Feb. 14, 1933. A. MAYER 1,897,066

METHOD OF CASTING STRAPS FOR BATTERY PLATES

Original Filed Sept. 26, 1930 3 Sheets-Sheet 1

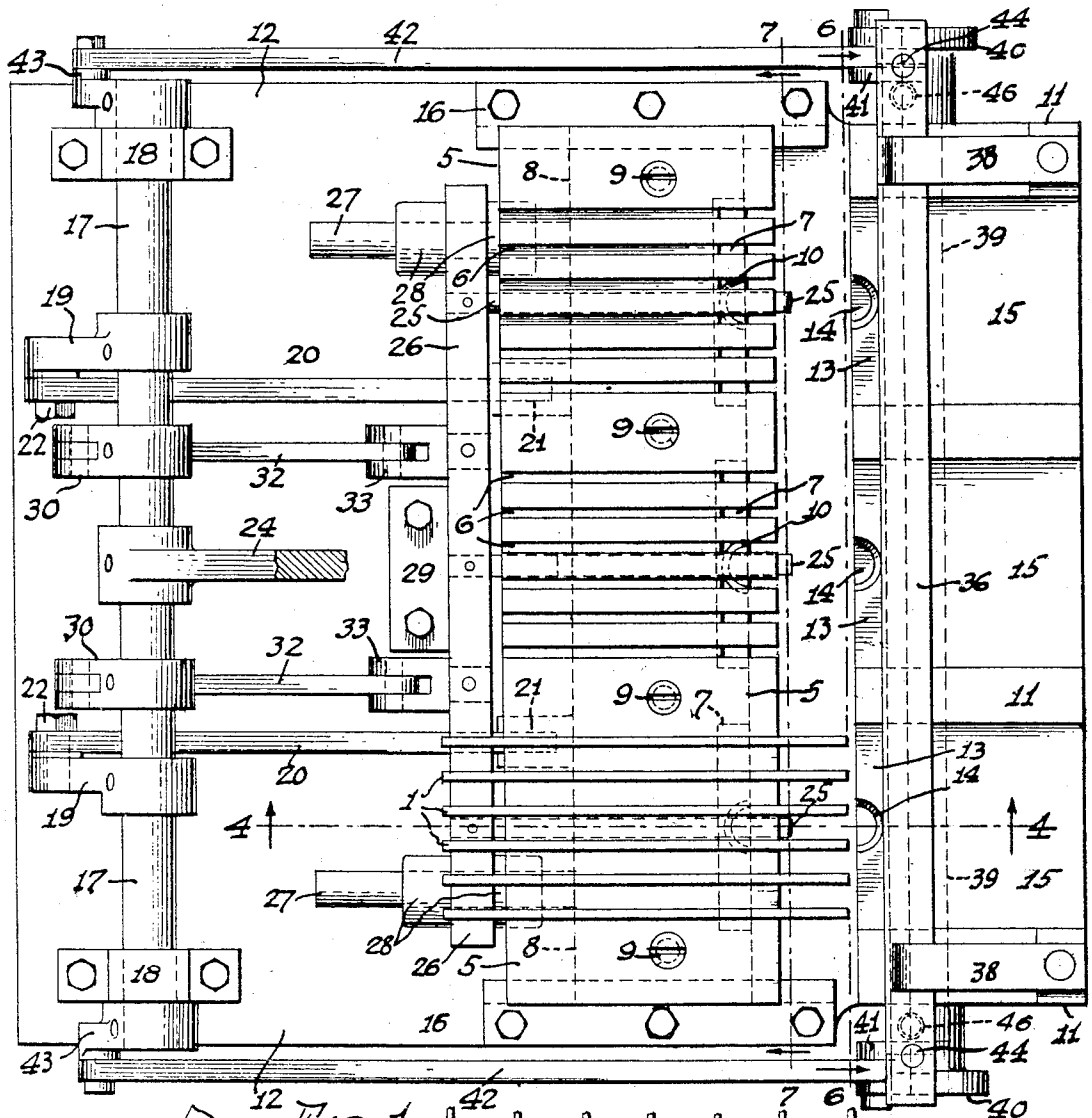

Fig. 1.

