Aug. 30, 1932. N. WALKER 1,874,068

METHOD AND APPARATUS FOR MAKING SHUTTER BLADES

Filed Feb. 9, 1931 4 Sheets-Sheet 1

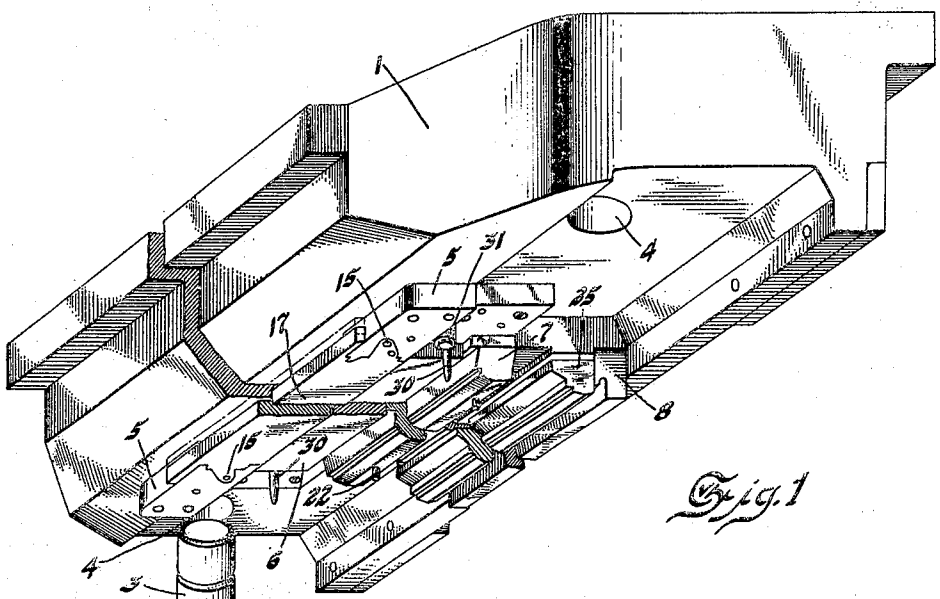

Fig. 1

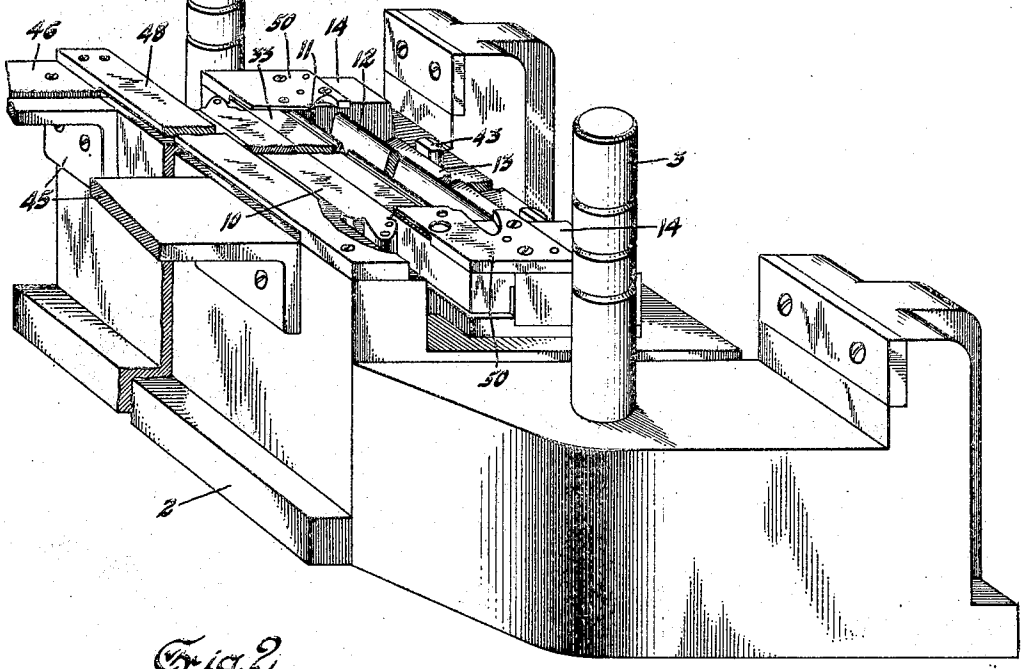

