

J. BURKHARDT.
CASTING MACHINE.

APPLICATION FILED JAN. 31, 1912.

Patented Aug. 25, 1914.

6 SHEETS—SHEET 1.

1,108,694.

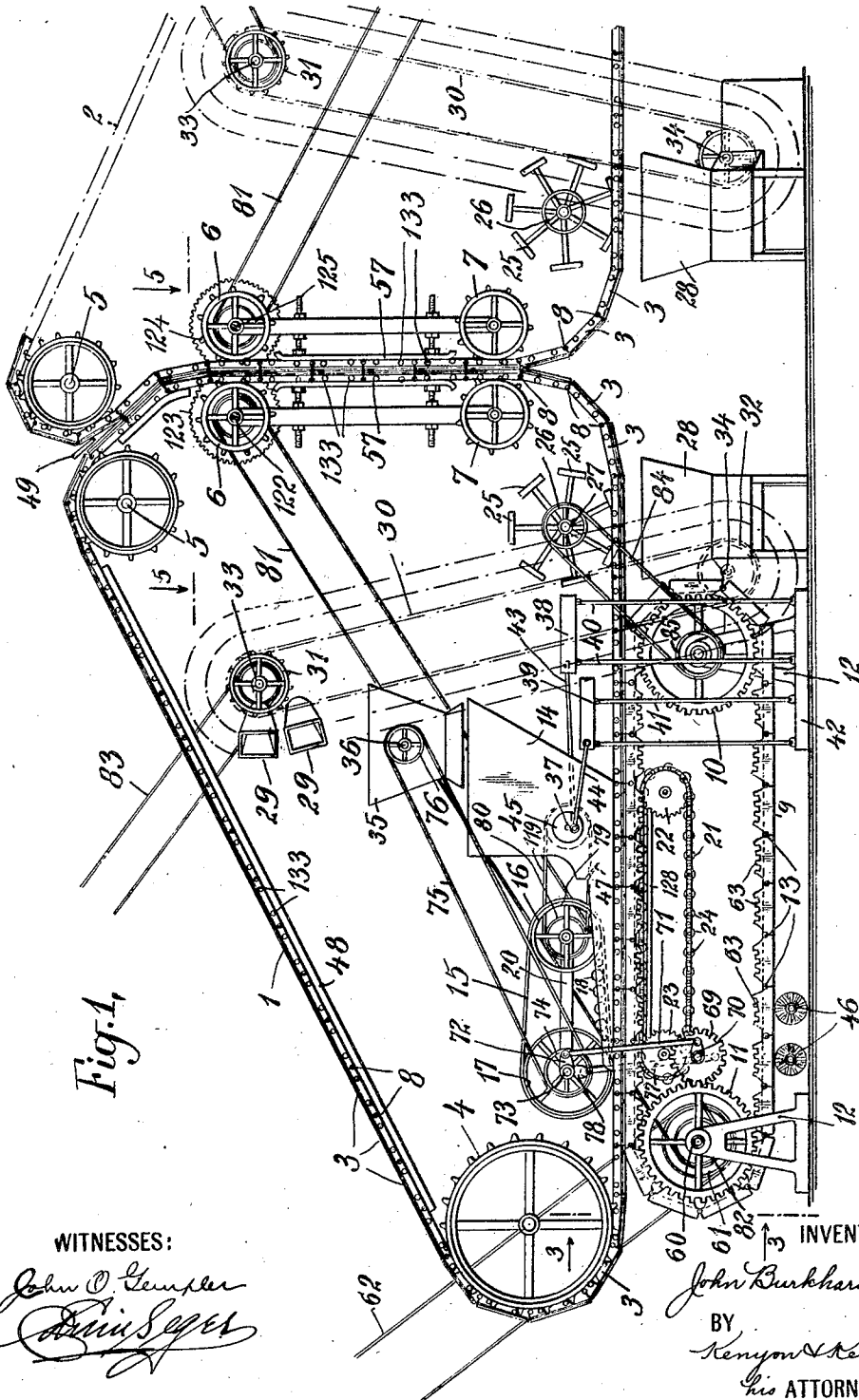


Fig. 1.

WITNESSES:

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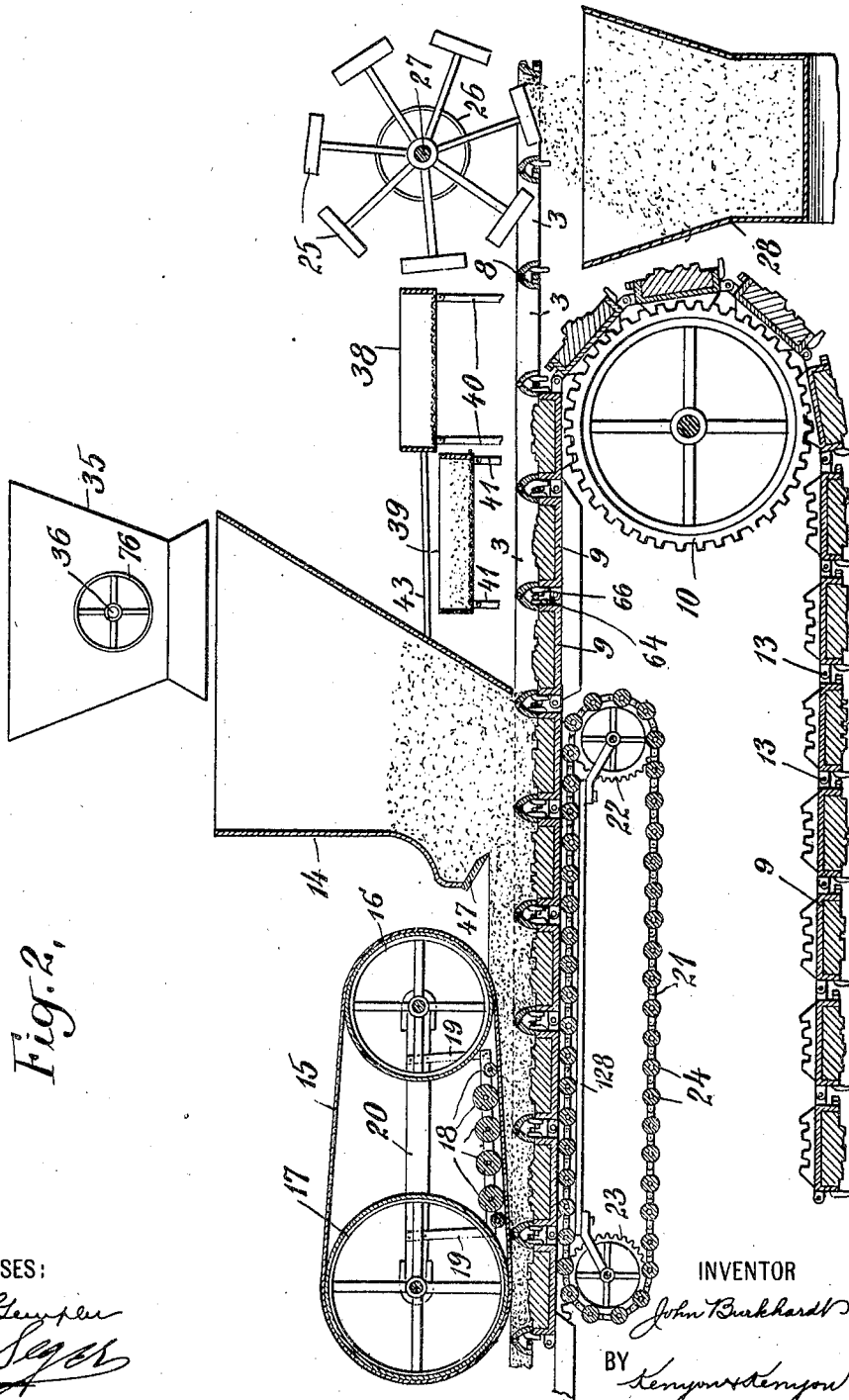


Fig. 2.

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Fig. 7.

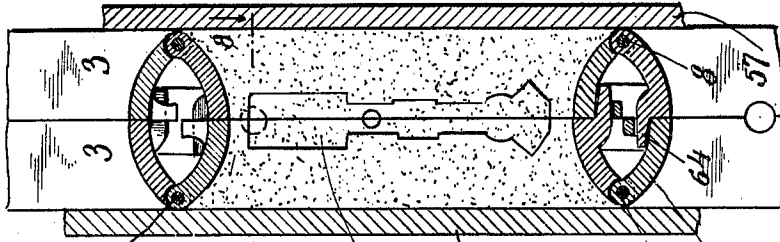


Fig. 6.

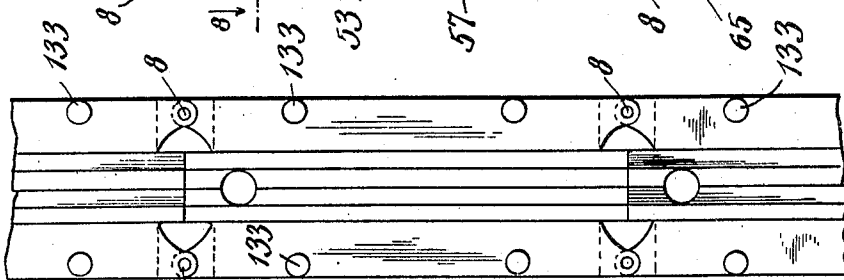


Fig. 4.

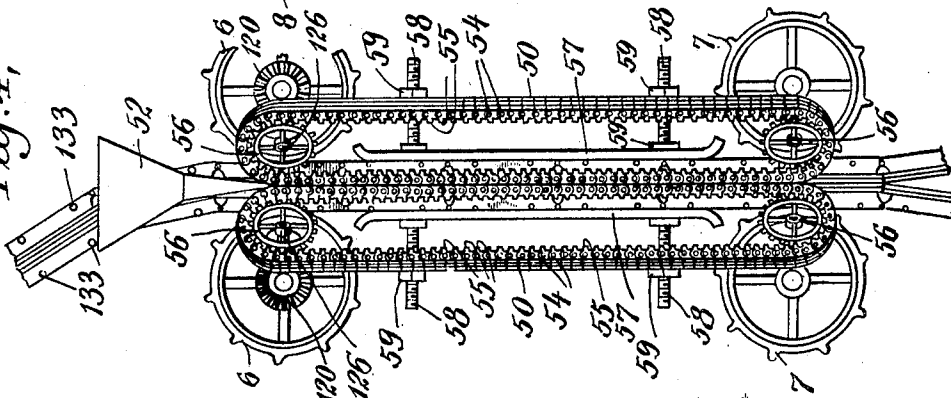
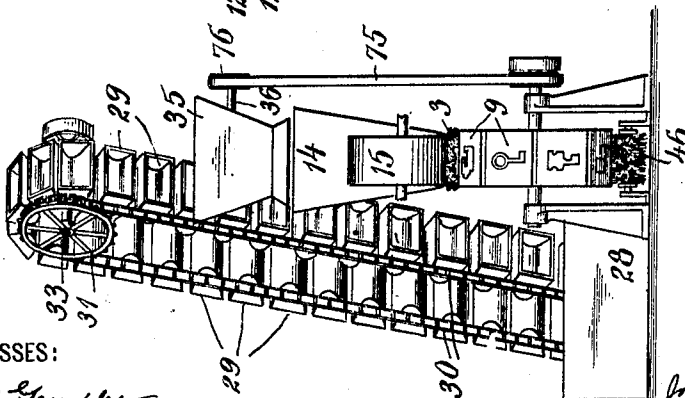


Fig. 3.



