in position as shown, the edges and three spots at the bottom of each cup are welded to the outside sheet. These welds show plainly in Fig. 9 and also in Fig. 10. Fig. 9 gives a good idea of the appearance of the side of the body at this stage, as it shows the different reinforcements, such as around the opening for the axle housing at *A,* the angles welded on at *B* to support various portions and the small angular plate *C* containing the rear louver.

Some of these welds are shown in Fig. 10, but in addition there is the substantial foot plate *A* and the longitudinal reinforcement *B,* consisting of a deep, inverted U-section that houses the propeller shaft almost directly behind the transmission. This U-shaped housing is cut away at *C* in order to accommodate the control shaft between the shift lever and the transmission case which is ahead of the foot plate. At *D* an auxiliary cross plate is shown.

Some of the smaller parts are stamped on presses, but this is only possible where there are several uses for the same part or where the dies are inexpensive. For a production of 3,000 cars a year does not permit the expenditure of large amounts for equipment if their cost is to be amortized within a reasonable time.

The radiator shell is riveted to the side sheets, while the body is mounted on the substantial fixture shown in Fig. 11. This arrangement permits the radiator shell to



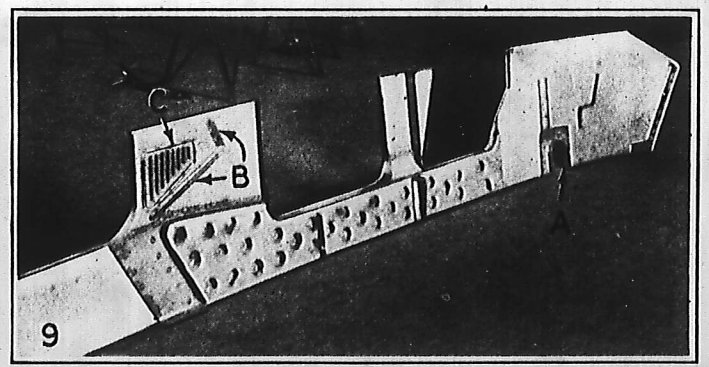


Fig. 8—Spot welding a reinforcement at the front end of the frame. This reinforcement has a series of cups, which are spot welded to the frame itself at three points in each cup. This adds greatly to the stiffness of the frame. Fig. 9—One of the sides of a body showing the reinforcement held in position, and also various angles attached at the desired point. The small angular plate containing the rear louvers is also welded onto the sheet

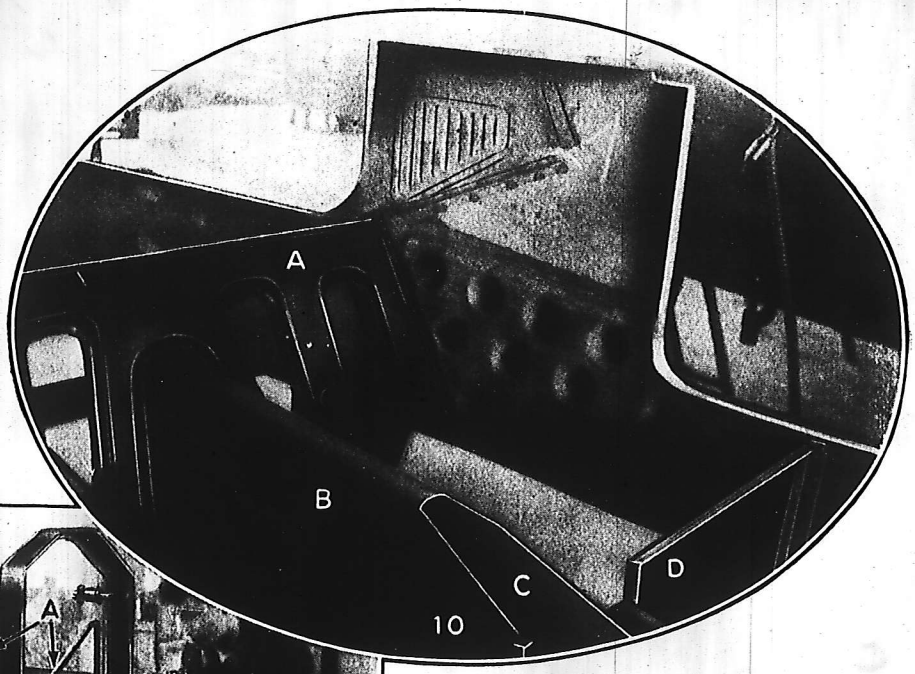


Fig. 10—A section near the front which shows the spot welding at the bottom of the cups in the reinforcing sheet and also the substantial footboard and longitudinal brace. This combination bracing makes a very stiff body

