T. B. STEPHENSON.

BULLET CASTING MACHINE.

APPLICATION FILED MAY 10, 1918.

1,319,673.

Patented Oct. 21, 1919.

4 SHEETS—SHEET 1.

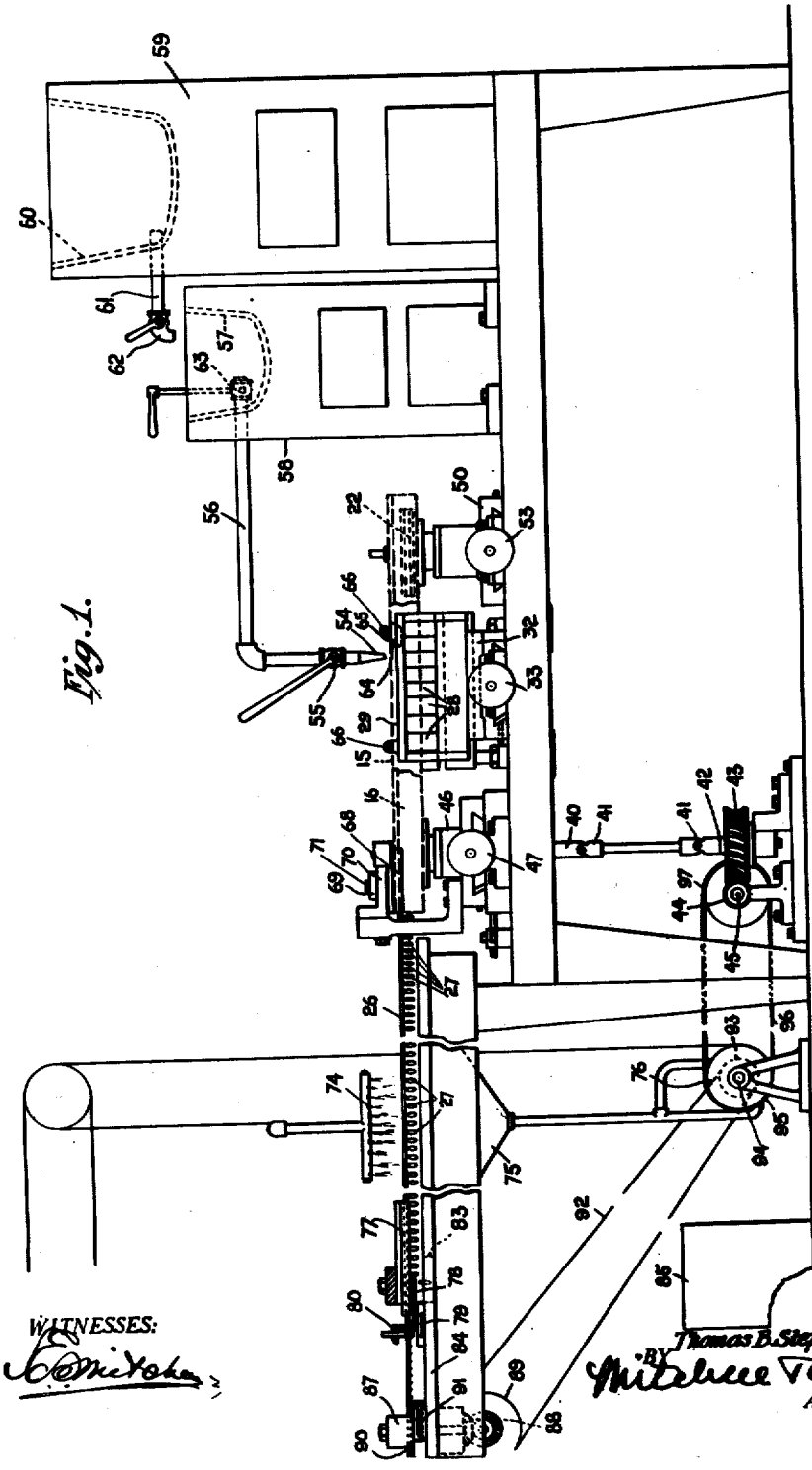


Fig. 1.

