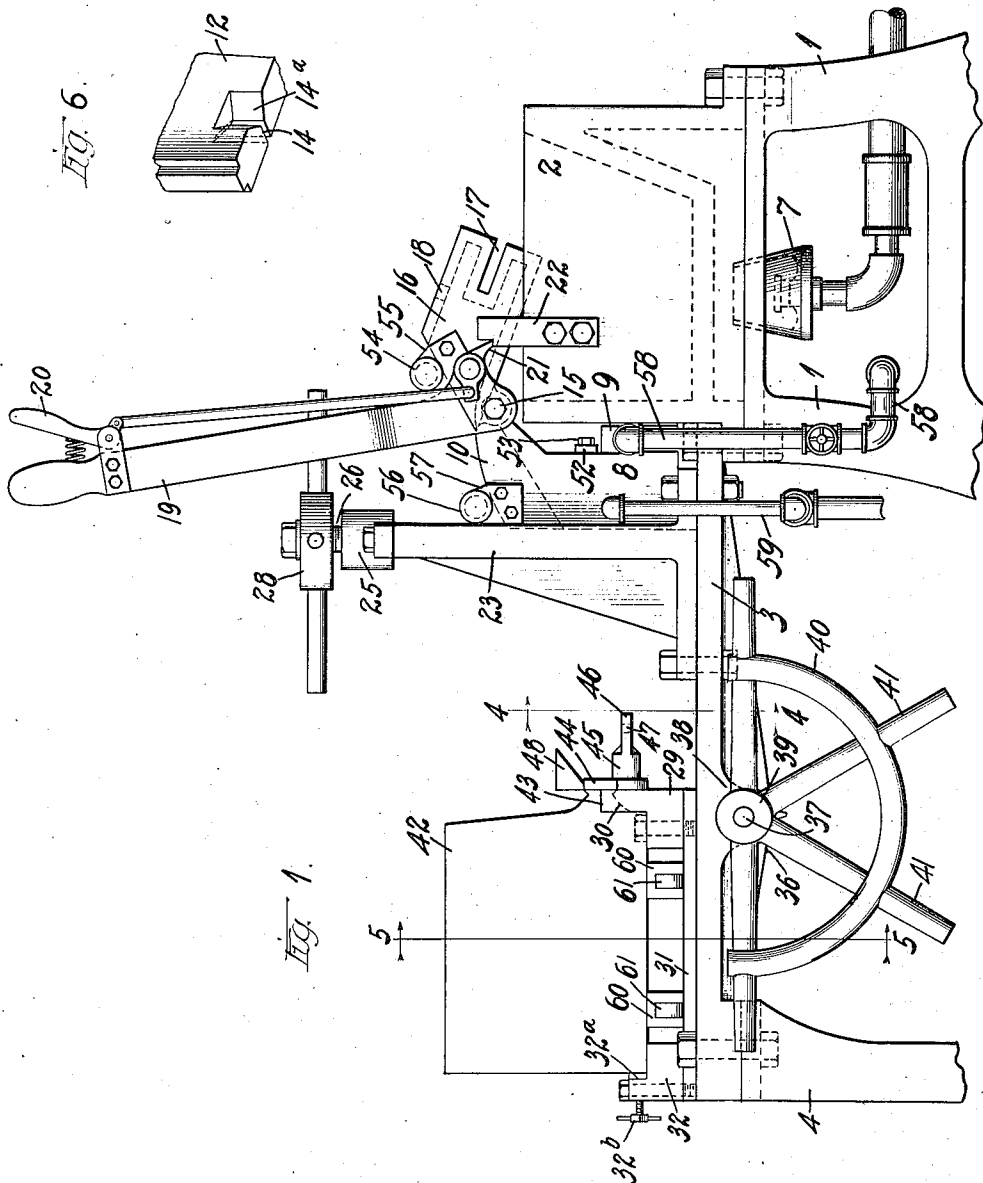


F. ENGEL.
CASTING MACHINE.
APPLICATION FILED DEC. 17, 1915.

1,235,779.

Patented Aug. 7, 1917.

