No. 729,752. PATENTED JUNE 2, 1903.

E. GATES.

PRODUCTION OF ALLOYS.

APPLICATION FILED JUNE 26, 1899. RENEWED MAR. 11, 1903.

NO MODEL. 7 SHEETS—SHEET 1.

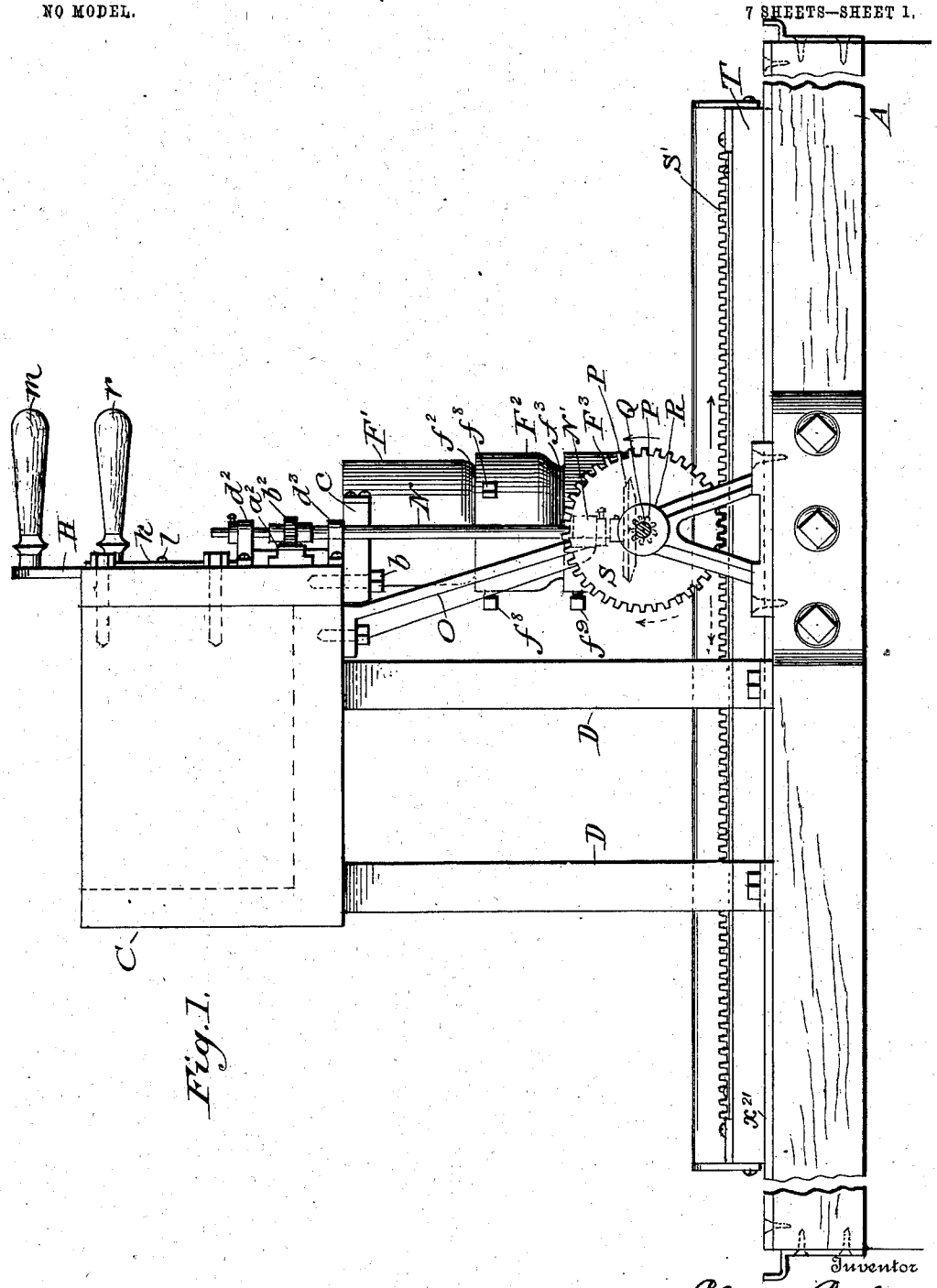

Fig. 1.

Witnesses

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NO MODEL. 7 SHEETS—SHEET 2.

