June 28, 1927. 1,634,152

C. L. LEE ET AL

METAL CASTING APPARATUS

Filed July 23, 1925 4 Sheets-Sheet 1

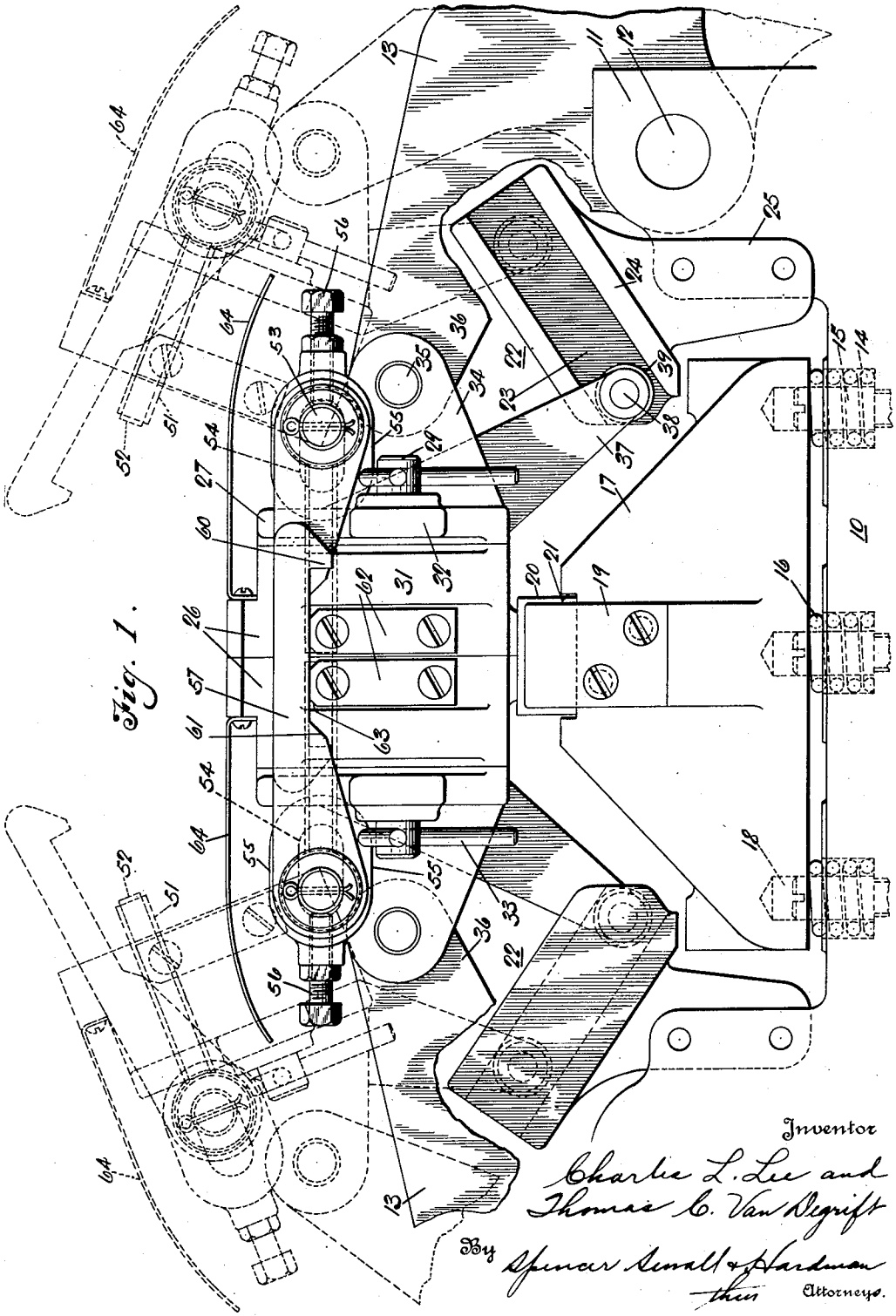


Fig. 1.