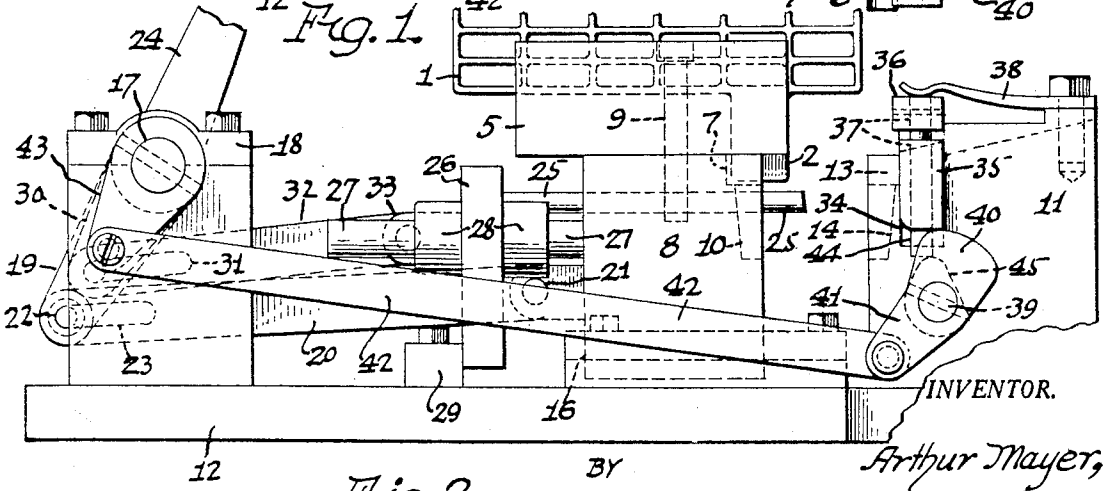

Fig. 2.

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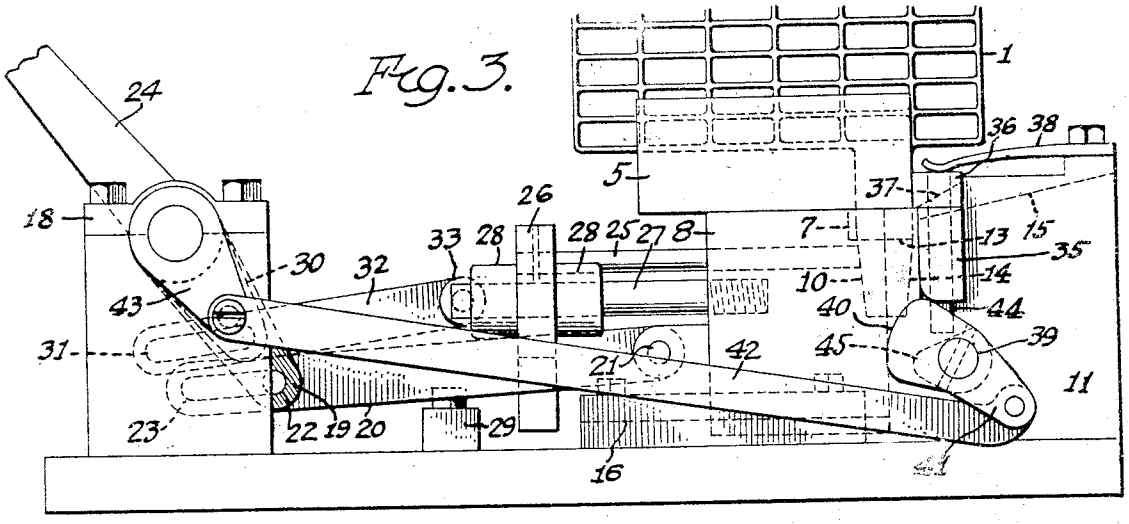
Fig. 3.