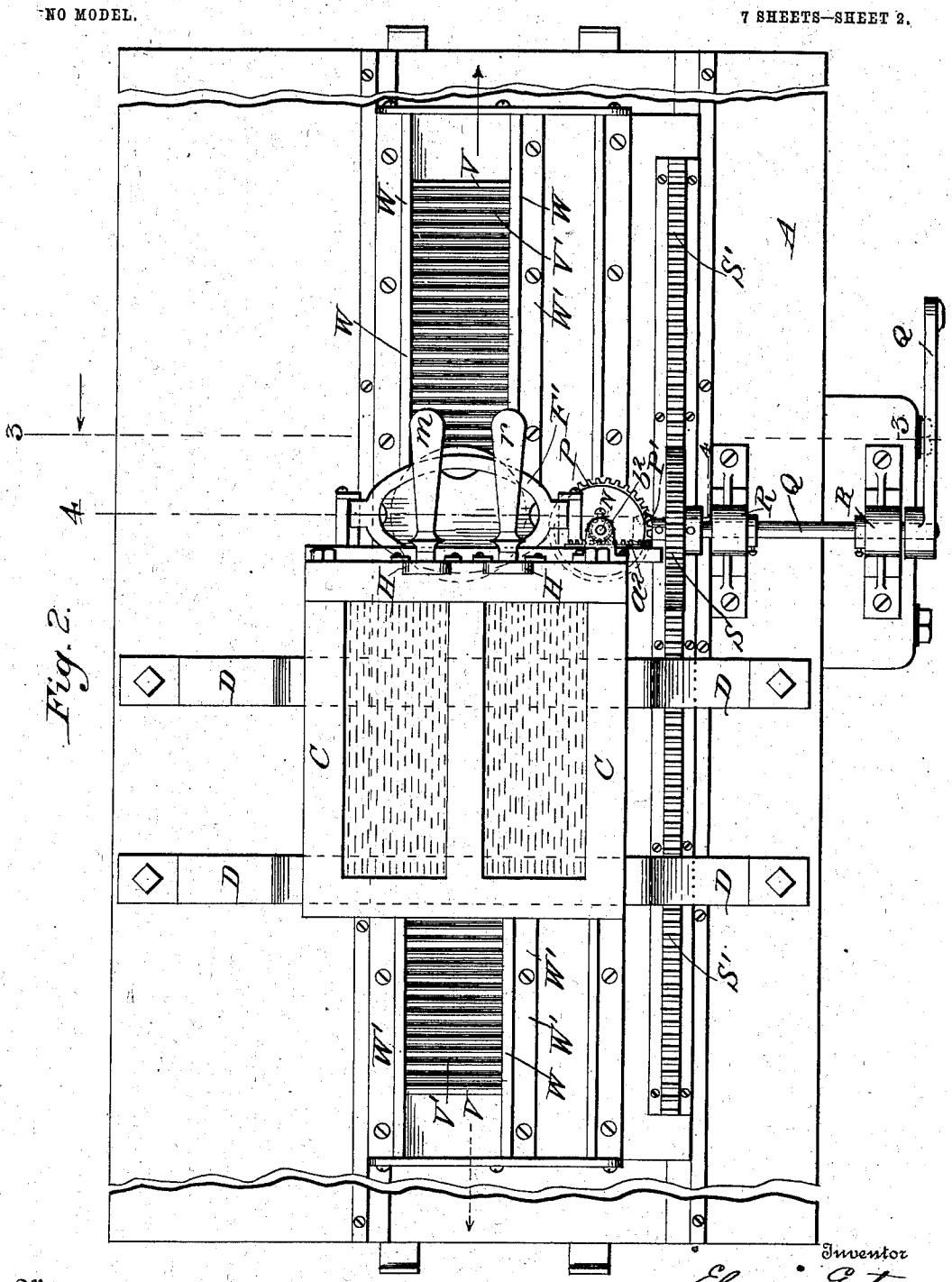

Fig. 2.

Witnesses

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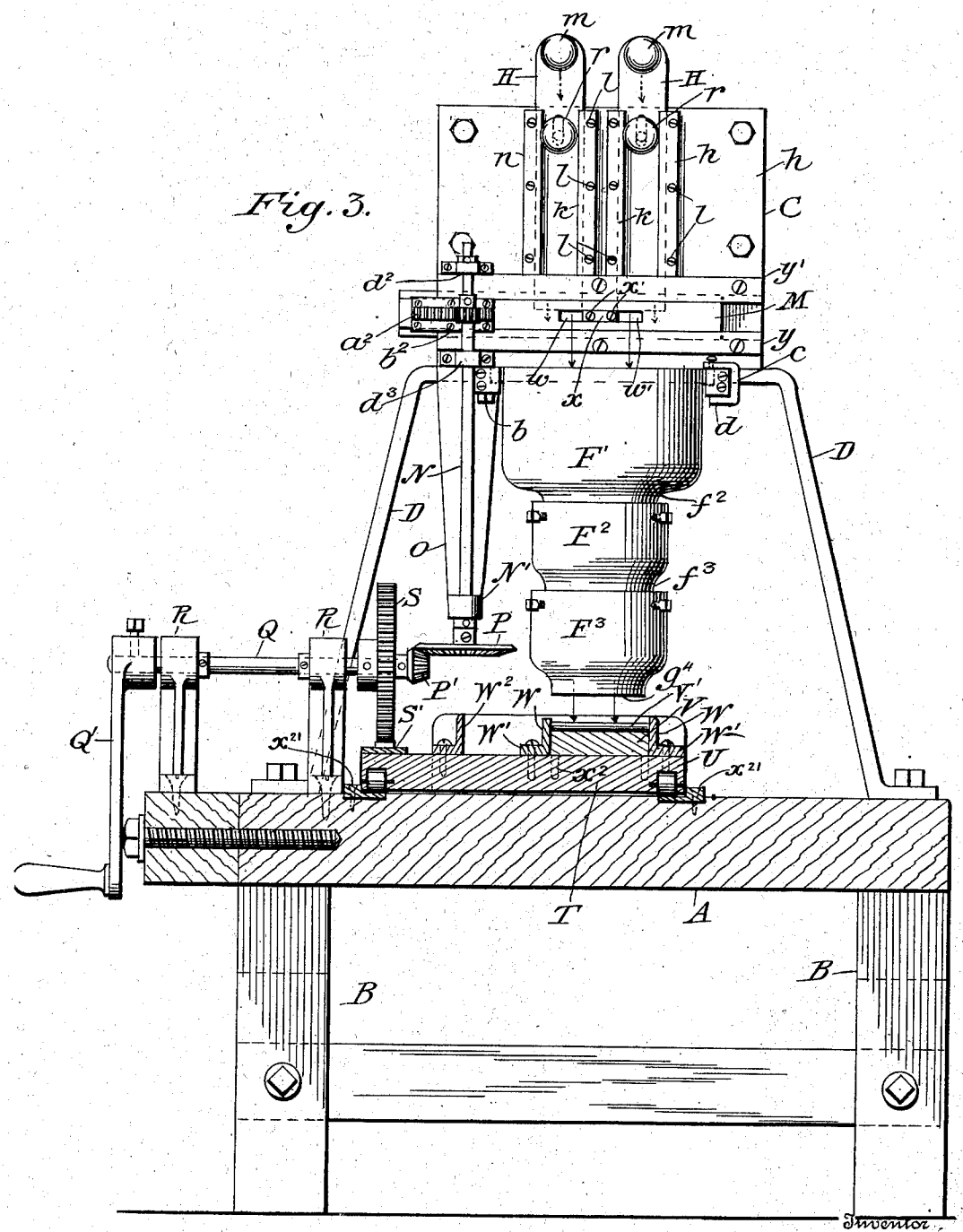
NO MODEL. 7 SHEETS—SHEET 3.

Fig. 3.



Witnesses

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NO MODEL. 7 SHEETS—SHEET 4.

Fig. 4.

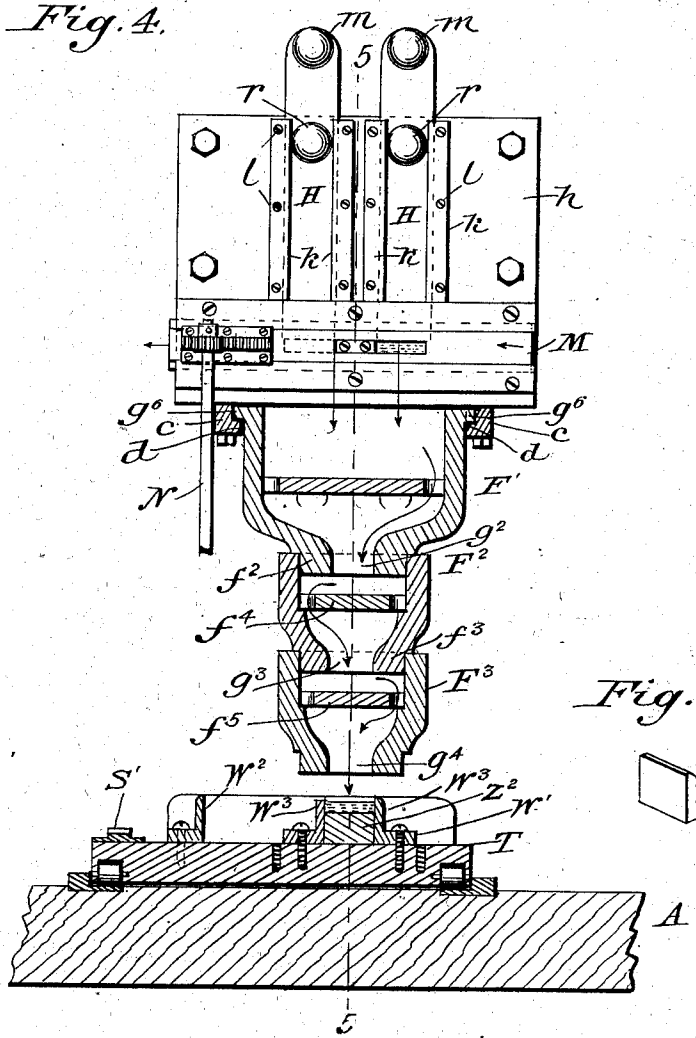


Fig. 4c.

