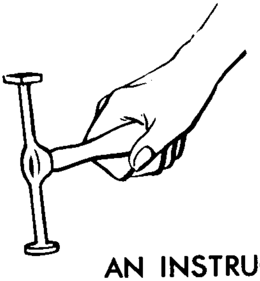
THE KEY TO

metal bumping

THIRD EDITION

BY FRANK T. SARGENT



AN INSTRUCTIVE MANUAL
OF BODY AND FENDER REPAIR PRACTICES

IMPORTANT SAFETY RULES FOR HAND TOOL USE

Hand tools, although commonly used, are specialized for particular jobs. Always use the right size and type of tool for the job being done. Keep tools in proper working condition.

Never use chisels or punches with "mushroomed" heads. They may chip and cause injury.

Screwdriver blades are made to turn screws; they should never be used for other purposes. Worn blades may slip and cause injury.

Only power impact sockets should be used on pneumatic or electric impact wrenches.

All wrenches are designed to a specific size-length-strength ratio. The use of a "cheater" or any other means for increased leverage is hazardous.

Keep hammer heads tightened on handle. Do not strike one hammer with another hammer. A hammer blow should always be struck squarely. Avoid glancing blows.

Eye protection, through use of safety glasses or hood, is recommended for any job involving the use of tools; particularly when using punches, chisels and hammers.

Use hand tools only for their designed purposes and within their size range.

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FOREWORD

THIRD EDITION

Our first manual of body and fender repair was published in 1931. This was revised in 1935. With the advent of the all steel body, followed by the turret top, the trade underwent a change of major proportions, obsoleting all of the woodworking, and many of the metal working techniques of the early period. This resulted in widely spread demands from the field for up-to-date information.

Accordingly, in November, 1939, we published the first edition of this handbook of body and fender repair practices, The Key to Metal Bumping. Since that time, it has constantly increased in popularity. It is now used extensively as a textbook and work of reference in technical schools, service departments, and repair shops everywhere.

Fairmount is the original manufacturer of body and fender tools, having entered the field in 1925. From the beginning, we have continually engaged in research and experimental work on tools, and in various phases of metal work; always maintaining close relationship with the field.

We believe that it is both our obligation and our privilege to continue to publish the results of our experience. Hence, we offer this revised edition, which we feel is of increased value to anyone interested in the trade.

Martin SPROCKET & GEAR, INC.
TOOL & FORGE DIVISION

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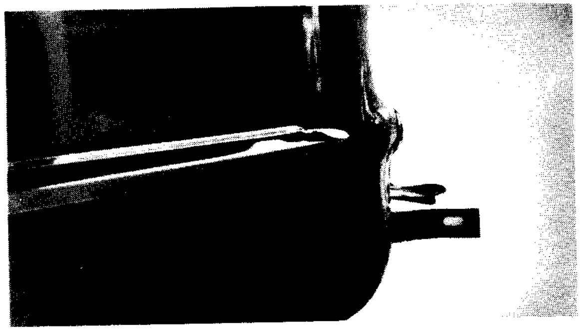


FIGURE 1

FIGURE 2

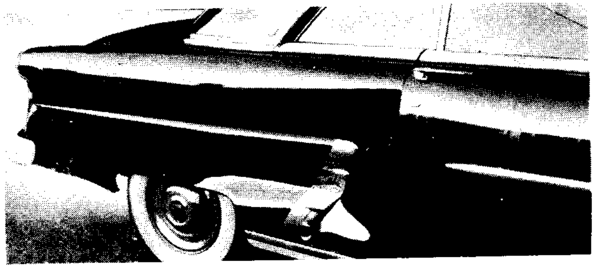


FIGURE 3

FIGURE 4

CHAPTER I

WHAT IS A DAMAGED PANEL

On the opposite page are photographs of four different damages in autobody panels. None of them look alike. They vary from the small fender damage shown in figure 1 to the severely damaged turret top shown in figure 4.

However, from the standpoint of repair, these four damages are exactly alike. They vary only in size, or rather extent and severity. Each one of them is made up of four basic elements.

The four elements are as follows:

A—CLASSIFICATION OF AREAS

1 DIRECT DAMAGE—that area which was in actual contact with the object which caused the damage. This area will be scored, scratched, and in severe cases, even punctured or torn.

2 INDIRECT DAMAGE—the buckled and distorted area of damaged metal which is adjacent to or surrounding the direct damage. Sometimes this will reach for several feet away from the direct damage.

B—PHYSICAL CHARACTERISTICS

3 RIDGES—these are ridges or peaks resulting from the bending and buckling of the metal. They occur both in the areas of direct and indirect damage.

4 V-CHANNELS—these are valleys or depressions resulting from bending and buckling. From the view-

point of the bystander they appear as inverted ridges. They occur in both the direct and indirect damage.

Now look again at the damages in figures 1, 2, 3 or 4. A close examination will show that each of them, from the smallest fender dent to the large turret top damage, is composed of the four basic elements.

In order to understand more about the ridges and V-channels, let us suppose that a panel were made of rubber, or another resilient material, and it was struck with an outside force. The rubber panel would flex easily, and give and go in until the force was spent. While still held in place by the force, it would contain all the four basic elements of a damaged steel panel—ridges, V-channels, direct and indirect damage.

However, as soon as the force was taken away, the rubber panel would restore itself to its original shape.

Why does a steel fender not restore itself to shape? To help us find an answer to this question, let us first consider what happens to a soft steel wire when it is bent as shown in figure 5 by grasping it as illustrated. It will not spring back to shape because it has been bent beyond its elastic limit and is "work hardened" in the bend. That is why a damaged fender will not spring out to shape.

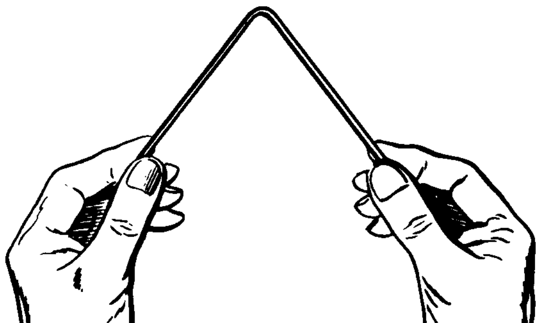


FIGURE 5

Now, suppose we try to straighten the wire by simply reversing the force to bend the two legs back to their original position. We get the condition shown in figure 6.

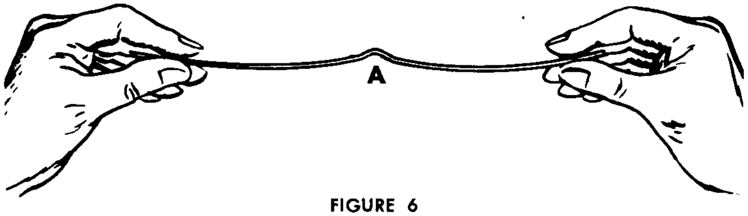


FIGURE 6

Why does the wire fail to be straightened? Why does a hump remain in the middle at A where the wire was first bent, so that instead of being bent in only one place, as in figure 5, it is now bent in three places, one curve or bend being formed on either side of the central hump?

The answer to these last questions furnishes the key to metal bumping. It is this: Wherever bent beyond its elastic limit, so as to "take a set," steel becomes work hardened—that is, becomes stiffer in the bend than before bending and therefore stiffer than the areas or parts adjacent thereto which were not bent.

As is well known, soft steel has a degree of elasticity and will spring back to its former shape as soon as the force is removed, providing it has not been bent beyond its elastic limit. However, when bent beyond its elastic limit, it springs back a little, but it cannot spring back to original shape.

Furthermore, as demonstrated in figure 6, it cannot even be made to spring back by simply reversing the force first used to bend it.

This is just as true in a fender as in a wire. The wire bent in figures 5 and 6 is entirely comparable to a cross section of similar width or thickness cut from a damaged panel at the dotted line A-A shown in figure 7.

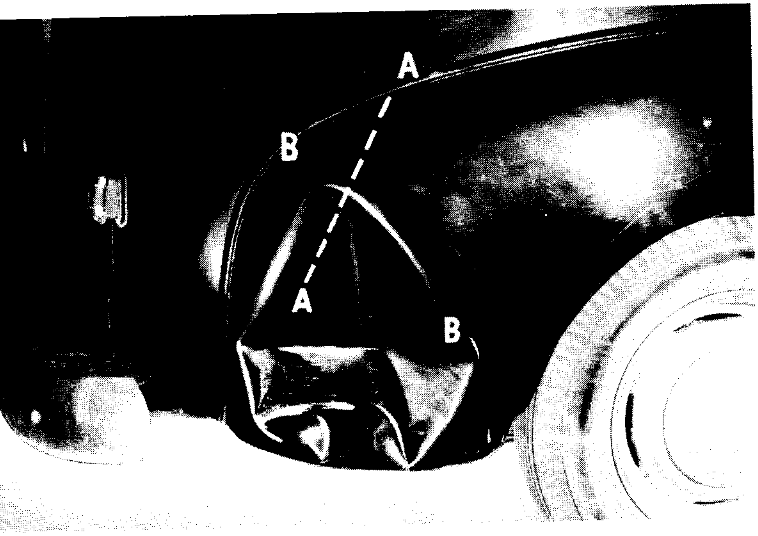


FIGURE 7

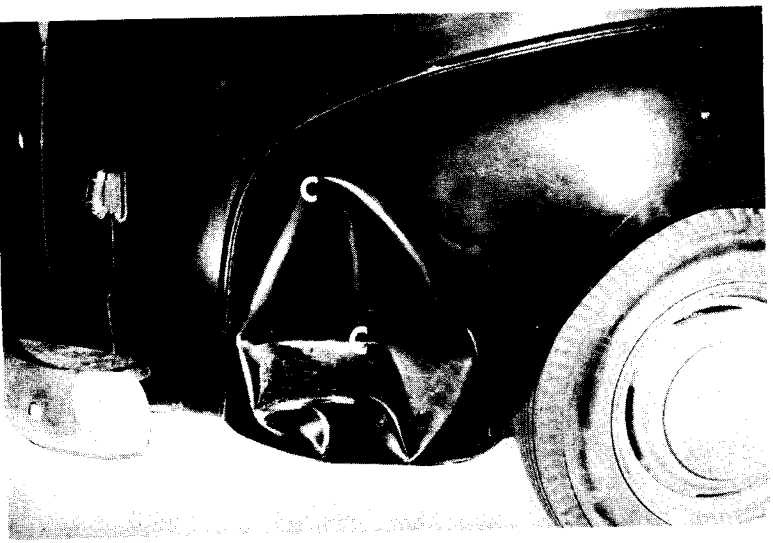


FIGURE 8

Where the line A-A crosses the ridge B-B there is a hump, or ridge, just as in the wire shown in figure 6. Being work-hardened, this ridge is stronger than the adjacent metal which is relatively unbent. Ridge B-B is, therefore, a stiff and strong rib. So are all the other ridges in the damage.

The line C-C in figure 8 is a V-channel, which is merely an inverted ridge. It also is a stiffened rib where the panel has been bent sufficiently to take a permanent set.

This damage in figure 8 is similar to a wheel. There is a center of the damage which represents the hub. There are ridges around the edge which represent the rim. There are four V-channels which represent the spoke of the wheel.

The direct damage is in the lower left hand quarter of the damaged area and it contains several ridges and V-channels. This quarter is severely damaged. However, in the indirect damage in the other three-quarters, the metal lying between

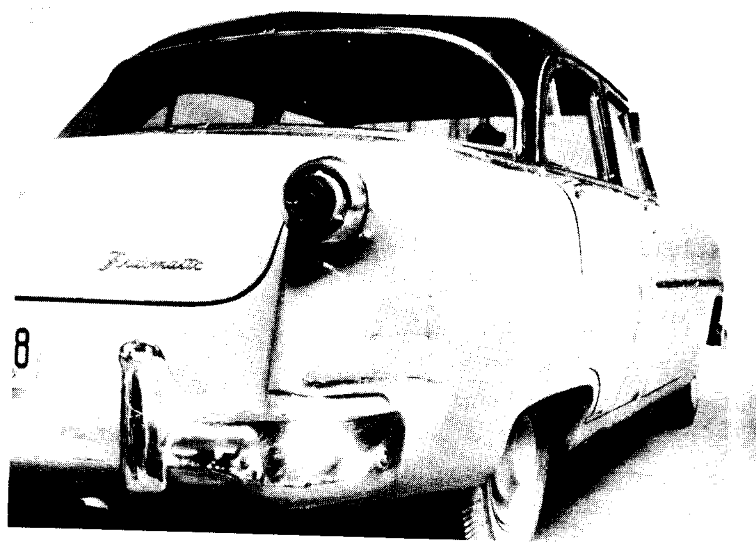


FIGURE 9

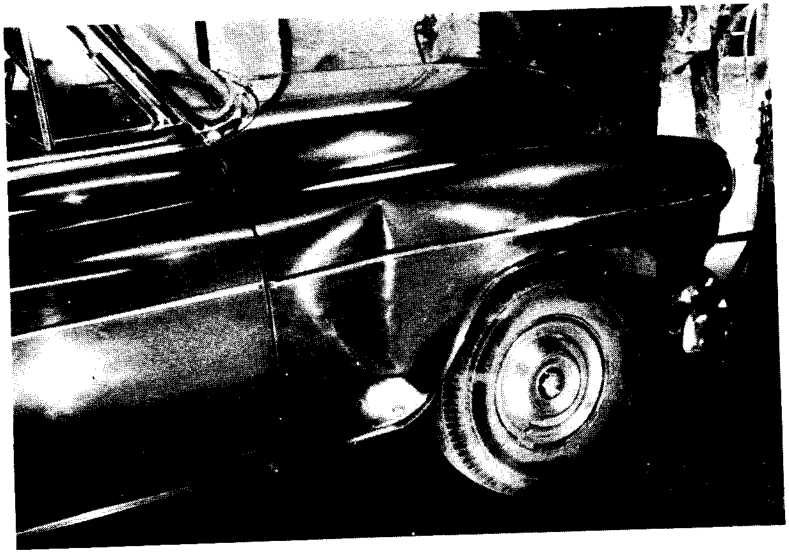


FIGURE 10

the spokes and the rim is relatively undamaged. It is only flexed. It is not bent beyond its elastic limit and would spring back to shape if not held by the stiffened ribs of ridges and V-channels.

In all damages the direct damage is usually more severe, that is, it contains more ridges and V-channels than the indirect damage. Also, the ridges and V-channels are usually closer together. This is illustrated in the two damages shown in figures 9 and 10.

These two damages illustrate the important point that the total area of a damage is not a measure of its severity, or the amount of repair work required to restore its original shape.

The damages are of two different types. The rear fender is a high crown panel and its damaged area is largely direct damage. The front fender is a low crown panel and it is nearly all indirect damage.

The area of direct damage in the front fender is shown in dotted outline in figure 11. If this fender is properly repaired, this is the only area which will require repair work. All of the indirect damage will flex back to its original contour.

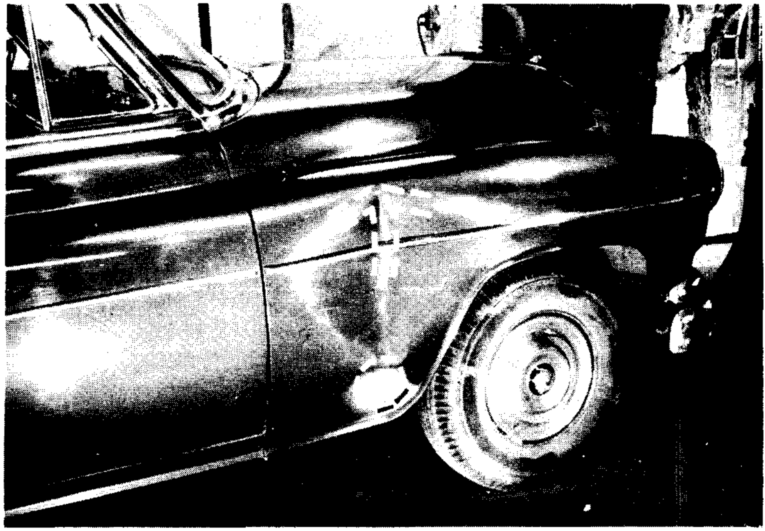


FIGURE 11

About seventy percent of the area of the damage in the rear fender in figure 9 will require repair work. The other thirty percent will flex back to shape.

To say this in another way, the restoring of the normal shape in any damaged panel can be largely a matter of removing or straightening ridges and V-channels in both direct and indirect damage. The rest of the damaged area will return to shape with little or no effort on the part of the metalman.

CHAPTER II

METHODS OF REPAIR

There are, as already suggested, two procedures which can be followed in repairing any damaged panel. One procedure is to straighten only those portions of the damage which have taken a permanent set. The relatively undamaged areas will then spring back approximately to original shape. *That is the Fairmount method.*

The other procedure is to get inside the damaged area with a heavy hammer, or other tool, and beat or push the whole area out roughly to shape. This is the "rough-'em-out—smooth-'em-up" method. Now, it is possible to obtain repairs of fairly good appearance by the latter method, but with a difference.

A good demonstration of the difference between the two methods is obtained by again considering the case of the bent wire, shown again in figures 12 and 13.

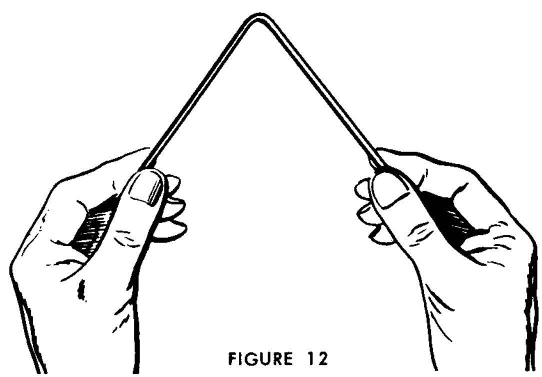


FIGURE 12

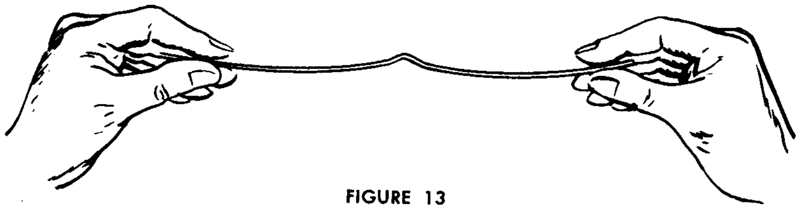


FIGURE 13

In this case, the damaging force was applied by the fingers. The bend is indirect damage. When we bent it back as by simply reversing the motion, we got the same results as by the "rough-'em-out" method. The result is a crooked wire. If we think of it as a cross-section cut from a fender, we can easily see that it will require considerable work to "smooth-'em-up" before it is smooth enough for repainting.

Next, let us try the Fairmount method, which is to apply the force only at the bent portion, as shown in figure 14.

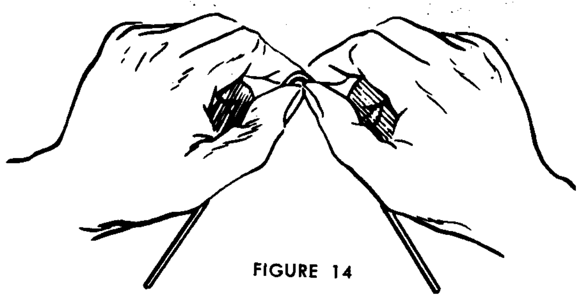


FIGURE 14

FIGURE 15

As we straighten the bent portion, the rest of the wire (not being bent, or being only flexed and not having taken a permanent set) goes back to its original shape and we get the result shown in figure 15.

This is a fairly straight wire. Considering it as a cross section of a fender, we can easily see that it will require very

little additional work to make it smooth enough for repainting.

The above demonstrates the difference between the two methods. Observe that if we repair a bent panel by forcing it out roughly to shape, we invariably add *unnecessary roughness* to the damage because those areas of metal which are only flexed must be forced back into position by hammer blows or by other means. This results in humps, knots, wavy and rough areas (frequently stretching the metal) where very little damage existed before.

In other words, the "Rough-'em-out — smooth-'em-up" method always causes additional damage to the panel in the flexed areas. This inevitably results in an excessive amount of work and time being spent on the job.

Figure 16 shows a "roughed out" turret top damage. Before being worked on, this damage was made up of ridges, V-channels, and flexed areas lying in between them, just the same as any other damage. If the picture is examined closely, the ridges and V-channels are still clearly visible.

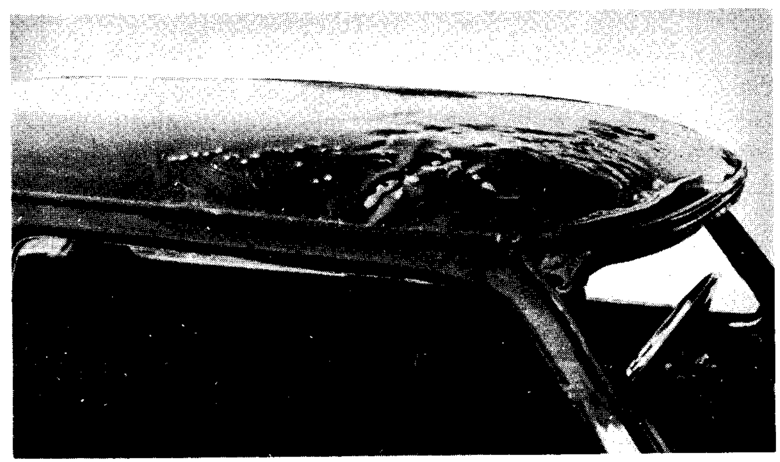


FIGURE 16

They have not been straightened. All of the original damage is still there, and all of the original repair work remains to be done. No real good has been accomplished. Instead, a heavy hammer has been used to pound and force and drive the V-channels and the flexed areas up to something like approximate level.