Fig. 2

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METHOD AND APPARATUS FOR MAKING SHUTTER BLADES

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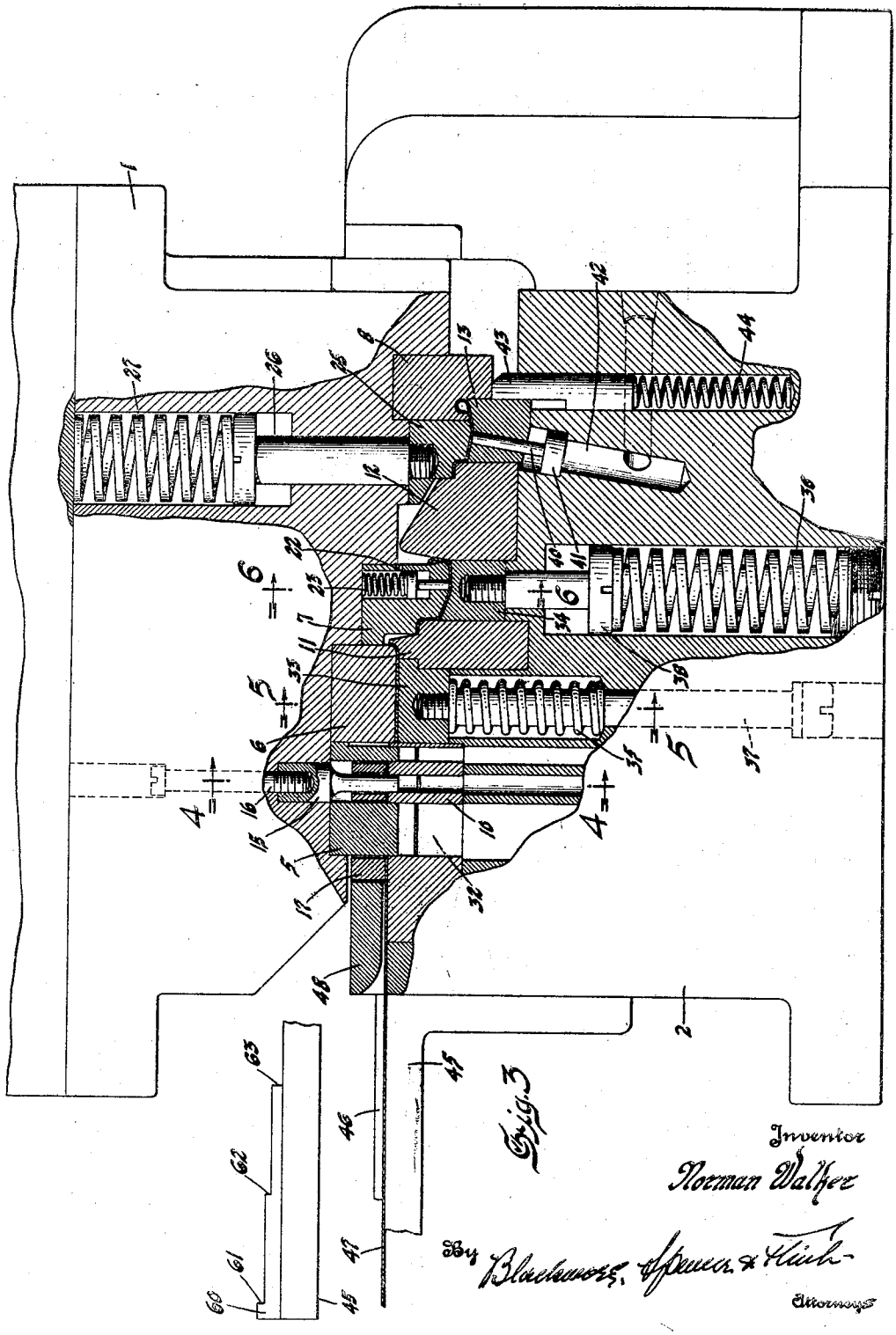