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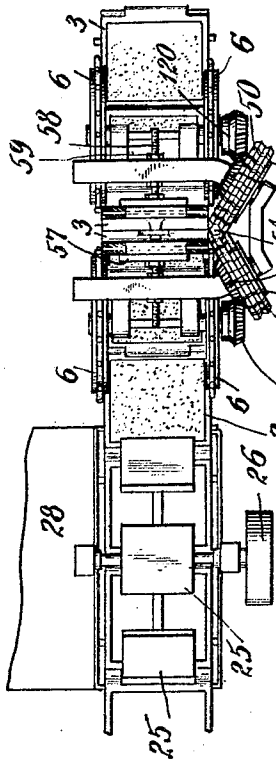


Fig. 5,

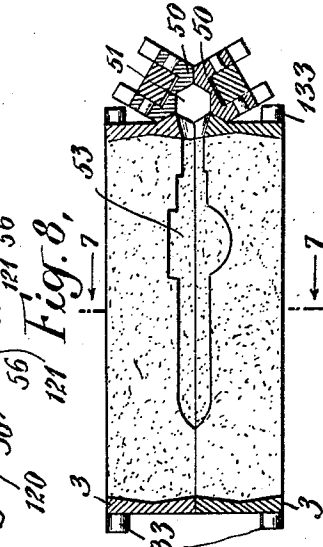


Fig. 8,

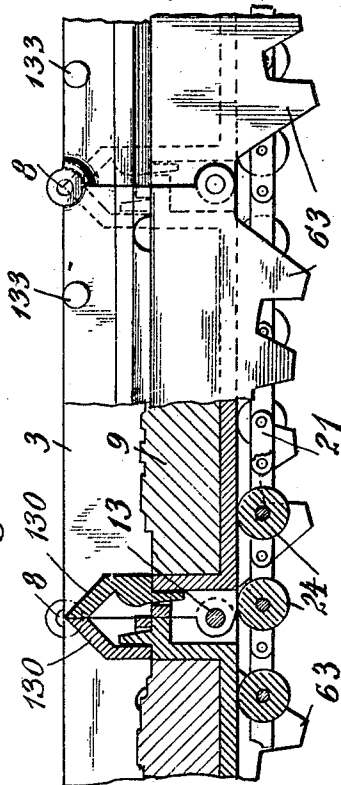


Fig. 11,

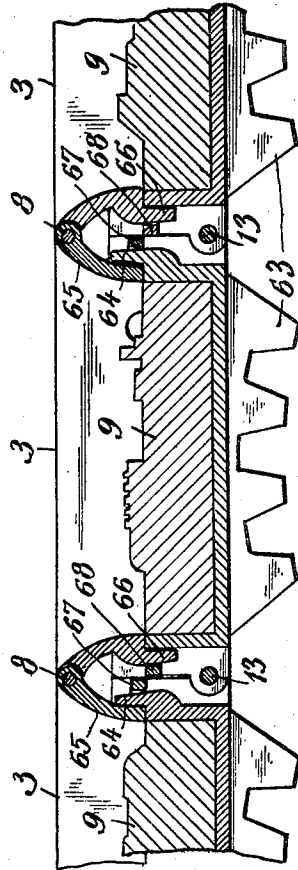


Fig. 10,

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6 SHEETS SHEET 5.