The flexed areas are especially rough. If the damage had been properly repaired, there would have been little or no work to do on them.

The V-channels are still bent, and have most of their original damage. In addition, they have the damage from the rough hammer blows. Also the original ridges are still in the damage.

When this damage is smoothed out, there will be excess metal at the old V-channels and ridges; and it will be necessary to perform several shrinking operations at each one. Also there will be many low spots in the former flexed areas, making it necessary to further rough them out, again causing further smoothing work.

This damage is clear and unmistakable evidence of the fact that the "Rough-'em-out—smooth-'em-up" method always causes additional damage to the panel. Damage which is entirely unnecessary, and which inevitably results in an excessive amount of additional and unnecessary repair work and time being spent on the job.

On the other hand, the Fairmount method aims at repairing only those portions of the damage which have taken a set and which actually require repairs.

In minor damages, requiring only ten or fifteen minutes repair work, the saving of time necessarily is small; however, the work is always easier to perform. On large jobs the work is not only much easier, but the difference in the efficiency of the two methods amounts to many hours.

The Fairmount method has three phases—analysis, metal bumping, and metal finishing.

Analysis is the first and most important phase, because by it the mechanical operations of bumping and finishing are planned so that they are simplified and shortened. To an experienced metalman, analysis is a brief operation. He notes the location of direct damage, the direction from which the damaging force came and the extent of the indirect damage.

He also determines whether and how much the reinforcing members of the body or fender are bent, and most important, the probable sequence in which the ridges and V-channels were formed as the damage occurred.

Metal Bumping is the mechanical phase in which the repairman restores the damaged panel, or panels, approximately to their original shape. On the basis of his analysis he begins at the farthest extremity of the damage; that is, he removes the ridges and V-channels one by one in the reverse order in which they were formed. He works on each one as long as it goes back to original position easily. During this operation, he may use one, or two, or even three, body jacks against the reinforcements, or body superstructure, always moving the damage back through the successive stages in which it was formed. Welding, shrinking, and torch soldering are a part of this phase of body and fender repair.

The third phase, metal finishing, is the process of preparing the metal-bumped surface for fine, smooth appearance, ready for repainting. The metal-bumped areas are filed, disc ground, and sanded smooth. Minor imperfections are smoothed by raising or lowering to exact level. Minute imperfections are filed or sanded to a precision job. When this phase is complete, the outside surface of the panel is as smooth as when new and is ready to be repainted.

CHAPTER III

ANALYSIS

The objective of anaylsis is to determine how a damage was formed; to plan the metal bumping operation so that the panel is brought out to original shape; and to plan the procedure *to avoid unnecessary work.*

When a panel is damaged, the colliding object first makes a minor damage around the point, or points of impact. If the object stops, that is all there is to it.

However, as the force continues on, the panel goes through a series of damages; each one of which is progressively more severe than the last. The damage spreads out farther and farther from the original points of impact. It becomes deeper and more severe. Finally it stops.

To say that a damage becomes more severe means that it not only becomes larger and deeper, it also has three additional meanings as follows:

1 That existing ridges and V-channels become more sharply bent, and become longer;

2 That new ridges and V-channels are formed;

3 That additional areas of metal are flexed below normal level.

By observation the metalman discovers the sequence in which the damage was formed. He locates the ridges and V-channels which were formed last—these are repaired first—then the ones which were formed next to last, those are repaired second—and so on until finally the last V-channel repaired is that one which was formed first.

To determine how a damage was formed, it is essential to observe several features or characteristics of it. The first feature is the location and the appearance of the direct damage.

If there are scratches in the direct damage, the direction from which the damaging force came is immediately reduced to two alternatives. An example is shown in figure 17. Here it is obvious that the first damage was made at A and the object first made contact at A and traveled toward B, or in the opposite direction beginning at B and traveled toward A.

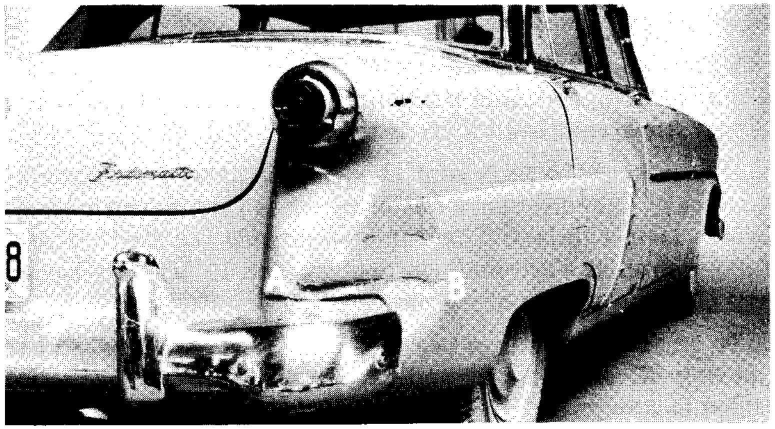


FIGURE 17

This direction can be easily determined. As an object travels across a panel damaging it, there are a series of ridges pushed up ahead, somewhat on the order of a wave being pushed ahead of a boat.

When the damage stops, this wave or ridge remains, it being bent beyond the elastic limit. Behind the colliding force there is no ridge. On this damage, shown in figure 17, there is a high ridge at B, and none at A.

It is obvious that the damage was formed from A to B. At B is the point to start the repair work.

This damage is also a good example of the type in which most of the area is composed of direct damage. Note that the areas of flexed metal are small. Most of this damage will require repair work. A small percentage, perhaps thirty percent, will flex out perfectly to shape.

Just the opposite is true of the example shown in figure 18. Large areas of this damage are only flexed, not bent. They are waiting to return to exact normal position as soon as the ridges and V-channels which hold them are repaired.

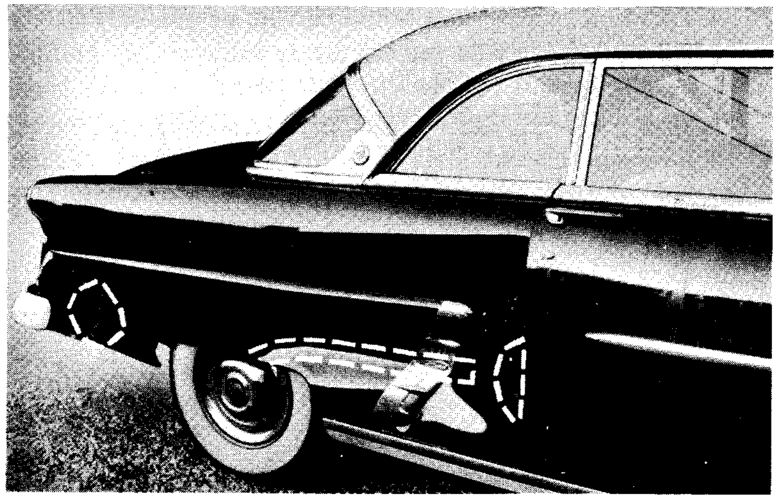


FIGURE 18

To determine the direction of the damaging force on this panel, the same procedure can be used as in the example shown in figure 17. This panel was damaged from back to front as can be seen by the crushed edge of the quarter-panel at the door opening.

The damage spread upward as the damaging force entered more deeply into the panel. The fender ornament also spread the damage over a larger area.

From the above it can be seen that when analyzing a damaged fender or panel, the metalman is concerned with the following:

1 Location of the direct damage (more than one area may be directly damaged).

2 Direction from which damaging force came.

3 Location of ridge farthest from direct damage in a straight line ahead of the direction from which the damaging force came.

4 Location, depth, and arrangement of ridges and V-channels lying between the direct damage and the farthest extremity of the direct damage.

5 How much the damage has already sprung back from its deepest point. This is taking into account the fact that any damage springs back to some extent when the colliding object goes away or is removed from the damage.

Considering all of the above the metalman then determines which ridge and V-channel was formed last; which next to last, and so on back to the original small spot where the colliding object first made contact.

He also knows that some of them may be formed almost simultaneously, and he locates them.

His repair plan is thus established. He brings each ridge and V-channel out in the reverse sequence in which it was originally formed.

As a metalman learns to do this and reaps the great advantages of the easier and faster work which results, he becomes very careful in his analysis of each damage. He finds that his work becomes so much easier that the moment or two spent in analysis, and thinking the job through, is time well spent, and also makes his job much more interesting.

CHAPTER IV

MAKING THE ANALYSIS

In this chapter will be shown two examples of damaged fenders and the analysis of each. In later chapters, the repair operation of these same damages will be shown.

The first is a damage with most of its area consisting of direct damage. See figure 19. This type of damage is frequently seen on high crown panels, such as the nose of front fenders, front ends of hoods, rear fenders and similar places.

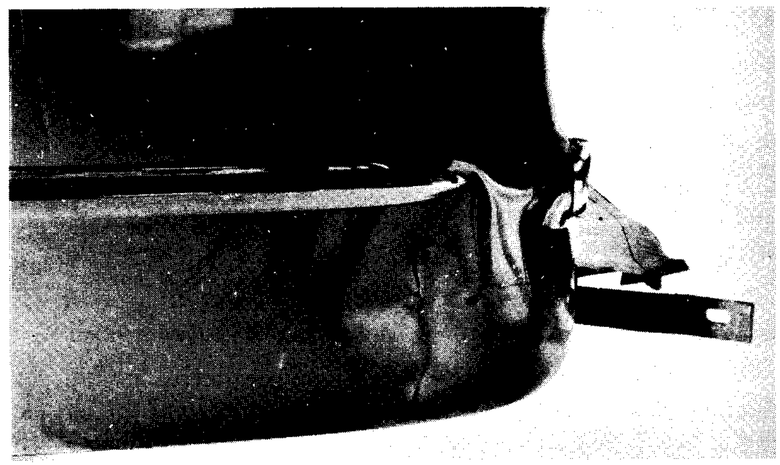


FIGURE 19

This fender was obviously hit directly from the side, not from the front or back. This is established by a deep, almost vertical, scratch in the paint in the center of the damage. This is also the center of the direct damage.

The indirect damage is at the top and bottom of the damaged area. It consists of V-channels and ridges at the upper and lower rims or edges.

The object which caused this damage first struck at one end of the deep scratch and traveled up or down toward the other end. The next step in the analysis is to determine which of these possibilities is correct.

This fender is crowned slightly. It would seem logical that the colliding object first made contact at the highest part of the crown which is the top of the scratch, and traveled downward. The shape and arrangement of the V-channels and ridges in the lower part of the damage supports this theory.

Now suppose it had hit first at the bottom and traveled toward the top. The shape and location of the ridges and V-channels in the top of the damage rule out this possibility. Nor does it seem logical, when considering the original crowned shape.

A close inspection of the groove shows the paint pushed up at the bottom of the scratch. This is final evidence.

Obviously, the bottom rim of the damage was formed last, and that is the place to begin the repair operation.

The second example is a front fender with a very large area of indirect damage as compared to the area of direct damage. See figure 20.

In this fender about 80% of the damaged area is indirect damage, and it is only flexed. It is not bent beyond the elastic limit. It will flex back to normal shape, providing the reverse sequence is followed.

To determine this reverse sequence, it again is necessary to visualize how the damage was formed. There are no scratches in the paint. There is a direct damaged point at the bottom of the fender skirt and also on the fender moulding.

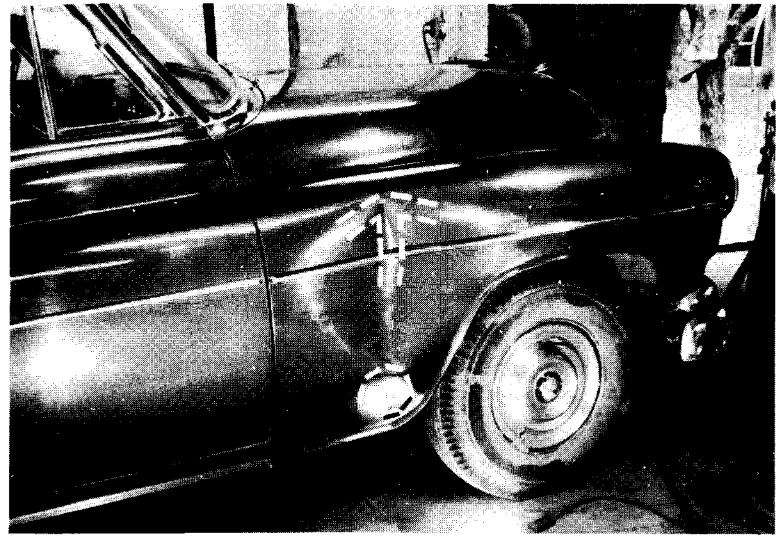


FIGURE 20

Apparently, the damaging force came straight in from the side, striking the moulding. The V-channel running straight up from the moulding was formed similar to the prow of a boat pushing through the water.

There was a ridge ahead of this wave and it remains in place at the upper rim of the damage.

If this ridge and V-channel were not in the damage it would spring out to shape by itself. In fact, it has already sprung out at the lower edge of the fender skirt. Here there was no high crown contour in which to form a sharp V-channel and ridge which could hold the damage, so the fender skirt flexed back partway.

If the ridge and V-channel above the moulding are properly repaired, nearly all of the indirect damage will flex back to shape without any work being done on it.

CHAPTER V

ORIGIN OF BODY AND FENDER REPAIR TOOLS

Modern body and fender repair tools are a natural development from the old-time sheet metalsmiths' hammers, anvils, swages, etc. The requirements of their craft were that they should be able, with hand tools, to bend, beat, roll, stretch, and trim a piece of flat sheet metal to form a kettle, pan, vase, lamp, or other object. This was creative work. An entirely new shape was formed of the sheet metal. And an entirely new surface resulted.

The tools used by the old-time journeyman sheet metalsmith were all hand-made, but their design was, nevertheless, highly developed for his particular work.

Bumping hammers are a development of his roughing hammers. Dinging hammers are a development of his planishing hammers. Dolly blocks and heavy spoons are really "hand anvils," a development of the anvils and stakes used by the journeyman coppersmith. His anvil consisted of a stand with detachable heads, these heads varying in shape and size according to the kind of articles to be made. See figure 21.

The first auto body panels were hand made. They were roughed with heavy hand tools in a crude die made of sand bags. Next, they were smoothed in a power hammer mounted on a heavy post. The final smoothing was done at the bench with hand tools.

Gradually, over the years, the extra deep-drawing steels were developed. This made possible the development of the present-day dies used in forming large streamlined panels as

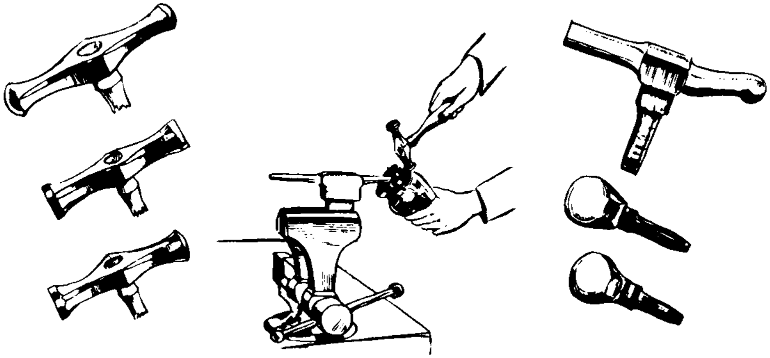


FIGURE 21

now designed, with compounded curves, unbroken by seams or welds.

A die-formed panel has a slight amount of elasticity. It is also springy. It has "life," or strength, in that it has die-formed strains throughout its entire area which tend to hold the panel in shape unless damaged. And, if damaged, these die-formed strains tend to return the panel to its proper shape, providing the damage strains are removed in proper sequence.

The necessary tools for removing or releasing the damage strains are those which can be applied to the ridges and V-channels without further injury to the panel. The most efficient and easily used tools are those which also are made from the best steels, properly designed and balanced for easy manipulation, forged and heat treated for long and hard service.

CHAPTER VI

METAL BUMPING

THE BASIC TOOLS AND BASIC OPERATIONS

The hammer and dolly are the basic tools and their use is the basic operation around which the body and fender repair trade has developed.

A dinging hammer is a light-weight sheet metal worker's hammer, manufactured in various weights from 7 to 13 ounces. The overall length of the head or pole varies from 4 to 6 inches, having on each end of the pole a mushroom head. Each of these heads has a slightly crowned working face.

The larger of the two working faces is low-crowned; i.e., comparatively flat. It is used for dinging on the dolly. The smaller working face is high-crowned; i.e., more rounded. It is used for dinging off the dolly.

The working faces of a dolly block are made of several different contours called high crown, medium crown, or low crown, or a combination of these.

A low crown face is a face having a radius of seventeen inches. A medium crown face has a radius of eleven inches. And a high crown face has a radius of seven inches.

A combination face would be one which is a combination and blend of two of the crowns. Thus one combination would be high crown across the face and medium crown lengthwise of the face, with the two radii blended together to produce a smooth even contour.

Another useful combination is low crown and medium crown. The general-purpose dolly contains a combination of low and medium crown blended in one face and medium and high crown blended in the other, thus making a very useful and adaptable tool.

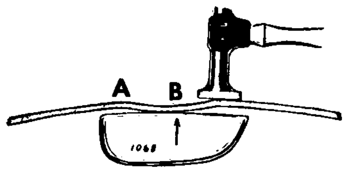


FIGURE 22

Figure 22 shows the dinging operation in its simplest form —that of dinging off the dolly. The dolly block is held against the bottom of the dent at B. Upward pressure is exerted as indicated by the arrow. This upward pressure is important. The hammer blows are directed against the rim of the dent, which is a slight ridge, unlocking the strains in this ridge. This allows the damage to go back to its original shape. Figure 23 is a photograph of a metalman performing this operation.

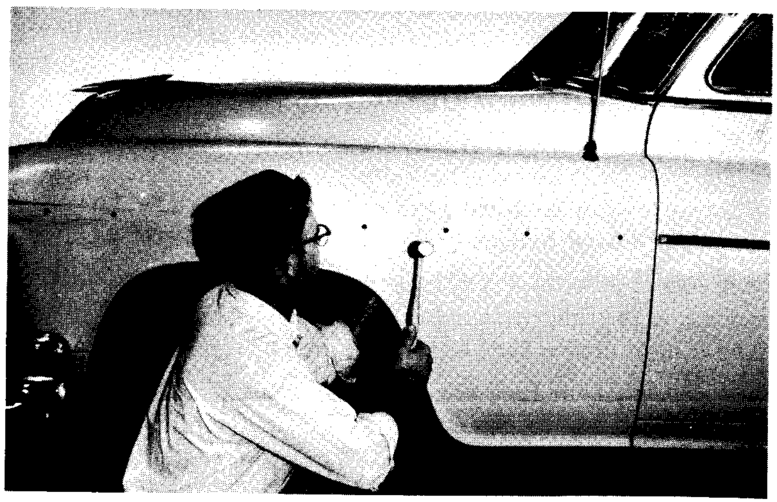


FIGURE 23

Another application of dinging off the dolly is shown in figure 24. This cross section shows a panel which has been cut at the bottom of a V-channel, A-A, which ends at ridge B. The dolly is held with upward force against the end of the V-channel near ridge B. At the same time hammer blows are struck with the high crown face against the ridge. The dolly is then moved progressively along the V-channel away from the ridge, as the hammer blows continue along the ridge.

This operation restores both the ridge and V-channel to approximately original shape at the same time.

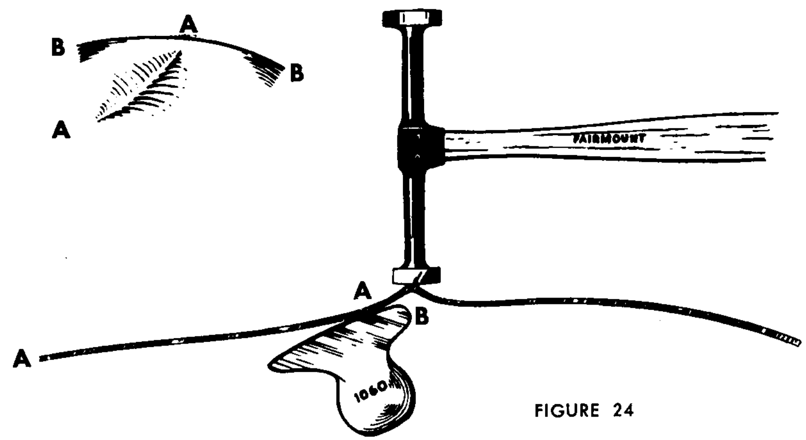


FIGURE 24

Another application is that of working the metal directly on an anvil with the hammer. The anvil is the dolly. It is held against the panel with upward pressure. See figure 25. The low-crown hammer face is always used. A low-crown dolly is used on low-crown panels such as a fender skirt, hood top or similarly crowned panels; a high-crown dolly is used on high-crown areas such as front fender noses, and hood noses. On medium-crown panels a medium-crown dolly is used.