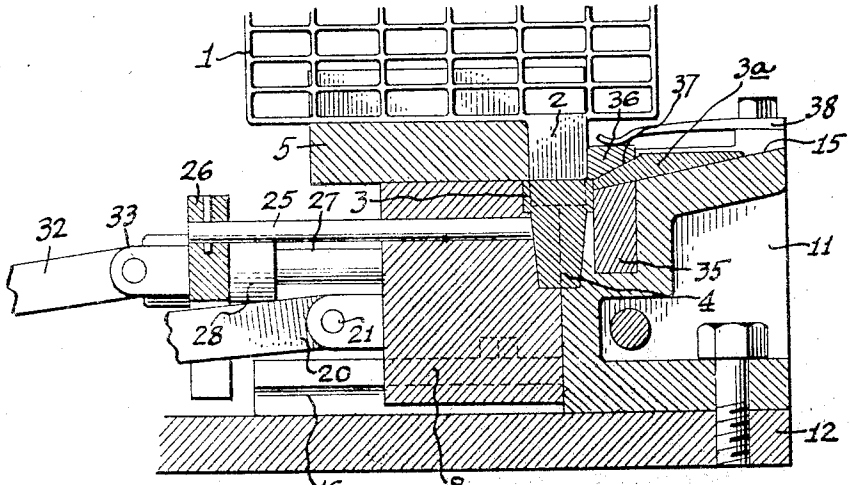


Fig. 4.

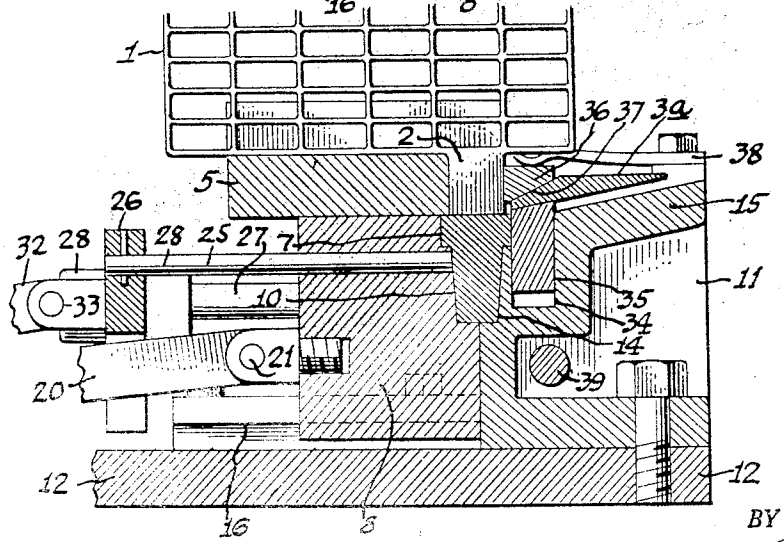


Fig. 5.

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Fig. 6.