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4 SHEETS—SHEET 2.

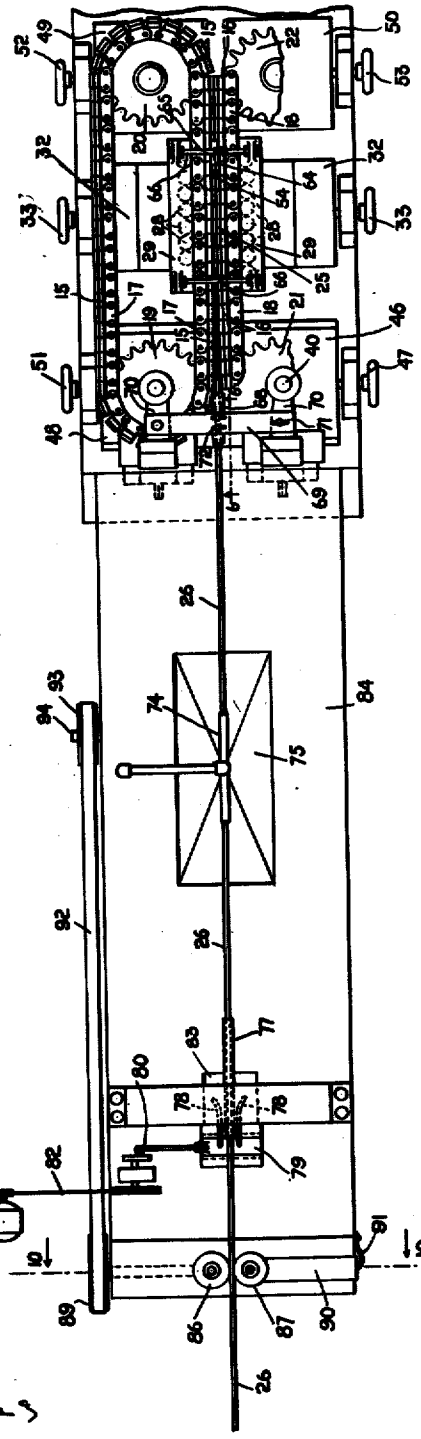


Fig. 2.

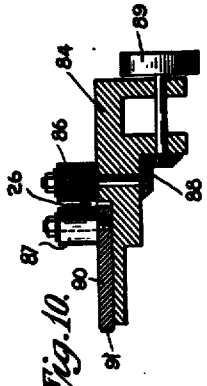


Fig. 10.

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4 SHEETS—SHEET 3.

Fig. 3.

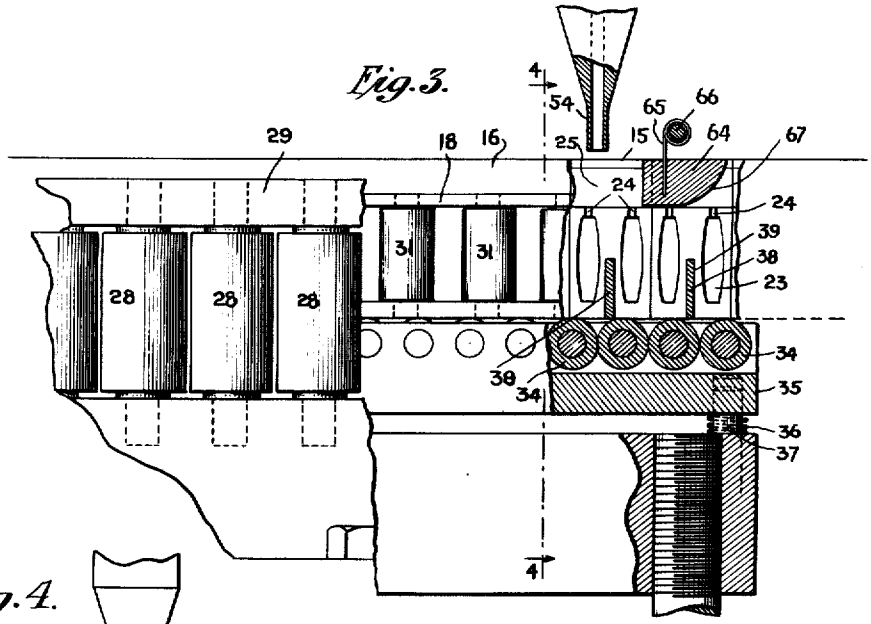


Fig. 4.