The result is that the panel is ironed smooth between the working faces of the dolly and hammer. Each blow dings smooth a spot about three-eighths inch in diameter. The succeeding blows are so struck that each slightly overlaps the previous spot. A row of spots is dinged across the edge of the damage. Next, another row is dinged adjacent to the first row, and so on, until the damaged area is covered with parallel rows of spots.

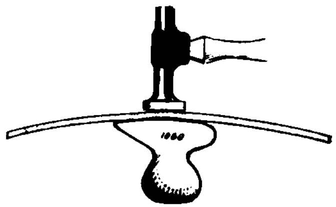


FIGURE 25

This stretches the panel only very slightly. The low-crown hammer face striking against the dolly which closely fits the contour of the panel minimizes the stretching so that it is almost imperceptible. In fact, the damage can be repeatedly dinged without noticeably stretching the metal.

The proper technique of striking the hammer blow also minimizes the stretching of the panel.

HOW TO USE THE DINGING HAMMER

The blow used in dinging on the dolly is not a follow-through blow such as is used in driving a nail, or in riveting. It is rather a glancing or slapping blow.

In skilled hands the hammer swing assumes a rhythmic quality. The hammer is held loosely in the hand, and is swung with a wrist action producing a slapping blow. Figure 26 illustrates the path through which the hammer travels.

The average metalman strikes about 120 blows per minute and in regular rhythm. As each succeeding blow is struck, the hammer rebounds as shown in figure 26. It is then lifted by wrist action to a point high enough to start the next blow.

Then, by a snap of the wrist, the hammer is thrown into its downward path for the next slapping blow. At no time is

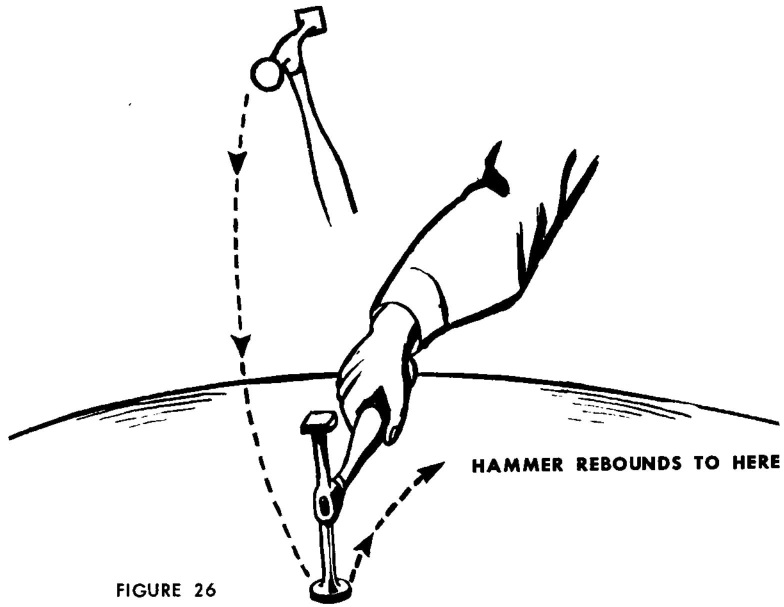


FIGURE 26

the hammer gripped firmly. The fingers are used to guide and control the hammer at the beginning and at the end of the blow. During the downward and upward flight of the hammer head, the end of the handle moves through a short arc; and the hand by continued wrist action follows along, loosely holding the handle and ready to grasp the handle more firmly at the end of the rebound.

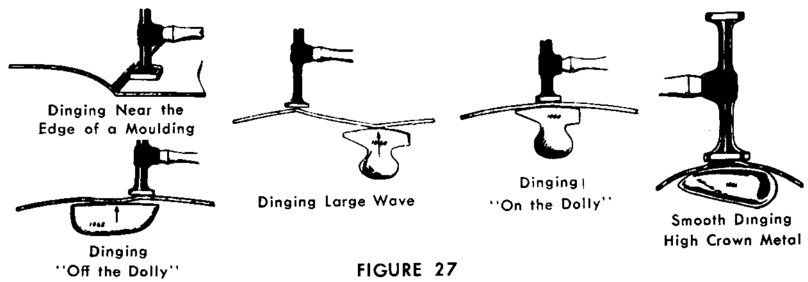


FIGURE 27

This is an operation requiring skill. It is easy to learn, however, if the hammer is properly balanced. An unbalanced hammer will rebound erratically to one side or another and destroy the aim of the blow, thereby making it necessary to grip the hammer firmly during the entire cycle of each blow. This prevents using the loose, slapping blow which is so effective. It also upsets the rhythm of the operation, makes it difficult to aim the blows with necessary accuracy and also results in slightly missing the dolly block.

HOW TO USE THE DOLLY BLOCK

The dolly block is held against the inside of the panel with pressure exerted by the operator's arm. As the hammer blow is struck, the dolly rebounds slightly from the inside of the panel, but returns immediately because of the tension in the operator's arm. As it returns, the operator accurately places it for the next spot.

If unbalanced, it is impossible for the operator to control the succeeding placement of the block, also making it difficult to strike the dolly accurately. Unbalanced tools are, therefore, a direct cause of inferior workmanship and inefficient production.

However, with properly balanced tools, the operation becomes automatic. It is done easily, quickly and with accuracy, yet without excessive fatigue. Properly balanced tools are a major contribution to good workmanship.

HOW TO USE THE DINGING SPOON

A dinging spoon is actually a pad acting as a hammer face. Its purpose is to transmit a hammer blow to a ridge in the damage without nicking or marking the paint or the metal. It spreads the hammer blow out over a wide area. See figure 28.

The spoon should be held somewhat loosely in the hand so that it can float and adjust itself with its own balance, the

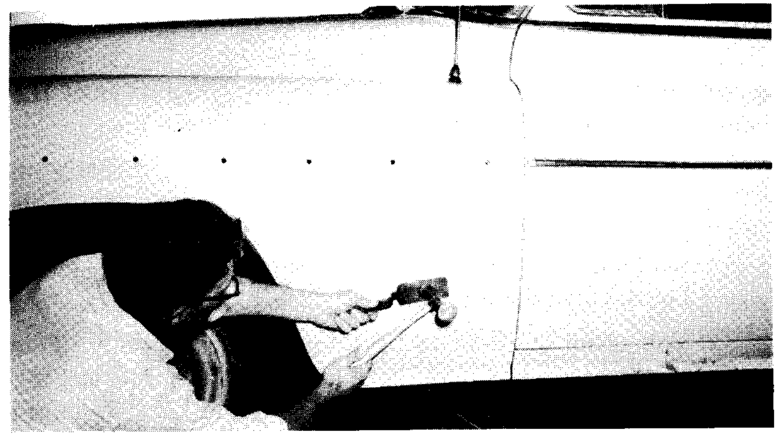


FIGURE 28

hand merely being used to guide the spoon under the hammer. Fairly sharp hammer blows are used. They should be directed straight at the ridge which is being dinged down.

Figures 28 and 29 are photographs of a metalman using a dinging spoon.

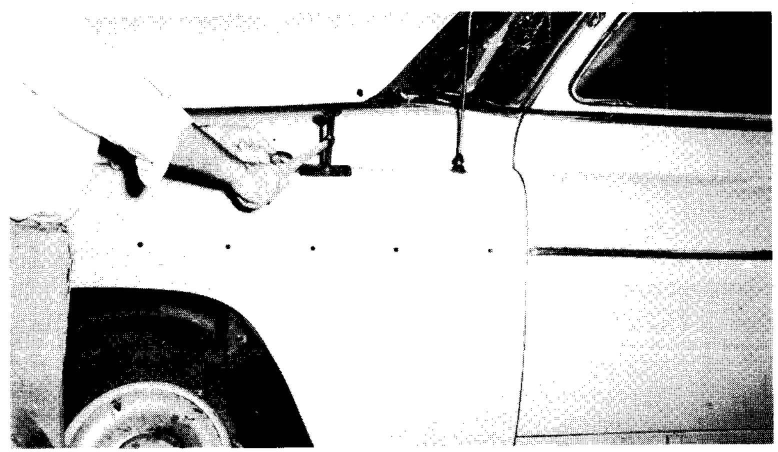


FIGURE 29

HOW TO STRAIGHTEN A RIDGE

Ridges are straightened by one of two methods. The selection of the method to be used is determined by the nature of the damage.

1 One method is by striking hammer blows directly on the ridge, either with or without a dinging spoon. This method is used where there is no adjacent V-channel which is interlocked with the ridge, the adjacent metal being only flexed or at most slightly bent.

2 The other method is by dinging off the dolly. This method is used where there is an adjacent interlocking V-channel. The ridge and V-channel are repaired simultaneously. As the ridge goes down the V-channel comes up. Sometimes a combination of the two methods will be used, changing back and forth from one to the other. The operation of dinging on the dolly is never used on a ridge unless there is an adjacent interlocking V-channel.

HOW TO STRAIGHTEN A V-CHANNEL

V-Channels are only ridges in reverse. If they were accessible from the inside it would be good practice to use the same methods as outlined above for ridges. Indeed, on some panels, such as hoods, this is sometimes possible.

Normally, they are removed by one of the following methods:

1 Dinging off the dolly. This was described in the instructions on ridges. In this operation both a V-channel and a ridge are straightened at the same time.

2 Striking with the face of a properly contoured dolly. This is in effect the same as hammering. The blows are struck in sequence, beginning at one end of the V-channel and progressing toward the other. Care should be taken not to perform this operation out of sequence or to begin at the wrong end of the V-channel. It is seldom that it should be the first operation performed on a damage. Ordinarily, the analysis will show that the first operation will be to ding down a ridge with a hammer and dinging spoon; or it will be to ding off the dolly, repairing both a ridge and V-channel together.

3 Dinging on the dolly. Normally, this method is used to further straighten a V-channel which has already been bumped up to approximate level with the dolly. When dinging on the dolly, good tools will make a spot about $3/8$ inch in diameter. These spots should be made adjacent to each other, and in parallel rows, forming a checkerboard pattern. An air hammer will materially speed up this operation.

4 Thrusting with a bodyjack. This method is similar to dinging off the dolly. A body jack with a suitable attachment is set up against the low spot or V-channel in places where the panel is not accessible to the hand and a dolly block, or where the damage and the body construction are so strong that hand pressure can not handle the job. The dinging hammer and dinging spoon are then used to ding down the adjacent ridges, similar to dinging off the dolly. It is seldom that the blows are struck directly against the body jack attachment similar to dinging on the dolly. By the time that the damage is restored enough to require this operation the panel is in alignment, and the operation can be done by hand or with the air hammer.

CHAPTER VII

METAL BUMPING PROCEDURE

APPLICATION OF THE FAIRMOUNT METHOD

Figure 30 shows the damaged rear fender described in Chapter IV. This damage has been much deeper at the moment of impact, but has sprung out somewhat as soon as the colliding force left the damage.

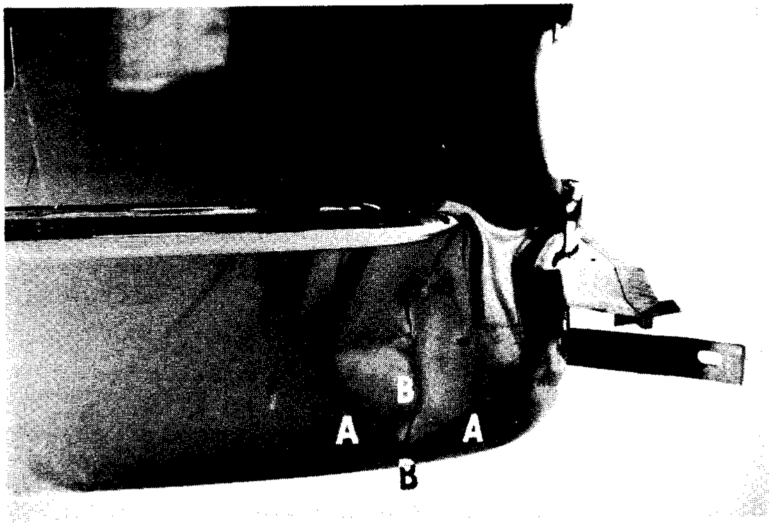


FIGURE 30

According to our analysis, ridge A-A was the last damage strain formed. V-channel B-B was formed next to last. Ridge A-A should be dinged down with a dinging spoon first. This was done lightly; the photograph in figure 31 was then taken.

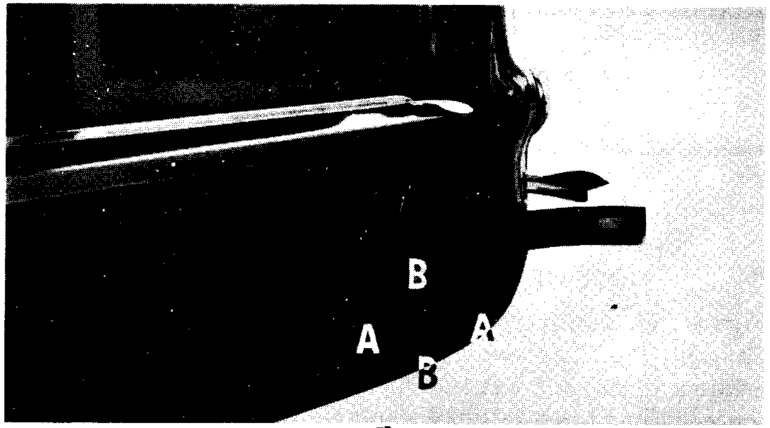


FIGURE 31

The results of this operation show the damage has begun to spring out slightly. The next step will be to bring out V-channel B-B by dinging off the dolly. The large crowned face of a general purpose dolly was held with firm pressure against the lower end of V-channel B-B. At the same time ridge A-A was struck three fairly light blows with the small diameter head of a dinging hammer.

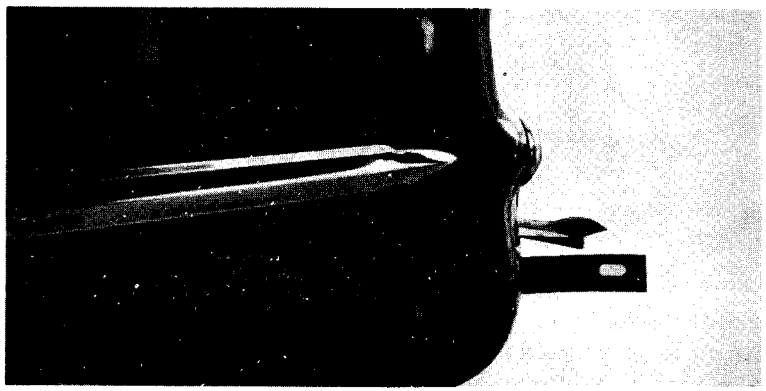


FIGURE 32

The results are shown in figure 32. Ridge A-A has vanished. It is almost perfectly smooth. V-channel B-B is more than half gone. Also, a considerable area of the flexed metal has sprung back to normal shape.

The next operation will be to bump out the remainder of V-channel B-B with the general purpose dolly block. This was done by striking the first blow at the bottom and progressing upwards toward the direct damage. Figure 33 was then photographed.

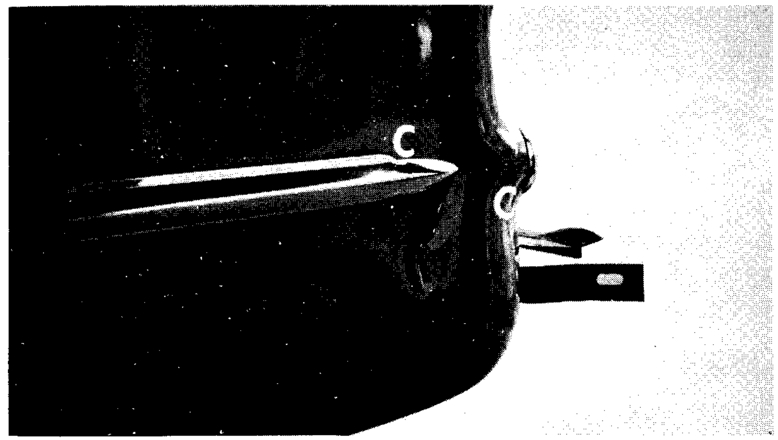


FIGURE 33

All the indirect damage in the lower part of the damage is metal bumped almost perfectly to shape. The next step is to repair the indirect damage in the upper half of the damage. This was done by dinging off the dolly. Ridge C-C was dinged down with the hammer as the dolly block was firmly held against the top end of the V-channel.

The direct damage was then bumped out with the dolly block beginning at the lower end of the scratch and working upwards. Following this, the direct damage was dinged smooth by dinging on the dolly.

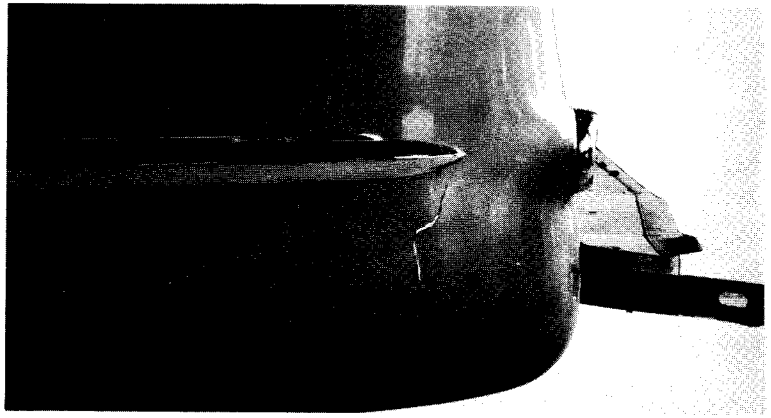


FIGURE 34

The results are shown in figure 34. This damage is now in very good shape. There is not a hump, or knot, or bump from the repair operation. There are only a few, very, very minor traces of the original V-channels left. They will be removed in the metal finishing operation.

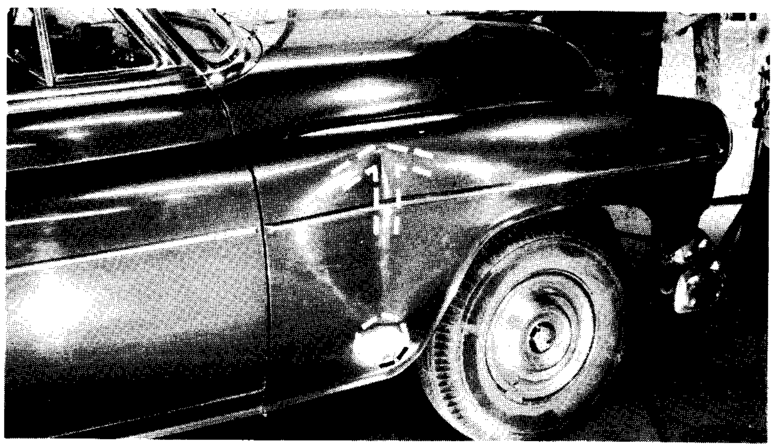


FIGURE 35

The important point is that this panel is now back in its original contour. The Fairmount Method of analysis, and its resulting proper sequence, made this job easy. The right tools brought it out in almost perfect shape.

Another damaged fender is shown in figure 35. If this damage is properly repaired, the only repair work necessary will be in that area shown in the dotted outline.

Very little spring back occurred when the damaging force left this fender. There is still a very large area of flexed metal waiting to spring out as the damage strains are released.

The first repair work was to strike two blows from the inside, using a general purpose dolly block. These were struck near the top of the V-channel.

The results are quite spectacular. They are shown in figure 36. Almost all of the flexed metal has sprung out. The remainder of the damage was then dinged smooth by dinging off the dolly at the top, progressing down toward the moulding line.

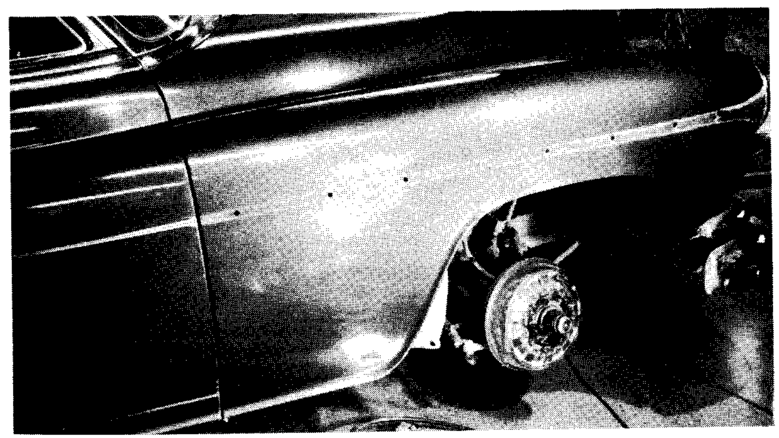


FIGURE 36

Low spots were bumped up with the dolly. The areas were then dinged smooth by dinging on the dolly and off the dolly. Figure 37 was then photographed.