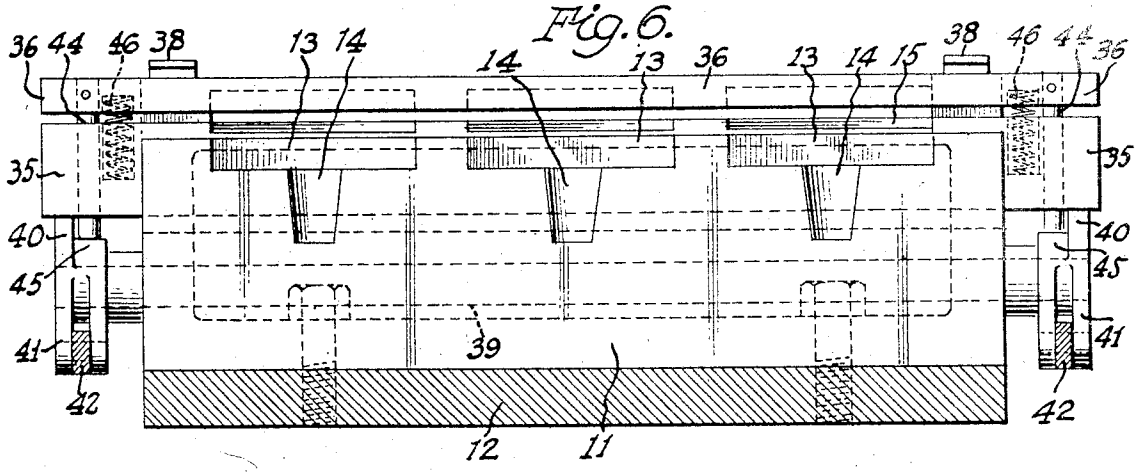
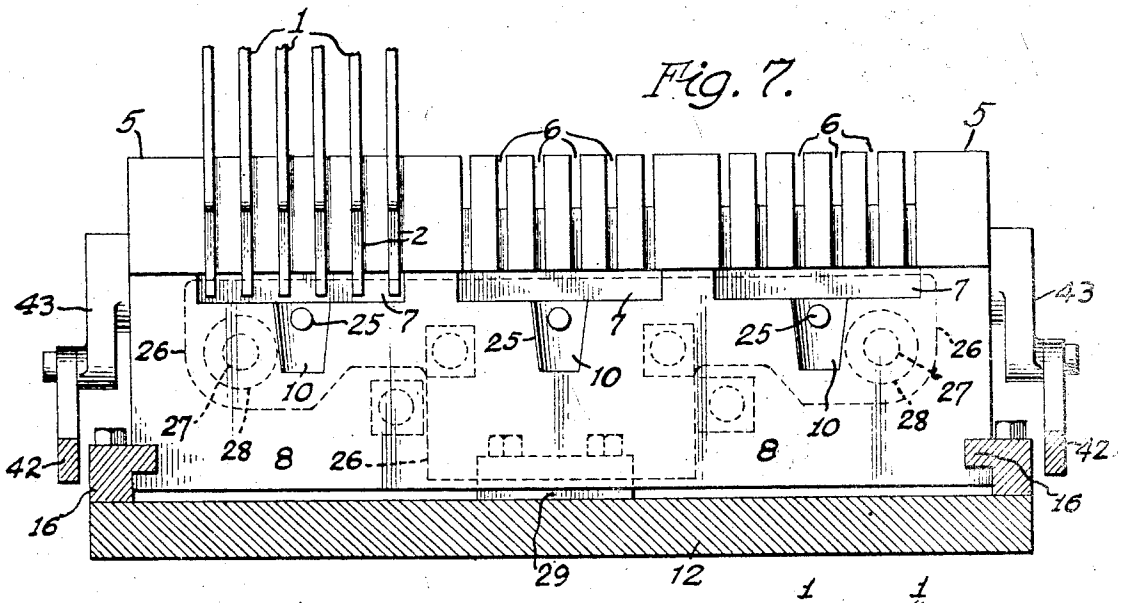


Fig. 7.



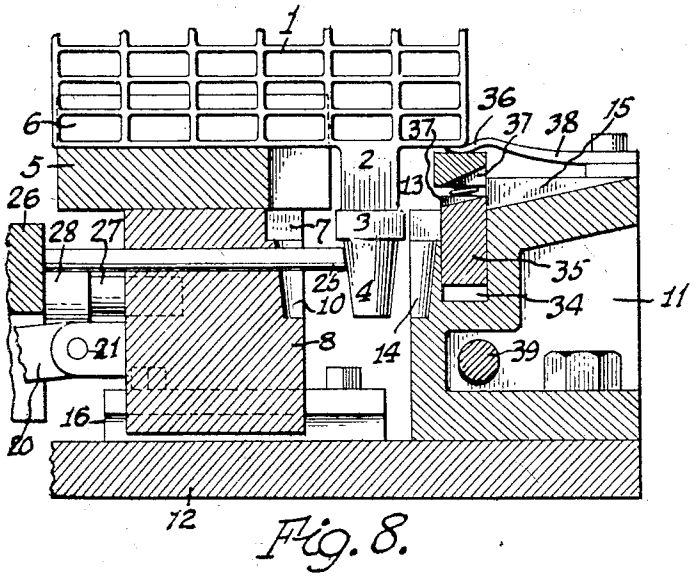


Fig. 8.

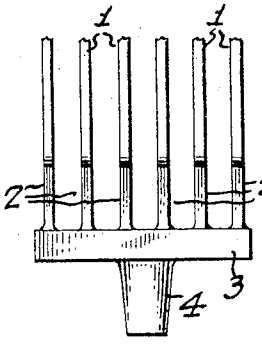


Fig. 9.

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1,897,066

UNITED STATES PATENT OFFICE

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METHOD OF CASTING STRAPS FOR BATTERY PLATES

Original application filed September 26, 1930, Serial No. 484,601. Divided and this application filed June 23, 1931. Serial No. 546,355.