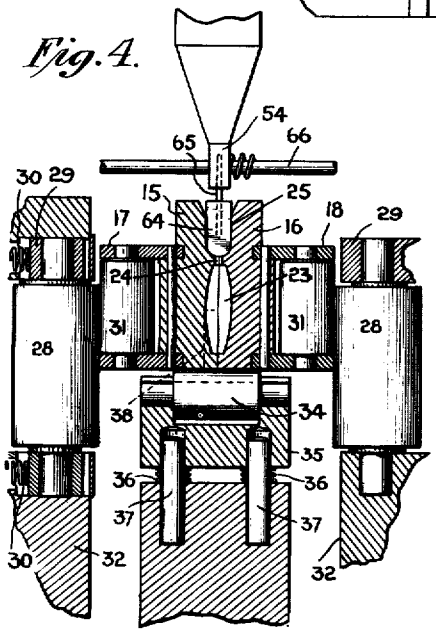
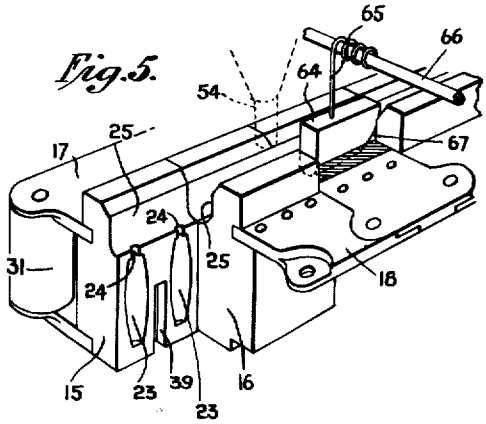


Fig. 5.



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4 SHEETS—SHEET 4.

Fig. 6.

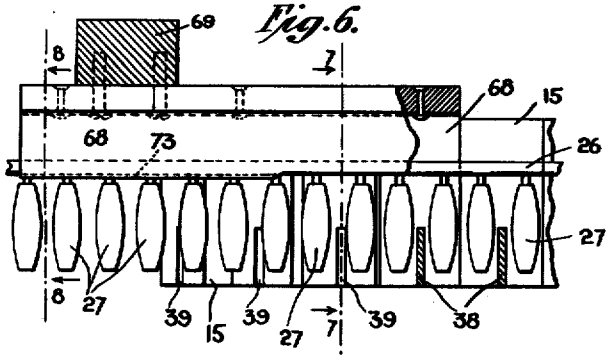


Fig. 7.

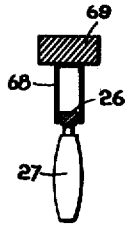


Fig. 8.

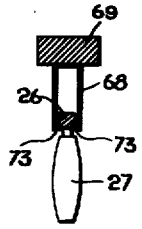


Fig. 9.

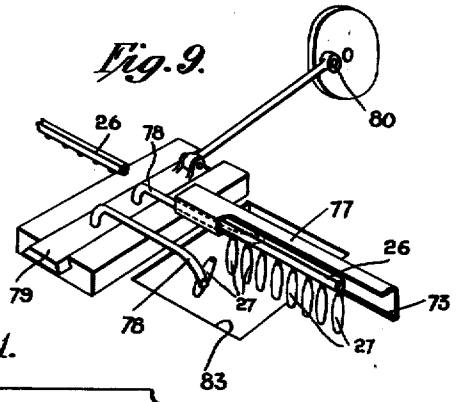


Fig. 11.