5 SHEETS—SHEET 1.



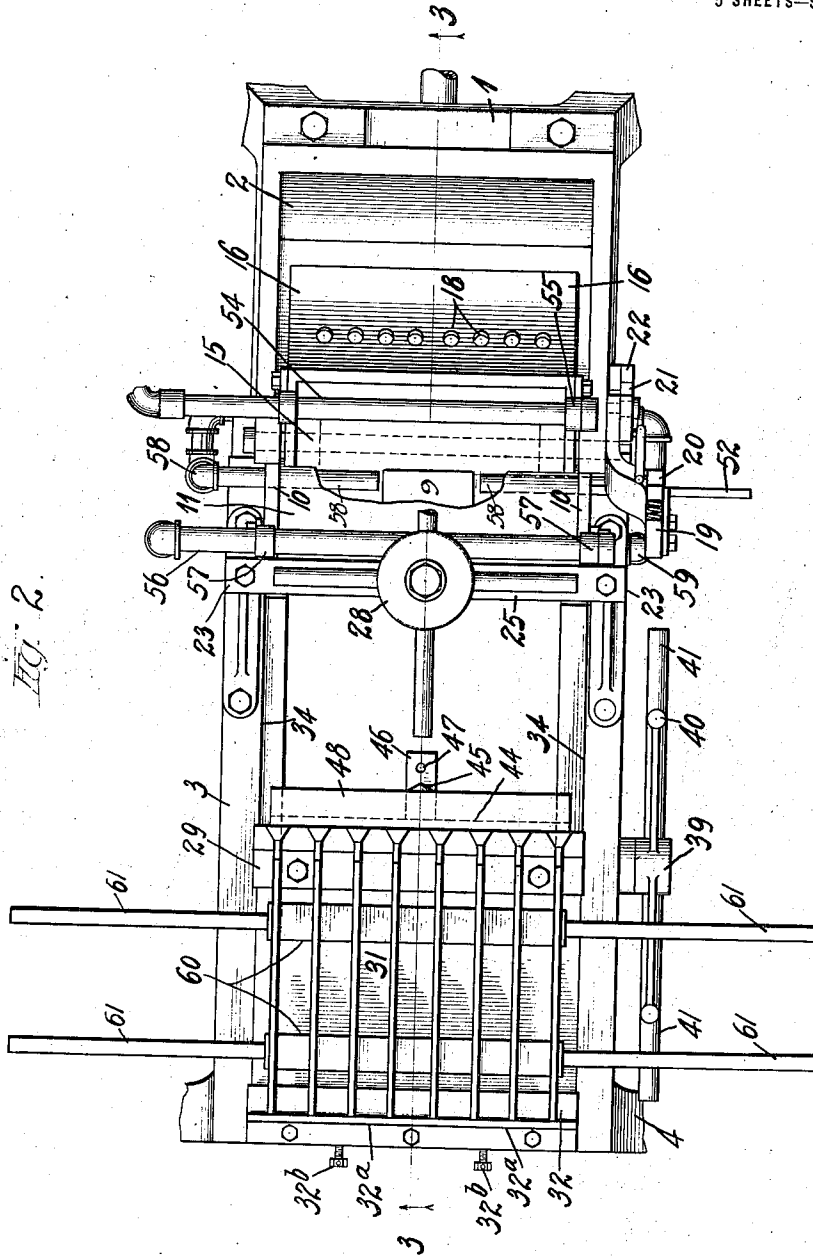
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5 SHEETS—SHEET 2.



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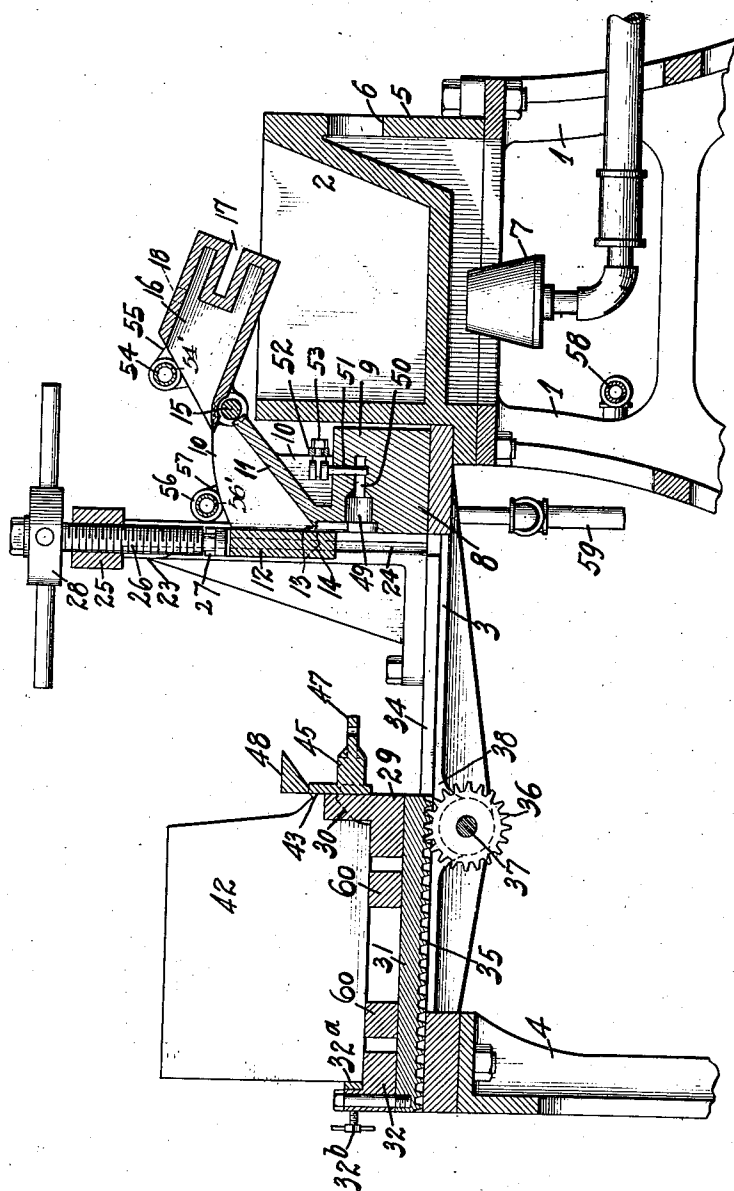
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Fig. 3.