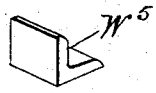


Fig. 4a.

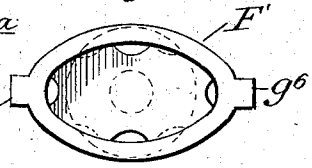


Fig. 4e.

Fig. 4d.

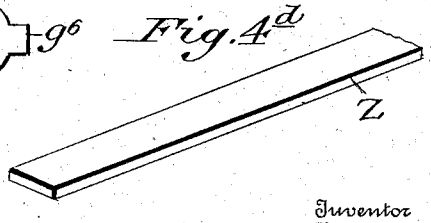
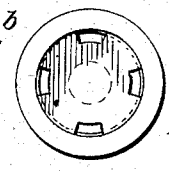


Fig. 4b.



Witnesses
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NO MODEL. 7 SHEETS—SHEET 5.

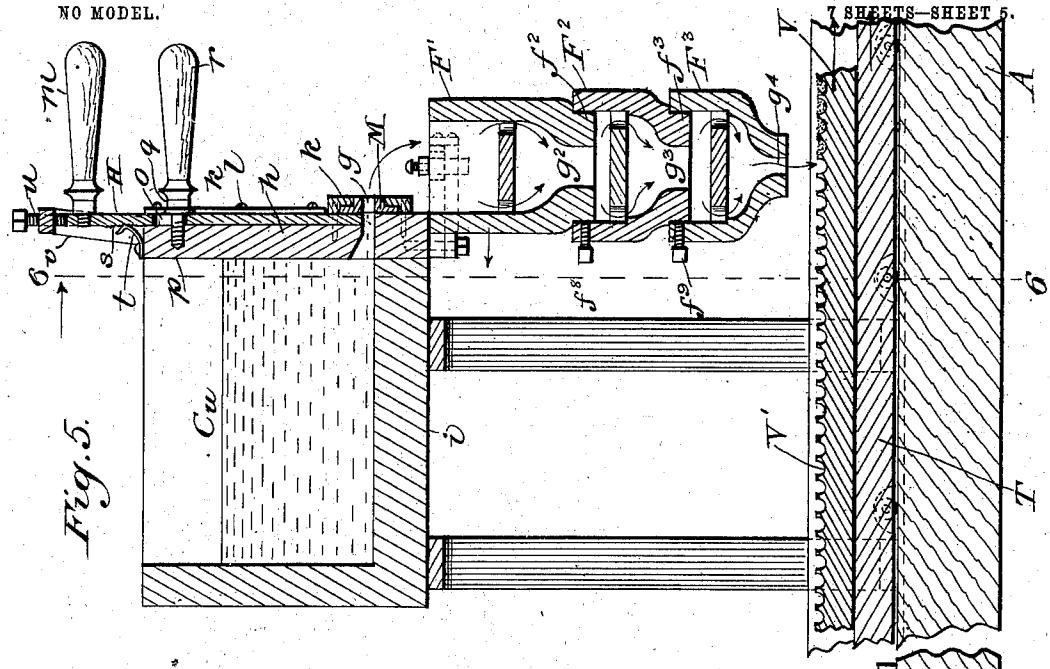

Fig. 5.

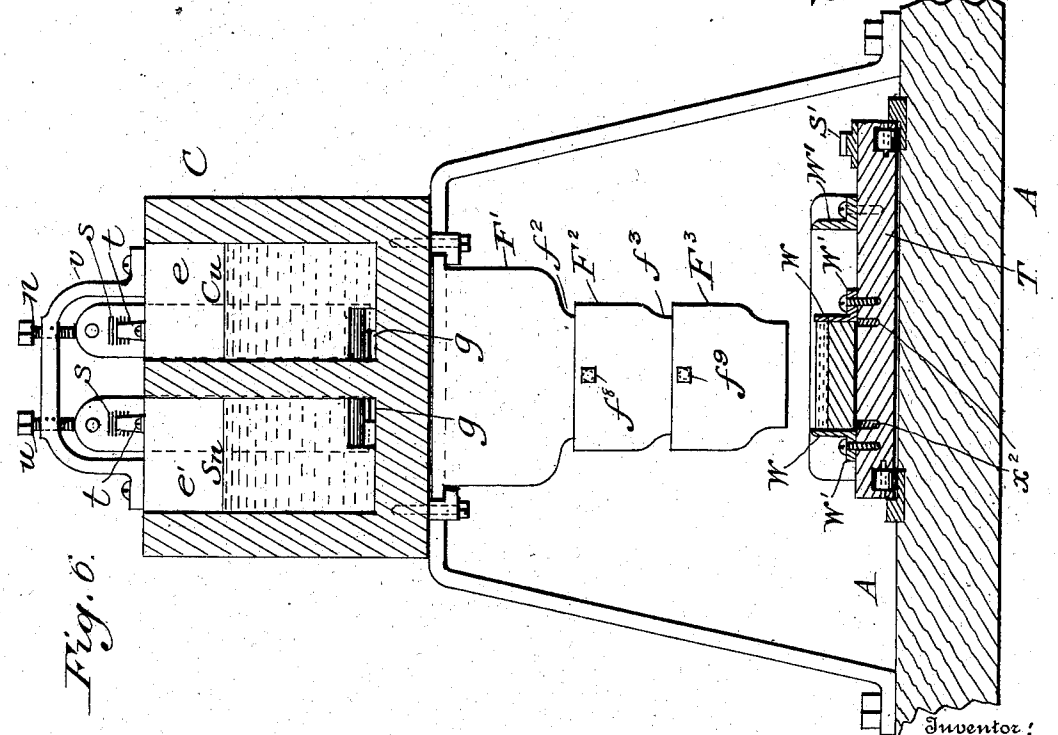

Fig. 6.

Witnesses

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NO MODEL. 7 SHEETS—SHEET 6.