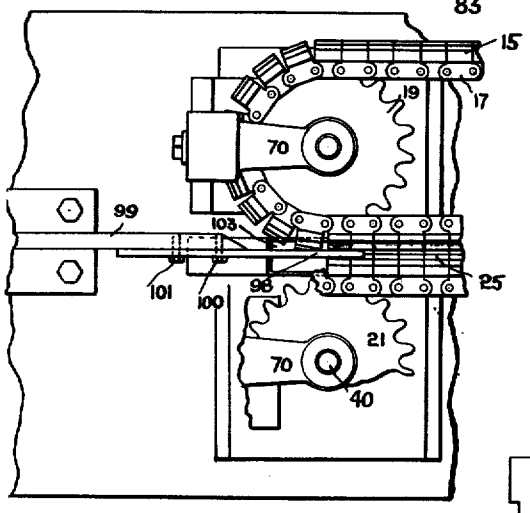


Fig. 12.

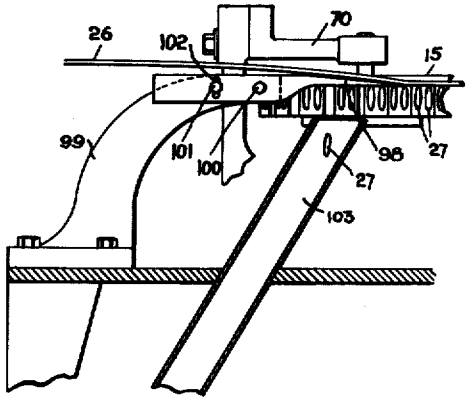
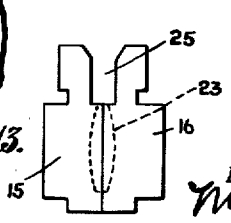


Fig. 13.



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UNITED STATES PATENT OFFICE.

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BULLET-CASTING MACHINE.

1,319,673. Specification of Letters Patent. Patented Oct. 21, 1919.

Application filed May 10, 1918. Serial No. 233,693.

To all whom it may concern:

Be it known that I, THOMAS B. STEPHENSON, a citizen of the United States of America, residing at Forestville, Conn., have invented a new and useful Bullet-Casting Machine, of which the following is a specification.

This invention relates particularly to machines for casting bullets and is in the nature of an improvement on the machine disclosed in my co-pending application #114,320.

The general objects of the present invention are to provide a machine of simplified and improved construction and which will be automatic in its operation so as to require practically no attention.

In addition to the foregoing it is one of the purposes of my invention to provide a machine which while simple, will be of relatively great capacity and will in addition be readily adjustable to meet various requirements.

Briefly the invention comprises a sectional mold made up of coöperating traveling mold sections formed with an open casting channel in the top thereof and casting chambers in communication with said open channel, the molten metal being delivered into this open channel and flowing into said chambers to produce a rod with the bullets or other articles dependent therefrom. This rod is preferably guided at the point of separation of the mold sections and means are preferably provided for feeding out the same and for separating the cast portions dependent therefrom.

Other features and details of construction will appear as the specification proceeds.

In the accompanying drawings I have illustrated the invention embodied in a practical commercial form but with the understanding that various changes and modifications may be made without departure from the true spirit and scope of the invention.

In said drawings:—

Figure 1, is a broken side view of the complete machine.

Fig. 2, is a top plan view of the same.

Fig. 3, is an enlarged broken sectional view of the mold substantially at the casting point.

Fig. 4, is a cross sectional view of the same taken substantially on the plane of the line 4—4 of Fig. 3.

Fig. 5, is a perspective view looking downward on the mold sections substantially at the casting point.

Fig. 6, is a broken partly sectional view taken substantially on the plane of the line 6—6 of Fig. 2.

Figs. 7 and 8 are detail sectional views taken substantially on the planes of the lines 7—7 and 8—8 of Fig. 6.

Fig. 9, is a broken perspective view of the breaker mechanism for separating the bullets from the continuous rod.

Fig. 10 is a detail sectional view of the drawing-out rolls taken substantially on the plane of the line 10—10 of Fig. 2.

Figs. 11 and 12 are broken plan and side views respectively of a slightly modified form of the invention.

Fig. 13 is an end view of a pair of the mold sections in this modified form.