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5 SHEETS—SHEET 4.

Fig. 4.

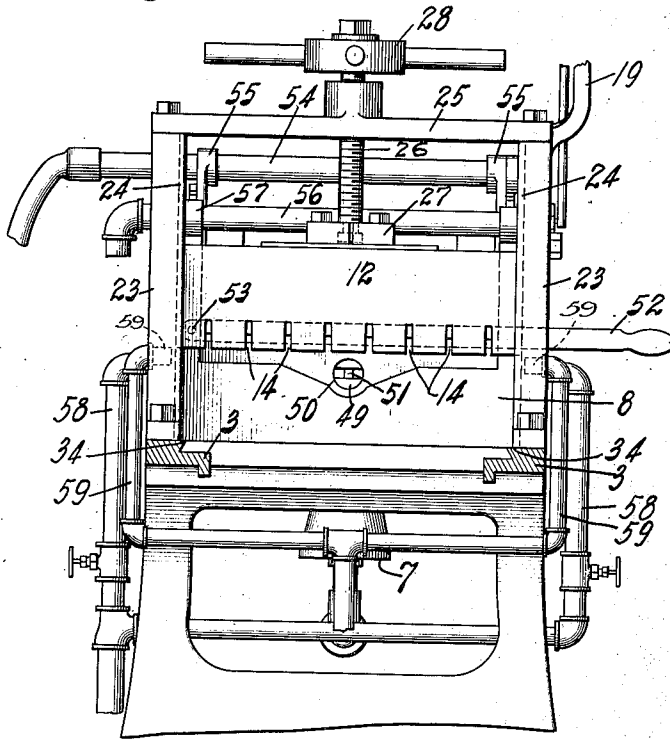
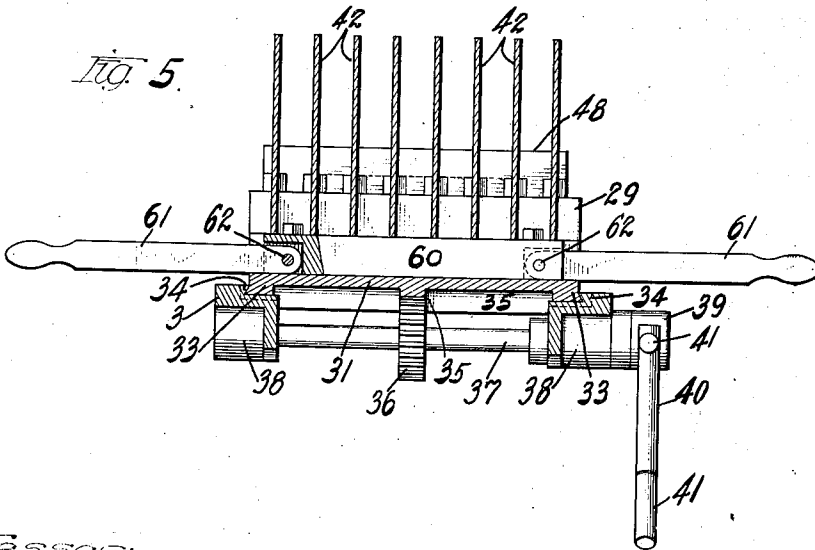


Fig. 5.