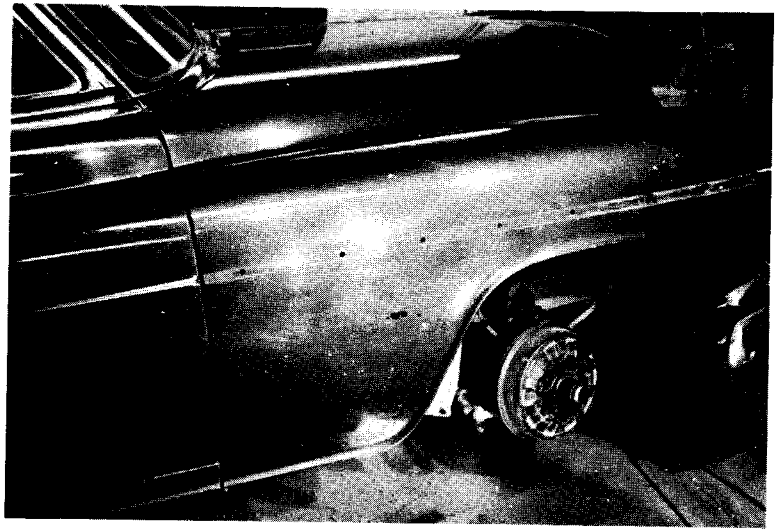


FIGURE 37

This is a smoothly bumped damage. It is easy to metal finish. But suppose that the damage had been "roughed-out." The entire area would have been forced or beat up to a shape. It would have been full of humps and knots, similar to the turret top shown in figure 16.

It would have been very difficult to metal finish, and it would have taken several times as long to perform both the metal bumping and metal finishing operations.

On a large damage, the saving in time in both the metal bumping and metal finishing operations may easily amount to several hours. And in addition to being much easier to repair, a higher quality job is obtained.

CHAPTER VIII

METAL FINISHING TOOLS AND HOW TO USE THEM

Metal finishing, the third phase of the Fairmount Method, is the operation of smoothing the minor imperfections left after metal bumping, so as to obtain an even, regular surface, ready for repainting.

From a quality standpoint, this is a very important operation. A damaged panel, properly metal bumped, but poorly metal finished, is a second class repair job. By comparison, the same damage, if poorly metal bumped, but given a good metal finish, will make a better appearing job when painted.

However, a damage properly metal bumped and given a good metal finish, looks like new when repainted. It is a quality piece of workmanship, with quality appearance and upon such jobs reputations are built which attract the most desirable class of work. This class of work is also the most profitable.

The surface of a metal bumped damage has minor irregularities in the form of low spots and slight waves which are only a few thousandths of an inch away from the correct contour of the panel. These irregularities must all be removed to produce a first class job.

There are two ways to locate these minor irregularities: by sight—after pushing a file or operating a disc sander across the surface to show up the low spots; and by touch—feeling the surface of the panel with the hand.

As a man gains experience in metal finishing, he becomes very skillful in feeling very slight surface imperfections with his hand. He becomes able to find and determine the exact nature of surface irregularities, many of which are too slight to be seen with the eye except by careful scrutiny under ideal lighting conditions. He is able to feel irregularities which might even then be overlooked, but which would later show up when the job is painted and polished, thus detracting from the quality of an otherwise perfect job of workmanship.

In feeling for surface imperfections, most body repairmen use the palm of the left hand. It is laid down flat on the panel with both the hand and the wrist somewhat relaxed. The elbow is dropped down until the wrist joint is only slightly bent. Thus the forearm and the hand are held in almost straight line. See figure 38.

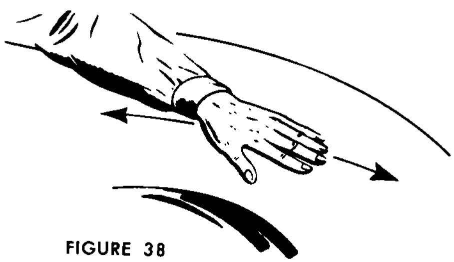


FIGURE 38

The irregularities are detected by moving the hand lengthwise back and forth all the way across the damaged area. As his is being done, the entire length of the hand—heel, palm and fingers—is kept in full contact with the panel, care being aken not to raise the palm, leaving only the fingers touching.

It is very important to follow the above suggestions as to osition of forearm and hand. When feeling only with the nds of the fingers, or with the fingers and heel, it is difficult o distinguish between a high spot and a low spot, and many rregularities will pass unnoticed.

Most body men wear cotton gloves while metal finishing. Gloves not only protect the hands, but it also is much easier

to feel the exact nature of the irregularities through a piece of cloth than with the bare hand. This is also demonstrated in the painting operation. The painter when later wet-sanding the surface, can easily feel any irregularities through the abrasive paper. That is why he will sometimes discover slight high or low spots which were overlooked in the metal finishing operation. The use of gloves enable the metalman to feel the irregularities in the panel in the same way.

THE FILE AND ITS USE

The body worker's file commonly used in metal finishing, becomes a flexible metal plane when bolted to an adjustable file holder. See figure 39. File holders are adjustable to provide a means of bending the file to conform to the crown of the panel. The file can also be curved to go down into concave panels. An adjustable file holder should, therefore, always permit flexing the file either way, but care should be taken not to flex it too much as to run the risk of breakage. The bolts should be loosened before flexing the file.

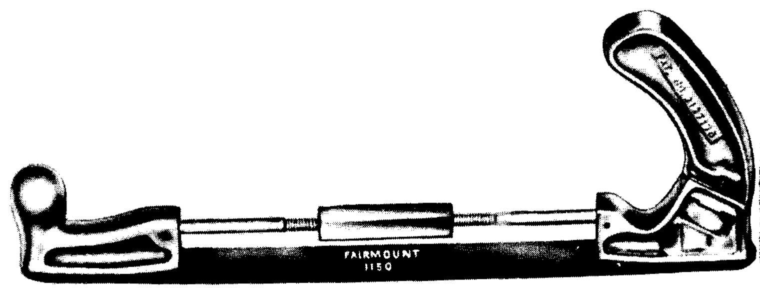


FIGURE 39

When filing beads and mouldings, it is necessary to push the file straight down its length in order to follow the moulding. With this exception, it is not good practice to push the file straight ahead along its length. It is better to turn the file about 30 degrees crossways of its line of travel, pushing equally hard with each hand, as illustrated in figure 40.

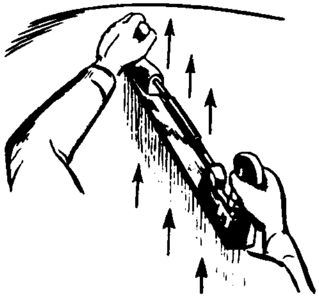


FIGURE 40

The file should be moved with long, straight, regular strokes, preferably in the long direction of the panel. Use a combined arm, shoulder and body motion and exert as much thrust with the left shoulder and arm as with the right. Allowing the file to ride on the panel on the return stroke does no particular harm to the file or the panel.

To obtain the full planing or shearing action of the file, it should be slightly advanced along its length as it is being pushed forward directly away from the operater. However, the path of the file cut is straight away from the operator. How this is done is further explained in the following and in figures 40 and 41.

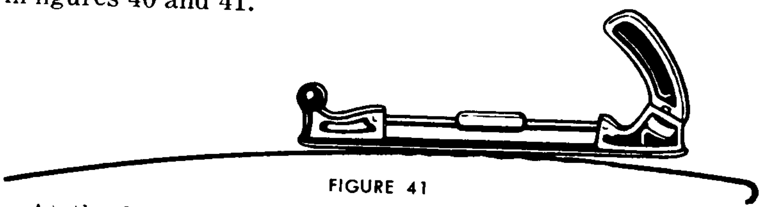


FIGURE 41

At the beginning of the file stroke, three or four of the teeth near the front end of the file are engaged and are cutting. As the file, held at a 30 degree angle, is pushed straight away from the operator and also advanced along its length, the engagement of the teeth actually doing the cutting, gradually progresses toward the rear of the file. Thus at the end of the stroke, the teeth engaged in cutting are near the rear end of the file and all of the teeth between the front and rear have been used.

Short, choppy strokes should never be used in filing, as the result is to chew up the surface of the panel and to go in and out of low spots. No shearing action is obtained. This is a very inefficient method of filing. In fact, it is not filing, it is scratching.

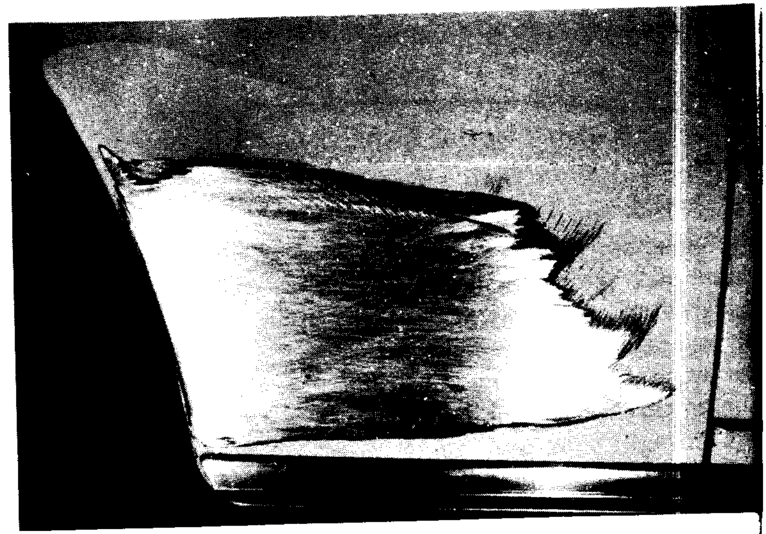


FIGURE 42

Figure 42 is a photograph of a good filing job. The results of long regular strokes, using a shearing action, can be clearly seen. There are no file scratches.

Caution should be exercised so as to remove only the minimum of metal. The file, instead of being used to plane off wrinkles and high spots, should be used only to locate them. Afterwards, when the wrinkles, waves and low spots are brought to correct level with a pointed hammer, or dolly and hammer, the file should be used to precisely smooth the surface for sanding.

HOW TO RAISE LOW SPOTS FOR METAL FINISHING

The low spots revealed by the file can be driven up with a pick hammer. This hammer not only raises a point of metal but also an area of metal all around the point. The sharper the pick end of the hammer, the smaller will be the diameter of the area of metal around the raised point; and the blunter the pick, the larger will be the area raised. See figures 43 and 44.

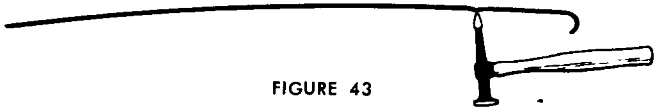


FIGURE 43

On a low-crown panel, such as a fender skirt or door panel, a blunt pick hammer will raise too large an area. It will not only raise the low spot, but will also raise some of the surrounding area which is already high enough, thus making it necessary to bring that metal back to proper level. Conversely, on a high crown panel, a sharp-pointed pick hammer will not raise an area large enough to bring the entire low spot up to proper level. If a blow hard enough to raise the entire spot is struck, the point raised by the hammer will be too high and must be flattened with a hammer and dolly to avoid filing through the metal at that point.

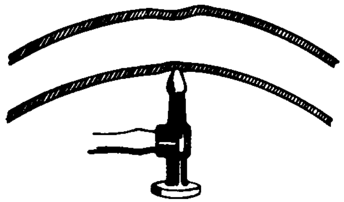


FIGURE 44

A sharp-pointed hammer should, therefore, be used to pick up low spots in a low crown panel, and a blunt point on high crown panels. Or, by varying the force of the blow to the degree necessary, a medium point may be used on both; but this is more difficult.

A wide, flat area on extra high crown fenders can best be bumped up to shape with a dolly block.

DISC SANDING

The disc sander with its backing pads and sanding discs, is as important a tool in metal finishing as the pick hammers and file. It has three distinct applications in the metal finishing operation:

1. PAINT REMOVAL—using the "open coat" or paint removing discs to grind off the old finish.
2. GRINDING OR CUTTING—partially replacing the file in producing a uniform surface by cutting off small peaks, wrinkles, etc. Use "closed coat" abrasive discs of No. 24 and No. 36 grit.
3. SANDING—using fine abrasive discs, No. 50 or No. 60 grit, to sand out file marks as well as scratches from the discs of coarser grit size previously used in the grinding and paint removing operations.

When the disc sander is used as a cutting or grinding tool with a No. 36 or coarser grit abrasive disc, the line of travel should be back and forth in horizontal lines. The reason is that the most efficient cutting is obtained by reversing the direction of cutting after each stroke. If we say that all horizontal strokes are East and West and that the operator is facing North, the proper direction for the sparks to fly on the West to East stroke (left to right) is slightly Northeast; and the proper direction for the East to West stroke (right to left) is Southeast. See figure 45.

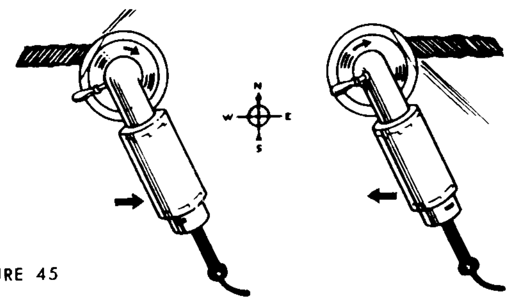


FIGURE 45

This produces a cutting action which levels the surface, particularly on the left to right stroke. It is somewhat similar in results to the file stroke previously described. It also reduces the amount of filing which would otherwise be necessary to produce a perfectly curved surface.

Figure 46 is a photograph of a good job of disc grinding a damaged area, as described above.

FIGURE 46

A different method is desirable when using the sander for the purpose of removing file marks or coarse grit scratches.

As compared with the East-West designations just mentioned, the sander should be moved vertically, or from North to South and the sparks will then fly to the East (right). The first vertical stroke should be on the left side of the damage. Each ensuing vertical stroke should slightly overlap the preceding stroke.

Figure 47 is a photograph of a good job of disc sanding to remove file marks and coarse grit scratches from disc grinding.

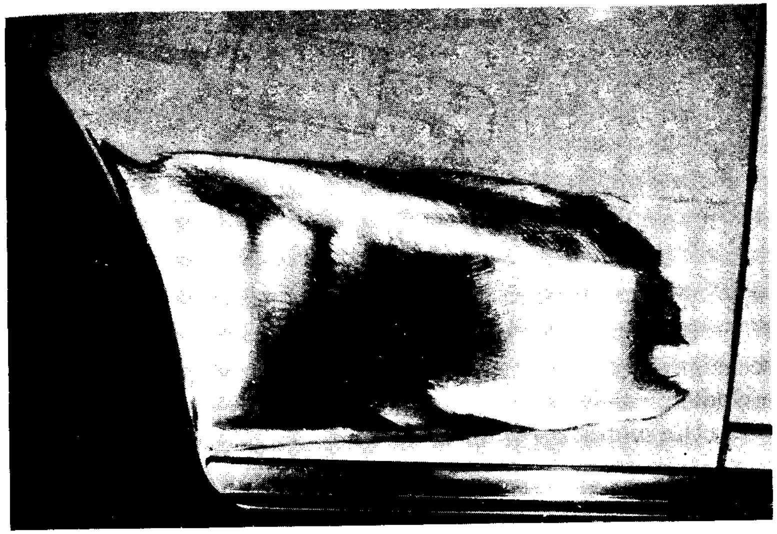


FIGURE 47

While bearing down with some pressure on the sander, it should be moved as slowly as possible, but not so slowly as to burn the metal; moving the tool back and forth rapidly does not give the abrasive time to cut.

The disc should be held as flat as possible, with at least an inch of its outer edge in contact. Always avoid tilting the sander at a sharp angle to the work, as this results in using only $1/4$ to $1/2$ inch of the edge of the disc. If so used, the edge of the disc cuts and gouges into the surface of the panel, so that neither grinding or sanding is obtained.

Much better, faster and smoother results are obtained if the disc is down as nearly flat as possible, using at least one inch of the edge of the disc. When this is done, the discs will also last a great deal longer. See figure 48.

For safety's sake, the sander should be started off the job and stopped on the job. Also, to protect the sander itself, it should never be laid down on the floor with the motor run-

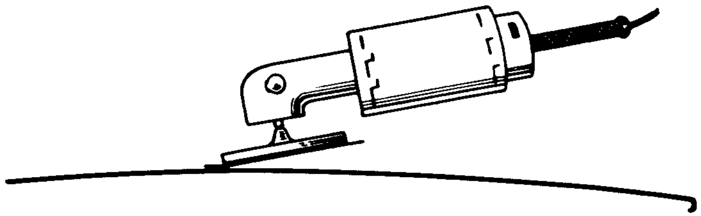


FIGURE 48

ning. If this is done, its cooling fan will pull dust and dirt from the floor into the motor housing. It is good practice occasionally to clean the dust from inside the motor housing by blowing compressed filtered air through the cool air intake while the motor is running.

CHAPTER IX

METAL FINISHING PROCEDURE

After a panel is metal bumped ready for metal finishing, the correct procedure to produce a quality job quickly and surely is as follows:

1 Feel panel and "pick up" all low spots which are found in this manner.

2 Remove paint. Use disc sander with No. 24 grit open coat, paint-removing disc. Operate sander with horizontal strokes using the grinding technique. Go over the damage rapidly, just removing the paint.

3 "Pick-up" additional low spots disclosed by paint removing operation.

4 Disc grind. Use No. 36 grit, closed coat abrasive discs. Operate sander with horizontal strokes, using grinding technique. Grind thoroughly.

5 "Pick up" any remaining low spots disclosed by grinding operation.

6 Regrind areas picked up in operation No. 5.

7 File damage lightly over the entire area.

8 "Pick up" all minor low spots disclosed by filing operation.

9 Cross file—this will disclose any areas which were not disclosed in first filing operation.

10 "Pick up" any low spots disclosed by cross-filing operation.

11 File smooth.

12 Disc sand. Use No. 50 grit closed coat abrasive disc—applying sanding technique described herein. Leave edges of old paint uniform, not jagged. Sand out all file marks, No. 36 grit marks and No. 24 grit marks.

13 Hand sand. Use No. 60 or No. 80 grit aluminum oxide abrasive cloth. Roll cloth into a pad and sand all roughness from No. 50 grit.

The job will now be ready for feather-edging and painting. (An excellent job of feather-edging the old finish and of producing a super sanded surface on the repaired damage can be obtained by using a vibrating or oscillating sander. Use grit sizes as recommended by their manufacturers.)

Various stages of the metal finishing operation are shown in this chapter. The examples used are the fenders previously shown in the chapter on Metal Bumping.

Figure 49 is a photograph of the metal bumped rear fender after the operation of disc sanding for paint removal. There are only two low spots remaining. They are indicated by the arrows.

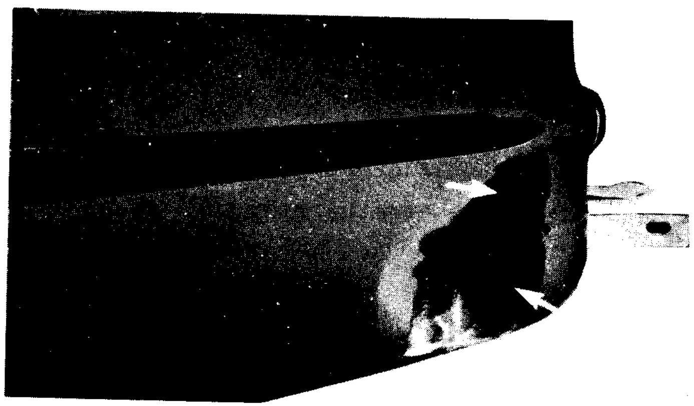


FIGURE 49

These low spots were picked up with a sharp pointed pick hammer. The area was then disc ground to cut off all over with a No. 36 grit closed coat disc. Figure 50 is a photograph showing the results.

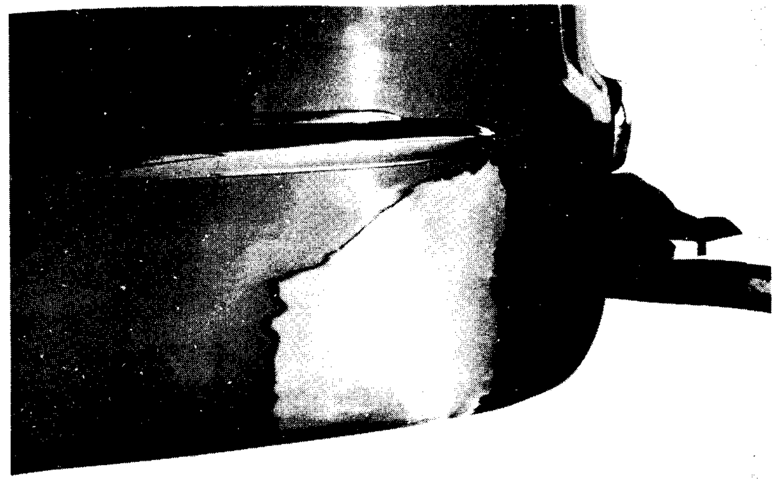


FIGURE 50

The job is so smooth that the filing operation was not necessary. This is because it was properly analyzed and metal bumped.

The final operation of sanding with a number 50 grit disc was then performed, making the damage ready for feather edging and painting.