Referring first particularly to Figs. 1 and 2, the sectional mold is made up of coöperating mold sections 15 and 16 carried by the links of two opposed endless chains 17 and 18, said chains being supported at opposite ends on sprockets 19—20 and 21—22.

The mold sections are of special construction in that they are formed on their meeting or matching faces with recesses 23 in communication by passages 24 with continuous longitudinally extending recesses 25, the recesses 23 in the faces of the cooperating mold sections forming the casting chambers and the coöperating opposed longitudinally extending recesses forming a continuous open casting channel in communication with the casting chambers through the passages 24. As a result of this construction a casting is produced consisting of a continuous rod 26 with the bullets or other articles 27 dependent therefrom.

At the casting point the coöperating mold sections are held closely engaged by guides consisting in the present disclosure of rolls 28 journaled in bearings 29 and yieldingly forced toward the mold chains by springs 30. To minimize friction, the chains may be provided with bearing rollers 31 for engagement with said spring-pressed guide

rolls. To take up for wear and to enable the substitution of mold chains of different sizes, the guide rollers may be mounted in adjustable carriages 32 which may be shifted by means of adjusting screws 33.

The coöperating mold sections may be supported at the casting point by supporting rollers 34 journaled in a support 35 yieldingly mounted on springs 36 and guided vertically on the guide pins 37.

The coöperating mold sections are maintained in proper registry by means of intermeshing teeth on the opposed sets of mold sections, said teeth consisting in the present disclosure of projections 38 on the mold sections 16 meshing with the slots or recesses 39 in the mold sections 15. As shown in Fig. 5, each mold section is formed with two mold cavities and the intermeshing teeth are provided in the faces of the mold sections between each two mold cavities.

The intermeshing teeth on the two mold chains serve an additional purpose in the embodiment disclosed—acting to form a driving connection from one mold chain to the other. Thus in the illustration, the mold chain 18 only is power driven and serves, through the intermeshing connections described, to impart the necessary movement of the other mold chain. The driving of the first mold chain is effected by extending the shaft 40 of the sprocket 21 downward and coupling it by universal joints 41 with an up-right shaft 42 carrying a worm gear 43 in engagement with a worm 44 on the power shaft 45. The purpose of the universal joints 41 in these driving connections is to allow for lateral adjustment of the sprocket 21 for different sized mold chains and for wear, etc., said sprocket being shown as mounted on a transversely movable carriage 46 shiftable by an adjusting screw 47.

From the construction disclosed it will be apparent that the power operated sprocket 21 will serve to draw the mold chain 18, and through the intermeshing connections, cooperating mold chain 17, through the confining guides described, this construction also serving to maintain the coöperating mold sections meshed in proper register at all times.

The other chain supporting sprockets 19—20 and 22 are also shown mounted on laterally adjustable carriages 48—49 and 50 which can be shifted by adjusting screws 51, 52 and 53. The adjusting screws 52 and 53 are preferably adjusted to bring the opposed reaches of the two chains into substantial parallelism at this entrance end of the sectional mold so that said chains will pass easily in between the confining guides and the screws 47 and 51 may be adjusted to spread the chains somewhat after they leave the confining guides.

The molten metal is delivered into the open casting channel by a nozzle 54 which may be approached relatively close to said channel and may be provided with a cut off and graduating valve 55. This nozzle or spout is shown connected by a suitable conduit 56 with a kettle 57 in the melting furnace 58.

In order that the machine may be kept supplied continuously with molten metal there may be provided an additional melting furnace 59 having a melting pot 60 in communication by way of conduit 61 and valve 62 with the supply pot 57. With this construction the "pig" lead or other material is put in the pot 60 to be melted and the molten metal is drawn off from this melting pot into the supply pot 57 as needed. This enables the molten metal in the supply pot being kept at a substantially constant temperature. The supply pot 57 is shown provided with a main cut off valve 63.

At a point in rear of the delivery nozzle a dam element 64 shaped substantially to fit the open casting channel is supported so as to prevent the metal running backward. This dam has an easy sliding fit in the casting channel and in order that it may, in a sense, "float" in said channel, it is shown supported by means of a spring 65 coiled about one of the transverse stay rods 66 which connects the two mold closing guides. Also the rear end face of the dam is shown as beveled or inclined, at 67, so that said dam may adjust itself and ride over any scraps of metal, or the like, which may remain on the mold sections.