Fig. 3

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METHOD AND APPARATUS FOR MAKING SHUTTER BLADES

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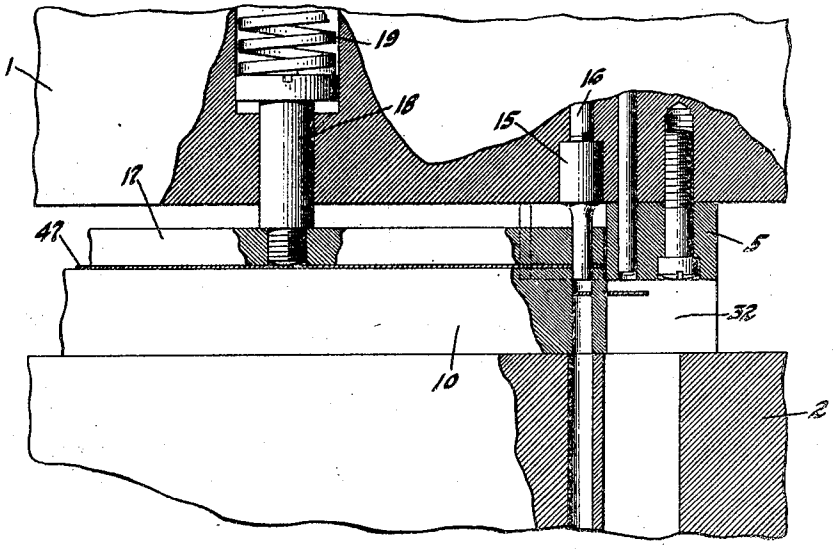

Fig. 4

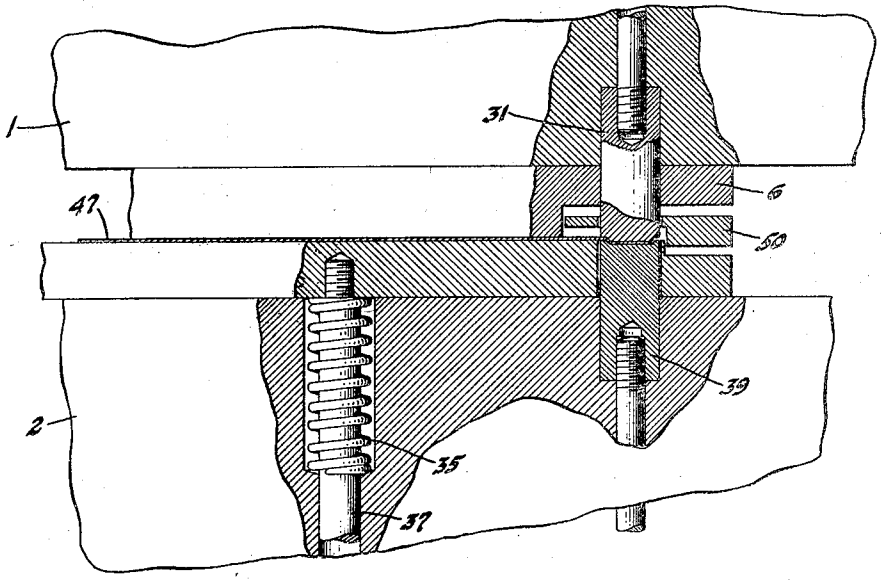

Fig. 5

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Aug. 30, 1932. N. WALKER 1,874,068

METHOD AND APPARATUS FOR MAKING SHUTTER BLADES

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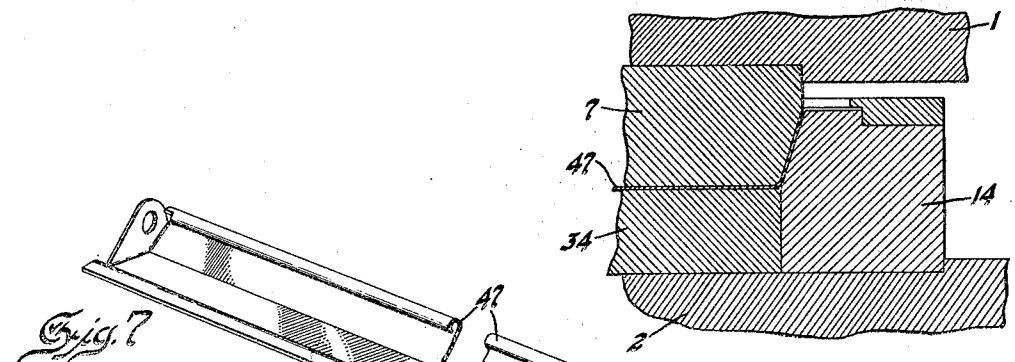