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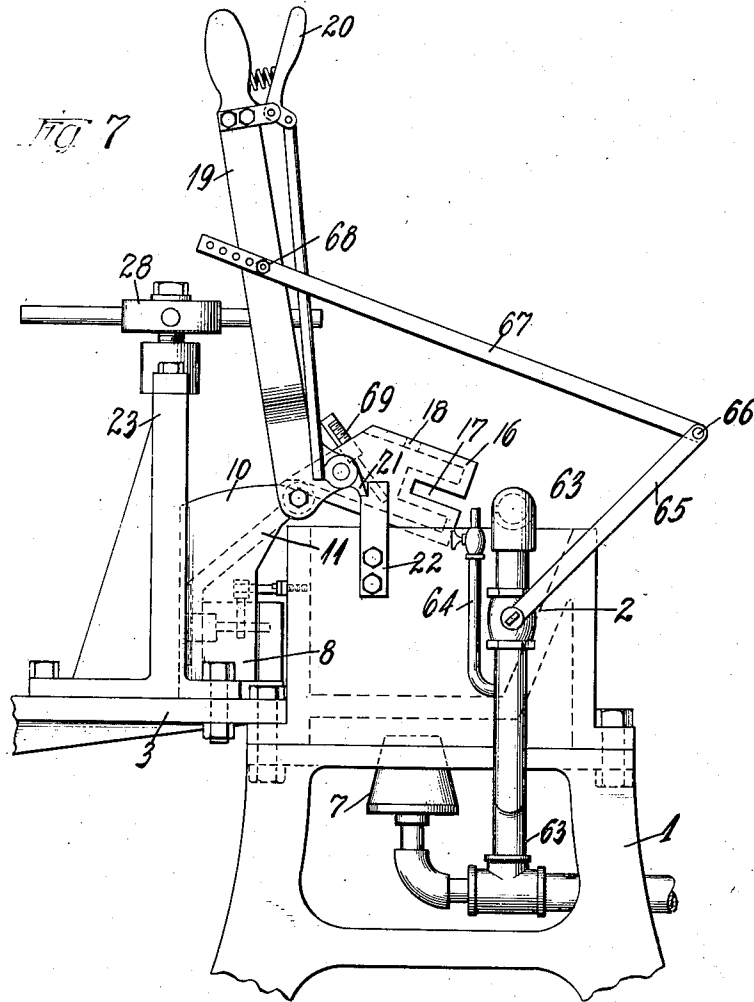
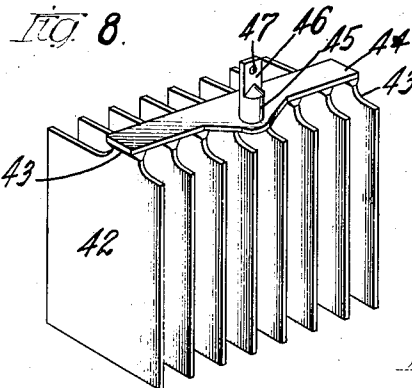
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5 SHEETS—SHEET 5.



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UNITED STATES PATENT OFFICE.

FRANK ENGEL, OF NIAGARA FALLS, NEW YORK, ASSIGNOR TO U. S. LIGHT & HEAT CORPORATION, OF NIAGARA FALLS, NEW YORK, A CORPORATION OF NEW YORK.

CASTING-MACHINE.

1,235,779.

Specification of Letters Patent.

Patented Aug. 7, 1917.

Original application filed September 19, 1910, Serial No. 582,696. Divided and this application filed December 17, 1915. Serial No. 67,392.

To all whom it may concern:

Be it known that I, FRANK ENGEL, a citizen of the United States, residing at Niagara Falls, in the county of Niagara and State of New York, have invented new and useful Improvements in Casting-Machines, of which the following is a specification.

This invention relates to casting machines. It relates more particularly to a machine whereby a group of battery plates may be connected to form an integral structure. This application is a division of my application, Serial No. 582,696, filed September 19, 1910.

One of the objects of the invention is to provide a machine whereby a number of storage battery plates may be mechanically and electrically connected by means of a conducting member, which shall be joined to each individual plate in such a manner as to be substantially integral therewith, whereby good mechanical strength and electrical conductivity are secured.