Fig. 13,

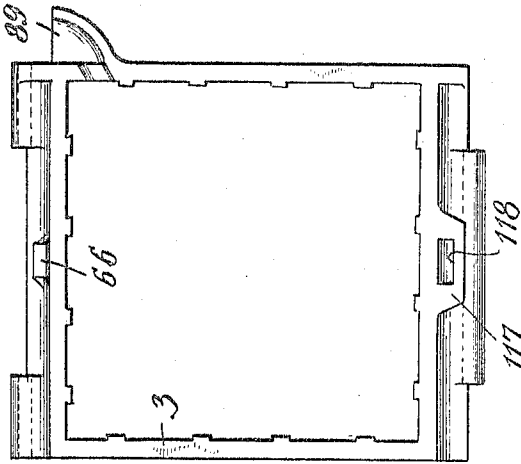


Fig. 14,

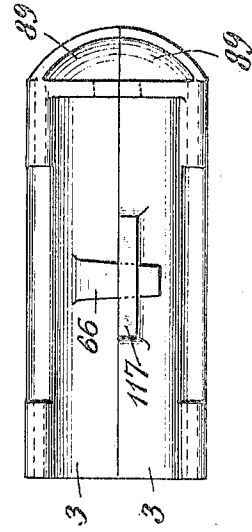


Fig. 12,

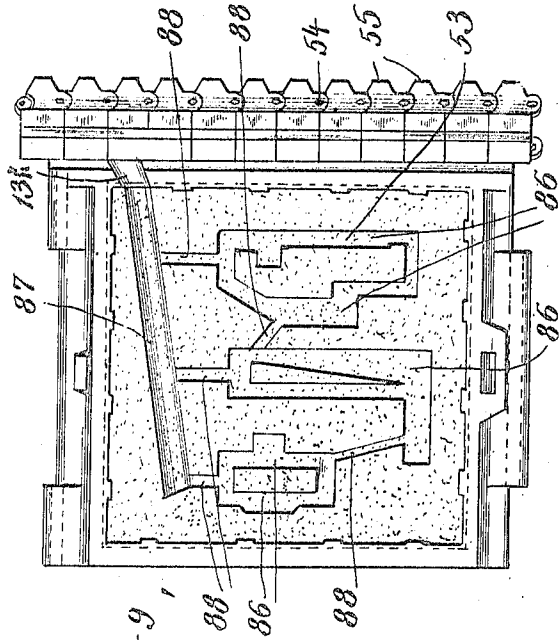
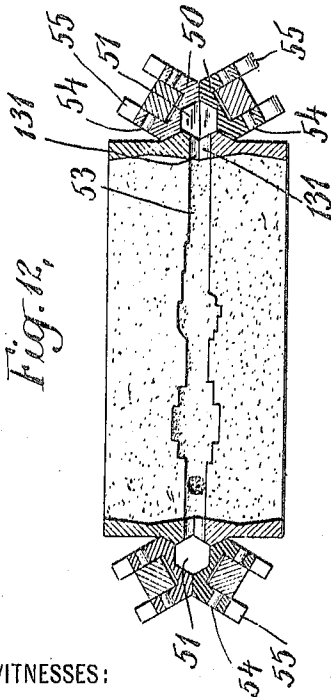


Fig. 9,

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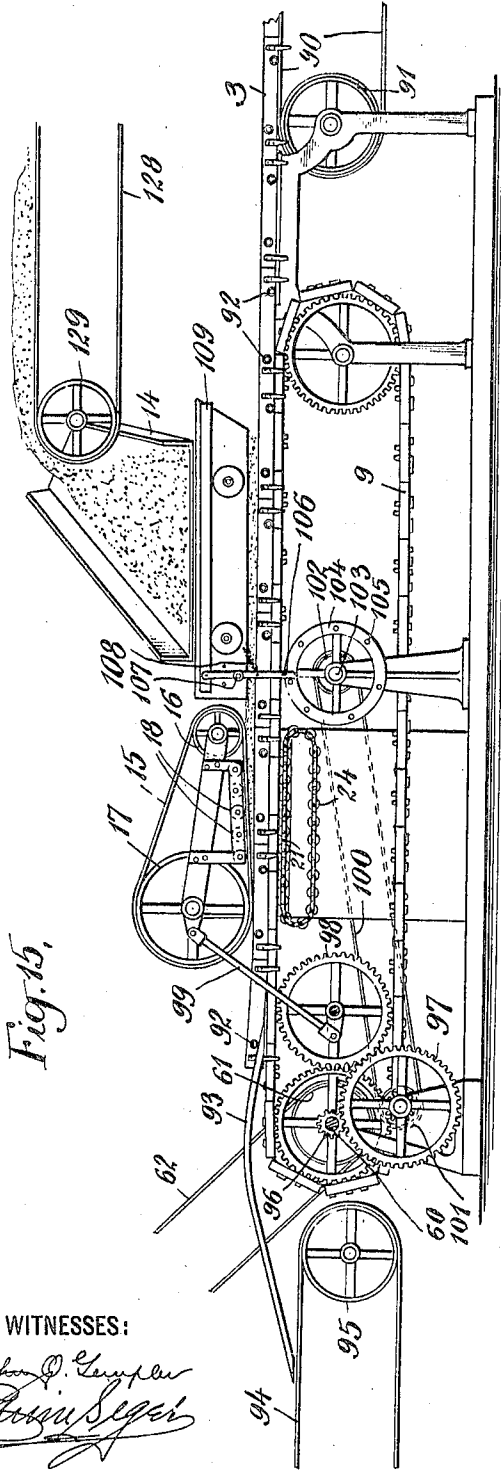


Fig. 15.

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John D. Luyker
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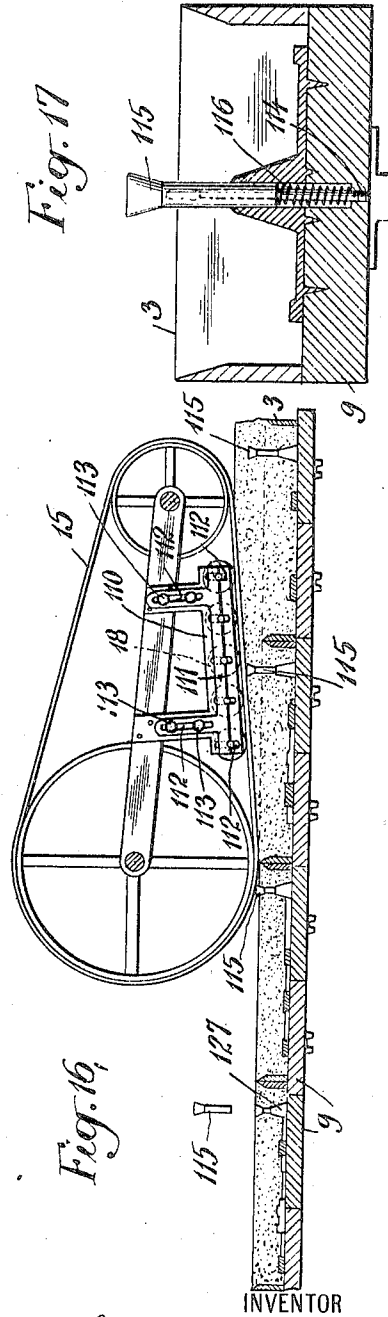


Fig. 17

Fig. 16,

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JOHN BURKHARDT, OF NEW YORK, N. Y.

CASTING-MACHINE.

1,108,694.

Specification of Letters Patent. Patented Aug. 25, 1914.

Application filed January 31, 1912. Serial No. 674,575.

To all whom it may concern:

Be it known that I, JOHN BURKHARDT, a citizen of the United States, and a resident of New York city, in the county and State of New York, have invented a new and useful Improvement in Casting-Machines, of which the following is a specification.