Fig. 6

Fig. 7

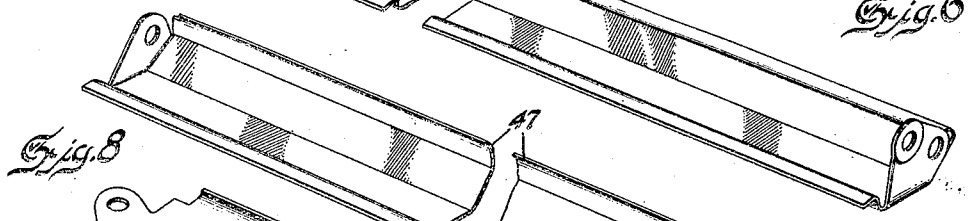

Fig. 8

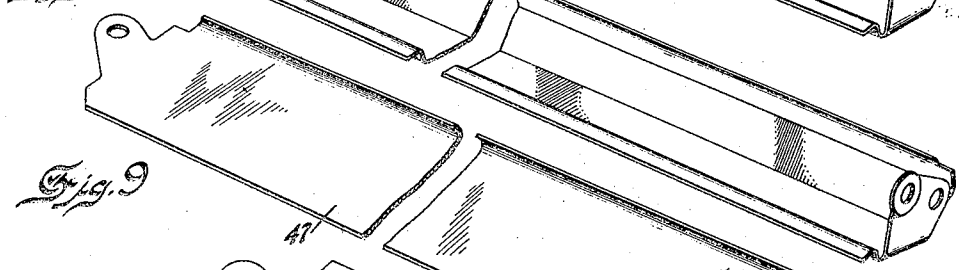

Fig. 9

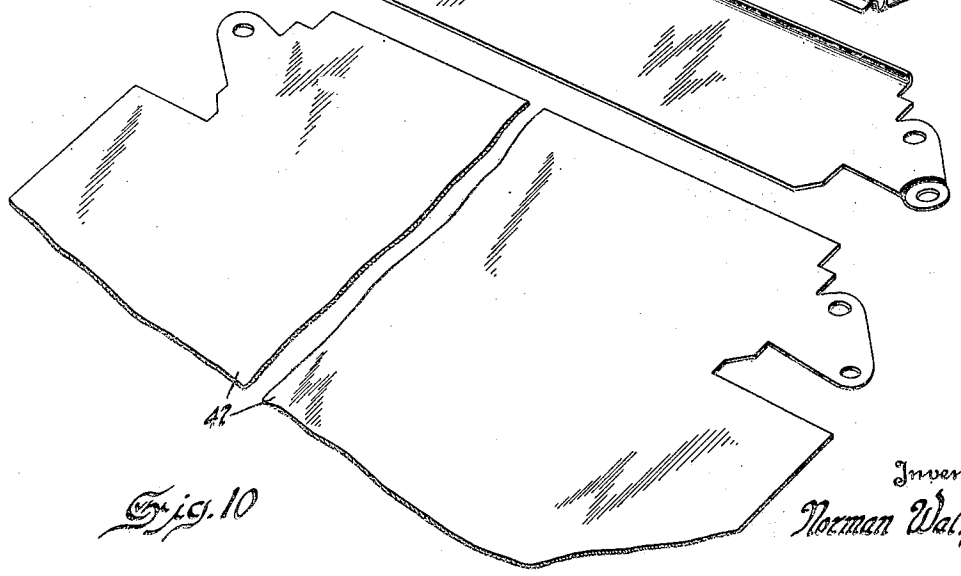

Fig. 10

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UNITED STATES PATENT OFFICE

NORMAN WALKER, OF LOCKPORT, NEW YORK, ASSIGNOR TO HARRISON RADIATOR CORPORATION, OF LOCKPORT, NEW YORK, A CORPORATION OF NEW YORK

METHOD AND APPARATUS FOR MAKING SHUTTER BLADES

Application filed February 9, 1931. Serial No. 514,648.