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METAL CASTING APPARATUS

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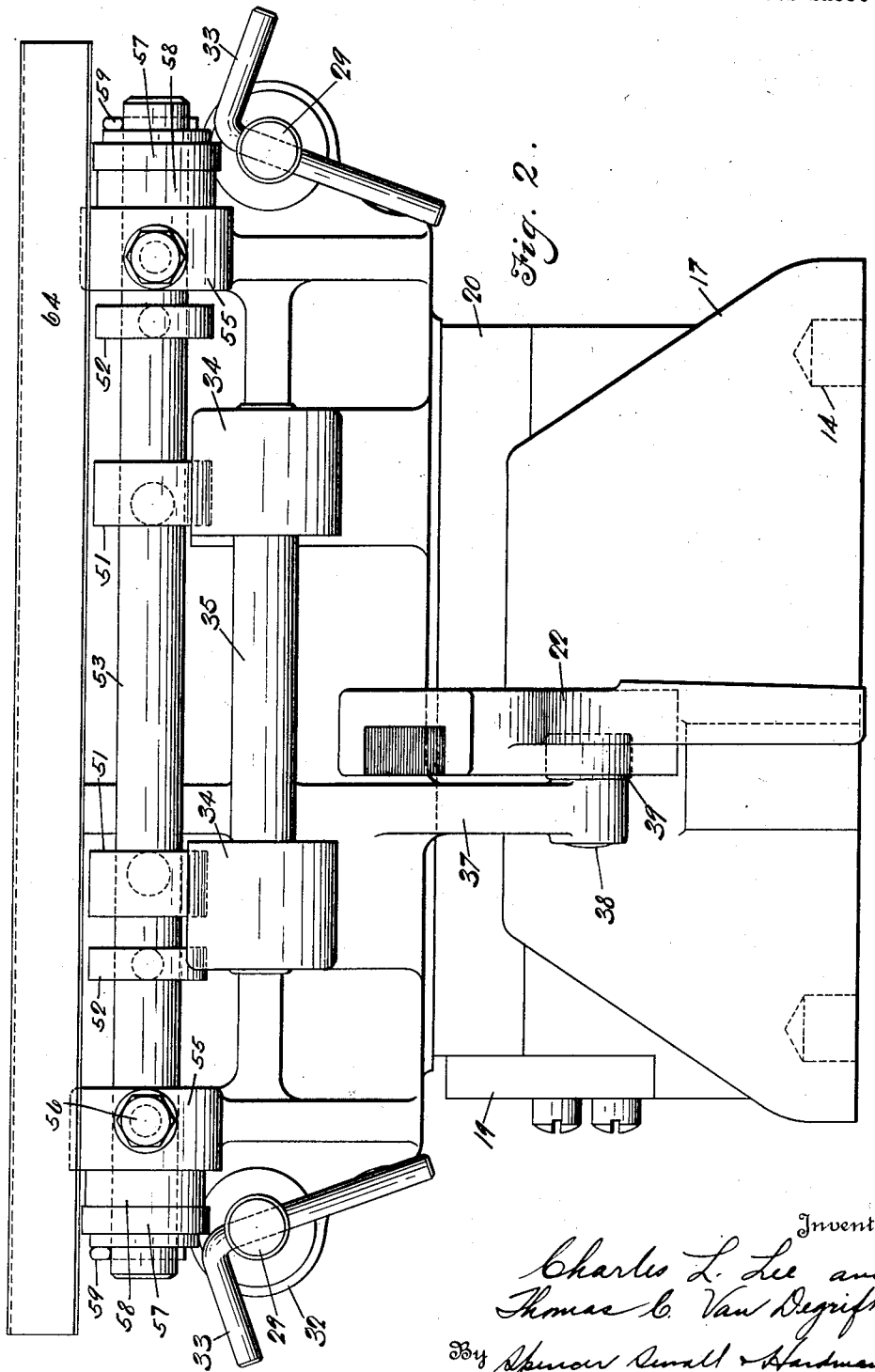


Fig. 2.

