No. 729,754. PATENTED JUNE 2, 1903.

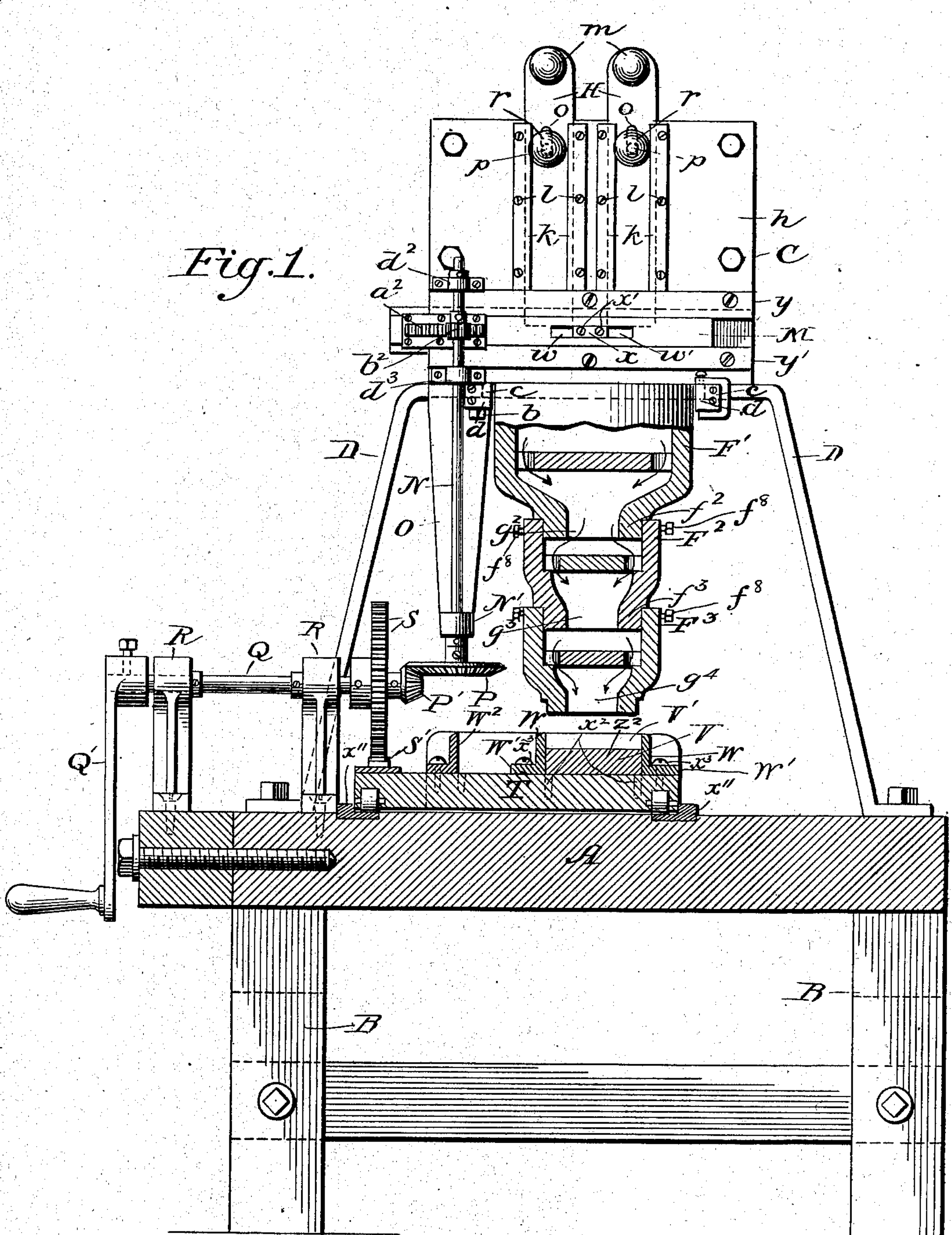
E. GATES.