Artificial cooling means may be employed if desired to accelerate the congealing and cooling of the molten fluid and usually the metal is cooled to a sufficient extent for the commencement of the mold opening operation as soon as the mold chains leave the confining guides. Thus, as shown in Fig. 2, the separation of the sprockets 19 and 21 at the delivery end may be such as to cause the mold chains to commence to separate as soon as they leave the confining guides.

Separation of the cast product from the mold cavities is facilitated and insured by means of a tubular guide 68 supported substantially mid-way between the sprockets 19 and 21 and arranged to receive the cast rod, "centralizing" it and separating it from both mold chains. This tubular guide is shown supported on a cross bar 69 connecting sprocket supporting brackets 70, suitable adjustable connections being provided as indicated at 71 and 72 to allow for the transverse adjustment of the sprockets. This guide is shown as entered into the casting channel and entirely open at the bottom at its forward end, as indicated in Fig. 7 and as having inturned supporting flanges 73 for the balance of its length. This construction

enables the rod to pass easily into the forward end of the guide and the inturned flanges provide ledges engaging beneath the rod to support and guide the cast product.

As the rod with the bullets dependent therefrom passes onward and out through the guide, the casting may be further cooled as by means of a shower, such as indicated at 74. The water from this shower may be collected in a pan 75 and used over and over again through the employment of a pump 76 and suitable connections.

After being sufficiently cooled the continuous casting is shown as passing on into another open tubular guide 77 similar to the one previously described and having inturned flanges for supporting the rod portion of the casting.

While thus supported in this guide, the bullets or dependent objects may be separated or stripped from the rod by suitable means such as the yoke shaped element illustrated and consisting of the forked arms 78 mounted on the transverse slide 79 which is vibrated back and forth by an operating crank 80, the latter being driven for instance, by a suitable motor 81 and connections 82.

This stripper or breaker may be timed to break off one or more of the bullets in the stroke in one direction and to break off a corresponding number of bullets in the successive stroke in the opposite direction. The bullets as they are broken off may be permitted to fall through an opening 83 in the top of the table or support 84 into a suitable collection receptacle 85.

The continuous rod after the bullets are separated therefrom, may be drawn out of the machine as by means of the feeding-out rollers 86 and 87, the first of those being shown as a toothed or corrugated roller driven by suitable gearing connections 88 from pulley 89 and the second being shown as mounted on the transversely movable slide 90 pressed yieldingly toward the driven roller by a spring 91. The effect of this is that the rod is yieldingly gripped between the two rollers and fed out of the machine as fast as the casting operation proceeds.

Suitable driving connections for the various portions of the machine may be provided. The pulley 89 of the drawing-out rollers, for instance, is shown driven by a belt 92 from pulley 93 on a driving shaft 94 which also carries a pulley 95 connected by a belt 96 with pulley 97 on the worm shaft 45.

The operation of the machine is continuous and economical and need not, it will be seen, be interrupted for charging or any other cause. Also the machine may be operated at a high rate of speed, giving the machine a great out-put. It will be apparent furthermore that the machine may be readily adapted and adjusted to molds for different sizes and kinds of objects.

An important advantage of the invention is that the bullets are produced by a continuous operation and without any intermediate steps, the molten metal flowing into the mold and forming the bullets dependent from a continuous rod or "runner" which carries the bullets along with it clear of the mold to a point where the bullets are automatically separated from said rod and are collected in a suitable receptacle. Thus the separation of the bullets is in effect, simply a part of the casting process and not a separate step. The mold construction, it will be seen, is of particular value where it is desired to cast a continuous rod with a series of objects dependent therefrom and it will be apparent that if desired, such mold can be used for other purposes than the casting of bullets.