Figure 51 shows the front fender example on which the metal bumping operation was previously performed. This is after the first operation of disc sanding with an open coat number 24 grit paint removing disc.

There are several low spots remaining. They were picked up with a medium point pick hammer and the job was then thoroughly disc ground with a number 36 grit disc. This was

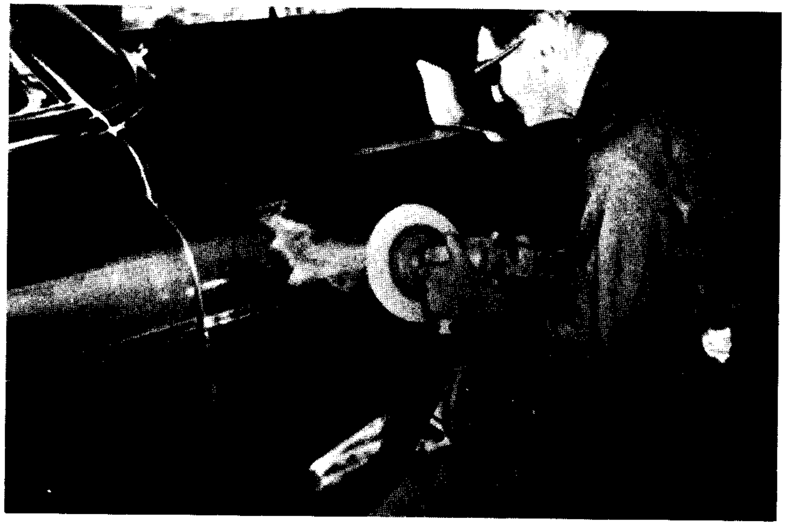


FIGURE 51

to cut all the minute waves as nearly level as possible and to reduce filing time.

The filing operation was next. It is shown in figure 52. As it progressed over the area, various low spots where the file would not touch were revealed. These were all picked up to level and filed smooth.

The job was also cross-filed. The cross filing and picking of the minute low spots produced a perfect contour.

The final operation was to disc sand the area with a No. 50 grit disc. Care was taken to sand out all file marks and all traces of the No. 36 grit and No. 24 grit discs.

Figure 53 was then photographed. This is almost a perfect job. When painted it will be impossible to find any traces of the damage.

Furthermore, it is an excellent job from the standpoint of craftsmanship. There are no deep scratches to be filled with

FIGURE 52

putty, or to be sprayed and resprayed with surfacer. Only two coats of surfacer will be sufficient to build the new paint up flush with the old. And these two coats will easily fill all the tiny scratches made by the No. 50 grit disc and the No. 60 or 80 grit cloth and production paper.

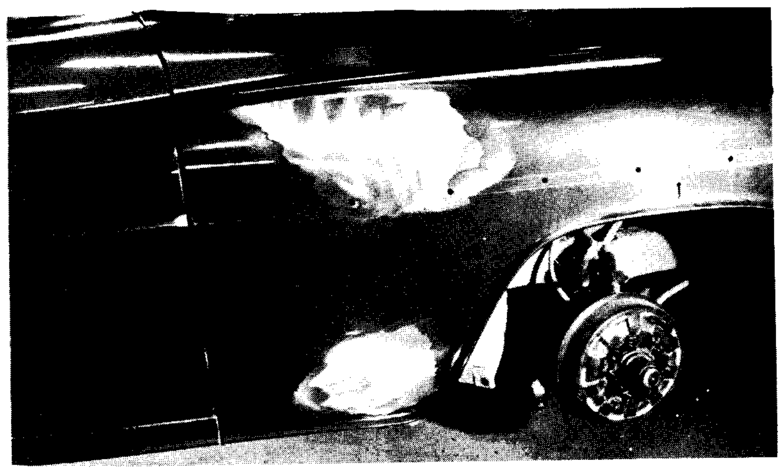


FIGURE 53

CHAPTER X

ALIGNMENT

Alignment is that phase of the metal bumping operation, the purpose of which is to restore the heavily reinforced framework of a damaged autobody or fender to its original position. Such heavily reinforced sections as cowl pillars, center pillars, quarter panel pillars, roof rails and similar strong assemblies, are of such thickness and strength that they cannot be straightened with hand tools.

When the damage includes one or more of the reinforcing sections of the body framework, it becomes necessary during the metal bumping operation to apply enough pressure on this framework to force it back to place. This pressure is applied by means of a jack. Two or even three jacks may be needed in an extremely serious damage.

The application of the jack is simply to set it up with a suitable attachment to exert controlled pressure against the bent frame work.

This does not mean that one should first push or pull the bent framework all the way back to place and then metal bump the damage. The results of this procedure would be to pull additional strains and do more damage to the panels which adjoin the framework.

Nearly always when the framework is bent, it has been directly damaged. Very often all the adjoining panels, or nearly all of them, are indirect damage. As the work is begun on the indirect damage to bring it back through the stages in which it was formed, the damaged framework, being too heavy and stiff, does not spring back as its turn comes, and cannot be forced by hand.

The jack in such cases is applied to help this framework return to original position apace with the metal bumping of the indirect damage. As the indirect damage is gradually unlocked and unrolled, the jack pressure must be re-established to take up the slack released by metal bumping the indirect damage strains one by one. This gives all the unfolding damage a place to go—back to original shape.

In the following is explained how the Fairmount Method is applied to a fender or body damage in which the reinforcing framework is out of alignment.

The damage is first unlocked. This means that all the ridges in the entire damage, beginning at the extreme outer edges of the damage, should be dinged down enough to partially release their strains or stiffness. No attempt should be made to force them down any farther than they go easily.

Now the jack should be placed against the bent framework and just enough pressure applied to force it back as long as it will go easily. This places a pull or tension on the area of indirect damage. In fact, some of the indirect damage may flex back towards normal shape.

Then, metal bumping should be started on the V-channels, (beginning at the farthest reaches from the direct damage) and be continued on the V-channels, each in its turn, according to the analysis of the damage. Continue (with this) only as long as the V-channels bump up easily—THEN STOP. The result of this work will be to relieve most of the jack pressure. In other words, the reinforcing member has sprung back part way, aided by the jack.

Now pressure should again be applied with the jack, just enough to restore the tension on the remaining damage.

Next, the ridges should be dinged down again as far as they will go easily. Perhaps at this point some of them which are farthest from the direct damage may go all the way down to normal level. The V-channels should also be further bumped out. These two operations should be alternated as long as good results are obtained, or until the tension set up by the jack is relieved.

Then more jack pressure is applied, followed by more metal bumping on the ridges and V-channels and so on, until the damage is unfolded and unrolled and the metal has returned to its original shape.

The procedure as outlined above adheres strictly to the principle of metal bumping the damage back through all its various stages of severity to its original shape, the jack being used as an additional tool applied only to heavily reinforced sections.

CHAPTER XI

FRAME STRAIGHTENING AND PANEL REPAIR

Frame straightening is a specialized field of automotive repair and the manufacturers of frame machines have published excellent material on frame straightening and the use of their equipment.

Frame straightening is, in many respects, similar to metal bumping. The following remarks on frame straightening may, therefore, also be helpful in throwing further light on the art of metal bumping.

The bend in the frame is work-hardened and stiff, just as the bent wire shown in figure 5.

A frame is made of such heavy material that it cannot be straightened with ordinary hand tools. Power must be used and a means found of applying this power from a suitable purchase or fixed point.

Occasionally, this purchase may come directly from some other portion of the frame itself. But in nearly every frame job, it is more practical and sometimes absolutely necessary to apply the power from a fixture to which the frame is securely held. Such a fixture is the frame machine.

The frame straightening operation is basically one of holding the bent frame member securely to a suitable fixture from which pull or pressure may be applied directly or indirectly to the bent area, and while doing so, also to relieve the strain in the bend by means of heat applied with a torch.

The repair of very severely damaged panels, which preferably should be replaced, but which must sometimes be salvaged because replacement panels are not available, is very similar to frame straightening. Extra power must be used. The damage is so stiff that it cannot spring out, and heat must be applied to the accordion-like folds. However, in all cases, the Fairmount technique of unlocking and unfolding the damage must be employed to obtain the best results with the least trouble and expense.

In this type of damage, much shrinking will be necessary because the metal is stretched beyond its normal length. Considerable dinging on the dolly will also be necessary. Here an air hammer can save much time.

But, as already stated, no matter what tools are employed, the technique of unlocking and unfolding the damage to frame or panels back through the various stages in which it was formed, will result in obtaining a better job, with expenditure of least possible time and effort.

HOW TO USE THE AIR HAMMER

The air hammer is a very useful piece of equipment. With it, best results are obtained on extra high crown panels, such as the nose crown of front fenders.

Before applying the air hammer, the damage should first be unlocked and unrolled by The Fairmount Method, using hand tools. The air hammer then serves the purpose of using power as an aid in smoothing the unrolled damage. It should be moved slowly back and forth in overlapping parallel lines of travel. A thin coating of light oil on both the inside and the outside of the fender makes the operation easier. The inside of the fender should be cleaned with a wire brush.

In case of underbody coating on the inside of the fender, warm the fender with an oxy-acetylene torch using a long brushy flame. Move the torch back and forth rapidly to avoid burning the paint. Wipe off the softened coating with rags.

CHAPTER XII

SHRINKING

When a panel has been damaged so that it is permanently stretched, it will, after it is restored to shape, be too high in the stretched area. It cannot be dinged down, as there is no place for the metal to go. It must be shrunk to normal size.

Also, if a damage has not been properly unlocked and unfolded, but is roughly beat out to a general shape, there will be high ridges which have no place to go, because the low areas which they should have released were stretched up to general shape in the roughing process. These high spots will also require shrinking to be brought down to level. Or, if the low areas are brought up further to release the high ridges down to level, then the rough stretched areas will require shrinking.

However, a properly analyzed and metal bumped damage will require shrinking only in the direct damage, where the panel has actually been grooved or stretched in the collision.

The shrinking should always be done following the metal bumping and before the metal finishing operation.

Basically, the shrinking operation is that of heating a small spot in the center of the stretched area and then upsetting the stretched metal into this heated spot, making it thicker.

1 With the oxy-acetylene torch, using a small tip, a spot $3/8$ inch in diameter should be heated to a little past cherry red in the center of the stretched area. (See figure 54). The heat expands the metal in the entire

FIGURE 54

stretched area, while the spot itself rises into a low peak. (See figure 55). Care should be taken to avoid burning a hole in the metal.

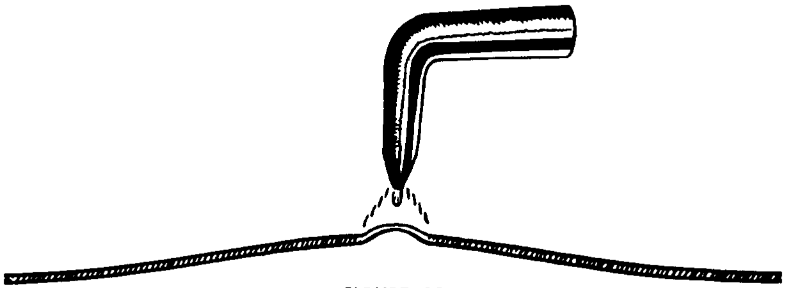


FIGURE 55

2 As quickly as possible after the spot turns cherry red, the torch should be laid down, a dinging hammer picked up, and a hard blow struck directly on the heated spot, driving it down. It is not necessary to use a dolly block or other backing-up tool. This hammer blow upsets the hot metal and is the mechanical action and work which shrinks the metal. The spot will now form a crater instead of a peak. (See figure 56).

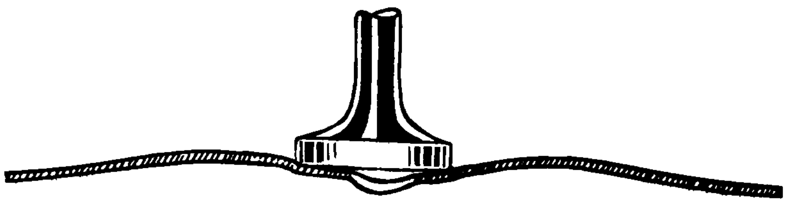


FIGURE 56

3 Next, as quickly as possible, a dolly block should be held with outward pressure from the inside against the bottom of the crater; at the same time the rim

of the crater should be tapped down from the outside with the dinging hammer. (See figure 57). This is simply a dinging off the dolly operation to smooth the crater-like spot to proper level for metal finishing. The spot will now appear as in figure 58. It will be noted that the expansion from the heat still remains in the metal.

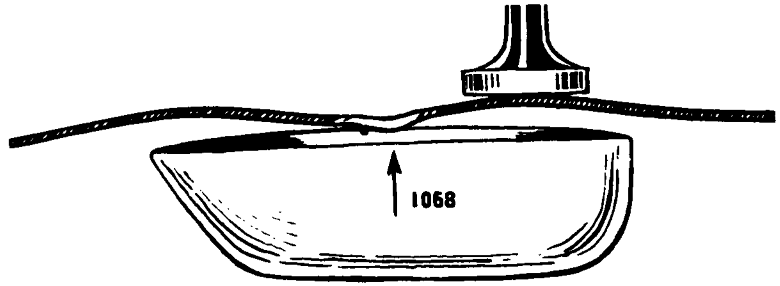


FIGURE 57

FIGURE 58

4 Finally a water-soaked sponge should be used to quench or chill an area about 6 inches in diameter all around the spot. (See figure 59). The chilling draws the expansion out of the metal very rapidly.

FIGURE 59

5 Continue shrinking additional spots until the contour of the panel is in proper shape as determined by feeling with the hand.

It is possible to shrink without quenching, by air cooling. However, the shrinking operation goes much faster when each spot is quenched. Over-shrinking is also avoided, as the operator is certain that all heat expansion is out of the panel before heating another spot.

If a dolly block is used as a backing-up tool, when upsetting the spot, a flat face should be used under a low crown panel and a low crown face under a high crown panel. However, when dinging the upset metal smooth, a low crown face is used under low crown metal and a high crown face under high crown metal.

It is also possible to shrink metal without using a dolly block at all—merely heating, upsetting and quenching—but it is much better to ding the metal smooth while hot. Smooth-dinging the hot metal further upsets the stretched metal into the spot and the surface is brought to correct level for metal finishing.

The metal can easily be overshrunk. It is necessary to be careful not to overshrink. Too many shrink spots will result in drawing metal out beyond the originally stretched area, buckling and warping a larger area of the panel. If this should happen, it will be necessary to stretch the overshrunk area with a hammer and dolly to allow the warped metal to flex back to shape.

On a low crown panel which is only slightly stretched, a spot 3/16 inch in diameter is large enough. A spot larger than ½ inch in diameter should never be used on any panel. There is a very good reason for this. In figure 56 it will be noted that the hammer face is much larger than the heated spot. That is important. A slow-motion picture would show the hammer face first striking the peak of the heated spot, driving it down level with the cooler metal around it. Then, the outer part of the hammer face would be seen making

contact with the cooler metal around the spot, forcing the entire stretched area down. This action causes the stretched metal to move further into the spot, thereby making the heated metal thicker; i.e., upsetting it. That is why large spots are not satisfactory. The hammer face cannot overlap sufficiently on the cooler metal around them.

In case of a long narrow stretch, a small spot should be shrunk at each end, then the center portion should be shrunk.

Sometimes a sharp, deep, badly stretched groove is encountered which resists being bulged to the outside. In that case it is better to heat and bring the stretched metal up by dinging off the dolly, then smooth-ding and quench it. In this operation it is sometimes good practice to heat a larger spot than ½ inch in diameter. In certain sharp grooves a spot ½ inch wide and 2 inches long, encompassing a fairly large area of the groove, would be suitable to heat. Care should be exercised to avoid overshrinking.

The shrinking operation is easy to learn. By heating a few spots in a scrap fender, the observant beginner will soon learn just how much heat should be applied. From then on he will have very little trouble so long as he follows the procedure described herein.

CHAPTER XIII

TORCH SOLDERING

Torch soldering offers a means of filling a sunken weld or an otherwise inaccessible dent to proper level for metal finishing. Figure 60 shows a metalman cleaning a dent in the window frame of a front door. This dent is inaccessible to tools and should be filled.

The procedure is as follows:

1 Cleaning—The surface of the dent to be filled must be absolutely clean. Rust and welding scale can be removed easily with a cup-shaped wire brush attached to a disc sander. See figure 60. Old paint, burned with the torch, can be brushed off easily while still hot, by

FIGURE 60

means of a hand wire brush. The surface should be cleaned about one inch beyond the rim of the dent to assure complete filling.

2 Applying flux—The cleaned area should be warmed with the torch before the flux is applied with an acid brush or swab. See figure 61. Warming with the torch hastens the chemical action of the flux in dissolving the oxides present on the cleaned surface.

3 Tinning—The metal should again be heated just warm enough, not too hot, so that it will take a deposit from the end of a bar of solder as it is rubbed against the dent. See figure 62. The torch should be used intermittently to reheat the area being tinned, as the molten solder is being spread or wiped with a clean rag over the entire cleaned area. See figure 63.

FIGURE 61

FIGURE 62

FIGURE 63

4 Filling dent—The torch flame should be held parallel to and in front of the dent, occasionally brushing the tinned surface with the end of the flame to keep it warm enough to hold the solder as it is being deposited. A bar of solder should be held at the end of the flame until about one inch of the end of the bar becomes plastic and begins to sag. Then it is quickly pressed against the hot surface being filled. See figure 64. Filling should be continued by this method until enough solder has been deposited to fill the dent completely. During this process, the end of the flame should occasionally be brushed over the deposited solder to keep it in plastic condition. The solder should never be heated to the melting point.

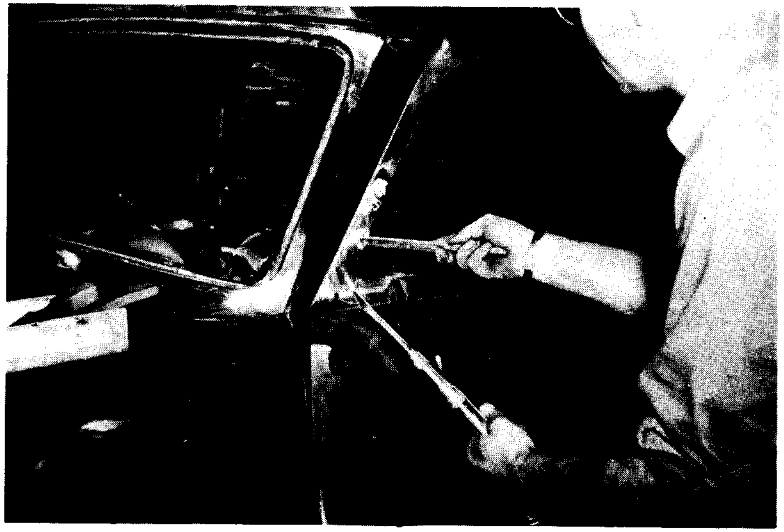


FIGURE 64

5 Shaping—The plastic deposit of solder should be smoothed and shaped with a No. 834 maple paddle greased with refined mutton tallow. See figures 65 and

FIGURE 65

66. As soon as the solder becomes too cool for shaping, the flame should be applied and again withdrawn when the solder becomes plastic; then the smoothing continues. This operation should be repeated until the desired shape is obtained. See figure 67.

During the shaping operation on a deep fill, the mass of solder may become cool and hard at the bottom, but be plastic at the surface. It then becomes impossible to shape it and the attempt to reheat it will result in melting the surface before the bottom of the fill becomes plastic enough to work.

To get the heat down into the entire mass of solder, use the edge of the paddle to cut grooves to the bottom of the fill. It will then be possible to heat the entire mass, so that the shaping operation may be resumed.

Care should be taken to avoid overheating the solder to a point where it melts and runs. Once the solder has been melted

FIGURE 66

FIGURE 67

and then cooled, the alloys separate and it sets up hard and loses most of its plastic qualities in further heating so that it becomes almost impossible to do a good job of smoothing and shaping the filled area.

When soldering is done in the center of a low crown panel such as a lower door panel, turret top or similar panels, the heat expansion will cause the panel to buckle and warp. This expansion should always be reduced by quenching. To quench, press a large water-soaked sponge down firmly on the heated area. However, the solder should be allowed to cool enough to become solid before quenching.

Pliers can be used to hold the butt end of the solder when it becomes so short as to burn the fingers of the operator during the filling operation. In that way each solder bar can be entirely used up, avoiding an accumulation of solder butts.

The solder should be kept clean. Dirty solder leaves pits in the surface of the filled area. Such pits will show up after repainting.

The grease from refined mutton tallow can be easily "killed" or removed for painting, by using any of the special solvent preparations suitable for cleaning a panel before repainting.

Refined mutton tallow fills all the requirements of a good lubricant for the torch solder paddle. It is non-odorous. It "kills" easily for painting. It is lasting, that is, it does not readily burn off the face of the paddle, causing the hot solder to stick to it.

Lard oil is also a good lubricant; but is not as heavy as mutton tallow. Beeswax is an excellent lubricant, but has the disadvantage of being extremely difficult to kill for painting. Lubricating oil is only fair, its chief disadvantage being that it causes the face of the paddle to burn. Laundry soap can be used and has the advantage of being easily killed for painting.