This invention relates to the manufacture of shutter blades for use particularly in the shutter assembly which controls air flow through the radiator in the cooling system of an engine for driving a motor vehicle or the like.

The invention aims to simplify manufacture and materially reduce production costs by the complete formation of the blade from raw material in a single machine. By performing simultaneously a series of operations on several parts in one machine instead of providing separate machines for each operation there results, among other advantages, high speed production and the elimination of intermediate handling of parts which means fewer workmen and less scrappage, together with a conservation of floor space and a smaller investment in machinery, all of which makes for economy and permits sale of finished article to the user at low cost.

A complete understanding of the invention will be had upon an inspection of the accompanying drawings, wherein

Figures 1 and 2 are each perspective views of upper and lower die members, respectively.

Figure 3 is a side elevation with parts in section with the die members in closed position.

Figure 4 is a section taken on line 4—4 of Figure 3.

Figure 5 is a section taken on line 5—5 of Figure 3.

Figure 6 is a section taken on line 6—6 of Figure 3, and

Figures 7, 8, 9 and 10 are perspective views showing several blanks in various stages of completion.

Referring to the preferred embodiment of the invention as illustrated in the drawings, there are involved an upper die block 1 and a lower die block 2 which are adapted for attachment to the plunger or ram and a stationary bed plate, respectively, of a punch press or the like, so that the blocks are moved toward and away from each other in each cycle of the press, there being provided guide pins 3 on one block for sliding engagement within the openings 4 in the other block to insure proper alinement of the parts throughout the range of movement. Fixed to the die block 1 are a series of dies 5, 6, 7 and 8 for cooperation with other die members 10, 11, 12, 13 and 14 fixedly carried by the lower block 2.

Associated with the die member 5 are three punch pins, shown at 15 as being held in the block by means of the screw stud 16, and in connection with the die member 5 and punch pins 15 there may be employed a stripper plate 17 carried by the upper block by means of studs 18, backed by coil springs 19. As shown in Figure 3 of the drawings the die or punch member 7 may be provided with one or more stripper or push pins 22 with each of which is associated an expansible spring 23. A spring pad 25 carried by the stud 26, against which a coil spring 27 acts, is shown mounted in the upper block 1 for cooperation with the die member 8. Pilot pins 30 and an embossing stud or punch 31 are carried by the upper die block adjacent the die member 6.

The die member 10 is preferably provided with openings 32 which aline with corresponding openings in the lower die block 2 for the discharge of scrap sheared from the material to be operated on. In addition to the fixed die members, the lower block also carries spring pads 33 and 34 having coil springs 35 and 36 respectively, as well as retainer studs 37 and 38 respectively. As shown in Figure 5 a die member 39 is mounted in the lower block for cooperation with the embossing die 31. The die member 13 may be provided with one or more openings for the projection therethrough of ejector or knockout pins 40, the heads 41 of which are slidable in suitable passageways provided in the die block, as indicated at 42 for connection with a supply of fluid under pressure under control of suitable valve means. Beyond the die 13 there may be provided depressible stops or pins 43 slidable in suitable openings in the block 2 against expansion spring 44 upon engagement with the die 8 as the ram descends. A shelf or shelves 45, having a suitable guide plate 46, may be secured on the lower block 2 for supporting the metal sheet, indicated at 47, from which the shut-

ter blades are to be formed. A guide member 48 having a flared mouth is shown on the upper side of the lower block for directing the material into proper position to be acted on. To further guide the material and prevent overriding or piling of the thin blanks one on top of the other, there may be employed gauge plates 50 having portions overhanging the blanks.