METHOD OF CASTING ALLOYS.

APPLICATION FILED JAN. 13, 1903.

NO MODEL. 2 SHEETS—SHEET 1.

Fig. 1.



Witnesses:
Chas. J. O'Neill
J. E. Hutchinson Jr.

Inventor:
Elmer Gates,
by Pennie & Goldsborough,
Attys

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

E. GATES.

METHOD OF CASTING ALLOYS.

APPLICATION FILED JAN. 13, 1903.

NO MODEL. 2 SHEETS—SHEET 2.

Fig. 3.

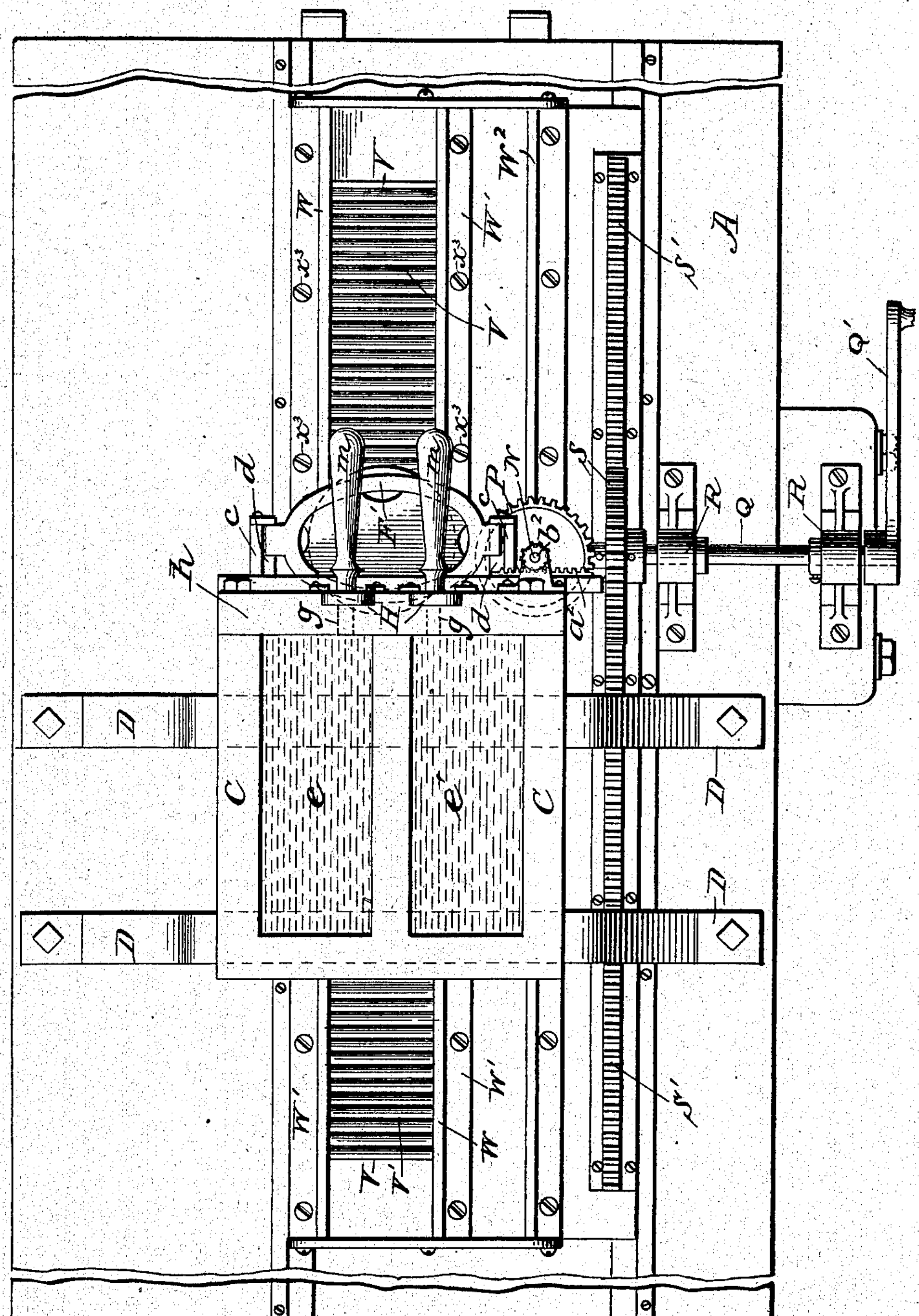


Fig. 2.

Witnesses:
Chas. J. O'Neill
J. E. Hutchinson Jr.

Inventor:
Elmer Gates,
by Pennie & Goldsborough,
Attys.

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

No. 729,754. Patented June 2, 1903.

UNITED STATES PATENT OFFICE.

ELMER GATES, OF CHEVY CHASE, MARYLAND, ASSIGNOR TO THEODORE J. MAYER, OF WASHINGTON, DISTRICT OF COLUMBIA.

METHOD OF CASTING ALLOYS.

SPECIFICATION forming part of Letters Patent No. 729,754, dated June 2, 1903.

Application filed January 13, 1903. Serial No. 138,814. (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, county of Montgomery, State of Maryland, have invented certain new and useful Improvements in Methods of Casting 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.

My invention relates to the production of alloys, and has for its object to provide a method of producing a series of alloys in the form of an integral bar or of a series of small ingots, exhibiting in succession combinations of two or more metals selected for the purpose, varying in the relative proportions of the constituent metals, whereby at a minimum expenditure of time and labor and at a 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 carrying out my invention I mix the metals from which the alloy bars or pigs are to be made while they are flowing from suitable tanks or reservoirs on the way to the molds, and in this mixing operation it is essential that the metals be combined in constantly and reciprocally varying percentages or proportions. To this end I find it desirable to 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 accompanying drawings, Figures 1 and 2 illustrate one form of apparatus for carrying out my improved method, and Fig. 3 is a diagrammatic view indicating the relative proportions or percentages of constituent metals in alloy bars or pigs produced by the practice of the invention.

In the form of apparatus shown in Figs. 1 and 2, 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 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 divided 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 of the tank.

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.