To use a cake of laundry soap or beeswax, brush the soldering flame quickly over the surface, melting it, then rub the face of the paddle on the molten surface.

Raw mutton tallow is undesirable as it soon becomes rancid, giving off a very disagreeable odor. Refined mutton tallow is recommended as the lubricant with the best all-around properties.

METAL FINISHING TORCH SOLDER

If a job is properly soldered, very little metal finishing will be required. More solder than necessary is a waste of time and money. It not only takes longer to put on too much solder, piling it up over the entire area, but it also takes considerably more time to metal finish it.

Solder is much softer than the steel and therefore cuts away faster. For that reason it is not advisable to disc sand because it will hollow into the solder leaving it at a lower

FIGURE 68

FIGURE 69

level than the surrounding steel panel. The soldered area will then, after being painted and polished, show up as a "bull's eye."

It is good practice to first to file the edges of the filled area and then finish the center, taking care not to cut the solder down lower than its proper level. See figure 68. A body file should be used first, followed by an open-cut solder float file. The solder float does not cut the solder very fast. It cleans up the slight ridges and file marks left by the body file and leaves the surface in good shape for sanding with No. 60 grit aluminum oxide cloth. See figure 69.

When sanding, also do the edges first. This means to sand the steel panel thoroughly around the filled area and then lightly sand the solder. As when filing and grinding, care should be taken when hand sanding to avoid reducing the soldered area down below the adjoining area of bare metal.

CHAPTER XIV

WELDING

A piece of equipment which is indispensable to any body repair shop is an oxy-acetylene welding outfit. It is a necessity even in the smallest shop doing fender repairs only. It can be used for welding, brazing, cutting, heating, shrinking and torch soldering.

A soft iron wire, 1/16″ in diameter, a No. 1 tip, and a small neutral flame, make the best combination for body and fender welding.

By neutral flame is meant a non-oxidizing, non-carburizing flame. An oxidizing flame is one in which there is too much oxygen. The excess oxygen, being present in the welding flame, burns the molten steel, resulting in a burned and weakened weld which is porous and dull blue or black.

A carburizing flame is one in which there is too much acetylene or carbon. This excess carbon combines with the molten steel, producing a hard brittle weld which is lava-like in appearance.

A neutral flame produces a good weld of shiny blue color. The surface of a good weld is rippled. In sheet steel, the rippled effect is produced by agitating the torch in a small circular motion, legthwise with the weld.

When welding a break in the edge of a fender flange, the fender should first be metal bumped and aligned to shape with a body jack to remove all strain from the torn area. Then the split or cracked edges should be held together with the fender flange pliers and the break tack-welded every inch or so along its entire length, starting near the edge. See figure 70. The tack-welds hold the broken edges in alignment, preventing them from spreading apart due to strains set up by the welding heat. Next, the pliers should be removed and the weld completed, beginning at the inner end of the break and welding toward the edge of the fender until the last tack-weld is reached. See figure 71.

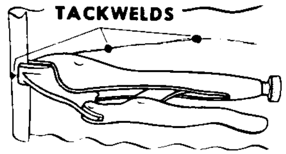


FIGURE 70

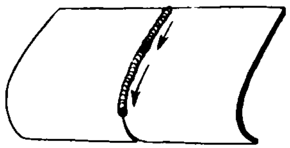


FIGURE 71

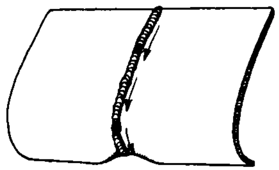


FIGURE 72

The remaining part of the break should not be welded to the extreme edge of the fender flange. If this were done, the edge of the flange would melt in when the welding heat approached the edge of the panel, leaving a semi-circular opening in the edge of the flange at the end of the weld. See figure 72. This opening would cause the flange to be weakened at this point simply because it is narrower than the rest of the flange.

A flange acts as a reinforcement, strengthening the edge of the fender. Its purpose is to hold the fender in shape. If it is left weakened in one spot, sooner or later it will break there and the fender will be out of shape again.

It is easy to avoid this narrow, weak place in a welded flange, by always beginning the weld in a flange at the outside edge, with about 3/8″ of the welding rod extending beyond the edge of the metal. See figure 73. The broken edges of the flange and the extending end of the rod are brought to welding heat at the same time. The molten rod flows back to the

edge of the flange and prevents the semi-circular indentation which would otherwise be formed. This makes a full-width, full strength flange. See figure 74. It is not necessary to reinforce the flange by further welding a piece of wire inside, along its length.

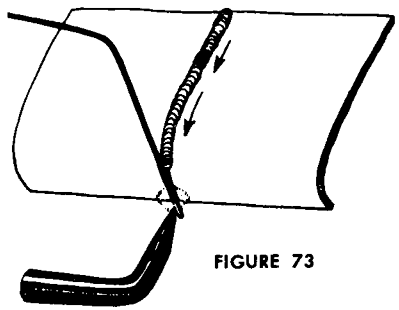


FIGURE 73

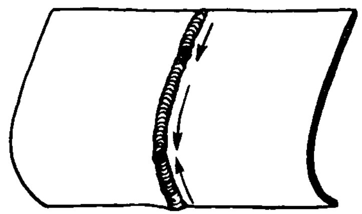


FIGURE 74

Hammering or forging a weld will save time in metal finishing. A weld in a break or in a torn place in the center of a fender can be hammered while still red hot. Weld about 1/2″ at a time, then quickly lay the torch on a box placed nearby and drop the welding rod. Quickly pick up the hammer and dolly and work the weld level and smooth, using the dolly as an anvil. Repeat this procedure until the full length of the break is welded and forged. A forged weld can be metal finished without soldering. Wherever forging is practicable, it is recommended as being a faster and cheaper method. The forging operation also produces a much stronger weld.

When welding body metal, it is better to weld forward (ahead of the tip) rather than backward (behind the tip). There are three reasons for this. If backward welding is done, the flame is directed against the place already welded, making it very easy to overheat and burn the weld; and it also keeps the weld hot longer, thereby spreading the heat farther out into the panel and causing more distortion than when welding forward. Another advantage of forward welding is that the heat is thrown ahead, preheating the metal about to be welded.

When installing a new panel, it should be located in place and tack-welded at each corner to hold it fixed until its position and fit are positively checked with the panels or openings which adjoin it. It should then be tack-welded every few inches along the seams. The weld should be completed with either an acetylene or arc welder.

It is not practical to braze a fender flange or any other panel subject to vibration from road shock. If the braze itself does not break, it will fail because the bronze only adheres to the steel instead of fusing with it and the adhesion later lets go under vibration. Once a place has been brazed, it can never be welded. If the braze fails, it can only be rebrazed; otherwise the entire brazed area must be cut out and a patch welded in its place.

However, where there is no danger of vibration and it is better not to heat the metal to welding temperature, a braze may be preferable and may stand up.

The larger body shops which offer a complete wreck service will find enough use for a portable arc welder of the transformer type to justify its purchase. It can be used for welding frames, welding-in new body panels, welding light metal to heavy reinforcements, welding aluminum, malleable iron castings and for many other purposes.

NOTE:

Beginners in the use of welding equipment should pay close attention to the directions and instructions furnished by the manufacturers of such equipment.

CHAPTER XV

A CHAPTER FOR BEGINNERS

A man who wishes to learn a trade in which he can earn high wages and have steady year-around employment need seek no further than body and fender repair. The investment required in hand tools is moderate. And there is a constantly growing demand for skilled men in this field.

One who has decided to learn the body and fender repair trade is not only faced with the necessity of acquiring skill in the use of a large number of hand tools, but he must also learn how to weld, torch solder, shrink metal, use the disc sander, body jack and several other pieces of equipment.

How to begin? The best thing to do is to begin on very minor dents. Get an old discarded fender and drive a few dents in it with a heavy hammer; then clamp the fender in a vise and start dinging and metal finishing. Here he will learn the feel of the tools and the reaction of the metal to the application of the different tools. He can experiment—find out, for instance, just how much filing the body steel can withstand before filing through and just how to strike the hammer blows, etc. After some practice of this kind, he may start on an actual repair job. It will be better for him to confine himself to small jobs first and gradually progress to the more difficult and complicated ones.

For an experienced man, body damages are as easily repaired as fenders. But for a novice, it is much better to work on fender damage where there are few reinforcements in the way, until such time as he becomes familiar with the reaction of the metal to the application of the different tools.

There is one thing which the beginner should be careful to avoid—the "rough-'em-out—smooth-'em-up" method of repair. Fenders have high crown areas and irregularities are less noticeable in them than in the low crown body panels. For that reason, a man can get by with the "rough-'em-out—smooth-'em-up" method on fenders. But later, when he tackles the low crown body or hood panels, he is lost. He has acquired a very bad habit which is hard to unlearn. It is a severe handicap which must be overcome before he can produce high quality work, efficiently and profitably, for himself or for his employer.

After the beginner has learned how to handle the ordinary fender damages, he will be ready to learn how to weld, torch solder and shrink metal. Then he will be ready to learn alignment and advance into the body repair.

A novice will make many mistakes. That is to be expected. However, the man who recognizes and analyzes his mistakes will learn much faster than one who will admit no wrong.

In this Manual, the fundamentals of body and fender repair are outlined. They are applicable to the repair of any damaged panel or body. The Fairmount Method is sheet metal repair simplified and while it requires some study, it will pay large dividends. First, because it shortens the time required for serving out a term of apprenticeship, and secondly because of the time saved in the repair of each and every job to which it is applied.

To the uninitiated, a severe body wreck appears to be a hopeless mess and its repair seems little short of magic.

To the partly initiated who has not yet learned analysis, it seems that damaged sheet metal is full of vagaries and whimsy and is a stubborn, cantankerous thing full of unexpected resistance hard to overcome.

But to a thoroughly experienced body repair man, each bad wreck is just another series of damage strains and its repair is simply a matter of unlocking and unfolding them one by one. He works along confidently and easily. He has learned not to fight the damage, but rather to take advantage of every strain in it and put them to his own use. He is often able to repair damages in ten or fifteen minutes which would have taken him an hour or more when he was a "rookie" just starting in the trade.

He is able to do this because:

1 He has studied the design of each tool and its applications.

2 He has acquired skill in the use of each of his tools.

3 He has learned to identify damage such as misalignment, high and low places, direct and indirect damage, when he sees them.

4 He has developed his sense of touch so that he can locate irregularities by feeling the surface of the damaged area with his hand.

5 He never does anything to the metal unless he knows exactly why he is doing it, thus avoiding additional work caused by bumping out areas not yet released and ready.

6 He is patient.

7 He is versatile.

8 He uses his ingenuity and applies correct strategy from his analysis of the damage.

9 He is careful. He knows that one wrongly placed blow on a damage can cause a great deal of unnecessary work to repair.

However, one thing is certain. No one man ever learns it all. A thorough going body repairman is constantly learning new tricks and short cuts, no matter how many years experience he has behind him.

CHAPTER XVI

HINTS, SHORT CUTS, TIME-SAVING TRICKS

GLASS

When installing one-half of a windshield without removing the other half, it is sometimes difficult to push the new glass and rubber panel past the cloth trim on the windshield post. This can be done easily by placing a piece of thin aluminum between the rubber channel and the trim, and pulling back on the aluminum as the glass and rubber channel are pushed into place. Grease the aluminum on the windshield side with brake fluid or liquid soap.

* * *

When fitting a windshield glass a close check can be made on the fit by the use of feeler gauges. More than .005 inch clearance at any one point when the rest of the glass fits tight, will probably result in a cracked windshield as soon as the car is driven on a rough road.

* * *

The ends of the crack in a broken windshield glass indicate the high points in the frame which are exerting pressure against the glass, causing breakage. These high points must be corrected to eliminate breakage.

* * *

When assembling the garnish moulding for a fixed glass (one which cannot be raised or lowered), it is better to start all the screws and draw each one down snug, not tight. Then, when all are in place, they should be tightened in pairs opposite from each other across the opening, and in that way avoid the risk of glass breakage.

* * *

A hose turned on a newly installed windshield to check for leakage will often avoid a "come-back" after the first rain.

* * *

A heavy cord looped around and slipped under the flange of the heavy rubber moulding used in windshields and rear sight glasses can be used to pull the rubber flange to the outside, as the glass, with the rubber moulding around it, is held tightly against the window frame from the inside of the body.

METAL WORK

A sharp-edged corner should not be left at the edge of a panel after filing . Paint cannot adhere to a sharp corner. If a sharp corner is left, moisture will in time creep in under the new paint, causing it to peel, and spoil an otherwise good paint job.

* * *

One method of preventing damage to the paint or finish when hammering down a ridge is to cover the face of the hammer with masking tape. The tape makes a cushion, protecting the paint from being chipped or broken.

* * *

In a roof rail repair, the headlining need only to be released along one side and pinned back out of the way with clothes pins.

* * *

It is very easy to remove sound deadener and insulation from the inside of body panels, if the panel is first warmed

with a torch. The torch should be kept moving rapidly back and forth across the outside of the panel. As long as the paint is not scorched the panel will not buckle or warp because of heat expansion.

* * *

Many times a small damage in which the paint is not broken can be dinged or bumped by the Fairmount Method, saving the original paint. A drop of oil on the working surface of the dinging hammer or dinging spoon acts as a cushion to protect the paint. The inside of the fender should be cleaned with a wire brush. When the damage is repaired, a little rubbing compound will restore the original luster of the finish.

* * *

To avoid removing and replacing the trim, an ice pick can be put through the trim to drive up a small dent. Scratching or fuzzing the trim with the point of the pick will remove all traces of the hole. Knitting needles can also be used for this purpose.

* * *

Scratch Awl—This low-cost high value tool, (figure 75), is one of the most useful metal finishing tools a body repairman can have. It may be used for driving up small dents which are impossible to reach with a pick hammer. For example, a dent in behind the inner construction of a body panel, can be reached by driving the scratch awl through the inner construction, then working the awl around to enlarge the hole and finally tapping the awl with a hammer as its point is held directly against the dent. Also the scratch awl offers a means of accurately placing a pick hammer blow where it is needed. Instead of perhaps hitting all around a tiny dent in the middle of a crowned panel with a pick hammer (and doing more harm than good), the awl can be held with its point directly against the dent and one blow of the hammer on the awl raises the dent. Each body repairman's tool kit should contain two of these awls—one with a sharp point for punching a hole through the inner construction and one with a blunt point for raising the dents in the outer panel.

* * *

Use a knitting needle inserted through the headlining to tap up small dents in a turret top. Close the hole in the headlining with a sharp pointed instrument.

* * *

Small, shallow dents located in areas where trim or inner panels prevent the use of a pick hammer can be raised by heat. Use the acetylene torch and direct the flame straight at the dent. Heat a spot until the metal is blue (too much heat might cause a fire inside the car). The heat expansion raises the low spot. It can be filed and sanded before completely cooled.

* * *

Occasionally when a rear fender is damaged badly enough to require replacement with a new fender, the wheelhouse section of the lower quarter panel will also be damaged. After the damaged fender has been removed, a hole can be punched with a scratch awl through the fender well in line with the fender anchor nuts. Then a long punch is inserted through this hole and the dents and creases pried up in the wheelhouse, thus avoiding the removal of the quarter trim pad. The new fender and anti-squeak cover the scratch awl holes.

* * *

Dents in the rear portion of a turret top panel which could otherwise only be reached by dropping the headlining all the way back from the front, can be brought out fairly well to shape by first unlocking the ridges and then soldering the end of a bar of solder to a cleaned and tinned spot in the center of the dent; the other end of the solder bar is bent into

a hook and used to pull the dent out as nearly to shape as possible. Then the remaining damage is filled with solder and metal finished.

* * *

Sometimes when it is necessary to cut away part of the double wall inner construction in order to work on the outer panel, one end only need be cut, then the inner panel can be bent back out of the way. Thus considerable time can be saved when welding the inner construction back in place.

* * *

When unrolling a stiff damage in a heavy gage front fender which resists the blows of the heavy dolly, it is of considerable help to hold another dolly against the outside of the damage for a backing up tool.

* * *

Wherever possible, the V-channels should be unrolled by dinging from the inside with a dinging spoon. This will bring the damage out much more smoothly than it is possible to bring it with a dolly.

* * *

A fast method of attaching the section of a drip moulding in the area of the door opening is to use drive screws, or screw nails. Use a short nail with a thin head. Drill clearance holes through the flange of the moulding before it is placed in position. The corresponding holes in the flange of the roof panel should be pierced with a sharp pointed awl, and made just large enough to allow the screw nail to start. They should be set tightly with a punch.

* * *

One method of accurately spotting a drilled hole is to center punch the correct location before drilling. Another method is to properly locate the drill point and spin it by hand a few turns before drilling with power.

* * *

An air hammer can be used to forge a weld. Place the air hammer on the fender near the weld. Heat the weld red hot and hammer immediately. In many cases this will eliminate the necessity of soldering the weld.

* * *

Straightening a small dent in a stainless steel or a chrome plated moulding can be accomplished quite easily by using a solder cast. Melt the solder into the undamaged area nearby, making a slug about two inches long, and completely filling the moulding over its flanged edges. Then by sliding the slug to the damaged part and hammering it on through, the original shape is restored exactly.To remove the slug melt it with the torch, being careful not to apply so much heat that the moulding is burnt.

ALIGNMENT

When measuring diagonals inside the body, measurements should always be taken from a body bolt. Three-eighths inch tolerance is permissible in diagonals across the body, 1/8 inch in diagonals in comparative door openings.

* * *

In body alignment, if the same result can be obtained by a pull from one side rather than a push from the other, it is usually better to use the pull.

* * *

Spotwelds between the turret top and quarter panel sometimes break when jacking out a caved in roof rail. It then becomes extremely difficult to close the opening tightly. This

can be prevented by welding them securely before applying jack pressure. Use either acetylene torch or the arc welder. If trouble seems likely, weld the suspected area in spots spaced about one inch apart.

* * *

Always when pushing inside a body with a jack, the base of the jack should be placed against a heavily reinforced section, or a body bolt, or a piece of wood blocking which will distribute the pressure over a wide area.

* * *

If the chassis frame has been bent and has carried the body out of alignment along with it, the body bolts should be tightened to insure that the frame, as it is straightened, will carry the body back into alignment with it.

* * *

A jack set up at an angle inside of the body with the base against a body bolt on one side and the head against the reinforced inner roof rail construction on the other side has a tendency to thrust the roof rail both outward and upward, when actually a straight outward thrust is what is needed. This straight outward thrust can be obtained with the addition of a turnbuckle, one end of which is attached to a body bolt directly under the head of the jack, the other end being attached with a wire loop or chain over the thrusting head of the jack. The turnbuckle can be tightened or let off as required while the roof rail section is being pushed out with the jack.

* * *

A piece of 14 or 16 gauge metal 2 inches square with a 1/2 inch hole in the center can be welded to the edge of a panel for exerting a pull on the panel. A turnbuckle hooked through the hole, the other end of which is pulling from a body bolt, the end of the frame, one of the axles, or other suitable anchorage, completes the set-up.

* * *

A collection of the handy lengths of 2 x 4's, 4 x 4's, 1 x 4's and 2 x 10's should be kept in a box, or another place where they can be easily located when needed.

* * *

A crooked fender flange should have its wrinkles heated and shrunk down flat, using a hammer and dolly. This strengthens the flange. A straight flange is a strong flange. A crooked or wavy flange is a weak flange. To shrink the flange, heat the kink and hammer flat on the beading lip of a dolly.

TOOLS

A turnbuckle (figure 76) is a very handy tool in body repair. Every shop can use a half dozen of various sizes.

* * *

Working faces of dinging hammers and dinging spoons should be kept clean and polished. A nicked face will transfer the nick, or mar the finish of the panel which is being repaired, each time a blow is struck. Faces can be polished with No. 150 grit emery paper, finishing up with No. 280 and finally with No. 360 or No. 400 which will produce a mirror finish.

* * *

A body repairman should study the applications of the various tools. A complete set of tools, properly used, pays big dividends, as compared to "getting by" with an incomplete set.

* * *

A piece of heavy paper or cardboard between the file blade and the file holder protects the file teeth.

The heavy spoons can be clamped in a vise as an anvil for working fenders, doors, etc., removed from the car.

TORCH WORK — SHRINKING, WELDING AND SOLDERING

To raise an extremely sharp ping in a door or other low crown panel, heat the center of the ping to cherry red heat and shrink it into place by dinging on the dolly. Have a wet sponge ready to quench the panel as soon as dinged smooth.

* * *

Use sheet asbestos as a barrier between the welding flame and adjacent trim or paint to prevent scorching or burning. Sheet asbestos can be purchased in rolls.

A mud made of flake asbestos and water can be used as a barrier between the welding flame and trim or finish. It can also be piled in a mass on a low crown panel to prevent heat distortion in the panel. It can be used over and over again by crumbling and again mixing with water.

* * *

Use a soldering copper to solder small places where it is not practical to use the torch, due to danger of burning trim, glass or other adjacent parts which cannot be protected from the flame.

* * *

If both a drip moulding and the panel adjacent to it require torch soldering, the drip moulding should be soldered last. Otherwise the solder would melt and run off the drip moulding when the adjacent panel is soldered.

* * *

Before heating a shrink spot all the way to shrinking heat, it is better to clean the burnt paint from the spot with a wire brush. Burning paint is so bright as to be blinding. If it is cleaned off, the color of the metal shows up more plainly and there is very little danger of over-heating and burning a hole in the metal.