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METAL CASTING APPARATUS

Filed July 23, 1925 4 Sheets-Sheet 3

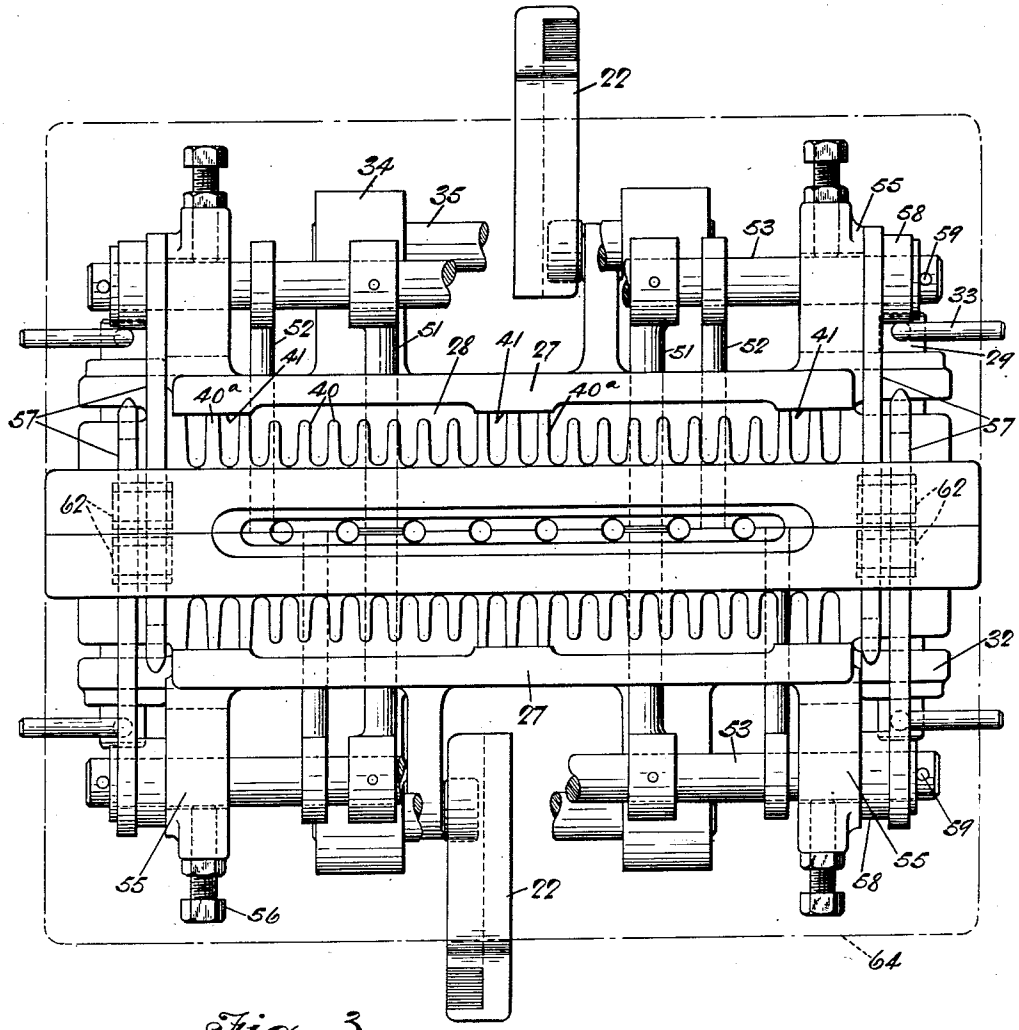


Fig. 3.