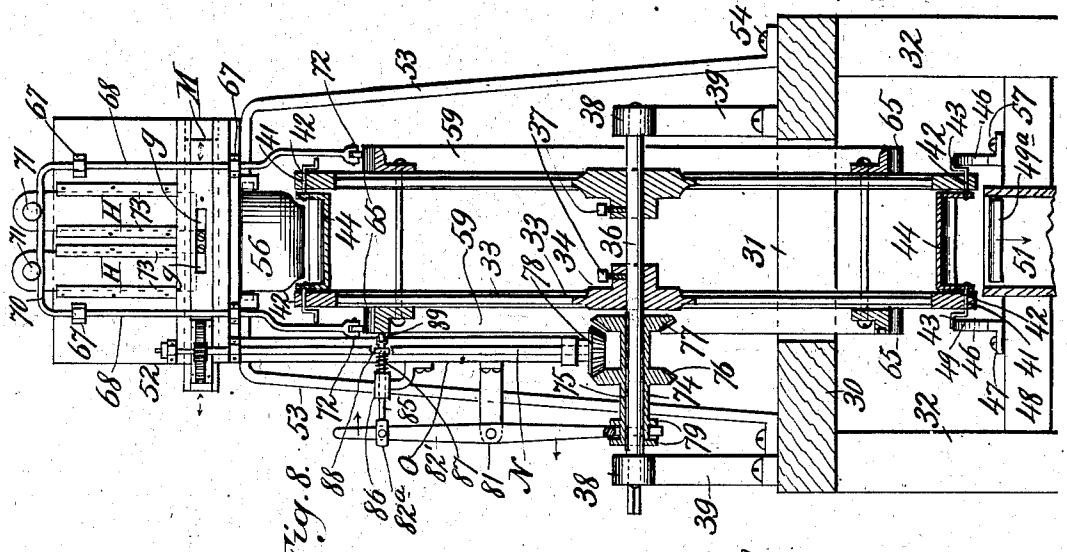

Fig. 8.

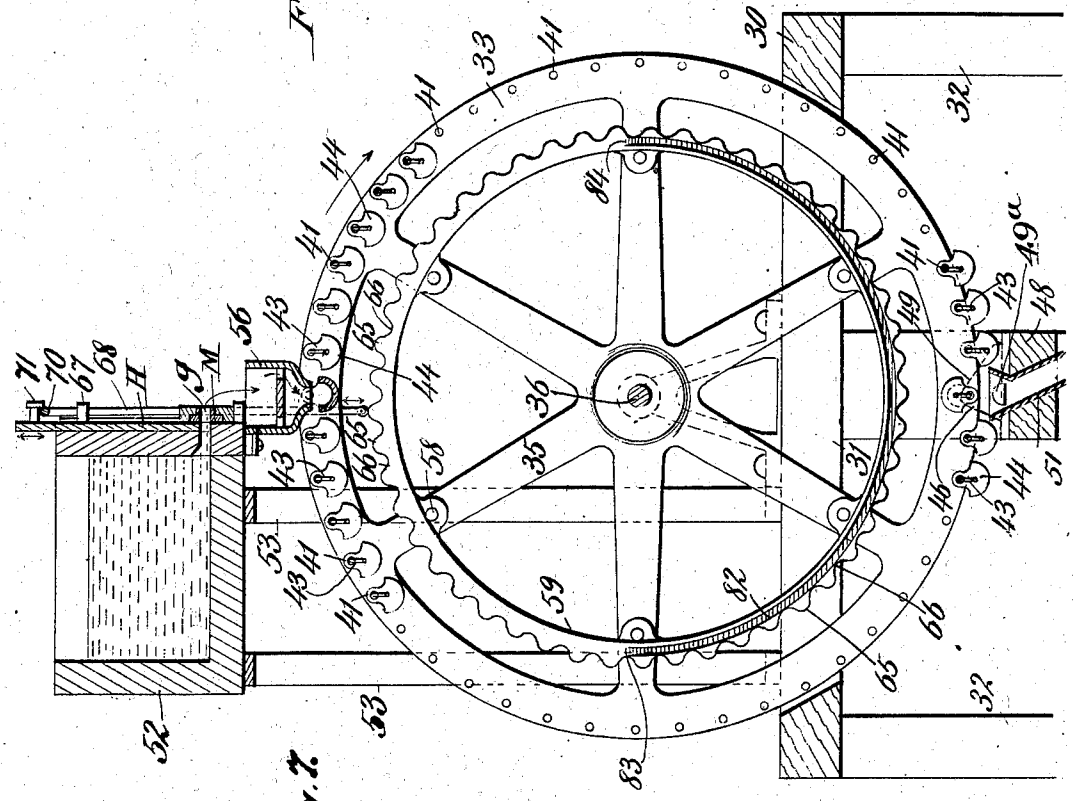

Fig. 7.

Witnesses

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NO MODEL. 7 SHEETS—SHEET 7.

Fig. 9.

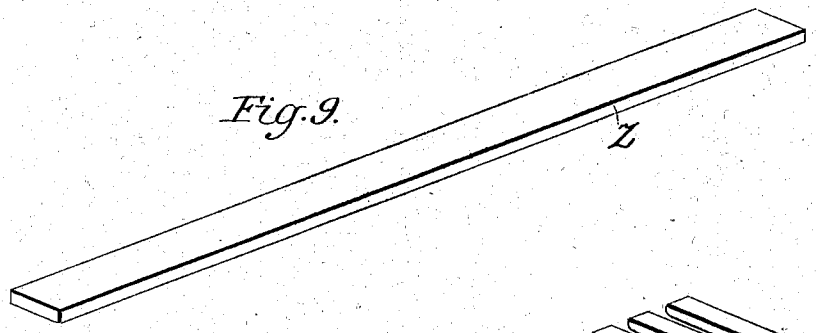


Fig. 10.

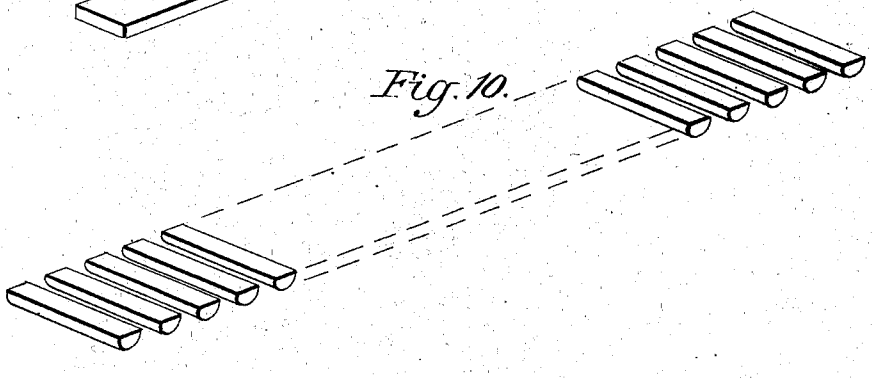


Fig. 11.