* * *

If a power-driven wire brush is not available for cleaning a weld for torch soldering, the best results can be obtained in two operations. The first is with a disc sander and an old disc. The remaining areas can be cleaned using a 1/4" electric drill and a small drill bit.

* * *

If a weld cannot be forged, it should be sunk slightly below level before soldering. The pick end of a finishing hammer can be used striking the blows directly against the weld. A backing up tool should be used. This can be a dolly block with a clearance channel, the open end of a short length of 1/2" diameter pipe, or other anvil. Whatever is used, it is important not to sink the weld too deep.

* * *

Door-ease makes a satisfactory lubricant for the soldering paddle. The end of the stick should be rubbed on the working face of the hot paddle.

DOOR REPAIRS

To bend the hinge strap in a concealed type hinge, place a 9/16 inch socket in the hinge with the wrench end of the socket on the cowl side. The other end of the socket contacts the hinge strap. As the door is thrust closed against the socket, the hinge strap bends, thereby moving the alignment of the door away from the cowl.

* * *

When installing a new door which involves fitting two glasses, it is better not to drill or punch any holes for metal screws until location and fit of each glass has been checked.

Door-ease should always be put on a fitted door. A little door-ease will sometimes work wonders with a sticky, hard-to-close door.

* * *

A small dent near the edge of a door which has a rubber weatherstrip, can be removed by pushing back the weatherstrip and driving a scratch awl through the edge of the door, then prying up the dent. The weatherstrip should be sealed down again over the hole with rubber cement.

* * *

Use a disc sander to remove a lower door panel for repiacement. Grind one edge at a time until the folded edge is cut through. Change to a new number 36 grit disc to cut the panel off across the top. Tilt the sander almost on edge, cutting only on the outer corner of the disc, making a vee cut. Do not cut entirely through or it will ruin the sharp edge. Cut just far enough to lift the panel and break it at the vee.

* * *

An easy way to hold a door part-way open is to clamp the Vise Grip pliers on the check link at a point which will hold the door in the desired position.

* * *

A door or trunk lid which has very little damage in its panel, but because of having been in a severe body wreck has been twisted or bent out of alignment, can be restored to alignment very quickly by giving it a "sudden shock." The "sudden shock" can be given the door by letting it fall from a height of several feet so that it lands flat on the floor with the inside turned downward; or by slamming the removed door down hard over a saw-horse. Of course, any buckled up ridges in the panel should first be unlocked.

TRIM

A wrinkle in a replaced headlining can usually be removed by shrinking with water. Use the spray gun, making certain that it is thoroughly clean and spray the wrinkled area. If it is still slightly wrinkled after drying, spray it again.

* * *

Holes for extra tacks or trim nails can be made with a small chisel sharpened like the blade of a knife. Drive the chisel through just enough to open a narrow slot for the tack or nail.

* * *

A drop cloth completely covering the front seat will protect the seat so that it is not necessary to remove it in order to keep it clean.

* * *

When working on a cowl panel or turret top with the windshield glass removed, the instrument panel should be masked off to protect its finish. Many times the masking of the panel or panels adjacent to the one being repaired will protect the finish which otherwise would perhaps become scratched or marred.

* * *

A completed body repair should always be blown out with an air hose, using filtered air. The finest repair job in the world is second-rate if left dirty.

* * *

Trim pad nails on Fisher Body doors can be removed without breaking the heads loose from the strip. To accomplish this, strike the edge of the trim pad with a hammer, loosening the nails. To prevent damaging the trim, cover the hammer face with masking tape.

Should a nail be broken from a Fisher Body door trim pad, lift the metal strip, pierce a small hole in the strip at the location of the broken spotweld. Assemble the nail through the metal strip. To prevent damaging the trimming when driving the nail, cover the hammer face with masking tape, or lay a clean rag over the trim.

* * *

Should a Fisher Body trim pad nail hole appear to be too large to securely hold the nail, it should be flattened with a hammer and dolly before replacing the trim pad.

* * *

If the threads are stripped in a hole for a self-threading screw, it can be partially plugged and the screw will hold securely. Cut a short length of $\frac{1}{16}$" diameter welding rod, form it into shape of the letter U, and hang it in the hole. It may be necessary to flatten the end which is between the two panels being assembled.

MISCELLANEOUS

If, when installing a new cross member, or other member in a frame, bolts are used, pull the bolts down tight, heat them red hot with the welding torch, then tighten again. Then, while still hot, rivet the bolts tight. This will securely fasten the new member. If properly done, it will avoid those come-backs in which a new cross member or side member has broken due to vibration caused by bolts being slightly loose, although riveted cold.

* * *

Bent die cast mouldings can usually be straightened by heating to a temperature of 160 degrees to 170 degrees F in an oven or other suitable place. Wear heavy leather gloves to handle the hot moulding. It is also possible to warm the moulding with a torch.

To start a fender bolt in which the bolt holes do not perfectly line up, grind a taper or lead on the end of the bolt. This taper should be similar to the lead on a tap of comparable size. Another method is to split the end of the bolt with a hacksaw and pinch the ends together, forming a taper.

* * *

Placing a jack under the frame and lifting the fender above the wheel will permit the fender to be bumped without removing the wheel—in most cases. It also lifts the fender to a better height for working without so much stooping or squatting.

* * *

A newspaper spread on the floor with a drop light lying on it will reflect light without glare on the lower portions of fenders, doors and quarter panels.

* * *

A handy lamp for a body shop is a floor lamp with the light unit adjustable all the way from floor level to seven feet, six inches high.

* * *

To avoid squeaks and enable the door to swing easily, it is always good practice to put a drop of oil on a hinge pin before replacing it.

* * *

When installing front fenders, radiator grille and hood, which involves fitting the hood, all bolts should be started, but none tightened, until the hood is in perfect alignment.

* * *

Those rattles which seem to play hide-and-seek can often be located by pounding with the side of the fist all around in the neighborhood of the rattle. A doctor's stethoscope is an aid in locating rattles.

Learning to work both right and left-handed saves time when filing those places which are awkward to reach right handed and easy to get at with the left hand. It is very useful to be able to work with a hammer and dolly both right and left handed.

* * *

White cotton gloves will wear much longer if turned with the nap side out.

* * *

Gloves not only protect the hand, if worn when metal finishing, but they also protect the file. The bare hand rubbed over a freshly filed surface when feeling for high and low spots, leaves a very thin film on the surface of the panel. This film retards the cutting rate and shortens the life of the file.

* * *

Reference to the motor car manufacturers' bulletins for details of construction and assembly of doors, quarter-panels, etc., often saves much grief and wasted time.

* * *

For safety's sake, disc sanding should never be done unless goggles are being worn by the operator to protect his eyes.

* * *

Opening a door on a badly wrecked body can usually be done by holding the latch released and pushing or kicking quite hard from the inside.

* * *

When a bumper guard has its bolt plate broken loose, it can be rewelded without damaging the outside chrome. Use the arc welder. Place the guard in a pan of water so that it is immersed almost to the point. The water prevents burning the chrome.

Use a sharpened socket to clean bolt heads which are covered with undercoating. This is a real time saver, and it is worthwhile to buy extra sockets of the common underbody sizes and sharpen them for this purpose. Grind the outside at an angle to make a sharp edge. Use a hammer to drive the socket on the bolt head.

* * *

To protect mouldings from damage in the disc sanding and and filing operations, cover them with several layers of masking tape.

* * *

If it is necessary to apply heat to a frame in the straightening operation, it should be heated before the full force of the hydraulic jacks is applied. This prevents cracking or breaking the frame, and thus results in a stronger job than one which is broken and welded.

* * *

It is not unusual to complete the repair work on a severe wreck and discover that the battery has run down. This can be prevented by disconnecting the battery at the start of the job.

* * *

No. 10 SA
SCRATCH AWL

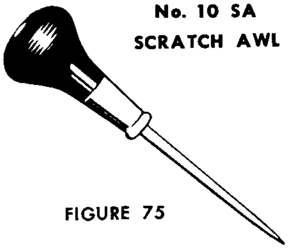


FIGURE 75

No. 11 TB TURNBUCKLE

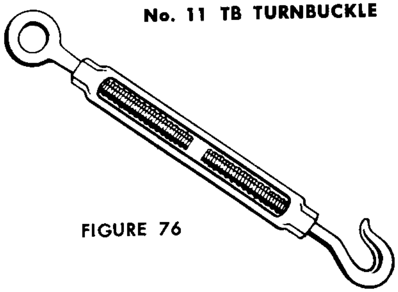


FIGURE 76

CHAPTER XVII

BODY AND FENDER REPAIR TOOLS

In this section we present the body and fender repair tools as created by Fairmount. Each tool is carefully designed and made to produce the following results.

QUALITY

Drop forged of the most suitable steel for its application and properly heat treated to withstand severe usage in lasting service.

EFFICIENCY

Each working face is correctly shaped and polished. As work is performed, each blow with hammer, dolly or spoon accomplishes its full share of the repair job and without nicking, stretching or distorting the panel. They are designed and made to give results.

BALANCE

Each tool is built to fit the hand comfortably and naturally. It feels right. The craftsman as well as the amateur appreciates the way the hammers, due to correct balance, almost guide themselves; how the dolly blocks are so easily guided that their control seems almost automatic; how all the tools fit the job for which they are used.

UTILITY AND ADAPTABILITY

The wide range of applications for each tool makes a complete set. They cover every need of the trade in all the phases of metal straightening and smoothing, on every panel, on all makes and models of automobiles. Each tool earns its way on a wide variety of repair work.

Most of the tools described on the following pages are, with minor improvements, the old standbys which have earned for Fairmount its leadership in the body and fender tool field.

BODY WORKERS' HAMMERS

Fairmount manufactures a perfectly balanced hammer for every purpose or need in body and fender repair.

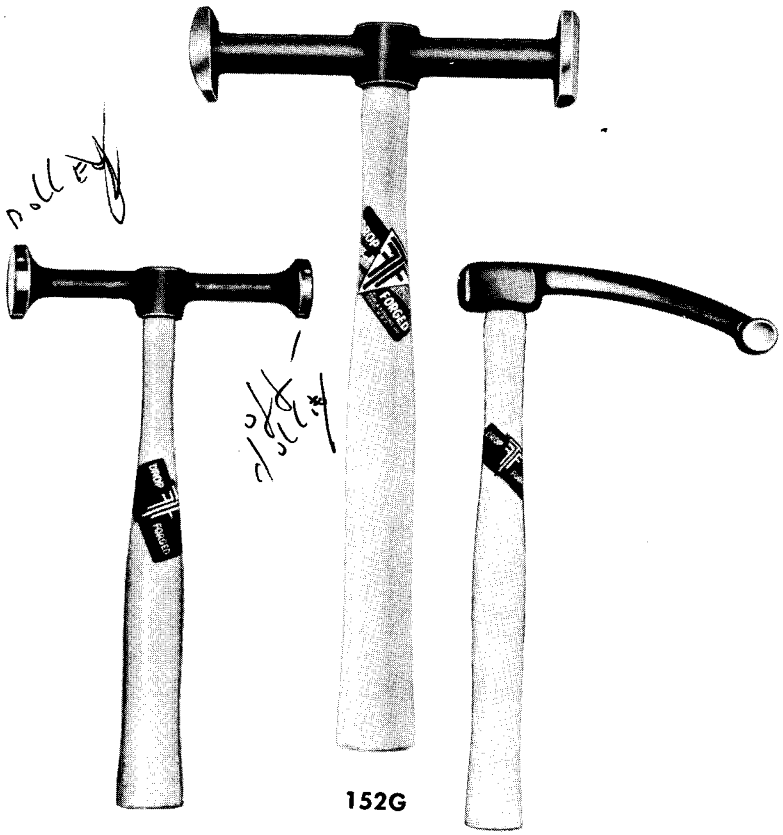
Each hammer is DROP FORGED, HEAT TREATED, BEAUTIFULLY FINISHED and has a handle of SECOND GROWTH WHITE HICKORY.

A description of each hammer showing its uses follows. Weights do not include handles.

NEW 150G — GENERAL PURPOSE DINGING HAMMER

RECENTLY REDESIGNED

Used on fenders and other high-crown panels. The large, low-crowned face is used for dinging "on the dolly." The small, high-crowned face for dinging "off the dolly" and for driving down ridges. This is the general purpose dinging and bumping hammer, originally designed by Fairmount and now the



150G 152G 155

standard pattern for the trade.

Wt. 11 oz. Faces, 1¼″ and 1-9/16″ Rd. Head, 6″ overall.

152G — HIGH CROWN CROSS PEIN HAMMER

A well designed and balanced hammer with high crown working faces for concave surfaces on doors, rear quarter panels, fenders and hoods.

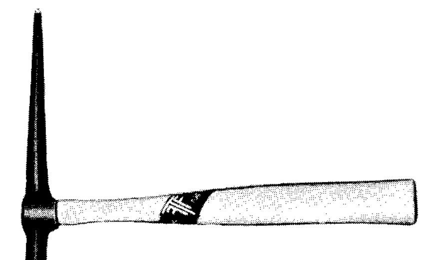
Square face 1⅛″ x 1⅛″, overall length 6″, weight 17 oz.

155 — FENDER BUMPER

This is the old standby for bumping out dents in places which cannot be reached with the hand and dolly. Its design gives clearance to reach around obstructions. It can also be used as a calking iron, as the head has been thickened to take the hard blows from a heavy hammer used for driving this one.

Wt. 1½ lbs. Length of head, 8¾″.

156G — PICK HAMMER



156G

Has a long-reach, thin point for dinging up low spots when metal finishing low crown panels. With this hammer, you can reach over braces and the inner construction inside bodies to the places hard-to-get-at. The dinging head has a high-crown face and is perfectly balanced with the pick end.

Wt. 9 oz. Face, 1¼″ Rd. Point, 1/32″ Radius. Length of pointed end, 5½″.

156GB — CURVED PICK HAMMER

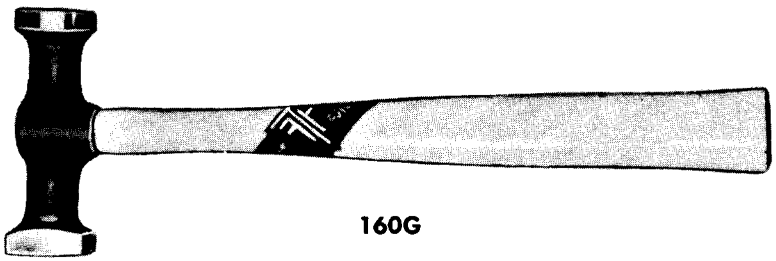
Same as 156G except that the pick end is bent in the arc of a normal blow. Reaches behind reinforcements, into edges of roof rails and other spots difficult to reach.

158G — GENERAL PURPOSE PICK HAMMER

Has medium size point and medium reach for general work. The strawberry point gives weight to perfectly balance the low-crown dinging head. Working face is low-crown.

Wt. 9 oz. Face, 1-9/16" Rd. Point, 3/32" Radius. Length of pick end, 3¾".

160G — HEAVY DUTY BUMPING HAMMER



160G

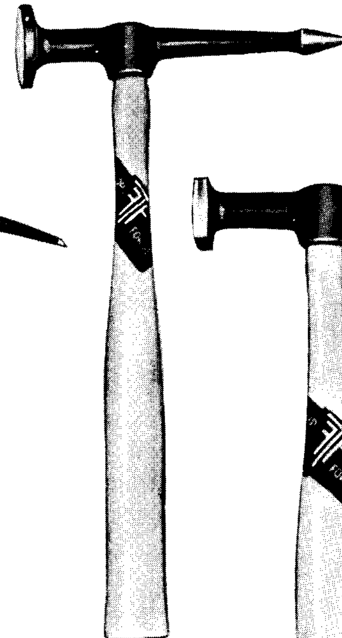
Heavy gauge truck fenders and similar weight panels require the power which can be applied with this hammer. It also produces results in straightening reinforcements, braces and the heavy floor panels.

Wt. 14 oz. Faces, 1¼" Rd. and 1-3/16" Sq. Head, 4" overall.

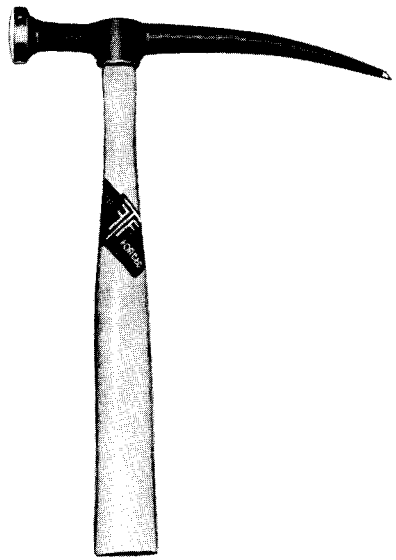
161G — DINGING HAMMER

The short reach, lightweight dinging hammer. It has a low-crown square face. This is the lightest dinging hammer made by Fairmount. It has become one of the standards of the trade.

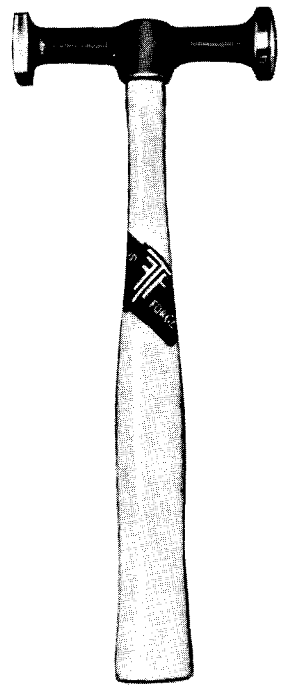
Wt. 9 oz. Faces, 1¼" Rd. and 1-3/16" Sq. Head, 4" overall.



158G



156GB



161G

162G — SHRINKING HAMMER

A carefully designed and well balanced hammer for light shrinking work in close quarters. Serrations on the round face expertly machined to assure rapid and accurate work.

Plain square face, 1 1/8". Round serrated face 1 1/4" diameter. Head, 4" overall. Weight 9 oz.

164G — UTILITY PICK HAMMER

Blunt point and short reach. One of the handiest little pick hammers ever made for driving up low spots in high-crown panels. Use this hammer on fenders without removing the wheel, or use it for other repairs where there is little clearance. Another good use is for thin-gauge panels.

Face, 1-9/16" Rd. Point, 5/32" Radius. Length of pointed end, 2". Head, 4" overall.

42HC — TRIMMERS' HAMMER

This is a magnetic tack hammer designed to fill the needs of trimmers employed in autobody factories and service shops. *Its curvature is exactly right for accurate blows.* Has been the standard of the trade for many years.

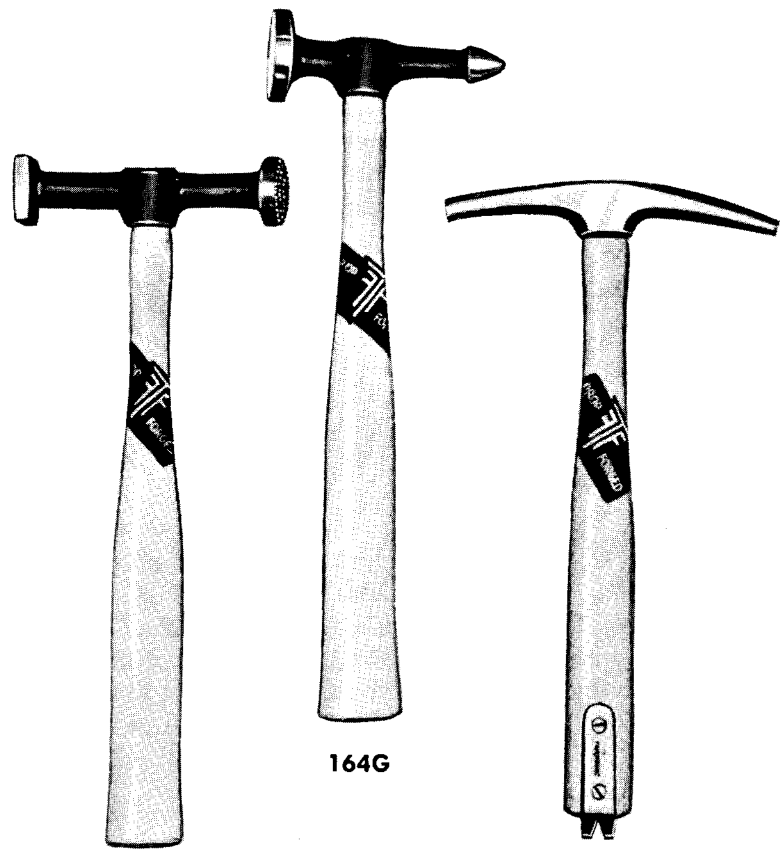
Wt. 7 oz. Also available (Catalog No. 42-H) without claw.

DOLLY BLOCKS

Alloy, deep forged, hardened and tempered. Working faces highly polished.

Each dolly block can have only a few working faces, obviously not nearly enough to handle all the panels on an automobile. For this reason, several different dolly blocks are necessary to do efficient work.

Other factors which govern the size and shape of a dolly block are: Convenient and safe hand hold; balance for accurate control; enough mass or weight to be a good anvil; not too heavy to avoid fatigue; and adaptability for use on many different panels.