In working with soft metals, such as pure lead, I have found it desirable to separate the "gate" or rod from the bullets while the bullets are still held in the mold. For this purpose I employ a knife such as indicated at 98 in Figs. 11 and 12 supported on a bracket 99 and having a sharpened cutting edge projecting into the mold channel at a point preferably slightly in advance of the centers of the chain supporting sprockets. This knife thus shears the rod from the bullets while said bullets are still held in the mold chambers. The point of this knife, it will be observed, fits closely to the bottom of the mold channel although preferably it just clears the bottom of said channel so that there will be no wear on the mold sections and so that the knife will not be dulled by engagement with said mold sections. For this particular construction the mold channel may be formed with a flat bottom and the knife with a finely tapered angular cutting edge.

The knife it will be seen furthermore serves as a guide for the rod or gate, said rod driving up over the top of the knife and being suitably disposed of, as by being wound up on a reel—this being possible where the metal is a soft lead or the like.

In order that the knife may be adjusted to properly fit the mold channel, I have shown it pivotally mounted on a supporting bolt 100 and as being held in its adjusted relation by a securing bolt 101 passed through the slot 102 in said knife into the supporting bracket.

The severed or separated bullets may be guided to the receiving receptacle as by means of a chute 103 disposed with its receiving end beneath the mold chains at the point of separation of the same.

I claim:—

1. In a casting machine, a separable mold

comprising coöperating mold sections having registering recesses in the meeting faces thereof and channel portions in communication with the recesses and forming when the mold sections are engaged a channel in one side of the mold in communication with the mold recesses, means for delivering molten material into said channel, means for advancing coöperating mold sections past said delivering means and a guide for the cast product entered into the casting channel described.

2. A combination like that set forth in claim 1, wherein the mold sections are separated at a definite point in their advancement and wherein the guide for the cast product is entered into the casting channel substantially at said point of separation of the coöperating mold sections.

3. A combination like that set forth in claim 1, wherein the guide which is entered into the casting channel is provided with shoulders engaging beneath the continuous portion of the casting formed in said channel.

4. In a casting machine, a separable mold comprising coöperating mold sections having registering recesses in the meeting faces thereof and channel portions in communication with the recesses and forming when the mold sections are engaged a channel in one side of the mold in communication with the mold recesses, means for delivering molten material into said channel, means for advancing coöperating mold sections past said delivering means and an open-ended tubular guide in line with the casting channel having spaced inturned flanges in the bottom thereof to engage beneath the continuous portions of the casting formed in said channel.

5. In a casting machine, coöperating mold sections formed with a continuous casting channel, means for delivering molten material into said channel, means for advancing the coöperating mold sections past said delivery means and a dam yieldingly supported in said casting channel and provided with an inclined under surface in rear thereof to enable the same to ride over fragments or particles that may remain in the casting channel.

6. In a casting machine, coöperating mold sections formed with a continuous casting channel, means for delivering molten material into said channel, means for advancing the coöperating mold sections past said delivery means, a dam fitting in the casting channel in rear of the point of delivery and means for yieldingly supporting said dam in said position.

7. In a casting machine, coöperating mold sections formed with a continuous casting channel, means for delivering molten material into said channel, means for advancing the coöperating mold sections past said delivery means, guides for maintaining the coöperating mold sections closely engaged at the point of delivery, a stay rod connecting said guides and a dam fitting in the casting channel and suspended from said stay rod.

8. A combination like that set forth in claim 7, wherein the supporting means for the dam consists of a spring element coiled about the stay rod.

9. In a device of the character set forth, means for casting a rod with a plurality of objects dependent therefrom, means for advancing the cast rod and means having a movement substantially transversely of the plane of the dependent objects for separating said objects from the rod.

10. A combination like that set forth in claim 9, wherein said separating means consists of a striker member vibrating transversely in the plane of the dependent objects.

11. A combination like that set forth in claim 10, wherein said striker is forked to receive the dependent objects.

12. A combination like that set forth in claim 10, wherein said striker is carried by a reciprocating slide.

13. In a combination like that of claim 9, means for guiding and supporting the cast rod against transverse movement while the separating means is operating on the dependent objects.