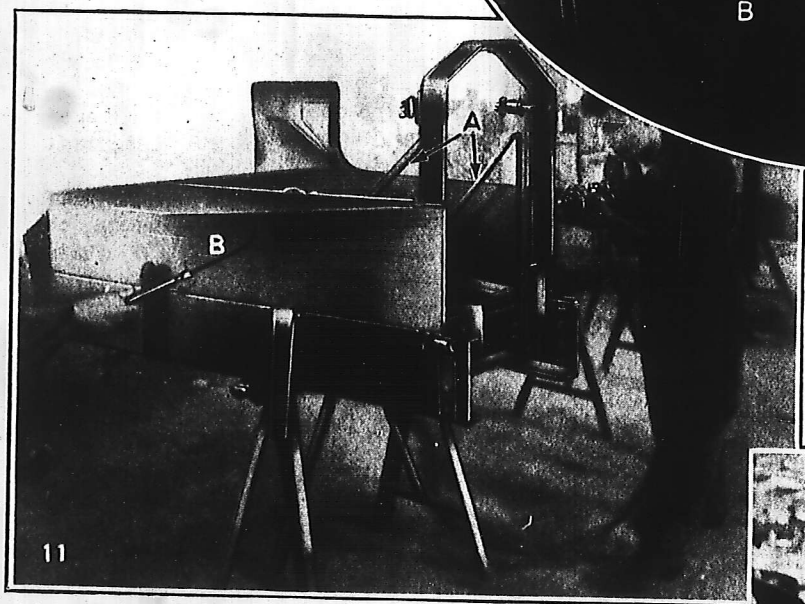


Fig. 11—Building up the front end by both riveting and welding. The body is assembled on the substantial framework shown, and the radiator shell is held in its proper position while being drilled and riveted

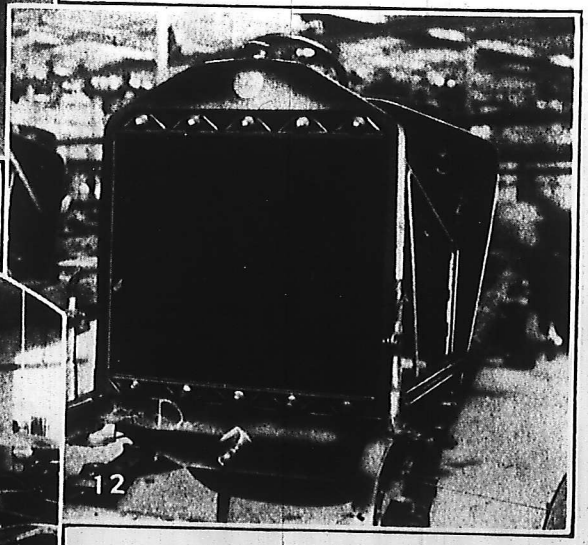


Fig. 12—Radiator cores assembled in the shell, or frame. This sectional construction is particularly convenient when repairs are necessary

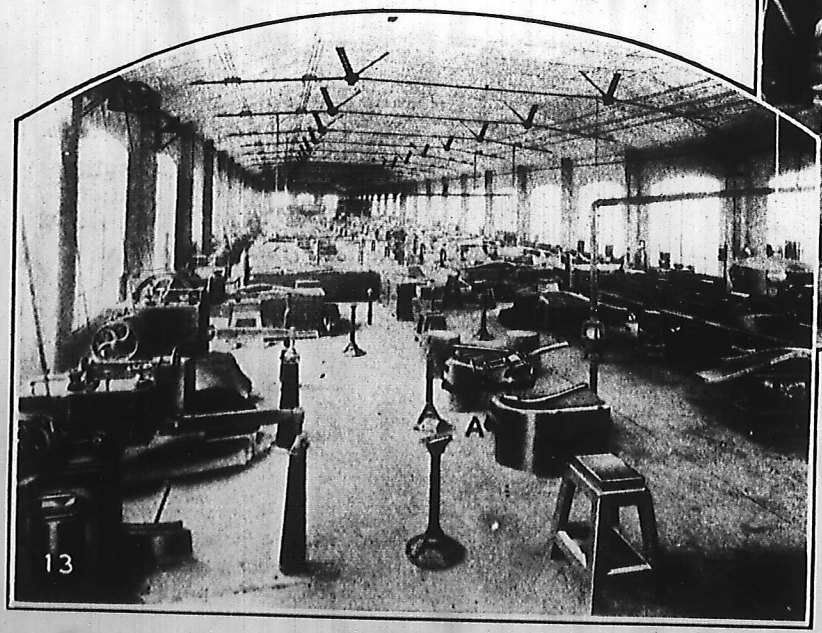


Fig. 13—A general view of the shop in which the fenders and similar parts are formed. The small power hammers at the left aid in securing the desired shapes, but much of the forming is done by hand in the large forms shown on the floor