Various attempts have been made in the past to connect storage battery plates by "burning" a common connecting member to a number of plates. According to this process, the various parts were connected by directing a flame against their adjacent surfaces, causing a partial fusion of the metal so that the resulting structure had a continuous outer surface of conducting metal, but within the joint was very incomplete and needed only to be cut into to reveal the imperfections. By the use of the machine which forms the subject of this invention, the juncture of the various parts is so complete that, upon being cut open, no trace of a joint can be found.

For the purpose of describing my invention, I have illustrated one embodiment of the invention and a modification thereof.

In the drawings:—

Figure 1 is a longitudinal elevation of the machine referred to.

Fig. 2 is a top plan view thereof.

Fig. 3 is a longitudinal central section on the line 3—3 of Fig. 2.

Fig. 4 is a section on line 4, 4, of Fig. 1.

Fig. 5 is a section on line 5, 5 of Fig. 1.

Fig. 6 is a perspective view of a detail.

Fig. 7 is an elevation of a modification of part of the machine.

Fig. 8 is a perspective view of a group of

plates having a connecting strap cast integrally therewith.

The machine selected for illustration includes, in general, a reservoir for molten lead mounted on a suitable base or support, an extension or table extending from one end of said reservoir and supported in any suitable manner, a traveling carriage sliding in ways on said table, said carriage adapted to carry a plurality of battery plates onto whose ends there is to be cast an integral strap, and intermediate mechanism between the plates and the reservoir for forming a mold and for pouring lead from the reservoir into the mold.

Referring to the drawings, there is shown a suitable support or stand 1, carrying a reservoir 2 for molten lead. Secured to one end of said reservoir by any suitable means, such as bolts, is an extension or table 3, supported at its distant end by legs 4.

The lead reservoir 2 has an additional end wall portion 5 (see Fig. 3) in which there is located an opening 6, which provides an escape for the products of combustion from the burner 7, which latter may be of any suitable type, preferably the ordinary gas burner with an air-mixing device.

An end portion of a mold 8 is preferably located on the table 3 adjacent the lead reservoir and is secured to said table by any suitable means such as bolts, said end portion being provided with a centrally located projection or block 9, more fully described hereinafter, and substantially parallel end walls 10. These end walls are connected by a diagonal or slanting partition 11, which, together with said walls and the sliding plate or top portion 12 of the mold, form a chute or trough adapted to form a run-way for the molten lead poured from above, as hereinafter described. Said top mold portion 12 does not quite meet the partition 11, so that a narrow slit or opening 13 is left at the bottom of said chute, as will be clearly apparent from Fig. 3. The top mold portion 12 is provided along its under side with a series of slots or grooves 14, seen more particularly in Figs. 4 and 6, each slot being adapted to receive a projecting lug of a battery plate. The slots widen out on the side of the top mold which is away from the battery plates, as at 14^a, so that the cast lead strap, which connects the various lugs, will

be provided with reinforcing fillets, as seen more particularly in Fig. 8.

The upper ends of the walls 10 constitute brackets which provide suitable bearings for a rod or bar 15, on which there is rotatably mounted the ladle or bucket 16, adapted to be lowered into the molten lead of the reservoir, and then tilted over so as to pour the lead down the chute referred to above. The ladle 16 is shown as provided with a recessed portion 17 at its base, described in connection with the modification herein illustrated, although I do not limit myself to this construction. In one of the side walls of the ladle, a plurality of holes or openings 18 are located, shown more particularly in Fig. 2. When the bucket is lowered into the molten lead, these holes are lowered well below the surface of the metal so that all the lead which enters the ladle enters through these holes, but does not carry with it the usual oxid or dross which is continually forming on the surface of molten lead.

Secured to the ladle 16, in any suitable manner, is the operating handle 19, by means of which the ladle may be conveniently dipped into the reservoir and then tilted over to pour out the lead which entered the holes 18. The handle 19 is shown as provided with a spring latch 20, which operates the pivoted catch 21, adapted to engage a fixed stop 22 secured in any suitable manner to the side of the reservoir. By means of this latch arrangement, the ladle, after being filled with lead, may be lifted above the reservoir and retained in the positions shown in Figs. 1 and 3, but not tipped far enough to cause the discharge of its contents until the mold has been properly adjusted.

Suitable guides 23 are provided for the top mold portion 12, these guides consisting of upright members, bolted or otherwise secured to the table or base 3 and provided with ways 24 in which the ends of said top mold portion are adapted to slide freely. The tops of said guides are connected by the member or yoke 25, through which passes the screw-threaded rod 26, having its lower end turning freely in the block 27, secured to the top mold portion 12. A suitable hand wheel 28 is provided, whereby said top mold portion may be readily raised and lowered, and whereby it may be tightly pressed down into position before the casting operation takes place.