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METAL CASTING APPARATUS

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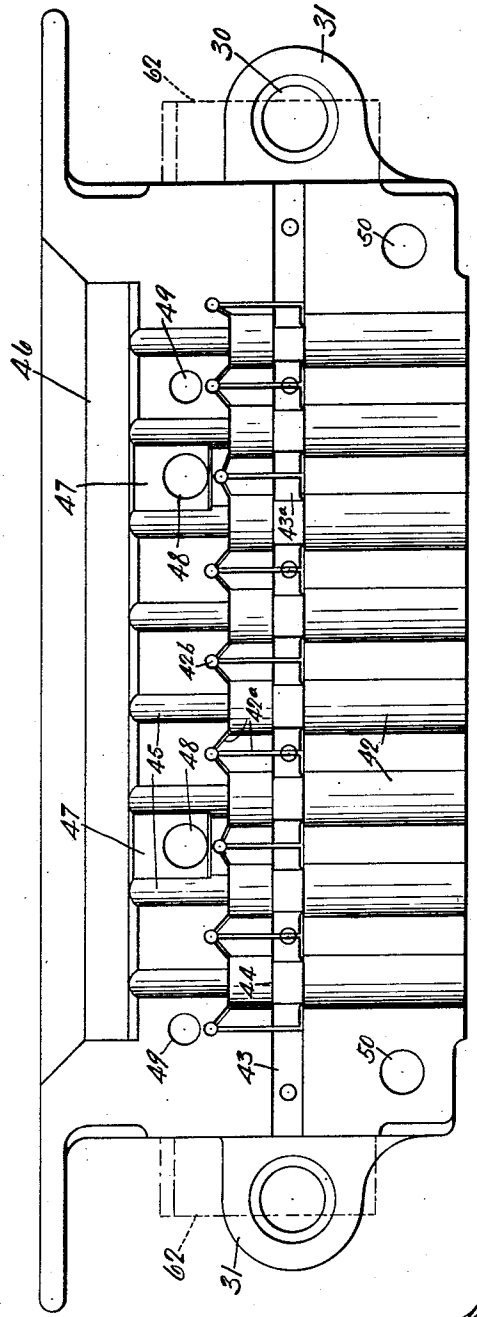


Fig. 4.

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Patented June 28, 1927. 1,634,152

UNITED STATES PATENT OFFICE.

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METAL-CASTING APPARATUS.

Application filed July 23, 1925. Serial No. 45,612.

This invention relates to casting machines and more particularly to casting machines having sectional permanent metal molds and ejecting means for removing the casting from the molds after the casting has set.

The object of the invention is to effectively release the casting in response to the separating movement of the mold sections.

The invention consists in the combination of means and detailed construction whereby the separation of one section of a mold from the other operates one or more ejectors mounted in the molds.

The specific construction of the mechanism constituting the subject of this invention is particularly described hereinafter, pointed out in the appended claims and defined in the annexed drawings in which:

Fig. 1 is a fragmentary elevation of a casting machine embodying this invention looked at along the plane of separation of the mold sections;

Fig. 2 is an elevation of a portion of the mechanism, looking toward the rear of one of the mold sections, and a carrier therefor;

Fig. 3 is a plan viewed from above of the mold carriers and mold sections when the molds are in closed position; and

Fig. 4 is an elevation of a mold section showing the mold surfaces.

Referring to Fig. 1, 10 represents a supporting frame for the casting elements, said supporting frame comprising upstanding lugs 11 (of which one is shown in Fig. 1) which are drilled to receive pintles 12 serving as fulcrums for operating levers 13 by which the mold sections are opened and closed. Levers 13 may be operated by hand or other mechanism not shown. The upper surface of the frame 10 between the lugs 11 on opposite sides of the frame is provided with a plurality of counterbored sockets 14 from which pins 15 project above the plane of the surface. In the counterbores surrounding the pins 15 are mounted relatively stiff coil springs 16, the upper ends of which stand above the plane of the upper surface of said frame. A yieldable base 17 is disposed above the upper surface of frame 10, said base being provided with sockets 18 in which the upper ends of said pin 15 are guided. The under surface of base 17 rests upon the upper ends of springs 16 and the base is thereby mounted on the frame so that it may yield as the casting expands. Base 17 has an end plate 19 bolted to one end as shown in Figs. 1 and 2, which serves as a stop to position a removable chill 20 which may be seated in a groove 21 extending transversely of the top of said yielding base 17.

Also mounted on the frame 10 are two stationary cams 22 each having an inclined cam-way 23 bounded by guide elevations 24. Said cams are secured to the base by bolts passing through depending arms 25 on said cams into an upstanding member on the frame. Cams 22 on opposite sides of the base 17 are identical in structure but are reversed so that the cam grooves 23 are disposed on opposite sides when the cams are secured in place. This is merely for convenience of manufacture, avoiding the necessity of making said cams in rights and lefts.