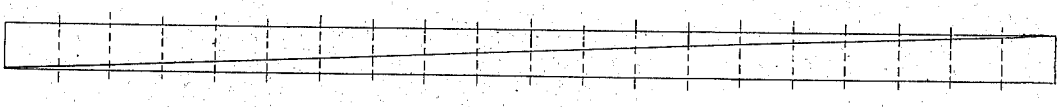


Fig. 12

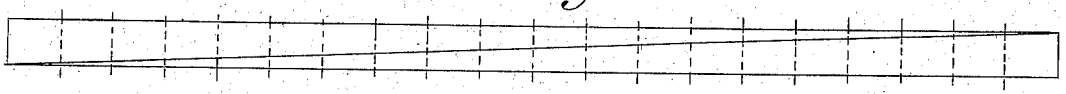
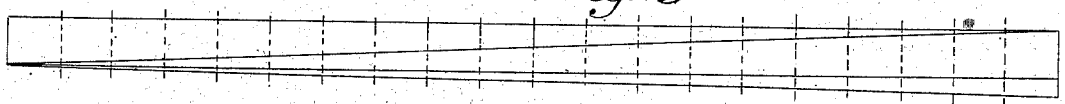


Fig. 13



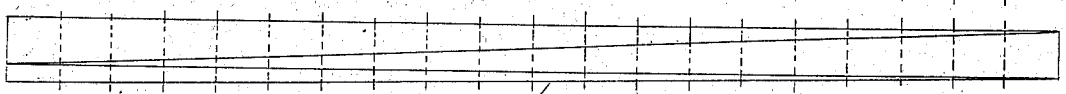


Fig. 14.

Witnesses

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No. 729,752. Patented June 2, 1903.

UNITED STATES PATENT OFFICE.

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PRODUCTION OF ALLOYS.

SPECIFICATION forming part of Letters Patent No. 729,752, dated June 2, 1903.

Application filed June 26, 1899. Renewed March 11, 1903. Serial No. 147,281. (No specimens.)

To all whom it may concern:

Be it known that I, ELMER GATES, a citizen of the United States, residing at Chevy Chase, in the county of Montgomery and State of Maryland, have invented certain new and useful Improvements in the Production of Alloys; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

The primary object of my present invention is to provide facilities for the production, preferably at a single casting operation, of an integral bar or of a series of small ingots exhibiting in succession a great many different alloys of two or more metals selected for the purpose, each alloy containing a different percentage of the component metals, whereby, at a minimum expenditure of time and labor and at small expense, the operator has at hand an entire series of different combinations of the metals chosen and is therefore in a position to make a comprehensive study thereof, so as to determine their several physical properties and their availability for use in the arts.

In the accompanying drawings, Figure 1 is a side elevation, partly broken away, of one form of apparatus constructed and arranged in accordance with my invention. Fig. 2 is a top plan view thereof. Fig. 3 is a front elevation, partly in section, on the line 3 3 of Fig. 2. Fig. 4 is a like view of some of the parts shown in Fig. 3, the mixing-chamber being shown in section on the line 4 4 of Fig. 2. Fig. 4^a is a top plan view of the upper compartment of the mixing-chamber. Fig. 4^b is a similar view of one of the lower compartments thereof. Fig. 4^c is a view in perspective of one of the side dams for closing the ends of the mold employed in the production of an alloy-bar. Fig. 4^d is a perspective view of an alloy-bar produced in accordance with one modification of my invention. Fig. 4^e is a like view of one of the alloy-pigs produced in accordance with another modification thereof. Fig. 5 is a longitudinal sectional view on the line 5 5 of Fig. 4. Fig. 6 is a vertical sectional view on the line 6 6 of the preceding figure. Fig. 7 is a side elevation, partly in section, of modified form of apparatus for practicing my invention. Fig. 8 is a vertical sectional view thereof partly in elevation. Fig. 9 is a view in perspective of an alloy-bar of a form appropriate to the practice of the invention. Fig. 10 is a view in perspective representing a series of alloys in the form of pigs, also produced in accordance with the invention. Figs. 11, 12, 13, and 14 are diagrammatic views indicating the relative proportions or percentages of constituent metals in certain alloy bars or pigs produced by the practice of the invention.

Similar letters of reference indicate similar parts throughout the several views.

Preliminarily to a more detailed description it may be stated that in the practice of my invention I employ at a suitable height or elevation a tank or reservoir containing in separate compartments the metals from which the alloy bars or pigs are to be made, each compartment being provided with an outlet or discharge opening. The metals flow from the tank or reservoir into a mixing-chamber, wherein they become thoroughly commingled or combined, and from said chamber they discharge into the casting-mold, which in some instances will be of form suitable to produce a continuous integral alloy-bar and in other instances adapted to produce a series of alloy-pigs. In either case the relative proportions of constituent metals vary in a predetermined manner from one section to another of the bar or from one pig to another of the series.

In the form of apparatus shown in Figs. 1 to 6, A represents a suitable supporting-base mounted on standards B, and C represents a supply tank or reservoir arranged at a convenient height and mounted upon supports D, the lower ends of which are secured to the base or platform A. The tank is held in place upon the brackets by means of bolts *b*, passing through the brackets from beneath and entering the tank from the bottom at near the forward end thereof. The said bolts *b* also serve to secure to the bottom or under side of the tank, at a suitable distance apart, two short strips or sections *c c* of metal, having horizontal flanges *d d*, which constitute a support for the mixing device, specifically referred to hereinafter.

The tank C in the present instance is di-

vided by a partition into two compartments *e e'*, each compartment being provided with a discharge-opening *g*, formed in the detachable front wall *h* of the tank, said openings discharging the metals directly from the bottom *i* of the tank, as shown in Figs. 5 and 6.

In some instances in the operation of my invention it is desirable that the flow of the metals through the outlets *g* be suddenly and completely cut off at intervals, and for this purpose I provide for each of said outlets a vertically-operating gate H, moving in vertical guides *k*, secured to the outer face of the front wall *h* of the tank by means of screws *l* or their equivalent. The said gates are each provided with an operating-handle *m*, and each gate is provided with a vertical slot *o*, through which passes a screw *p*, which enters a threaded opening therefor in the wall *h*. The shanks of the said screws are enlarged at *q* to overlap the edges of the vertical slots *o* in the gates, and each shank is provided also with a handle *r*, by means of which the same may be turned in either direction. The screws, therefore, serve as set-screws to securely lock the gates in any position to which they may be raised. In conjunction therewith I preferably serrate the inner surfaces of the gates at *s* and employ spring-pawls *t* for engaging said serrations, said serrations serving as a convenient indication of the height to which the gates have been raised and holding them temporarily until the set-screws are applied. It is also evident that on releasing the set-screws the gates can be readily and speedily moved down to close the outlets *g*.

It is further desirable in some instances to limit the possible upward movement of the gates, and for this purpose I provide adjusting-screws *u*, working in a frame *v*, secured to the upper surface of the wall *h* of the tank. (See Figs. 5 and 6.) By properly adjusting the said screws in the frame the said gates cannot be raised beyond a certain limit, the screws serving as appropriate stops or abutments.

In order to carry out the primary object of my invention, it is essential that the metals be mixed or combined in constantly and reciprocally varying percentages or proportions as they leave the tank, and to attain this end I provide means (operating during the discharge of the metals from the outlets *g*) for gradually closing one of said outlets and correspondingly opening the other.