The mold into which the molten lead is poured comprises a receptacle, having at one side the end mold portion 8, having at the top the mold portion 12, both described above, and having a bottom mold portion 29 comprising an L-shaped block having slots or grooves 30 in its upper portion, adapted to receive the projecting lugs of the battery plate. This bottom mold portion

29 is suitably secured to the carriage 31 by means of bolts, or in any other suitable manner. A second L-shaped block 32 is secured to the opposite end of said carriage to support the opposite lower corners of said battery plates. An adjustable bar or clamping member 32^a is preferably mounted on the block 32 and adjusted by screws 32^b, although I do not limit myself to this feature. The carriage 31 is provided with projections 33, adapted to slide in suitable ways 34, formed on the base or table 3, as seen more particularly in Fig. 5. A rack 35 is shown as constituting an integral part of said carriage 31 and extends downwardly therefrom, although it is obvious that a detachable rack may be used with said carriage, if desired. The rack 35 meshes with the pinion 36, mounted on the shaft 37, and supported in suitable bearings 38, formed by downwardly extending projections on said table 3. On one end of said rod 37, is located an operating wheel 39, having a rim 40 which forms only a half circle and having spokes or hand grips 41. As seen in Fig. 1, the upper half of the operating wheel is cut away to avoid interference with certain features of the carriage hereinafter described.

In order to close the mold preparatory to the casting operation, a number of storage battery plates 42 are mounted on the supports 29 and 32 and clamped firmly therein by means of the adjustable bar 32^a, with portions of their projecting lugs 43 received in each of the slots 30, in the support or bottom mold portion 29. The battery plates 42 have previously subjected to a process which renders their surfaces dense and compact and which greatly increases their superficial area, although this feature is not apparent from the drawings. The invention is not limited to the use of plates of any particular configuration or proportions, however, or to plates subjected to any particular prior processes. Upon rotating the operating wheel 39, the carriage 31 is moved to the right of its position, as seen in Fig. 1, until said bottom mold portion 29 bears against the end mold portion 8, whereupon the hand wheel 28 is turned to lower the top mold portion 12 until said mold portion is firmly pressed down against the bottom mold portion 29, with the upper halves of the projecting lugs 43 fitting within the slots 14 in the lower end of said top mold. With the parts in this position it will be apparent that the only opening of the mold is the slit 13, and it will be further apparent that the extreme ends of the lugs 43 project into the space in the mold.

Upon filling the ladle 16 with molten lead and tipping the contents thereof into the chute formed by the partition 11 and side walls 10, the lead, which has previously

been super-heated, that is, heated to a higher degree than merely that necessary to melt it, as will be hereinafter described, flows through the slit 13 and assumes the form of the mold, the heat of the lead being sufficient to partially melt the projecting tips of the lugs 43 so that these lugs 43 are combined with the cast strap 44 in such a way as to form a unitary structure.

10 The connecting strap so formed is shown more clearly in perspective in Fig. 8, from which it will be apparent that there is preferably formed, integrally with said strap, a projecting terminal member 45, having a flattened portion 46 provided with a hole 47, adapted to receive a terminal clamping bolt, not shown. In casting the terminal strap and projecting terminal portion, there is a slight excess of lead used, which forms the gate 48, which gate is afterward cut off. The projecting terminal 45 and extension 46, referred to, are formed by virtue of a recess 49 and extension 50 in the central block 9, forming an integral part of the end mold portion 8 described above (see Fig. 3).

25 In order to form the hole 47 in the terminal extension 46, a vertically movable pin 51 is provided, carried by the lever 52, pivoted at 53 to part of said end mold portion. It will be apparent that by raising and lowering the handle 52 (see particularly Fig. 4), the pin may be raised to release the terminal member after the casting operation. By operating the hand wheel 28, the top mold portion 12 may be lifted, whereupon the carriage, and the plates carried thereby, are free to be returned to initial position.

The means for giving to the lead the additional heat referred to, consists of the pipe 54 supplied with hydrogen, said pipe being secured to the ladle 16 by means of brackets 55, or other suitable supports, from which pipe a number of hydrogen flames are directed, through a plurality of holes 54' against the surface of the lead in the ladle, after said ladle has been lifted to its intermediate position, and while the mold is being adjusted in its closed position. These hydrogen flames not only provide the additional heat required, but also burn off all the dross on the surface of the lead, leaving it bright and clean. This superheating of the lead is desirable in order to cause a thorough fusion of the projecting battery plate lugs with the connecting strap. The pipe 54 may be provided with any suitable flexible connection, not shown, so as to readily permit of the movement of the ladle 16.