My invention relates to casting machines.

It has for its object to provide a machine for automatically making sand molds for casting articles of any desired pattern; also for automatically casting articles in said molds.

It consists of the novel devices and combinations herein shown and described.

In the drawings accompanying this specification and forming part hereof, I have shown my invention in its preferred form as embodied in a machine for automatically casting metal articles of varying shapes or patterns.

Referring to the drawings, Figure 1 is a side elevation showing one form of my improved machine for making sand molds and for casting articles therein, one-half of the machine being complete and part of the other half being broken away; Fig. 2 is an enlarged central longitudinal section through a part of the mechanism of one-half of the machine, illustrating the bringing together of the flasks and patterns and the feeding and compressing of the sand; Fig. 3 is an end view of the sand hopper and a perspective view of the sand conveyer; Fig. 4 is a side view of the complete molding apparatus, showing the chains carrying the molds to form the main gateway; Fig. 5 is a horizontal section on the lines 5-5 of Fig. 1; Fig. 6 is an enlarged side view of a complete mold with parts of two adjoining molds; Fig. 7 is a longitudinal section through the two flasks of a mold, taken on the lines 7-7 of Fig. 8; Fig. 8 is a cross-section through a mold, taken on the lines 8-8 of Fig. 7; Fig. 9 is a side view of one of the flasks showing the pattern formed in the sand and before the casting operation; Fig. 10 is an enlarged side view of a pattern; Fig. 11 is a similar view of a modification; Fig. 12 is a horizontal cross-section through a modified form of the casting apparatus showing a main gateway on each side; Figs. 13 and 14 show a modified form of flask adapted for use where there is no main gateway or passage, Fig. 13 showing a single flask and Fig. 14 the completed mold;

and Figs. 15, 16 and 17 show a modification in which there is only one series of flasks and patterns, Fig. 15 being a side view, Fig. 16 a central longitudinal section through the compressing means, and Fig. 17 illustrating a means for forming a hole in the sand mold for the introduction of metal.

In the preferred form of my machine, that shown in Fig. 1, I provide two series of flasks, two series of patterns, one pattern for each flask, each flask and its pattern of one series being complementary to the corresponding flask and its pattern of the other series, so that when the two flasks are brought together, each with its half sand mold, a complete sand mold will be formed, and I provide means for bringing the flasks and patterns together, introducing sand into them, and compressing it so that it will not fall out, and then bringing together the two complementary series of flasks and introducing metal into the completed molds formed thereby, and separating the two series of flasks to discharge the cast articles. In Fig. 1, I have shown one-half of the machine complete and containing one series of flasks, patterns and the means for introducing and compressing sand and conveying the various parts, but for want of space, I have shown the other half of the machine only partially. It will be understood, however, that the remaining parts of the other half are identical in all respects with the corresponding parts of the completed half shown in the figure.

The two series of flasks are represented in Fig. 1 as 1 and 2. Each series is composed of separate flasks 3, 3 flexibly secured together so as to form an endless chain of flasks capable of moving around the gear wheels 4, 5, 6 and 7. In order to permit of this flexibility, each flask 3 is pivoted to the adjacent flasks as at 8.

9, 9, are patterns which, at the proper time, are adapted to enter the flasks 3, 3. These are similarly arranged to form an endless chain passing around the sprocket wheels 10 and 11 mounted in brackets 12, 12 of the framework. The patterns are pivoted to one another at 13, 13 so as to form a sufficiently flexible chain of patterns to pass around the sprocket wheels 10 and 11.

14 is a sand hopper for holding sand and for discharging it at the proper time into the flasks containing the patterns.

I provide means for automatically com-

pressing the sand in the flasks and patterns. The device shown for this purpose consists of a belt 15 passing around rollers 16 and 17, the belt being pressed downward, where it lies over the flasks, by means of a series of weighted rollers 18 mounted in a frame 19 secured to the framework 20 forming a part of the framework of the machine and carrying the rollers 16 and 17. The weighted rollers and the belt are arranged so as gradually to compress the sand more and more into the flasks, being arranged for this purpose lower at the left than at the right, as shown in Figs. 1 and 2. By this means the sand is packed so tightly into the flasks that it will not fall out in passing around rollers 4 and 5 on its way to the position where the casting operation is performed.

21 is an endless belt passing around sprocket wheels 22 and 23 mounted in the framework carrying a series of idle rollers 24. The purpose of this belt and its idle rollers is to support the patterns while the sand is being fed into the flasks and patterns and is being compressed therein, and to reduce friction.

25, 25 are sand ejectors mounted on a shaft 27 carrying also a wheel 26, shaft 27 being supported in the framework of the machine. These ejectors enter the flasks 3 after the castings have been ejected from them, and they force out the sand into a hopper 28. I preferably provide automatic means for conveying the sand from this hopper into hopper 14. These means consist of a series of buckets 29, 29 secured to an endless chain or belt 30 passing over sprocket wheels 31, 32 mounted on shafts 33, 34, respectively, carried by the framework of the machine. These conveyers carry the sand from hopper 28 and dump it into an upper hopper 35 provided with a shaft 36. This shaft may, if desired, be provided with any suitable means of the usual construction, for breaking up any cakes or lumps of the sand in preparing it for further use. The sand falls from hopper 35 into hopper 14, and from there it falls into the flasks and is carried by them and compressed, as already described. I also preferably provide a shaft 37 turning in bearings in hopper 14 provided with any suitable means for breaking up the sand in hopper 14. I also preferably provide means for dusting in a small amount of charcoal, and also of a finer sand into the flasks after the patterns have been brought into position in them before the coarser sand of hopper 14 is fed. The devices shown for this purpose consist of two sieves 38 for the charcoal and 39 for the fine sand pivotally mounted on arms 40 and 41, respectively, both sets of arms being pivoted at the bottom to a base plate 42 of bracket 12. An oscillating movement is given to these two

sieves by means of crank arms 43 and 44, respectively, eccentrically secured to a disk 45 fast on shaft 37.