14. In a casting machine, a separable mold comprising, coöperating mold sections having registering recesses in the top thereof forming a casting channel, means for longitudinally advancing the mold sections and for separating said mold sections at a definite point in their advancement and a guide for the cast product disposed substantially centrally between the mold sections at the point of separation thereof, whereby to strip the cast product from both sets of mold sections.

15. A combination like that set forth in claim 14, wherein the mold sections are separable to an adjustable extent and wherein the centralizing guide is adjustable to suit the adjustment of the mold sections.

16. In a casting machine, coöperating mold sections recessed to form an open casting channel in the top thereof and communicating casting chambers below said channel, means for longitudinally advancing and separating the mold sections, an open end tubular guide disposed in line with the casting channel to receive the rod cast therein, said guide having opposed inwardly extending flanges to support said rod and separated from each other to provide a throat for the objects cast in the casting chambers and dependent from the rod.

17. A combination like that set forth in

claim 16, wherein the supporting flanges terminate short of the front or receiving end of the guide.

18. In a casting machine, coöperating mold sections having complemental recesses for forming a continuous rod with objects dependent therefrom, means for advancing and for separating the mold sections to advance the cast rod free of the mold sections, means for guiding the rod freed from the mold sections and an abutment adjacent said rod guiding means for engagement by the objects dependent from the guide rod for separating said objects therefrom.

19. In a casting machine, coöperating mold sections for forming a cast rod with articles dependent therefrom, means for advancing and separating the mold sections and drawing-out rollers engaging and frictionally gripping the cast rod for feeding the same from the separated mold sections.

20. A combination like that set forth in claim 19, wherein the feeding rollers are yieldingly engaged with the rod and one of said rollers is power driven and roughened to more firmly grip the rod.

21. In a casting machine, coöperating mold chains, supporting sprockets therefor, means for adjusting one of said sprockets relative to one of the other sprockets and a power driven shaft for operating said adjustable sprocket provided with universal joints therein for permitting said adjustment.

22. In a casting machine, mold chains and coöperating engaging mold sections carried thereby provided with complemental recesses for forming a continuous rod with articles dependent therefrom, means for advancing and separating the mold chains, a guide for engaging the cast product as it emerges from the mold sections, means for separating the dependent objects from the cast rod, and drawing-out rollers for drawing out the rod from which the dependent articles have been stripped.

23. In a casting machine, coöperating mold sections having a continuous casting channel and mold chambers communicating therewith and a knife having its cutting edge entered in said casting channel to separate the material in said channel from the material in the mold chambers.

24. A combination like that set forth in claim 23, wherein the knife and mold sections are relatively adjustable for the purpose of setting the knife and casting channel in proper relation.

25. A combination like that set forth in claim 23, wherein the knife is relatively adjustable to fit the casting channel.

26. In a casting machine, coöperating mold sections having a continuous casting channel and mold chambers communicating therewith, means for advancing and for separating the mold sections at a predetermined point in their travel and a cutter entered in said casting channel at a position in advance of the point of separation of the mold sections.

27. In a casting machine, coöperating mold sections having a continuous casting channel and mold chambers in communication therewith and a guide having a sharpened cutting edge entered in said casting channel.

28. In a casting machine, coöperating mold sections having a continuous casting channel and mold chambers in communication therewith, means for advancing the coöperating mold sections and for separating the same at a given point in their travel and means entered in said mold channel at a point in advance of the point of separation of the coöperating sections for separating the material in the casting channel from the material in the mold chambers.

29. In a casting machine, coöperating mold sections provided with mold chambers, means for advancing and for separating the coöperating mold sections and a guide chute adjacent the point of separation of the coöperating sections for receiving the articles from the casting chambers.

30. In a casting machine, a separable mold comprising coöperating mold sections having registering recesses in the meeting faces thereof and channel portions in communication with the recesses and forming when the mold sections are engaged a channel in one side of the mold in communication with the mold recesses, means for delivering molten material into said channel, means for advancing coöperating mold sections past said delivering means and an open-ended substantially tubular guide in line with the casting channel and arranged to receive the cast product issuing from the mold sections.

THOMAS B. STEPHENSON.