The means for effecting the gradual opening and closing of the two outlets *g* simultaneously consists of a slide M, moving transversely across said outlets, which slide is provided with an elongated orifice within which projects a small plate or block *x*, secured to the front of the tank by screws *x'*. This plate serves as a stop to limit the movement of the slide M in either direction and also to divide the elongated slot into two ports *w* and *w'*, which are adapted to register with the outlets from the respective compartments of the tank C, when said slide is in mid-position, as indicated in Fig. 3. The slide M is retained in position by two angle-plates *y y'*, also secured to the front face *h* of the tank.

The slide M can be operated in a variety of ways; but as a simple and effective means therefor I secure to the outer face of the same, at or near the end, a toothed rack a^2, which is engaged by a toothed pinion b^2, carried by a vertical shaft N, which near its lower end turns in a sleeve or bearing N', formed at the lower end of a pendent arm or bracket O, which at its upper end is secured to the under side of the tank A. The upper part of the said vertical shaft turns in bearings d^2 d^3, above and below the pinion b^2. At its lower end the vertical shaft N is provided with a beveled gear-wheel P, which is engaged by a beveled pinion P', carried at the inner end of a main operating-shaft Q, which is provided at its outer end with an operating crank or handle Q'. Said shaft Q is supported in bearings R R, secured to the base or platform A, and it is evident that by turning the same in one direction or the other the slide M will be moved accordingly. The shaft Q also carries a large pinion S, engaging a toothed rack S' for operating the movable bed-plate T or mold-carrier, which carries the mold in which the alloy bars or pigs are formed. This feature of the apparatus will be more fully explained hereinafter.

The mixing device hereinbefore referred to consists, preferably, of one or more mixing-compartments F' F^2 F^3, which are in communication with each other and the lower end of which empties or discharges into the mold beneath. Said mixing device may be constructed in various ways; but preferably I form the upper compartment F' substantially oval or elliptical in top plan and contracted or reduced in size at its lower end, forming a neck portion f^2, substantially circular in shape and having a passage g^2, through which the mixed metals pass into the next lower compartment F^2 below. The said section or chamber F' of the mixing device is provided with a horizontal partition f^4, having openings, as shown. The metals flow upon this plate from the openings *g* in the tank and thence pass through the partition, as indicated by the arrows in Figs. 4 and 5. As a means for supporting the mixing device in proper position beneath the openings *g*, I provide the said section F' thereof with lugs or offsets g^6 at opposite points, and these lugs are slipped over the flanges *d d* of the metal sections *c c* on the under side of the tank. In some instances the said compartment F' can be used alone; but preferably I employ the additional compartments to insure the thorough mixing of the metals. Compartment F^2 of the mixing device is substantially the same in construction as F', excepting that the body

of the same is circular in top plan. It is formed with a similar neck f^3, having a passage g^3, and it is similarly provided with a perforated spreading plate or partition f^5. The compartment F^2 is secured to the neck f^2 of the upper section by means of set-screws f^8. The third and lowermost compartment F^3 of the mixing device is precisely the same in construction as the section F^2, and it is secured to the latter by means of set-screws f^9. It has a passage g^4, discharging the metal into any suitable mold. The said passage g^4, as will be observed on reference to Fig. 5, is made quite narrow in one direction, so as to deliver the mixed metals to the mold to greater advantage. The metals flowing into F' from the tank will pass successively into F^2 and F^3, as shown by the arrows, and in this way will become thoroughly mixed. It will be understood that the metals will pass through the outlet-passage g^4 of the lower chamber F^3 in substantially the same constantly-varying proportions in which they leave the outlet-openings g of the tank.

The movable bed-plate T, as hereinbefore mentioned, is provided with a toothed rack S', engaged by the pinion S for moving the said bed-plate back and forth beneath the outlet g^4. Said bed-plate is provided with wheels which travel on the rails x^{21}, secured to the base A, and from the construction and arrangement shown it will be seen that when the shaft Q is turned the bed-plate will be moved, as will also the slide M for varying the metal-discharge.

I may obtain the castings in the form of pigs, such as are shown in Fig. 10, in which case I secure in place upon the bed-plate the mold V (shown in Figs. 1, 2, 3, 5, and 6) and which is formed with a series of cavities V', which receive the metal as the bed-plate is moved beneath the mixer. To prevent the metals from flowing out at the ends of the mold-beds or cavities V', I arrange along each side of the mold a plate W, which is flanged at W' and secured to the bed-plate. Said plates effectually close the ends of the mold-cavities in an obvious manner and they also hold the mold in place upon the bed-plate. I also provide in the top of the bed-plate additional screw-holes x^2 x^2, so that the said plates W can be readily brought closer together and secured in place whenever it is desired to employ a narrower mold V than the one herein shown. Also secured to the bed-plate, some distance to one side of the mold, is an additional plate W^2, which is in position to serve a similar purpose for very wide molds.

In order to obtain the casting in the form of a single bar Z—as indicated, for instance, in Figs. 4^d and 9—I lay a flat metal strip Z^2 upon the movable bed-plate, which fits snugly between the two side plates W^3, (shown in Fig. 4,) which side plates W^3 extend above the upper surface of the strip Z^2, as shown, and also at each end of said strip a similar but shorter plate W^5, Fig. 4^e, is employed to confine the metal on the strip Z^2 at the ends thereof. In this way a continuous mold is formed on top of the strip Z^2, into which the combined metals flow during the movement of the bed-plate beneath the outlet g^4 of the mixing-device, and the casting produced is of the bar shape represented in the figures already referred to.

Having described one form of apparatus adapted for the practice of my invention, I will now briefly describe several ways in which the same can be operated. The compartments of the tank A are first filled or partially filled with the fluid metals to be alloyed—for instance, copper and zinc—the gates H having previously been forced down to completely close the discharge-openings g of said compartments. The mold V, Figs. 1, 2, 3, 4, 5, and 6, is also moved by the bed-plate into proper receiving position beneath the outlet g^4 of the mixing device F, so that the foremost cavity V' thereof shall receive the first or initial quantity of the combined metals, while as the bed-plate is moved forward by turning the crank Q' the remaining mold-cavities will be successively filled in regular sequence. The proper rate of speed at which to move the bed-plate is determined by the rapidity with which the metal flows through the mixer, and the rate of flow of the metals from the tank is of course governed partly by the discharge capacity of the outlet g and partly by the rate of movement of the slide M. The mold being in place and the gates down, as explained, the slide M should be at about the position indicated in Fig. 4—that is to say, with the outlet for the copper completely closed and the outlet for the zinc open to its full capacity, or to the maximum capacity to which it may be limited when the gate therefor is opened. If at the time of starting the said slide M is not in the position indicated, then it should be so placed by the operator, which can readily be done by hand after slightly lifting the shaft N to disengage the pinion b^2. Everything being thus in readiness, the gates H H are quickly raised to the extent permitted by the adjusting-screws u therefor, and the shaft Q is started into motion. As soon as the gates are raised the fluid zinc begins to flow in a full stream, but the slide M having immediately started to move across the outlets, the said stream is gradually cut off or diminished in size. At the same time the outlet g for the fluid copper is gradually opened, and thus this metal is caused to flow out in a stream of gradually-increasing size. In this way the two metals are caused to flow into the mixing device, respectively, in gradually diminishing and increasing proportions, and they also flow through the mixer and are deposited in the mold-cavities in substantially the same proportions from end to end of the mold. After the slide M has reached the limit of its movement in one direction the outlets g are cut off by the gates long enough to permit the emptying of the pigs from the mold or until a new mold is placed into position upon the bed-plate, whereupon the same

operation can be repeated reversely by merely turning the crank or handle Q′ in the opposite direction. A series of alloys thus cast in the form of pigs will have varying proportions or percentages of the two metals, and each pig or alloy will have a different proportion from the others.