60 In order to facilitate the operation of the device, it is desirable to provide means for quickly cooling the larger masses of cast metal, such as the gate 48 and the terminal extension 45. For this purpose, an air pipe 56 is provided, supported on brackets 57, secured to the side walls 10 of the end mold

portion, said pipe being provided with a plurality of small openings, 56' for directing cold air downwardly against the top of the gate, after the casting operation. Another cold air pipe 58 is shown more particularly in Fig. 1 as extending horizontally between the reservoir 2 and the end mold portion 8, for the purpose of directing a stream of cold air against the sides of the block 9 for the purpose of quickly cooling the terminal lug 45 and extension 46. One of these pipes 58 is provided for each side of the machine.

Gas pipes 59, having the usual air-mixing nozzles, not shown, are preferably provided for the purpose of directing a flame against the lower ends of each of the opposite walls 10 on the center mold portion 8, for the purpose of heating up the walls of said mold to a sufficient extent to prevent too rapid cooling of the molten metal when it is first poured into the mold, as such cooling might defeat the object of fusing together the lugs and connecting strap.

After the casting operation has taken place, and the parts have been returned to their normal positions as described above, the plates 42, with their connecting strap, are lifted from the supporting blocks 29 and 32, and the gate 48 is cut off, leaving the product shown in Fig. 8. To facilitate lifting the plates, and particularly the lugs 43 from the slots in the mold portion 29, either one of two ejecting means are preferably provided, consisting of a bar or block 60 having a handle 61 at each end, pivoted at 62, seen more particularly in Fig. 5. It will be apparent that by simply pressing down the ends of the handles 61, the block 60 and the entire group of battery plates above said block will be raised a slight amount, sufficient, however, to enable the group of plates to be readily lifted from the carriage. By having the operating wheel 39 cut away, as described above, the manipulation of these ejectors is not interfered with.

110 In the modification illustrated in Fig. 7, the various parts, indicated by the same reference characters as those previously used, are the same as the parts heretofore described, the additional reference characters applying only to new parts. In this modification, the lead in the ladle is kept hot by a flame directed into the recess 17 in the bottom of the ladle, rather than by the surface flame previously described. The gas pipe 63 is located parallel to said recess and has a plurality of holes 17' whereby a plurality of flames may be directed into this recess 17. A pilot light is indicated at 64. The lever 65 is pivoted at 66 to the lever 67, which is in turn bolted at 68 to the main operating lever 19. The operation of the lever 19 causes the proper opening and closing of the valve in the pipe 63, so that the gas flame is directed against the ladle only when the ladle is in

its intermediate position. A thermometer 69 may be mounted on the ladle for the purpose of determining the temperature of the lead. Although the arrangement shown in 5 this modification is effective to properly superheat the lead, the arrangement first described is the preferred one, as the lead is not only kept hot, but clean. Of course, it is apparent that a hydrogen flame, for the 10 purpose of cleaning the surface of the lead in the ladle, might be used in connection with this modification, if desired.

The advantages of the construction shown in Fig. 8 are obvious, the effect of having a 15 strap integral with each plate being to reduce the resistance to the lowest point under the circumstances. The union between the lugs and the fillets on the strap is so perfect that, on cutting apart these members in any 20 direction, no joint or opening of any kind can be detected, which is an obvious improvement over straps that have been "burned" to battery plates in the usual manner.

25 I do not wish to limit myself to the details of the machine described above, as it is obvious that various changes may be made therein without departing from the spirit of the invention as defined by the appended 30 claims.

What I claim as new and desire to secure by Letters Patent of the United States is:—

1. In a casting machine, in combination, means for melting lead, means for with- 35 drawing a definite portion of said lead, means for superheating said portion, means for confining said superheated molten lead against a portion of the surface of a lead member, whereby an integral lead structure 40 is formed on cooling.

2. In combination, means for melting lead, means for withdrawing a definite portion of said lead, means for superheating said portion, a mold having walls, certain 45 portions of said walls consisting of lead, means for directing said superheated lead into said mold whereby said superheated lead, in cooling, adheres to said lead walls and forms a structure integral therewith.

50 3. In combination, means for melting lead, means for ladling out a definite portion of said lead, means for superheating and cleaning said portion, a mold having wall portions of lead, and means for pouring said 55 superheated lead into said mold whereby a casting is formed integral with said lead wall portions.