The present application is a division of my co-pending application, Serial No. 484,601, filed September 26, 1930. The invention relates to the casting of battery straps across a series of battery plates, particularly at the lugs of the plates.

In casting the connecting strap to the lugs, the bond is not always satisfactory. By the method described herein, a more satisfactory bond is obtained.

The lugs of the plates are inserted in the mold shaped to form the strap. The lugs are so located in the mold that the metal poured into the mold engages the lugs in falling to the bottom of the mold. The lugs are heated by this contact to such a temperature that, when engaged by the metal rising in the mold, they are in a condition to form a highly efficient bond with the molten metal.

The invention is fully disclosed by way of example in the following description and in the accompanying drawings in which—

Figure 1 is a plan view of a machine in which the casting is performed;

Fig. 2 is an end elevation of the same;

Fig. 3 is an end view similar to Figure 2, but showing the machine in closed or casting position;

Fig. 4 is a longitudinal section substantially upon the line 4—4 of Figure 1, but showing the parts in the position shown in Figure 3;

Fig. 5 is a view like Figure 4, except that the sprue severing means is shown in position with the sprue severed;

Fig. 6 is a transverse section substantially upon the line 6—6 of Figure 1, and looking in the direction of the arrows;

Fig. 7 is a section substantially upon the line 7—7 of Fig. 1, and looking in a direction opposite to that of Fig. 6;

Fig. 8 is a longitudinal section showing the mold opened, and

Fig. 9 is an end view of a group of plates held together by a strap cast thereto.

The battery plates or grids 1 are preformed or cast in the usual manner and are of the usual construction, each having a lug 2 projecting from an edge of the grid, and the purpose of this machine is to assemble these grids in banks or groups in properly spaced relation and with the lugs 2 of each group connected by a transverse connecting strap 3 integral therewith, and with this strap provided with an integral terminal post 4.

To hold the plates or grids 1 in one or more groups each consisting of the desired number of grids and in properly spaced relation, a holder member 5 is formed in its upper side with slots 6 spaced apart and arranged in groups, there being three such groups of six slots each, shown, and these slots open through the side edges of the strap forming this holder, and at one end extended through the bottom of said strap, so that each grid may be set into a slot in inverted position with its lug 2 projecting downwardly through the end of the slot which extends through the bottom of the strap, so that the lower ends of these lugs of each group will project downwardly below the lower face of the strap and into one half of a mold cavity for each group formed in one side of a mold block 8 upon which the holder 5 is secured by screws 9. Intermediate the ends of each mold cavity 7, a half-cavity 10 formed in the block, opens into said half-cavity 7, both cavities being open through the side of the block with each cavity 7 of sufficient length to extend across a group of grids and provide a mold for one half of each connecting strap 3 of each assembly, the half cavity 10 at the same time forming one half of the terminal post 4 integral with said strap.

To form the other half of each connecting strap 3 and post 4, a fixed block or member 11 fixedly secured to a base plate 12, is formed in one side which is opposed to the mold block 8, with mold cavities 13 to form the other half of the several straps 3 and mold cavities 14 to oppose the cavities 10 and form therein the other half of the terminal posts, said block 11 being also formed with open ways or channels 15, one for each group of grids, leading into one side of the cavities 13 and of a length equal to said cavities, to receive molten metal and conduct the same into said cavities 7, 10, 13 and 14 when the side face of the mold block 8 is against the adjacent side face of the block 11 so that said cavi-

ties together form complete molds for said strap and post. The mold thus formed by said blocks 8 and 11 is therefore divided vertically at the center line of the cavities, and the casting formed integral with the lugs 2 by pouring molten metal into the mold cavity into which the lugs project, may be released by moving the block 8 away from the block 11 upon ways 16 provided on the base 12 at each end of the mold block 8.

To move the block 8 away from the fixed mold block 11 and release the casting from the mold cavities therein, a shaft 17 is mounted in bearings 18 on the base plate 12, parallel with the rear side of the block 8 and on this shaft are cranks 19 connected by connecting rods 20 with said block, the forward end of each rod being pivotally attached to the rear side of said block as at 21 and connected at their rear ends to said cranks by pins 22 on said cranks passing through elongated slots 23 in said rods. A lever handle 24 on said shaft provides means by which the shaft may be turned to actuate said cranks and move said block 8 toward or from said block 11.