With the alloy bar Z, Fig. 4[d], produced by the mold shown in Fig. 4, the same variation in the proportions of the two metals is found to exist from end to end of the bar. In this connection reference is made to the diagrammatic views Figs. 11, 12, 13, and 14, which indicate such variations by scale-degrees. In Fig. 11 the casting of the bar is supposed to have been started with the outlet for the zinc closed and the outlet for the copper open to its maximum capacity. Thus in a bar having twenty equal divisions, each subdivided into five equal subdivision or degrees, we have at zero no zinc and one hundred per cent. of copper. At the first degree of the first division of the scale there are found one per cent. of zinc and ninety-nine per cent. of copper; at the second degree, two per cent. of zinc and ninety-eight per cent. of copper, and so on to the other end in the same relatively diminishing and increasing ratio. In Fig. 12 the same variations are shown with the order of the metals reversed. In Figs. 13 and 14 three metals (Cu, Zn, and Au) are represented with corresponding variations. For the production of these latter bars it is obvious that it will be necessary to provide an additional metal receptacle and a discharge-opening therefor in the slide that is common to all.

In Figs. 7 and 8 I have shown a modification of my invention wherein I employ a rotary mold-carrier supporting a series of molds in which alloy pigs are cast. In this modification the operation of the parts is automatic and the pigs are successively discharged from the molds into a hopper or other suitable receptacle therefor. Referring to the figures, 30 indicates a base which is provided with a longitudinal opening 31 and which is supported in a raised position by means of the legs 32. The rotary mold-carrier comprises two disks or rings 33, each having a central hub and radial spokes, the two rings being mounted upon a revolving shaft 36 and adjustably secured thereon by means of set-screws 37. The shaft is operated in any suitable way and is supported in bearings 38 at the upper ends of vertical supports 39. The same rings are each formed concentrically with corresponding openings 41, and passing through each of said openings is a pin 42, each provided at its outer end with a crank 43. Corresponding pins 42 of each ring are secured at their inner ends to the opposite ends of molds 44, in which the alloy pigs are cast. The said molds are each so suspended between the rings as to have a free swinging motion, and they are thus rendered self-adjusting in conformity with the constantly-changing portions into which they are brought by the revolution of the rings. At each half-revolution of the said rings each of the molds is tilted upside down, so as to discharge its contained pig, after which the mold resumes its former position and is carried on to be again filled with the fluid metals. Different means can be used for tilting the molds to discharge their contents, but preferably I employ beneath the base or platform 30 two stationary cams 46, which are secured at 47 to a cross-brace 48, connecting two of the supporting-legs of the base, which cams are each provided with an inclined surface 49. As each mold is carried around to the cams the cranks 43 ride upon the said inclined surfaces 49, and the mold is tilted upside down, whereupon the alloy 49[a] is discharged into the hopper or other receptacle 51, and the said mold is carried all the way over by the highest point of the cam and again resumes its upright position, as before.

The tank for the fluid metals is indicated at 52, and the same is held in position above the mold-carrier by means of supports 53, secured to the base or platform 30. The tank is the same as the one hereinbefore described and discharges into a mixer 56, which in turn discharges the metals in a mixed condition into the molds as the mold-carrier is revolved. In the presence instance, however, the gates H H are opened and closed automatically with the filling of each mold, to effect which I employ the following devices: Fastened concentrically to the outer side of each disk or ring 33 is a smaller ring 59, having on its circumference a continuous series of raised surfaces or cams 65, the edges of which are slightly inclined in opposite directions, with intervening notches 66.

Working in suitable guides 67, secured to the front of the tank, is a vertically-movable frame or yoke 68, which is spread so as to bring the two ends thereof in proper position to be engaged by the cams 65, while the upper cross-piece 70 of said frame comes directly beneath pins or projections 71 on the front faces of the gates near the upper edges of the latter. The lower ends of the said movable frame are each provided with a small roller 72, which rollers ride the two series of cams. It is evident that as the rings 33 are revolved the frame is given a rising-and-falling motion and the gates are raised and lowered therewith, it being understood that the gates are permitted to fall by their own weight in the guides 73 therefor arranged on the front of the tank. It will be noted that when a mold has been brought into position for filling the bottom of said mold is directly over one of the notches 66, while the cam 65, which succeeds said notch, has raised or lifted the gates to their highest position. As the motion of the rings is continued the frame is lowered into the next notch, and the gates are closed until the next mold is brought into position, and thus is the operation adapted to be carried on continuously. The revolution of the rings can be easily regulated or timed

in manner to prevent flooding of the molds, and when it is desired to use molds of smaller size the rings 33 are merely moved closer together by releasing and afterward resetting the set-screws 37.

In the present modification of my invention the movable slide M, together with its actuating-shaft N and the rack-and-gear connections between the two, all operate substantially in the same manner as that hereinbefore described; but in the present instance I employ means for reversing the movements of said parts automatically without reversing the motion of the main operating-shaft. Said means consist, preferably, of a sleeve 74, movable lengthwise on the shaft 36 and having a spline fitting a longitudinal groove 75 in the shaft, by which the said sleeve is caused to turn with said shaft. The sleeve is provided with two beveled gear-wheels 76 77, adapted to engage the beveled gear-wheel 78 on the lower end of shaft N, and the said shaft N will be made to revolve in one direction or the other, according to which one of the movable gears is in engagement with said gear-wheel 78. Pivoted at 81 is a lever 82′, the lower bifurcated end of which embraces the outer end of sleeve 74 between two collars or flanges 79 thereon, and normally the said lever is in a substantially vertical position with one of the gears on the sleeve in engagement with gear-wheel 78. Now to reverse the motion of shaft N, and consequently to change the direction of movement of slide M, it is merely necessary to move the lever to shift the sleeve 74, and this is done automatically each time that the slide M reaches the limit of its travel in either direction. Thus that one of the cam-rings 59 adjacent to the lever is provided on its outer side with a cam-groove 82, beginning at 83, say, and extending around and ending at the diametrically opposite point 84, and said cam-groove is for the purpose of engaging or operating upon the inner end of a movable rod 85, supported and guided in a bearing 86 and provided with a spring 87, exerting its tension between the inner end of said bearing and a nut 88 on the rod. Said rod at its outer end is connected to the lever 82′ by means of a collar 82^a, having a set-screw. The tendency of the spring is to force the inner end of the rod against the side of the ring 59, and the rod is provided with a roller 89, which moves upon the surface of the said ring during one half-revolution of the mold-carrier and upon the bottom surface of the cam-groove during the remaining half-revolution of said carrier. Therefore during the time the inner end of the rod 85 is in contact with the flat surface of the ring 59 the lever 82 will be substantially in the position shown and one of the gears 76 77 will be in engagement with gear-wheel 78 to operate shaft N to move the slide M in one direction across the outlets *g* of the tank. By the time the said slide has reached the limit of its movement in this direction the cam-groove will receive the roller 89 on the rod 85 and the sleeve 74 will be at once shifted to change the gear connection with shaft M. This reverses the motion of said shaft, and consequently reverses the movement of the slide.