Two mold sections are shown designated by reference numeral 26; each mold section is secured to a mold carrier 27 which is spaced from the back of the mold as indicated at 28 so as to provide for the circulation of air between the carrier and mold in order to efficiently conduct away heat. Each mold section is secured to its respective mold carrier by two headed, smooth-shank bolts 29, the heads of which may be seated in the countersunk openings 30 formed through lateral ears 31 at the opposite ends of the section. The shanks of the bolts are adapted to traverse grooved ears 32 provided at opposite ends of the appropriate carriers 27, said ears 32 being provided with holes registering with holes in ears 31 of the mold. The ends of bolt shanks 29 are perforated transversely so as to receive slip keys 33 by which the bolts 29 may be held in place and which may be quickly removed when it is desired to replace the mold sections with others.

Projecting from the back of each mold carrier 27 are two hinge lugs 34 between which extends a pintle 35 upon which is hinged the work arm 36 of the aforesaid lever 13. Projecting downward and outward from the rear face of each mold carrier 27 is an arm 37 having on its free end a transverse pin or lug 38 which may, if desired, be surrounded by a roller 39 engaging in said cam groove 23 of cam 22. The position of each fulcrum 12, of lever 13,

pintle 35, and roller 39 with respect to the inclination and position of cam groove 23, is such that when levers 13 are operated to open the mold sections, the contiguous faces of the mold sections will remain approximately parallel during the early portion of the separating movement and thereafter will assume an inclined position as indicated in dotted lines in Fig. 1. The movement described is such that the molds pull directly away from the casting by right line movements and then open to such an angle that ready access may be had to the mold sections for cleaning and sooting.

Each mold section 26 is made, preferably, of a suitable metal such as cast iron or alloys of iron or copper. The back of each mold section is provided with a series of heat dissipating fins, ribs or corrugations which may be integral with the mold or attached thereto. The fins, ribs or corrugations extend preferably up and down as shown in Fig. 3. In the construction illustrated central and lateral fins 40^a have their ends abutting against surfaces 41 provided on the inner face of the mold carrier thereby spacing the mold section from the carrier as described.

The mold sections shown are provided with mold cavities 42 adapted to form valve push-rod tappets. The tappet made in these molds has a groove around it and this groove is formed in the mold by means of an insert 43 having transverse grooves 44. The use of the insert 43 is merely for purposes of convenience to overcome certain difficulties in machining the mold. Each mold cavity 42 is provided with a gate 45 each of which communicates with a run 46 for receiving the molten metal. In the mold shown in Fig. 4, two of the gates 45 are connected by a space 47 so that when the metal has been poured a web of metal will extend between said two gates, this web of metal being engaged by the end of an ejector pin 51 when the mold is opened, as will be presently explained. The mold cavities may be vented through passages formed by chamfered edges 43^a on the insert 43, small grooves 42^a in the mating faces of the sections and transverse vent holes 42^b in the mold sections. The mold section illustrated is provided with four holes of which two, designated by 48, are formed in the molds so that their axes intersect the spaces 47. Two other holes 49 intersect the mold section at points where the surfaces join when the molds are closed. At the opposite lower corners of the mold section shown are two holes 50 for the reception of two justifying pins (not shown) disposed in corresponding positions in the mating mold. The lower ends of mold cavities 42 are open, thus permitting the metal when poured into the molds to come into contact with the chill 20 and thereby chill the end of the tappet for a considerable distance in order to provide a hard wearing surface for the end of the tappet which comes in contact with the cam when it is in use.