The moving of the block 8 away from the block 11 will withdraw the casting from the half of the mold in the block 11, but as the grids 1 are carried by the holder 5 which is mounted upon the block 8, these grids will move with said block, and therefore in order to eject the casting from the mold in said block 8 it is necessary to provide ejecting rods 25 arranged to slide longitudinally through transverse openings in said block there being preferably, as shown, one rod opposite each cavity 10 with the free end of each rod arranged to engage one side of the terminal post and push said post out of the cavity, thereby forcing the strap 3 out of its mold cavity in the block 8 and also moving the several grids 1 longitudinally in their holding slots 6 and their lugs 2 out of the ends of these slots.

It is necessary however that the grids with the strap and terminal post cast thereon, move with the block 8 sufficiently to withdraw the strap and post from the mold cavity in the block 11 and it is also necessary that the end of the rod 25 be in position to fill the opening in the side of the cavity 10 when the parts are in position for casting so that the molten metal filling the cavity will be excluded from the hole in which the rod reciprocates. The rods 25 are therefore secured at their rear ends to a transverse bar 26 which in turn, is mounted for free sliding movement upon guide rods 27 fixed at their forward ends within openings in the rear side of the block 8 and project rearwardly therefrom through guide openings in said bar, said bar being formed with lateral bosses 28 around said guide openings to provide longer bearings for the bar on said rods. The bar 26 is therefore free to move upon said rods independently of the movement of the block 8 and as the rods 25 are secured at their outer ends to said bar, they move with the bar.

When the block 8 is moved rearwardly by the pins 22 coming into engagement with the rear ends of the slots 23, the bar 26 being free to move, will move with the block, carrying the rods 25 with it until said bar 26 comes into contact with a stop 29 on the base 12, when it with said rods will be stopped in such rearward movement, and the rearward movement of the block 8 continuing, such movement being permitted by the sliding of the guides 27 through the bar, said rods 25 will be projected through the block into engagement with the cast terminal post and thus move said post 4 and connecting strap 3 out of their mold cavities in the block 8, and as said strap and post are integral with the lugs 2 on the grids 1, said grids will be moved in their slots longitudinally a distance sufficient to disengage the lugs 2 from the guide slots in the holder 5, thus ejecting the assembly and leaving the parts in open position as shown in Figures 1 and 2.

The closing of the mold or the moving of the parts to the position shown in Figure 4 is accomplished by swinging the lever 24 which will bring the pivot pins 22 into engagement with the forward ends of the slots 23 and continuing this movement, will move the block 8 into face engagement with the block 11 and close the mold.

To insure the movement of the bar 26 and rods 25 with the block 8 back to proper position with the bar spaced from the stop 29 and with the ends of the rods 25 flush with the side wall of the mold cavity 10, said shaft 17 is provided with crank arms 30 having pivot pins passing through elongated slots 31 in links 32, the opposite ends of which links are pivotally connected to the rear side of the bar 26 as at 33. The pivot pins engaging the slots 31, permit movement of the bar 26 independently of the block 8 and means for moving same, but in moving the parts to closed position, the pivot pin of each crank 30 engages the end of the slot 31 and thus the last portion of the movement of the lever 24 will positively move the bar and rods to exactly the proper position.

In casting, a sprue 3*a* as shown in Figures 4 and 5, is formed in each of the ducts 15 into which the molten metal is poured, and this sprue is integral at the mouth of each duct with the cast strap 3. To shear off these sprues even with the side face of the strap of the cast assembly, the block 11 is formed with a channel 34 adjacent the side of the several half mold cavities 13, said channel extending from end to end of the block, and fitting closely in this channel is a shearing bar 35 arranged to be raised within said channel, and in so doing, to shear off the sprue from each connecting strap 3 of each

assembly, as shown in Figure 5. To give a clean shearing action, a presser bar 36 is provided to rest upon the end portion of each sprue adjacent said connecting strap, said bars 35 and 36 being each notched slightly as at 37 to provide an opening therebetween, said bars forming a mouth for each duct 15 through which the molten metal enters the mold proper. This presser bar is slightly wider than the shearing bar 35 so that when the mold is closed with the parts in the position shown in Figure 4, the inner side of this presser bar will abut the edges of the lugs 2 and the side face of the holder 5 to close the top portion of the mold recess 13 adjacent said lugs, and to press said presser bar 36 downwardly to its seat on the upper edge of the shear bar 35, flat springs 38 are secured to the block 11 to engage said bar 36 adjacent its ends at the ends of the block.