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 and formed with ports w and w', which are separated by a small plate x, secured to the front of the tank by screws x', as shown, and serving as a stop for limiting the movement of the slide in either direction. The slide is guided by two angle-plates y y', also secured to the outet face of the wall 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 C. 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 one 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 having openings, as shown. The metals flow on this plate from the openings g in the tank and thence pass through the partition. 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. 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^8. It has a passage g^4, discharging the metal into any suitable mold. 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'', 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, in which case I secure in place upon the bed-plate the mold V (shown in Figs. 1 and 2) 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 by screws x^3. 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, arranged closer together than the screws x^3, 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, I lay a flat metal strip upon the movable bed-plate, which fits snugly between the two side plates W, (shown in Fig. 2,) which side plates W 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 is employed to confine the metal on the strip at the ends thereof. In this way a continuous mold is formed on top of the strip, 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.

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 and 2, 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 plate is moved forward by turning the crank O 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 in position to close outlet w and open outlet w'. 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 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 caued 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 in 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 produced by the modified mold referred to above 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, Fig. 3, which indicates such variations by scale degrees. 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 subdivisions 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 is 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.

Having thus described my invention, what I claim is—

The method of producing a succession of alloys varying in relative proportions of the constituent metals, which consists in causing streams of the melted component metals to intermingle, one of said streams gradually increasing while the other gradually decreases, thereby producing a combined stream correspondingly varying in relative proportions of the component metals from the beginning to the end of the casting operation, and finally casting said combined stream to produce a product corresponding to the rate of flow, substantially as described.

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

ELMER GATES.

Witnesses:

EDWIN S. CLARKSON,

JOHN C. PENNIE.