Assuming the machine to be fully charged with material to be formed, there will be performed upon closing movement of the die four separate and independent operations on as many blanks. The first of these will consist of a blanking operation whereby the die members 5 and 10 will shear or cut away material along the edges of that portion of the sheet 47 engaged thereby, it being understood that as the die parts come together the stripper plate 17 makes advance contact with the blank and clamps it smoothly and flatly against the die member 10, and that as the movement continues the shearing dies 5 punch out material at each side which then drops as scrap through the openings 32, and the pins 15 pierce holes in the sheet whereby there will be formed apertured ears at the front portion of the sheet along opposite sides as illustrated in Figure 10. At the same time another operation is being performed by the die members 6 and 7 on a part previously blanked out to bring it to the shape illustrated by Figure 9. As the dies close the member 6 first clamps the blank against the spring pad 33 and then sinks the pad and shears the blank from the sheet 47 between the edges of the dies 6 and 10 while it curls or bends the sheet along the leading edge by moving the same into engagement with the curved surface of the die member 11. To locate or center the blank during this initial curling operation the tapered pins 30 are provided which enter an aperture in each ear of the blank and firmly hold the blank against displacement while at the same time a portion adjacent the outermost hole in one ear is raised by the embossing punch 31. The third operation occurs when the punch 7 clamps against the pad 34 the central part of a previously curled blank and sinks the blank between adjacent converging surfaces of the members 11 and 12 which serves to bend upwardly the opposite edges of the blank, thereby forming the blank to substantially channel shape in cross section. The sinking of the punch 7 also brings the ears along opposite ends of the blank into engagement with the die members 14 which bends these ears upwardly to close the ends of the channel, as shown in Figure 6, whereby the blank is formed to substantially the shape illustrated in Figure 8. In the fourth operation, the pad 25 engages a channeled blank and locks it in place and thereafter the die member 8 receives the leg containing the initial curl and further curls or bends the leg to form the annular bead on the leading edge of the shutter blade, as illustrated in Figure 7.

By these several operations all performed at one stroke of the press, one complete blade is formed after having passed through the machine in four steps. As the press opens and the parts return to original positions, the strippers push the blanks off the punches and the valve controlling the application of air pressure is actuated to force out the knock-out pins 40 and eject the completed blade from the machine. Thereafter the sheet 47 with its blanked-out end may be moved forward a given amount for the next press closing stroke, which thereby moves forward also beneath the gauge plates 50 the blank containing the preliminary curl and seating on the pad 33, which in its normal position brings the severed blank back into alinement with the sheet, and the movement of the severed blank pushes forward the channeled blank beyond the spring pad 34 until it reaches and rides down the inclined upper surface of the member 12 by gravity into position on the die 13 against the spring pressed pins 43 which are at this time at their uppermost limit of sliding movement. The parts are then ready for a repetition of the closing stroke and the several forming operations as before described.

It will be appreciated from the above that the amount of scrap or waste material is reduced to an absolute minimum. After the stock is once started into the machine the only waste is that which is cut away at the sides to form the ears, there being no other waste inasmuch as the transverse shearing operation in severing the blank leaves no intermediate material but forms the trailing edge of one blade blank and leading edge of the next succeeding blade blank. There is, in addition, however, a slight amount of material discarded incident to feeding a new sheet into the machine. This is necessitated by the fact that the edges of the raw stock are not squared. As an aid to the operator in starting a new sheet into the machine there may be provided on the shelf or support 45 at or near its outer end, and in addition to the guide 46, a gauge 60 having three steps or shoulders 61, 62 and 63 spaced one from the other a distance corresponding to the width of a blank with the stop 61 located at a distance from the shearing edge of the die 6 slightly greater than the sheet to be operated upon. These shoulders are for selective engagement with the rearmost edge of the sheet and serve to station the leading edge in certain predetermined positions within the die. For example, the new sheet is first laid on the supporting shelves 45 with one side abutting the guide 46 and brought into a position wherein its rear edge engages the shoulder 61 so that its front edge will then

lie on a transverse line somewhere within the margins of the die members 5 and 10. The closing of the die members at this time will result in the notching of the two corners of the sheet, the material cut away dropping through the openings 32 at each side. As the die members are again opened the sheet is moved forward until its rear edge seats against the shoulder 62. Upon the next closing movement of the die members the leading portion is sheared off providing a straight edge on the next succeeding portion which is then being blanked out. That part which is sheared off to square the sheet must be removed by hand from between the die members on the next opening movement and discarded. The formation of scrap in this fashion occurs only at the time a new sheet is being started into the machine. As the sheet is again moved forward and engaged by the shoulder 63 the operation of the machine continues, as has been heretofore described, and the only scrap thereafter is that cut from the sides of the sheet.