To forcibly raise the shear bar 35 after the casting operation is completed and sever the spruces 3*a*, said bar is extended beyond the ends of the block 11 and secured upon each end of a shaft 39 mounted in bearings in the block 11 and extending beyond the ends of said block, is a cam member 40 to engage beneath the ends of said shearing bar 35 and force said bar upwardly in its channel. These cams 40 are simultaneously operated and in timed relation to the opening and closing of the mold, by providing crank arms 41 on the cams and to the lower ends of which arms connecting bars 42 are pivotally connected at one end, their opposite ends being pivotally attached to crank arms 43 secured upon the ends of the operating shaft 17. The movement of this severing bar and also the movement of the block 8 and bar 26 is therefore effected by the swinging of the operating lever 24 by means of which the shaft 17 is turned, and the movement of these parts will be in timed relation due to the fact that there is a loose or slotted connection between the arms 19 and 30 on this shaft and their connecting bars or rods 20 and 32, so that the first movement of the shaft 17 will operate the cams 40 to raise the bar 35 and sever the sprues 3*a* while the cast assembly is still firmly held in the mold.

In order to release the sprues 3*a* from between the bars 35 and 36 after the severing operation, these bars are forcibly separated by providing the hold-down bar 36 with pins 44 which are secured at their upper end to said bar adjacent its ends and pass freely through openings in the bar 35 beyond the ends of the block 11 with their lower ends in position to be engaged by cams 45 on the shaft 39. The relative positions and dimensions of the cams 40 and 45 are such that the cams 40 will first raise the severing bar 35 to sever the sprue, and then the pins 44 will come into contact with the cams 45, holding the hold-down bar 36 in elevated or raised position but permitting the bar 35 to drop away from bar 36 as the cams are turned, and this separating of bars 35 and 36 to release the sprues is further insured by interposing coiled springs 46 (see Fig. 6) between said bars within recesses therein adjacent said pins 44. Therefore immediately upon the cutting off of the sprues as shown in Figure 5, the bars 35 and 36 engaging the portions of the sprues within the notches 37 in said bars, will be separated, releasing the sprues.

It will now be seen that the metal poured into the mold engages the lugs, particularly a corner of each, before reaching the bottom of the mold. The lugs are thereby preheated by the flowing metal, and it is to be noted in this connection that the lugs are engaged by the inner, unchilled part of the metal stream where the temperature is higher than at the outer surface thereof. This temperature is sufficient to melt away the parts of the lugs first engaged by the stream, and obviously the remainder of each lug is heated throughout. Figures 1 and 4 show in dotted lines that a portion of each lug originally lies in the mold cavity 3 and below the comparatively cool top member 5. The parts of these portions not melted away, remaining in the mold cavities proper or below the member 5, are heated to a considerably higher temperature than the parts of the lugs above the bottom plane of the member 5. As the metal raises from the bottom of the mold into contact with the lugs, it is gradually cooled, especially at the upper surface. Ordinarily, this condition is detrimental to the formation of a satisfactory bond between the poured metal and the lugs, but owing to the preheating of the lugs, a highly efficient bond is obtained, due perhaps to a plasticizing of the lugs in the preheating.

What I claim is:—

In the casting of a strap across the lugs of battery plates in a mold comprising a recessed mold block and a top member upon the same adapted to receive the lugs, the method consisting in inserting the lugs of said plates downwardly through said member to extend below the same and into the recesses of said mold block in spaced relation to the walls of said recesses, pouring molten metal into said recesses in a stream crossing one of the lower corners of each lug at such an acute angle to the vertical axis of said lugs and with such directive force as to melt off only a portion of the lug parts lying below the top member and in the mold recesses, whereby the residues of the last named lug parts lying in the mold recesses retain such high temperature as to permit the poured metal to be welded thereto.

In testimony whereof I affix my signature.

ARTHUR MAYER.