46, 46 are two brushes for cleaning the sand out of the patterns.

The operation of the parts thus far described is as follows: It will be understood that each flask 3 and its pattern 9 in series 1 has its corresponding or counterpart flask and pattern in the other half of the machine in connection with series 2. The flasks 3 and the patterns are brought together by the means above described, each pattern entering its flask and passing in succession underneath the sieves 38, 39, hopper 14 and the compressing belt and rollers 15 and 18. In this passage a small quantity first of charcoal and then of fine sand is sifted into the combined flask and pattern through the oscillation of the sieves 38 and 39, and then the flask and its pattern are filled with sand of a coarser variety from hopper 14, the knife 47 of the hopper cutting off the sand at the proper height, the sand being first moistened by any suitable means (not shown). The sand is then gradually compressed downward into the flask forming one-half of a sand mold. The patterns and flasks are then separated, as shown at the left in Fig. 1, the patterns passing downward around sprocket wheel 11, and the brushes 46 dusting the sand out of them while the flasks pass upward around sprocket wheel 4 and over a supporting shelf 48 and around sprocket wheels 5, where the two sets or series of flasks, each containing its one-half of the completed sand mold, are brought together to form the complete sand mold. These two series of flasks are preferably brought together at an angle sufficiently removed from the vertical to permit the introduction (if desired) and retention of cores in the completed sand molds, as clearly shown in the upper part of Fig. 1. At this point a core 49 is shown as in the act of being introduced. At the angle there shown, this is easily done and the core is retained in proper position. The two series of flasks 1 and 2 then pass downward between sprocket wheels 6, 6, 7, 7. At the same time, I preferably bring two series of molds 50, 50 so as to unite alongside of the completed molds formed in the flasks in order to form a main gateway 51 for the passage of metal from funnel 52 to the hollow spaces 53 in the sand molds. These molds 50 are pivotally united together as at 54 to form an endless chain provided with a series of sprocket teeth 55 passing over teeth of sprocket wheels 56, 56. Four of these sprocket wheels are shown (see Fig. 4), two for each chain.

57, 57 are two guide plates between which the flasks and endless mold chains 50, 50 pass and by which they are held closely to-

gether during the casting operation. Metal flows from funnel 52 down main gateway 51 into the hollow spaces 53 in the sand molds forming the castings.

5 58 and 59 are bolts and nuts for supporting the guide plates 57 and for permitting adjustment. After passing between the guide plates and the endless chains, the flasks of the two series are separated, as shown in Figs. 1 and 4, and the cast articles are discharged.

10 The means for driving the various parts are as follows: 60 is the main driving shaft having a pulley 61 driven by a belt 62 from any suitable source of power. Sprocket wheel 11 is fast on shaft 60 and drives the endless chain of the patterns 9 by means of the engagement of the sprocket teeth 11 with the teeth of sectors 63 on the back of the patterns. These sectors drive sprocket wheel 10 in their turn. Chain 1 of the flasks 3 is driven by means of an upward projection 64 from pattern 9, striking against depending arm 65 from the flask 3, and by 25 the forward end of each pattern striking a depending arm 66 of flask 3.

67 and 68 are side projections from the flask and the pattern, respectively, for more securely locking the parts together when in combination.

30 Meshing with gear 11 is a gear 69 supported in the framework and having a crank arm 70 and a crank rod 71 connected to crank arm 72 loose on shaft 73 of roller 17. 35 Crank arm 72 is fast on a sleeve on shaft 73, the sleeve carrying with it a pulley 74 driving belt 75 turning pulley 76 fast on shaft 36 of upper hopper 35. Secured to the opposite side of gear 69 is a crank rod 77 fast with 40 crank arm 78 secured to pulley 17 for rotating belt 15. Belt 15 drives pulley 79. Fast with this is pulley 80 driving belt 119, wheel 45 and shaft 37, rotating the arms in hopper 14 for stirring up the sand. An intermittent shaking motion is imparted to hoppers 45 38 and 39 by means of rods 43 and 44, respectively, secured to opposite sides of wheel 45.

50 The endless chain of molds 50 is driven from a bevel gear wheel 120 on shaft 122 of sprocket 6, the latter being driven by belt 81 from pulley 82 fast on the shaft 60, and bevel gear 121 on shaft 126 of gear 56. The other mold chain 50 is driven through gear 55 123 fast on shaft 122 and gear 124 fast on shaft 125 of the opposite sprocket 6. Belt 81 on a pulley on shaft 125 drives power shaft 60 (not shown) on the right-hand side of the machine. It will be understood that 60 the corresponding parts in the right-hand half of the machine, of Fig. 1, are similarly driven to those of the left-hand side, the main driving shaft 60 on the right-hand side of the machine being driven by belt 81 above 65 described. The sand conveyers are driven

through sprocket wheel 31 by means of a belt 83 communicating with any suitable source of power, preferably the same one as that which drives pulley 61. The sand ejectors 25 are driven by belt 84 running over 70 pulley 85 fast on the shaft of gear wheel 10, the belt passing over ejector pulley 26. The brushes 46 may be driven from any suitable source of power (not shown).

In Fig. 9 is shown a flask containing one-half of a complete sand mold, the hollow 75 spaces of the mold being represented at 86 and 87 and 88 representing sub-gateways for leading the metal to the hollow spaces of the mold, or from one part of such spaces to 80 another.

In Fig. 12 I have shown mold chains 50 arranged on each side of the flasks, thus giving two main gateways for the more ready access of the metal to the interior of the 85 sand mold.