I claim:

1. A press for forming radiator shutter blades from sheet metal stock fed progressively a given amount between each press closing stroke, including a pair of relatively movable die blocks, work performing parts carried by each block and arranged in co-operative relation for action on the stock with each press closing stroke, said parts including shearing dies having a stripper device associated therewith, means to form a preliminary curl on the leading edge of a sheared blank, forming dies to press to channel shape in cross section a blank containing a preliminary curl, and means to give a final curl to the initially curled edge of a channeled blank.

2. A press for forming radiator shutter blades from sheet metal stock fed progressively a given amount between each press closing stroke, including means to blank out a given portion of the sheet to provide ears along opposite edges thereof, means to sever from the sheet a portion previously blanked out and to impart a preliminary curl to the leading edge thereof, means to bend angularly to the face of a blank the end ears thereof and also opposite edge portions, one of which contains the preliminary curl, and means to further curl the annular edge portion containing the preliminary curl.

3. A press for forming radiator shutter blades from sheet metal stock fed progressively a given amount between each press closing stroke, including a stationary die block and a movable die block, blanking dies carried by the blocks, a spring pressed stripper plate on the movable plate adapted for advance engagement with the sheet, co-operating forming dies fixed on the respective blocks to impart a preliminary curl to the leading edge of a blank and a spring pressed pad associated with the stationary block to clamp the blank against the descending die prior to the forming operation, a spring pressed pad on the stationary block, and a punch on the movable block adapted to co-operate with the pad to grip an intermediate portion of a blank and sink the blank between fixed parts on the stationary block to turn angularly the opposite edge portions of a blank and co-operating die members on the respective blocks to bend over the turned edge portion containing the preliminary curl and a spring pressed pad associated with one die member to make advance contact and clamp the blank against the other die member.

4. A press for forming radiator shutter blades from sheet metal stock fed progressively a given amount between each press closing stroke, including a stationary die block and a movable die block, a blanking die, a guide for the sheet stock leading to said blanking die, a forming die, a spring pressed pad associated with said forming die and adapted to position a blank in alinement with said guide whereby the blank can be engaged by the stock and pushed forward as the stock is fed along the guide, a work performing part, and an element with an inclined surface leading to said work performing part and on which a forwardly advanced blank may move by gravity to a position to be acted on by the work performing part.

5. The method of forming radiator shutter blades from sheet stock, including feeding a given amount of stock into a press at each stroke of the press and thereby moving forward previously fed material, simultaneously performing individual operations on given portions of the material at each stroke including a shearing operation, an initial curling operation, a forming operation and a final curling operation, and ejecting a formed blade at the end of each stroke.

6. The method of forming radiator shutter blades from sheet stock, including feeding a given amount of stock into a press between each two successive strokes of the press and thereby moving forward previously fed material, closing the press to (1) cut away material along the edges of the stock last introduced and provide thereby apertured ears, (2) shear entirely across the sheet to separate a blank from the sheet and initially curl the leading edge of the blanked portion, (3) form to substantially channel shape a blank having the initial curl and bend its ears angularly to close the ends of the channel and (4) give a final curl to the leading edge of a channeled blade.

7. The method of forming radiator shutter blades from sheet stock, including feeding a given amount of stock into a press between each two successive strokes of the press and

thereby moving forward previously fed material, closing the press to (1) shear entirely across the sheet to separate therefrom a blank and form an initial curl on the leading edge of the blank, (2) form to substantially channel shape a blank having an initial curl with the curled edge faced inwardly, and (3) bend to curled completion the leg of a channeled blade having an initial curl.

8. The method of forming radiator shutter blades from sheet stock, including feeding a given amount of stock into a press between each two successive strokes of the press and thereby moving forward previously fed material, closing the press to (1) cut away material along the edges of the stock last introduced to afford ears along opposite sides thereof, (2) sever a blank from the sheet, and (3) bend the ears of a severed blank to an angular position.

9. The method of forming radiator shutter blades from sheet stock, including feeding a given amount of stock into a press between each two successive strokes of the press and thereby moving forward previously fed material, closing the press to (1) sever a blank from the sheet, (2) form a severed blank to substantially channel shape, and (3) reversely curl one leg of a channeled blade.

In testimony whereof I affix my signature.

NORMAN WALKER.