Slidably mounted in the holes 48 and 49, respectively, are ejector pins 51 and ejector resetting pins 52, pins 51 sliding in holes 48 and resetting pins 52 sliding in holes 49. Holes are formed also in each carrier 27 to register with the holes 48 and 49 in each mold section in order to accommodate passage of said ejector pins 51 and resetting pins 52. The ejectors 51 and resetting pins 52 are secured to a bar 53, the opposite ends of which pass through slots 54 formed in lugs 55 that project rearward from each mold carrier 27. Threaded in the outer end of each lug 55 is a set screw 56, the end of which enters slot 54 and which may be adjusted to vary the distance between the end of the set screw and the inner end of the slot, thus adjustably limiting the extent of movement of ejector bar 53 and correctly positioning the bar when the molds are closed. The set screws can be adjusted so that the inner ends of the ejectors will terminate flush with the inner surfaces of the mold sections. As the inner ends of ejector pins 51 intersect a mold cavity, the act of closing the mold would not fully reset them. Ejector resetting pins 52 are so disposed that their inner ends lie in the plane of the mating faces of the sections where there is no mold cavity when the mold is closed. They therefore insure correct resetting of the ejectors.

Pivoted on the end of each bar 53 are ejector operating devices 57. The ejector operating devices which are attached to one bar 53 are so positioned thereon as to overlap the corresponding ejector operating devices on the opposite bar 53. Said ejector operating devices are spaced in appropriate position by means of collars 58 placed on one bar 53 between the ejector operating device and the pin 59 on the bar, whereas on the opposite bar 53 the ejector operating device is spaced from the lug 55 by said collar 58 and is pivoted on the bar between the collar 58 and said pin 59. The end of each ejector operating member 57 has a detent 60 which, in the form shown, is a hook-like formation. Also, on each operating member 57, spaced from detent 60, is a cam surface 61. Secured to or formed on each end of each mold section is a combined catch and cam operating device 62. Each of said devices has an upper end which may be chamfered at opposite sides as at 63, the chamfer extending a lesser distance below the top of the catch than the detent 60 extends below the lower surface of said ejector operating device 57. Each ejector operating device, when the molds are closed, rests on top of

two catches 62, the surface of said device between the detent 60 and the cam 61 being in substantial contact with said top.

Members 64 shown in Figs. 1 and 2, are splash plates to prevent hot metal, which may overflow or spatter during a casting operation, from reaching the joints of the machine.

In operation the molten metal will be poured into the mold sections when closed, as indicated in Figs. 1 and 3. Levers 13 may then be operated to separate the mold sections. The mold sections will separate by substantially parallel movement, keeping their adjacent surfaces approximately parallel, until each catch element 62 contacts with a detent 60 on the respective ejector operating members 57. Continued opening movement of the molds then causes the catch on each mold section to pull the ejector operating members 57 so that each ejector bar, to which the ejector and ejector resetting pins are connected, slides in the slots 54 on the opposite mold carrier, thus advancing the ejector and resetting pins through the mold section on that carrier. After the casting has been ejected, and the mold sections and carriers approach the opening limit of movement, cam surfaces 61 on ejector operators 57 engage with the catches 62 mounted on that mold section which is attached to the same carrier as the ejector operator, thus lifting it so that the detent 60 is released from engagement with the catch 62 on the opposite mold section. The ejector operators 57 assume now the positions shown in dotted lines in Fig. 1 with the ejectors and resetting pins protruding beyond the mold surfaces as shown. The molds may then be cleaned or sooted as desired. When the molds are closed, the ends of the ejector resetting pins 52 protruding through one mold section come in contact with a plane surface on the opposed mold section and thus restore the ejectors and ejecting mechanism to the position shown in full lines in Fig. 1, the pins 51 being pushed back flush with the casting cavity surface which it intersects.

While the form of embodiment of the present invention as herein disclosed, constitutes a preferred form, it is to be understood that other forms might be adopted, all coming within the scope of the claims which follow.

What is claimed is as follows:

1. In a casting machine comprising mold sections movable toward and from each other; an ejector movably mounted on each of said mold sections, and means for temporarily connecting the ejector mounted on one section to the other section whereby the ejectors will operate to eject the casting when the mold sections are separated.

2. In a casting machine comprising mold sections movable toward and from each other; an ejector movably mounted on each of said mold sections; ejector operators connected respectively with said ejectors; and devices movable respectively with said sections for temporarily engaging the ejector operator of the other section and operating the ejector when the molds are separated.