Figs. 13 and 14 illustrate a form of flask and sand mold in which there is no main gateway 51. Instead of the main gateway, each flask is provided with a cup 89 into which 90 the metal is delivered from the funnel, Fig. 13 showing a flask forming one-half of the sand mold, and Fig. 14 the two halves united together to form a complete sand mold. 117 is a projection with a slot 118 through which 95 arm 66 projects to lock the two together.

In cases where there is no room for the two complete halves of my improved machine, or where it is not desired to employ both halves, a single series of flasks and 100 patterns may be used. I have illustrated such a form of the machine in Figs. 15 to 17. In such a form, the alternate flasks with their patterns, are arranged to form complementary halves of the completed sand 105 mold. In this form the flasks 3 are placed by hand upon an endless belt 90 passing around a roller 91 and another roller (not shown), and driven by any suitable means (not shown). They are pushed by hand 110 until engaged by the chain of patterns 9, when they are fed forward in the way already described, under the compressing belt and rolls 18, as already described. At the left-hand end of the machine, the flasks 3 115 are lifted from the patterns by means of a roller 92 projecting from each side of the flask, striking and rolling up on guide rails 93, there being one on each side of the machine. Each flask is pushed along by the 120 flask succeeding until it passes onto an endless delivery roll 94 running over roller 95 and another roller, not shown, for purposes of removal. In this form of machine, power belt 62 passes around pulley 61; rotating 125 shaft 60. Through gear 96 fast on shaft 60, gear 97 is driven, the latter driving gear 98. A crank arm 99 imparts motion to wheel 17 driving belt 15. A belt 100 driven by pulley 101 fast on the shaft of gear wheel 97 and 130

passing around pulley 102 fast on shaft 103 of wheel 104, drives the latter wheel. This wheel has on its margin a number of pins 105 which strike lever 106 projecting into their path, and give it an oscillating motion. 5 Lever 106 is fulcrumed at 107 and has a spring 108. At its upper end it is fastened to a rod 109 to which arms (not shown) in hopper 14 are secured for agitating the sand.

10 If desired, the compressing rolls 18 and belt 15 may be made adjustable vertically to permit of the use of flasks of greater or less height. I have shown this form in Fig. 16. This adjustment is secured by 15 mounting rollers 18 in a frame 110 adjustable vertically on support 111 forming part of the framework. This is secured by slots 112 and bolts 113, 113.

20 In Fig. 17, I have shown a device for readily forming a hole in the sand mold contained in one of the flasks. It consists of a plunger 115 held up by spring 116 intervening between the plunger and the mold. 25 114 is a supporting rod secured at the bottom to pattern 9, the hollow plunger sliding over and around rod 114. Plunger 115 is depressed and then removed after the mold is formed, leaving hole 127 in the sand mold, 30 as shown at the left in Fig. 16. In practice, the two adjacent flasks are taken and placed face to face and metal is poured in through the opening thus made. 138 is an endless belt running over a roller 129 and another (not shown) for conveying sand to the hopper. Knife 47 (Fig. 2) may, if desired, be made adjustable vertically. 35 138 is a floor or pressure plate for supporting endless chain 21 and rollers 24. Pins 133 on the flasks 3 are engaged by the sprocket teeth of sprocket wheels 6, 6, 7, 7, to aid in the driving of the flasks. In the side wall of each flask toward the mold chains 50 is left an opening half cylindrical in shape, 45 131. When two flasks come together they make a complete cylindrical opening in the side wall through which metal passes from the main gateway 51, as shown at the right in Fig. 12.

50 In Fig. 10 I have shown arms 65 and 66 as pivoted at 8, the pivot point here running entirely through from side to side of the flask, and the upper parts of 65 and 66 are rounded. In this construction it is possible that sand might work in between the 55 joints.

In Fig. 11 I have shown a modification of the connection of these parts. In this construction, the arms are shown as 130, 130 60 and meet at a sharp point along their upper edge, and the pivotal connection 8 is made at the sides only of the flask. In this construction the sand is not as apt to enter the joint as in the other construction.

65 In place of the sand ejectors and brushes

for cleaning the sand out of the flasks and patterns, any other suitable means could be employed, such as a blast of air or other cleaning device. Similarly, other means could be provided than those shown, for 70 feeding the sand into the flasks, such, for example, as a blast of air, or manual feeding.

The purpose of sifting in charcoal from sieve 38 before the sand is fed in, is to enable the patterns to draw out from the flasks 75 without disturbing the sand molds. Any other suitable parting material may be used in place of the charcoal. In place of the plunger 115, any other suitable means may be employed for forming the hole in the sand 80 mold.

In making the compressing rollers and belt vertically adjustable, a certain amount of slack will sometimes be formed in the belt. Any suitable means for compensating 85 for this may be provided.

Where only one-half of my improved machine is used, the flasks can be made much longer than where two series of flasks are used. This is sometimes of considerable ad- 90 vantage.

By means of my improvement, sand molds can be easily, accurately and automatically made for any desired pattern of casting. The various parts of the process are carried 95 on expeditiously, cheaply and automatically.

Many changes from the particular form of devices shown in the drawings, other than those hereinbefore specifically mentioned, may, of course, be made without departing 100 from my invention.