164G

162G

42HC

All of these factors govern the design of each Fairmount dolly block. The blocks listed below make a matched set, which furnishes complete service for all panels, on all makes of cars.

1058 — TOE DOLLY

One of the original dolly blocks manufactured by Fairmount. Its thinness and length make it accessible in narrow pockets. Its large flat face is frequently used in shrinking and dinging flat panels. Its flat sides furnish a convenient anvil for repairing flanges. These features give this dolly its continued popularity among metalmen.

Size $4\frac{3}{4}$" x $2\frac{1}{4}$" x 1-1/16". Weight $2\frac{1}{2}$ lbs.

1059 — HEEL DOLLY

One of the original dollies manufactured by Fairmount. Its design makes it possible to reach into sharp corners and wide radii. Its continued high demand is based on these features, which no other dolly has.

Size, $3\frac{1}{8}$" x $2\frac{3}{8}$" x 1-7/16". Weight, $2\frac{1}{2}$ lbs.

1060 — GENERAL PURPOSE DOLLY

This block has unlimited applications and is one of the most useful dolly blocks ever made. Its shape gives it a convenient and comfortable hand hold, even during the heaviest blows. Its weight, its balance and its several differently crowned working faces, together with its two beading and flanging lips, combine to give this dolly its wide range of uses.

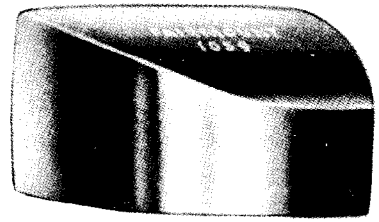
Size $2\frac{7}{8}$" x $2\frac{3}{8}$" x $2\frac{1}{4}$". Weight, 3 lbs.

1061 — UTILITY DOLLY

This is a high-crown dolly with one narrow beading edge. The thick rounded sides are useful in short radii curves. It has dozens of uses in the high-crown portions of hoods, fenders and body panels.

Size $3\frac{1}{8}$" long, 3" wide, $1\frac{5}{8}$" thick. Weight 3 lbs.

1058



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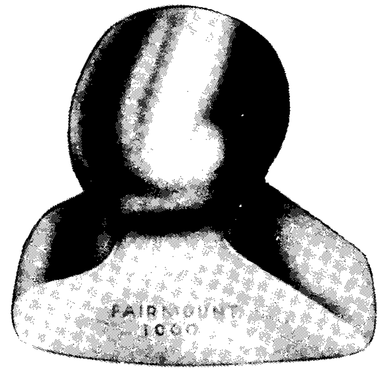


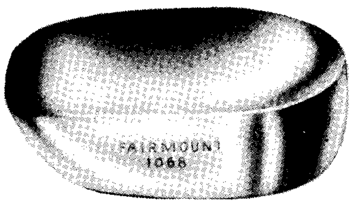
1060

1061

1068 — LOW-CROWN DOLLY

Has a wide range of uses on low-crown panels where medium and high-crown dollies would stretch the metal. Note that the angle between the sides and large face is less than 90 degrees. This important feature lets this dolly reach into the very corner of a flanged edge.

Size 2¾" x 1⅝" x 4". Weight 3 lbs.



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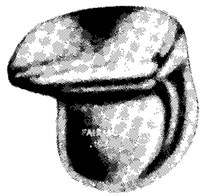


1070

1070 —"CHAMPION HEAVYWEIGHT" DOLLY

A heavy duty general purpose fender dolly. It is a necessity on those extra heavy-gauge fenders which resist the blows of lighter dollies. Blows from this dolly bring out the toughest damage. It seats comfortably in the hand in such a manner that the fingers are protected from injury in a swinging blow.

Size 3⅝" x 3¼" x 2½". Weight, 4 lbs.

GENERAL PURPOSE SPOONS

DROP FORGED

1036 — LIGHT DINGING SPOON

With this spoon, ridges can be easily dinged down level and very smooth. In fact, many ridges can be dinged so smooth that filing and disc sanding are unnecessary. When held against the ridge and struck with a hammer, it spreads the hammer blow over a large area of the ridge, making it smooth and prevents nicking or marking of the metal.

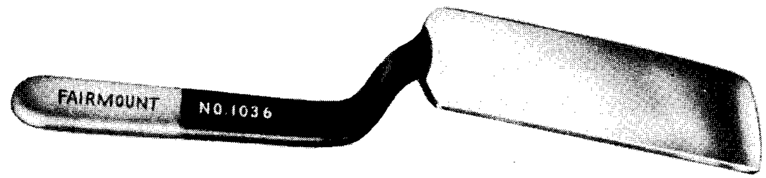
Being balanced, the dinging spoon should be held somewhat loosely in the hand, so it can locate itself on the high spot or ridge. The hand is used to guide the spoon, yet allowing it to float. In this way, the spoon levels itself on the ridge and distributes the hammer blow to the exact spot where needed. *THIS SPOON IS NOT MADE FOR PRYING.*

Length, 10" overall. Face, 2" x 4-5/16". Weight, 11 oz.

1045 — LONG TURRET TOP SPOON

This is a general purpose body spoon. The extra long handle gives it balance in the dinging operation, when used as a dolly behind reinforcements. The end of the blade has a calking face. This strong, rugged spoon can be struck heavy blows with the heaviest hammers. Its design makes it an excellent pry tool.

Overall length, 10". Face, 1⅞" x 5¼" x 3/16". Handle, 1⅛" Octagon. Weight, 3½ lbs.



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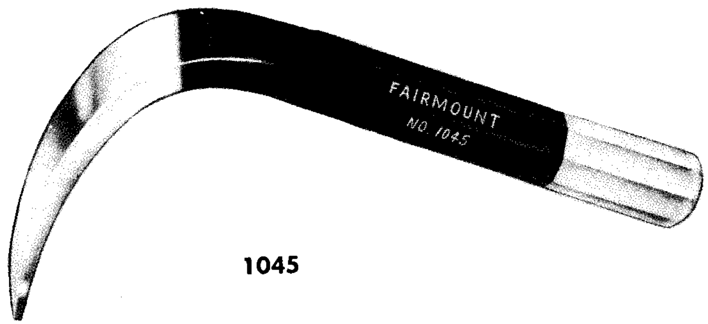


1045

1050 — THE COMBINATION SPOON

This is a general purpose fender spoon. It is used as a dolly behind brackets, inner panels and similar places. The handle is offset to give balance in the dinging operation. It has a high-crown working face and a long reach, giving it wide adaptability.

Face, 1¾" x 5½". Handle, 1" Octagon, 4¾" long. Weight, 2¾ lbs.

1052 — SPOON DOLLY

This useful dolly block has a permanently attached extension handle which gives it many uses in places which are otherwise inaccessible to the hand. It can be driven in between reinforcement and the outer panel and then used to pry outward as the metal is dinged with a hammer. It is strong and rugged and can be used as a forming and calking tool in the deep pockets of doors, quarter-panels, rear fenders and lower trunk panels.

Size, 2½" x 1" x 3". Weight 3½ lbs.

MISCELLANEOUS REPAIR TOOLS

1091 — HEAVY DUTY DRIVING AND FENDER BEADING TOOL

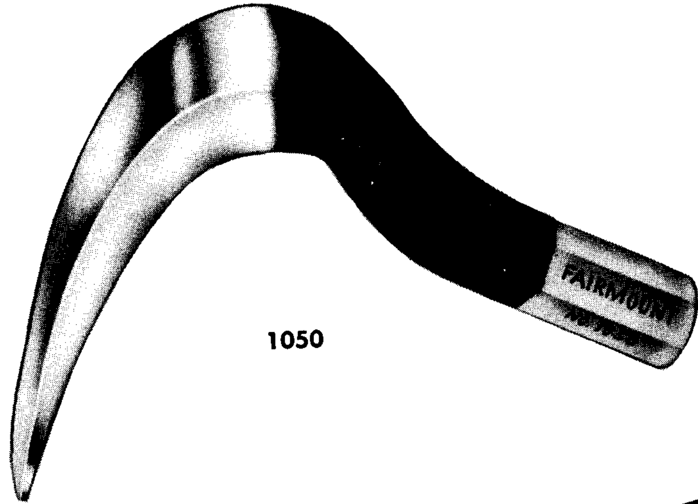
A most useful tool for restoration of turned under, non-wired flanged edges. Especially handy for alignment of inner construction and flanges on alligator hoods. Heavy-formed striking pads.

Overall length, 14⅛". Weight, 3¼ lbs.

1096 — CALKING IRON

An excellent precision-made wide calking iron. Polished working faces are carefully rounded for use on inside mouldings. Drop forged and heat treated.

Face 1¾" wide, 1" radius, overall length 11".
Weight 1 pound.



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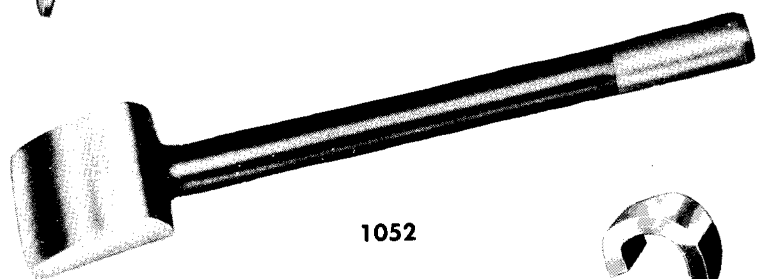

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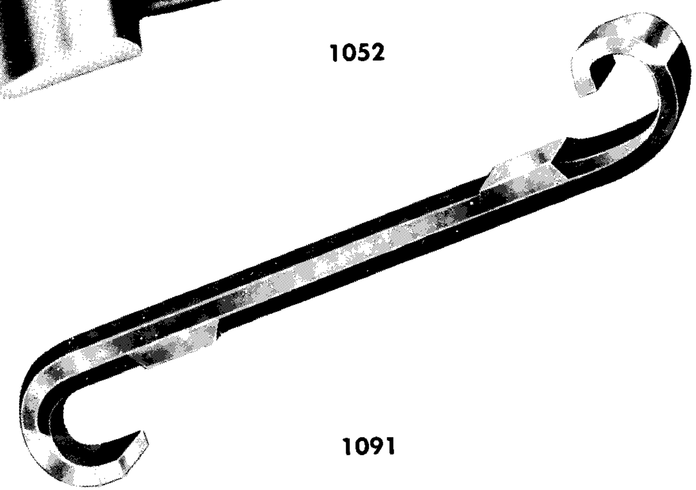


1091

1150 — ADJUSTABLE FILE HOLDER

The handle of this file holder can be offset to either right or left, to provide clearance for the operator's fingers when filing next to an obstruction or another panel. The handle can be entirely reversed and again offset to either side. Very handy and useful. However, the holder is also adjustable for curving or flexing the file either way. Its design permits flexing the file either way to the maximum point of safety against breakage. The bolt which attaches the file at the rear of the holder should be loosened before flexing.

Weight 1¼ lbs.

830 — DETACHABLE SOLDER PADDLE SET

Solder Paddle Set, consisting of handle and eight removable paddle blades, all made of high-grade hard maple for lasting service and boiled in tallow to give additional wearing qualities. Spring steel clip in the foot of the handle permits instant snap-on and release of the paddle blades.

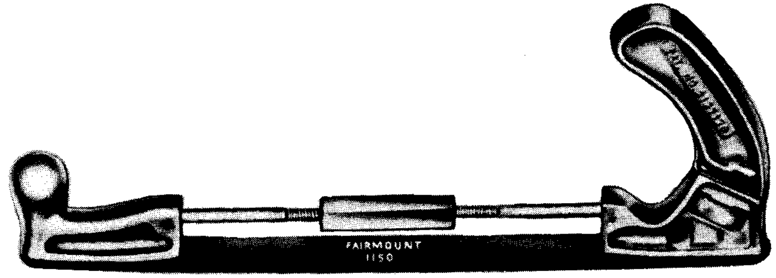
The set consists of handle, six of the No. 1 blades, size 4¼" x 1⅜"; one No. 2 blade, size 4¼" x 1⅝"; one No. 3 half-round blade 4¼" x 1⅜".

834 — SOLDER PADDLE

This paddle is made of close-grained maple which is the finest material for this purpose. Other woods or materials have the disadvantage of sticking to the hot solder, making it difficult to use them. If kept clean and lubricated, this paddle stays clean and spreads the solder deposit evenly and efficiently.

The well-shaped handle fits the hand comfortably. The blade is full size and flat faced so that it may be used as is, or trimmed to any shape desired.

Overall length, 11". Working surface of blade, 1¾" x 6". Weight, 4 oz.



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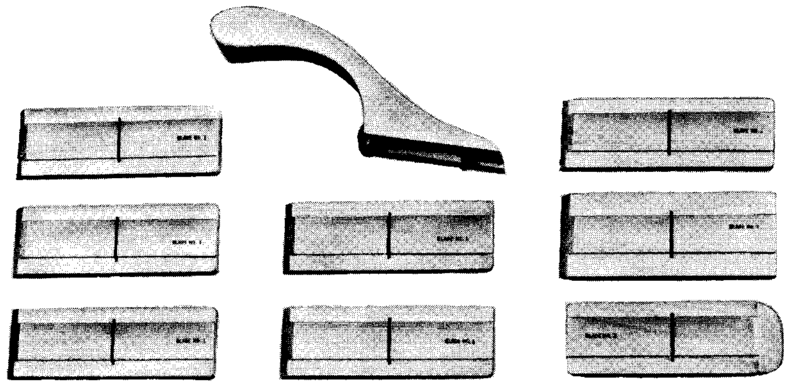

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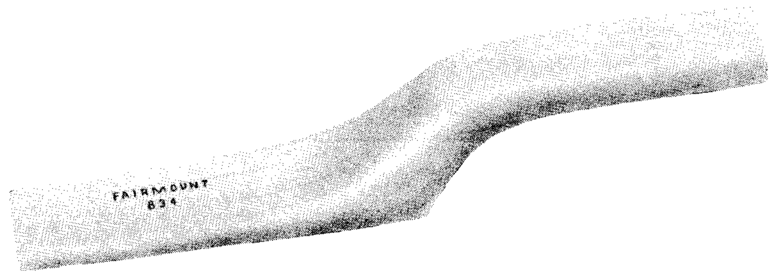


834

GLOSSARY

TERMS USED IN BODY AND FENDER REPAIR TRADE

ALIGNMENT—Fitting or aligning two or more adjacent panels for proper appearance or for functional service.

ANTI-SQUEAK—The fabric strips inserted between the fenders and body.

BACK REST—That portion of the seats which supports the occupants' backs.

BAILEY CHANNEL—See run channel.

BELT MOULDING—A moulding which is on the outside of the body approximately at the height of the door handles.

BUMPER BRACKETS—Bumper hangers.

BUMPER GUARDS—Chromium finished upright bars securely fastened to the bumpers.

CHECKING DIAGONALS—Measurement across similar lines of a body, or frame to determine how much the body or frame is out of alignment. Also used to compare door openings or other symmetrical portions of a body. Comparable measurements should be equal within ⅛ inch.

CIRCLE THE DOOR—Forcing more curvature into a door so that it fits the other door or the quarter panel.

DASH—The front panel of a body. It is between the engine and the front compartment of the body.

DECK LID—Trunk door or coupe compartment door.

DINGING—Straightening damaged metal, whether spoons, hammers or dollies are used. In the early days of automotive manufacture, dinging was the name of a highly paid trade; dingmen worked on completely finished bodies and fenders, removing dents, pimples. wrinkles, low waves and other minor imperfections in the metal without injury to the high gloss lacquer or varnish. This trade has largely died out due to development of spot touch-up and improved dies for forming panels.

DIRECT DAMAGE—That portion of a damage which was in actual contact with the object causing the damage.

DISC SANDING—Using a disc sander as a sanding tool.

DIVISION BAR—The trim bar between the right and left sides of the windshield or rear sight glass.

DOG-LEG—That curved portion of the quarter panel in the rear door of a four-door sedan.

DOOR HEADER—The narrow panel which forms the top of the door opening.

DOOR PAD—Door trim.

DOVETAIL—Those fittings on the lock side of the doors which hold the door in alignment, preventing it from vibrating up and down while traveling on rough streets.

DRIP MOULDING—The eaves trough on either side of the turret-top.

EMERY CLOTH—Aluminum oxide cloth.

ESCUTCHEON PLATE—The decorative trim ring under each window control handle and each inside door handle.

FACE BAR—The chromium finished bumper bars.

FENDER WELL—That portion of the quarter panel which provides clearance for the rear wheel.

FERRULE—The decorative trim ring or plate between the outside door handle and the door panel.

FLANGE—A reinforcement on the edge of a panel, formed at approximately right angles to the panel. Its purpose is to hold the panel in shape and it should therefore be straightened, if bent.

GARNISH MOULDING—The inside decorative moulding which is fastened in the glass openings, holding the glass in place.

GRINDING—Using a disc sander as a cutting tool.

HEADER PANEL—That portion of the turrent top which lies just above the windshields.

HEADLINING—The cloth ceiling in body.

HINGE PILLAR—The reinforced section of a cowl, center pillar, or quarter panel to which hinges are secured.

INDIRECT DAMAGE—Damaged metal which was not in actual contact with the object which caused the damage.

INSTRUMENT PANEL—That panel which contains the speedometer and other instruments. Sometimes erroneously called the dash panel.

KICK PADS—The trim pads inside the lower cowl.

KICK-UP—The raised portion of the floor panel just in front of the rear cushion, or in some cars that raised portion of the floor panel which provides clearance for the rear axle.

LOCK PILLAR—The heavily reinforced sections of quarter panels and center pillars which contain the lock plates.

METAL BUMPING—The act or art of working damaged metal with the hammer and dolly; also bumping out metal with a dolly block alone. Also used in some localities, particularly in Michigan, as the name for the entire trade of body and fender repair.

OUTRIGGERS—The frame supports on which the body rests.

PADDLE-SOLDERING—Torch soldering.

POWER OR POWER TOOLS—Generally refers to hydraulic jacks used in body repair. Also refers to mechanical jacks and pneumatic hammers.

QUARTER PAD—Quarter panel trim.

QUARTER PANEL—The side panel which extends from the door to the rear end of the body and from the roof to the floor.

QUARTER WINDOW—The window in a quarter panel.

QUENCHING—Chilling a heated solder job or shrink spot with water.

REAR SIGHT—The rear window.

ROCKER PANEL—Sill panel.

ROOF BOWS—Those transverse metal bows to which the headlining is secured.

ROOF RAIL—That portion of the turret-top which lies along each side.

RUN CHANNEL—The fabric covered channel in which the movable glass operates.

SHRINKING—A means of heating, upsetting and shortening stretched metal.

SHROUD—Cowl.

SPOON—An offset tool with which work can be applied to a portion of the panel away from the direct line of force as applied through the handle. Applies to power spoons as well as hand spoons.

SPRING HAMMERING—Dinging with a light dinging spoon and hammer.

TAIL PANEL—Lower trunk panel.

TORCH SOLDERING—Filling cavities, or building beads with solder which is heated for working with the paddle by means of a flame of fairly low heat as compared to a welding flame.

TRIM—A term used to describe the upholstery in all, or in part.

TUNNEL—A raised portion in the floor panel at the center of the body. Its purpose is to provide clearance for the driveshaft.

WEATHERSTRIP—The heavy rubber strip secured to the edges of each door and trunk lid.

WHEEL HOUSE—That portion of the quarter panel above the fender and below the quarter window.

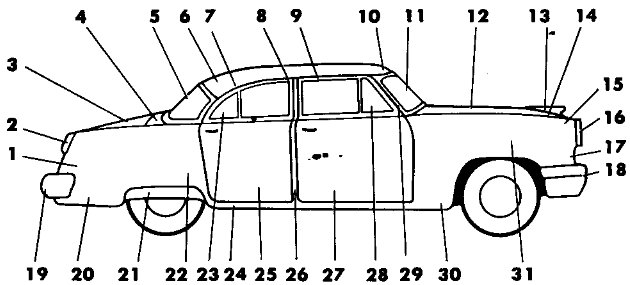
WIND CORD—The heavy fabric trim cord secured to the inside of the body around each door opening.

WINDOW REVEAL—That portion of a door or quarter panel which is immediately adjacent to the glass.

WINDSHIELD PILLAR—The heavily reinforced upper cowl posts which lie on either side of the windshield.

NOMENCLATURE

BODY AND FENDER PANELS AND SECTIONS



1 Rear Fender
2 Tail Light
3 Trunk Lid
4 Rear Deck
5 Rear Sight Glass
6 Turret Top
7 Roof Rail
8 Rear Door—Upper
9 Front Door—Upper
10 Header Panel
11 Windshield
12 Hood
13 Hood Ornament
14 Hood Nose
15 Headlamp Shell
16 Headlight
17 Front Fender Nose
18 Front Bumper Face Bar
19 Rear Bumper Face Bar
20 Rear Fender Skirt
21 Rear Fender Pant
22 Rear Quarter Panel
23 Ventilator
24 Sill or Rocker Panel
25 Rear Door Lower Panel
26 Center Pillar
27 Front Door Lower Panel
28 Ventilator
29 Windshield Pillar
30 Front Fender Skirt
31 Front Fender

NOTES