3. In a casting machine comprising mold sections movable toward and from each other; an ejector movably mounted in one of said sections; an ejector operator connected with the ejector, said ejector operator having a detent; and a device connected with the other mold section for engaging the detent and thereby operating the ejector when the mold sections are separated.

4. In a casting machine comprising mold sections movable toward and from each other; an ejector movably mounted in one of said sections; an ejector operator connected with the ejector, said ejector operator having a detent; a catch connected with the other mold section for engaging the detent and thereby operating the ejector during the separation of the mold sections, and means, connected with the section to which the ejector operator is connected, adapted to disengage said detent from said catch after the casting has been ejected.

5. In a casting machine comprising mold sections movable toward and from each other; an ejector movably mounted in one of said sections; an ejector operator pivotally connected with the ejector, said ejector operator having a detent and a cam surface; a catch, connected with the other mold section, for engaging the detent and thereby operating the ejector during the separation of the mold sections; and a cam element, connected with the section to which the ejector operator is connected, adapted to move the ejector operator and thereby disengage said detent from said catch after the casting has been ejected.

6. In a casting machine comprising mold sections movable toward and from each other; an ejector movably mounted in each section; an ejector operator connected with each ejector, said ejector operators having each a detent; a catch connected with each mold section and engaging the detent of the ejector operator on the other section, and thereby operating the ejectors during the separating of the mold sections, and means, connected with each section, adapted to disengage the detents from said catches after the casting has been ejected.

7. In a casting machine comprising mold sections movable toward and from each other, an ejector movably mounted on each section; a pivoted ejector operator connected with each ejector, said ejectors having each a detent and a cam surface; a combined catch and camming element connected with each ejector so constructed and arranged

that each ejector will be moved to eject the casting during the separation of the sections and thereafter moved, thereby releasing the detents from the catches after the casting has been ejected.

8. In a casting apparatus comprising mold sections movable toward and from each other; carriers for said mold sections; ejectors movably mounted in at least one carrier section; an ejector bar mounted in the carrier in which said ejectors are mounted, said bar being capable of sliding toward and from the casting surface of the mold section; an ejector operator connected to each end of said bar; a detent on each ejector operator, a catch connected to each end of the opposite mold section for engaging said detents and operating the ejector bar when the mold sections are separated.

9. In a casting apparatus comprising mold sections movable toward and from each other; a carrier for each mold section; ejectors movably mounted in at least one carrier and section; an ejector bar slidably mounted in the carrier in which said ejectors are mounted; an ejector operator connected to each end of said bar; a detent and a cam surface on each ejector operator; catches connected with the other section, and camming devices on the section to which the ejector bar and operators are connected for first engaging the detents on the ejector operators when the mold sections are separated and thereafter moving the ejector operators to release the detents.

10. In a casting apparatus comprising mold sections movable toward and from each other; carriers for said mold sections; ejectors movably mounted in each section; an ejector bar slidably mounted in each carrier; an ejector operator connected to each end of each bar; a detent and a cam surface on each ejector operator; catches and camming devices connected with each end of each section for engaging said detents and operating ejector bar when the mold sections are separated, and thereafter moving said ejector operators so as to release the detents.

11. In a casting apparatus comprising mold sections movable toward and from each other, at least one of said mold sections having a hole intersecting a mold cavity and a hole intersecting a surface that contacts with a corresponding surface on the other mold section; an ejector movable in the first named hole; an ejector resetting device movable in said second named hole; means connecting said ejector and said ejector resetting device so that they retreat together, the ends of said ejector and said ejector resetting device, when the molds are closed, lying, respectively, flush with the surface of said mold cavity and said mold contacting surface.

12. In a casting apparatus comprising mold sections movable relatively toward and from each other, an ejector movable on one section in such a manner as to engage a casting therein, an ejector operating device, a resetting device connected to said ejector so disposed as to engage a surface on the other mold section and reset the ejector when the mold sections are closed.

In testimony whereof we hereto affix our signatures.

CHARLES L. LEE.
THOMAS C. VAN DEGRIFT.