What I claim as new and desire to secure by Letters Patent, is:

1. In a machine for making castings, two series of flasks, two series of patterns adapted 105 to enter the flasks, each flask and its pattern in one series complementary to the corresponding flask and pattern in the other series, the two flasks with their sand molds forming, when brought together, a complete 110 molding flask, means for feeding sand into the flasks and patterns, compressing devices for compressing the sand in the same, means for feeding metal into the completed molding flasks, and conveyers for bringing the 115 flasks and patterns in each series together, for moving them into position to receive sand, and then into position to be compressed, for separating the patterns from the flasks and for bringing the complemen- 120 tary flasks together to form the completed molding flasks, and into position to receive metal; and for removing and separating the complementary flasks to discharge the molded articles. 125

2. In a machine for making castings, two series of flasks, two series of patterns adapted to enter the flasks, each flask and its pattern in one series complementary to the corresponding flask and pattern in the other 130

series, the two flasks with their sand molds forming, when brought together, a complete molding flask, means for feeding sand into the flasks and patterns, compressing devices for compressing the sand in the same, means for feeding metal into the completed molding flasks, conveyers for bringing the flasks and patterns in each series together, for moving them into position to receive sand, and then into position to be compressed, for separating the patterns from the flasks and for bringing the complementary flasks together to form the completed molding flasks, and into position to receive metal, and for removing and separating the complementary flasks to discharge the molded articles, and sand ejectors for forcing the sand out of the flasks.

3. In a machine for making castings, two series of flasks, two series of patterns adapted to enter the flasks, each flask and its pattern in one series complementary to the corresponding flask and pattern in the other series, the two flasks with their sand molds forming, when brought together, a complete molding flask, means for feeding sand into the flasks and patterns, compressing devices for compressing the sand in the same, means for feeding metal into the completed molding flasks, conveyers for bringing the flasks and patterns in each series together, for moving them into position to receive sand, and then into position to be compressed, for separating the patterns from the flasks and for bringing the complementary flasks together to form the completed molding flasks, and into position to receive metal, and for removing and separating the complementary flasks to discharge the molded articles, and means for brushing the sand out of the patterns.

4. In a machine for making castings, two series of flasks, two series of patterns adapted to enter the flasks, each flask and its pattern in one series complementary to the corresponding flask and pattern in the other series, the two flasks with their sand molds forming, when brought together, a complete molding flask, means for feeding sand into the flasks and patterns, compressing devices for compressing the sand in the same, means for feeding metal into the completed molding flasks, and conveyers for bringing the flasks and patterns in each series together, for moving them into position to receive sand, and then into position to be compressed, for separating the patterns from the flasks and for bringing the complementary flasks together to form the completed molding flasks, at an angle sufficiently removed from the vertical to permit the introduction and retention of cores in the completed flask, and for separating the complementary flasks to discharge the molded articles.

5. In a machine for making castings, two series of flasks, two series of patterns adapted to enter the flasks, each flask and its pattern in one series complementary to the corresponding flask and pattern in the other series, the two flasks with their sand molds forming, when brought together, a complete molding flask, means for feeding sand into the flasks and patterns, compressing devices for compressing the sand in the same, means for feeding metal into the completed molding flasks, conveyers for bringing the flasks and patterns in each series together, for moving them into position to receive sand, and then into position to be compressed, for separating the patterns from the flasks and for bringing the complementary flasks together to form the completed molding flasks, two separate series of molds adapted to be brought together adjacent to the completed molding flasks to form a main gateway for the metal communicating with the hollow spaces in the molds, and means for feeding metal to the main gateway.

6. In a machine for making castings, the combination of two series of sand flasks, each flask in one series containing a sand mold complementary to that in the corresponding flask of the other series, conveyers for bringing the complementary flasks together at an angle sufficiently removed from the vertical to permit the introduction and retention of cores in the completed molds formed by the bringing together of the complementary flasks, and for separating the flasks to discharge the cast articles, and means for feeding metal to the completed molds.

7. In a machine for making castings, the combination of two series of sand flasks, each flask in one series containing a sand mold complementary to that of the corresponding flask in the other series, conveyers for bringing the complementary flasks together to make completed molds and for separating them to discharge the cast articles, two separate series of molds adapted to be brought together adjacent to the completed sand molds to form a main gateway for the metal communicating with the hollow spaces in the completed sand molds, and means for feeding metal to the main gateway.

8. The combination with a series of sand molds, and means for moving them, of two additional series of molds adapted to be brought together adjacent to the sand molds to form a main gateway for the metal communicating with the hollow spaces in the molds.

9. The combination with a series of sand molds, and means for moving them, of two additional series of molds adapted to be brought together adjacent to the sand molds to form a main gateway for the metal communicating with the hollow spaces in the

molds, and to be moved with the series of sand molds, and means for feeding metal to the main gateway thus formed.

5 10. In a casting machine, the combination
of two endless series of sand molds, each
sand mold in one series being the comple-
ment of the corresponding sand mold of the
other series, means for bringing the corre-
sponding sand molds of the two series to-
10 gether to form completed sand molds, and
two endless series of molds adapted to be
brought together adjacent to the two series
of sand molds to form a main gateway for
the passage of metal to the hollow spaces of
15 the sand molds.

11. In a casting machine, the combination
of two endless series of sand molds, each
sand mold in one series being the comple-
ment of the corresponding sand mold of the
20 other series, means for bringing the corre-
sponding sand molds of the two series to-
gether to form completed sand molds, two
endless series of molds adapted to be brought

together adjacent to the two series of sand
molds to form a main gateway for the pas- 25
sage of metal to the hollow spaces of the
sand molds, and a funnel for feeding metal
to such main gateway.

12. In a casting machine, the combination
of two endless series of sand molds, each 30
sand mold in one series being the comple-
ment of the corresponding sand mold of the
other series, and means for bringing the
corresponding sand molds of the two series
together at an angle sufficiently removed 35
from the vertical to permit the insertion and
retention of cores in the completed sand
molds.

In testimony whereof, I have signed my
name to this specification, in the presence of 40
two subscribing witnesses.

JOHN BURKHARDT.

Witnesses:

EDWIN SEGER,
JOHN O. GEMPLER.