4. A mold for lead comprising a wall portion having a recess therein, a movable pin 60 adapted to extend through said recess, a top portion adjustably supported in contact with said wall portion, and a bottom portion adapted to slide toward and away from said wall portion, said bottom portion hav- 65 ing a plurality of slots adapted to receive a

plurality of lead battery plates, means for advancing said bottom portion toward the remaining parts of the mold to close the same, whereby a portion of each plate projects into said mold in order that the super- 70 heated molten metal poured into said mold may partially fuse said projecting portions to form a casting integral with said plates, said casting having a hole formed by said 75 movable pin.

5. A machine for casting battery terminal straps integral with storage battery plates, comprising a suitable base, a receptacle for molten lead mounted on said base, a mold 80 and a frame for battery plates also mounted on said base, whereby storage battery plates mounted in said frame may project into said mold, means for removing a portion of said molten lead from said receptacle, means for 85 superheating said portion, and means for pouring said superheated portion into said mold.

6. A terminal strap casting machine comprising a receptacle for molten lead, a mold, means for transferring said molten lead 90 from said receptacle into said mold, and means for superheating said lead during said transfer.

7. In combination, means for melting lead, a mold, battery plates having lugs consti- 95 tuting part of said mold, means for transferring said molten lead from said receptacle to said mold, and means for superheating and cleaning said molten lead during 100 said transfer.

8. A casting machine for lead terminal straps, comprising a ladle, means for dipping said ladle into molten lead, means for lifting said ladle and holding it in elevated 105 position, means for directing a flame against the surface of the molten lead in said ladle to clean the same, and means for pouring said lead into a mold.

9. A casting machine for lead comprising a pivoted ladle, means for dipping said ladle 11 into molten lead, means for lifting said ladle, and means associated with said ladle for directing a flame against the surface of the molten lead contained therein, to clean the surface and superheat said lead, pre- 11 paratory to pouring.

10. A ladle for a lead casting machine, comprising a pivoted receptacle having holes in one of the walls, means for dipping said ladle into molten lead with said holes be- 115 neath the surface of said lead, whereby the molten lead which enters the ladle is substantially free from dross, means for elevating said ladle, and means for superheat- 120 ing and cleaning the surface of the lead in said ladle.

11. A mold for superheated lead, comprising an end portion, top portion and bot- 125 tom portion, said end portion provided with a recess, and said top and bottom portions 13

provided with slots in their meeting faces, each of said slots in one member alining with a corresponding slot in the other member, means for moving said three portions
 5 into close contact in order to close said mold, and a plurality of battery plates, each having a projecting lug adapted to fit into and completely fill a pair of said corresponding slots, whereby said lugs constitute a part of
 10 the walls of said mold.

12. A mold for superheated lead comprising an end member having parallel side walls and a vertical connecting wall joining said side walls, an upper diagonal wall
 15 joining said side walls to said vertical wall, said diagonal wall being located below the tops of said side walls, whereby a trough is formed, and an extension for said vertical wall located between said side walls, said
 20 extension being provided with a recess, and a movable pin adapted to be projected across said recess.

13. A mold for a battery terminal strap comprising top and bottom members having
 25 contacting faces, slots in each of said members arranged in alinement with those of the opposite member, whereby a battery plate terminal lug may be received between said members when in contact with each other,
 30 a part of each lug projecting into a recess in said upper member and a part projecting into a recess in said lower member, each of

said recesses having a flaring mouth facing the inner portion of the mold, whereby a fillet may be cast onto each of said lugs. 35

14. In combination, a carriage adapted to support a plurality of battery plates, means for sliding said carriage, means for casting an integral connecting strap onto said battery plates, and means for ejecting all of
 40 said plates as a unit.

15. In combination, a carriage for holding a plurality of battery plates, said carriage being provided with slots to receive said plates, a member adjacent said slots and adapted to engage the edges of said plates, and means pivoted to each end of said member for moving said member against the edges of said plates to eject them from said
 50 carriage.

16. In combination, a sliding carriage adapted to support a plurality of storage battery plates in vertical, spaced, parallel relation, a rack on said carriage, a pinion engaging said rack, a wheel for rotating said
 55 pinion to move said carriage to and fro, ejectors for said battery plates, adapted to be slipped under said plates, said wheel having a portion cut away to permit the insertion of said ejectors. 60

In witness whereof, I have hereunto subscribed my name.

FRANK ENGEL.