Referring back to the construction first described, it may be stated that instead of allowing the gates H to remain open during the casting of an entire set or series of pigs the same can be quickly shut down by hand each time a mold-cavity is filled, and then when the bed-plate has been moved to bring the next succeeding cavity into proper position for filling the gates can be again lifted to the extent permitted by their adjusting devices. This operation can be carried on in a manner to exactly correspond with the automatic opening and closing of the gates explained in connection with the modification in Figs. 7 and 8, wherein the vertically-moving frame is used for thus operating the gates.

Having thus described my invention, what I claim is—

1. In an apparatus for making alloys, a series of receptacles for molten metals, each having a discharge-outlet, and means for gradually and inversely varying the discharge of metals from said outlets.

2. In an apparatus for making alloys, a series of receptacles for molten metals, each having a discharge-outlet, and means for gradually and simultaneously opening one outlet, and closing the other during the discharge of the metals therefrom.

3. In an apparatus for making alloys, a series of receptacles for molten metals, each having a discharge-outlet, means for gradually and inversely varying the discharge of metals from said outlets, and a mold for receiving the metals discharged.

4. In an apparatus for making alloys, a series of receptacles for molten metals, each having a discharge-outlet, means for gradually and simultaneously opening one outlet and closing the other during the discharge of the metals therefrom, and a mold for receiving the metals discharged.

5. In an apparatus for making alloys, a series of receptacles for molten metals, each having a discharge-outlet, means for gradually and inversely varying the discharge of metals from said outlets, and a mixing vessel receiving the discharge.

6. In an apparatus for making alloys, a series of receptacles for molten metals, each having a discharge-outlet, means for gradually and inversely varying the discharge of metals from said outlets, a mixing vessel receiving the discharge, and a mold for receiving the commingled metals.

7. In an apparatus for making alloys, a series of receptacles for molten metals, each having a discharge-outlet, means for gradually and inversely varying the discharge of metals from said outlets, a mixing vessel receiving the discharge, and a mold for receiving the commingled metals, said receptacles and said mold having relative movement.

8. In an apparatus for making alloys, a plurality of receptacles for molten metals, each having a metal-discharging outlet, means for shutting off such outlets at intervals, and additional means for gradually and simultaneously opening one outlet and closing the other during the discharge of the metals therefrom.

9. In an apparatus for making alloys, a plurality of receptacles for molten metals, each having a metal-discharging outlet, means for shutting off the outlets of one or both metals at will, and additional means for gradually and simultaneously opening one outlet and closing the other during the discharge of the metals therefrom.

10. In an apparatus for making alloys, a plurality of receptacles for molten metals, each having a metal-discharging outlet, means for shutting off such outlets at intervals, means for varying the maximum discharge capacity of the outlets, and means for gradually and simultaneously opening one outlet and closing the other during the discharge of the metals therefrom.

11. In an apparatus for making alloys, a plurality of receptacles for molten metals, each having a metal-discharging outlet, means for shutting off such outlets at intervals, means for gradually and simultaneously opening one outlet and closing the other, during the discharge of the metals therefrom, a mixing vessel receiving the discharge, and a mold receiving the combined metals from said mixing vessel.

12. In an apparatus for making alloys, a plurality of receptacles for molten metals, each having a metal-discharging outlet, means for shutting off such outlets at intervals, means for gradually and simultaneously opening one outlet and closing the other, during the discharge of the metals therefrom, a mixing vessel receiving the discharge, and a mold receiving the metals in a combined state from the mixing vessel, said vessel being divided horizontally by a partition having openings for the passage of the metals.

13. In an apparatus for making alloys, a plurality of receptacles for molten metals, each having a metal-discharging outlet, means for shutting off such outlets at intervals, means for gradually and simultaneously opening one outlet and closing the other, during the discharge of the metals therefrom, a mixing vessel receiving the discharge, and a mold receiving the combined metals from the mixing vessel, said vessel comprising a series of chambers or sections each divided horizontally by a partition having openings for the passage of the metals.

14. In an apparatus for making alloys, a plurality of receptacles for molten metals, each having a metal-discharging outlet, means for shutting off such outlets at intervals, means for gradually and simultaneously opening one outlet and closing the other, during the discharge of the metal therefrom, a mixing vessel receiving the discharge, and a mold receiving the combined metals from the mixing vessel, said vessel comprising a series of chambers or sections detachably connected together, and each divided horizontally by a partition having openings for the passage of the flowing metals.

15. In an apparatus for making alloys, a plurality of receptacles for molten metals, each having a metal-discharging outlet, means for shutting off such outlets at intervals, means for gradually and simultaneously opening one outlet and closing the other, during the discharge of the metals therefrom, a mixing chamber or vessel receiving the discharge, and a movable bed-plate having a mold into which the combined metals are discharged from said mixing vessel.

16. In an apparatus for making alloys, a plurality of receptacles for molten metals, each having a metal-discharging outlet, vertically-moving gates for shutting off such discharge at intervals, and means for gradually and simultaneously opening one outlet and closing the other, during the discharge of the metals therefrom, a mixing-chamber receiving the discharge, and a movable bed-plate having a mold into which the combined metals are discharged from said mixing vessel.

17. In an apparatus for making alloys, a plurality of receptacles for molten metals, each having a metal-discharging outlet, means for shutting off such outlets at intervals, and a movable slide for gradually and simultaneously opening one outlet and closing the other, during the discharge of the metals therefrom, a mixing vessel or chamber receiving the discharge, and a movable bed-plate having a mold into which the combined metals are discharged from said mixing vessel.

18. In an apparatus for making alloys, a plurality of receptacles for molten metals, each having a metal-discharging outlet, vertically-moving gates for shutting off such outlets at intervals, means for engaging and holding the gates to any position to which they may be brought, and means for gradually and simultaneously opening one outlet and closing the other during the discharge of the metals therefrom.

In testimony whereof I affix my signature in presence of two witnesses.

ELMER GATES.

Witnesses:
D. CLAUDE,
J. HILLING.