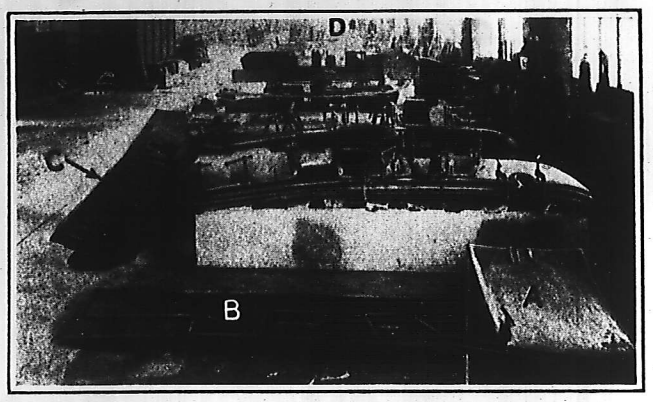


Fig. 14 — The dies, or forms, over which the bodies are shaped, as well as some of the sheets themselves in various stages of completion

be clamped in position and the holes to be drilled through the front end of the body and the shell while in this position. The method of aligning the radiator shell is to position it by means of the forms shown at *A* so as to insure its being square with the sill of the body. At the same time some of the small outside welding is done as at *B*, while the body is in a convenient position.

The radiator cores fit inside the shell and are bolted to it. They are made in sections as shown in Fig. 12. The cowl is welded in place across the top and acts as a cross plate at the top of the front portion. The result of this construction is to make a body that is very rigid and free from squeaks.

Two views of the sheet-metal shop are shown in Figs. 13 and 14, and give a good general idea of the equipment used. The light trip hammers at the left in Fig. 13, sometimes called "bumping" hammers, are of considerable assistance in forming certain desired shapes on the fenders and other parts. Most of this shaping, however, is done on the forms at *A*, where the skill of the workman plays an important part. This view shows the excellent lighting of the shop and the ample room provided for each operation. Fig. 14 gives a general view of larger work, including the forms on which the sides of the bodies are shaped. The large forms can be modified so as to handle more than one type of body. This view shows the preliminary form at *A*, the sheets as they come from the trimming machines at *B*, and as they appear after forming and before further work has been done on them at *C*. At *D* the sides of the bodies are being placed on the vertical forms where they will be assembled and welded together into a complete body unit.

Workmen become greatly skilled in hammering, forming and welding shaped metal, to secure both the proper shape and a smooth surface for finishing. The parts are so carefully handled that but little filing of the exposed welded seams is necessary before the first filler coat is applied to the metal.

Different Incentives for Different Classes of Executives

By Howard Coonley
President, Walworth Company

OUR company has had incentive plans for executives under experimentation for fifteen years, during which period one plan at a time might be tried for a year or so. Finally we have reached the point where no plans for executives in different positions are the same. For the purposes of this discussion I am going to speak of three only.

The first is what we might call the compensation that goes to the general officials of the company. I might explain that the Walworth Company manufactures and sells direct to the jobber and to the large consumer, but also sells through its own branches to the ultimate purchaser. Each year that we can earn above that 10 per cent on the common stock, we feel that a portion properly belongs to those executives in these varied activities who have played a major part in the success of the company. The directors each year, so far, have decided to set apart for this purpose 10 per cent of what we now call our "Extra Profits." The point I want to bring out in that first form of bonus is that it primarily depends entirely on the success of the company as a whole.

The second form of bonus is based entirely on the record of the unit itself, and today that form is used only in the case of our factories. We have put our manufacturing plants on a single-unit basis because we feel that the record of each plant is largely dependent on the efficiency of its own organization. These men have no influence on the other activities of the company. Therefore, they can be best recompensed by a share in the profits over which they have a very definite control.

This second type of bonus depends, first of all, entirely on the showing of some individual unit of the company; secondly, there are varying bases of computation of bonuses for our different production units which depend on the character of their equipment and the competitiveness of their product.

The third form of extra compensation is primarily used in the case of our branch houses. At one time we figured the compensation of the branch manager and his immediate subordinates entirely on the showing of that individual unit. We determined to discard that form of bonus payment and divide the managers' bonuses, as equally as we could, between the showing of the company as a whole and of his particular branch, since we found that the interests of the two clashed at times.

Since our branches handled not only Walworth material but the products of other manufacturers, which we call "resale material," and since we were primarily interested in the distribution of our own products, we decided to minimize the influence of resale material on the branch's bonus. So we have rather an intricate but apparently satisfactory plan whereby the bonus of these branch managers is taken approximately 50 per cent from the showing of their own branch and 50 per cent from the showing of the company as a whole.

Abstract of a speech presented before the American Management Association in New York.