No. 778,789.

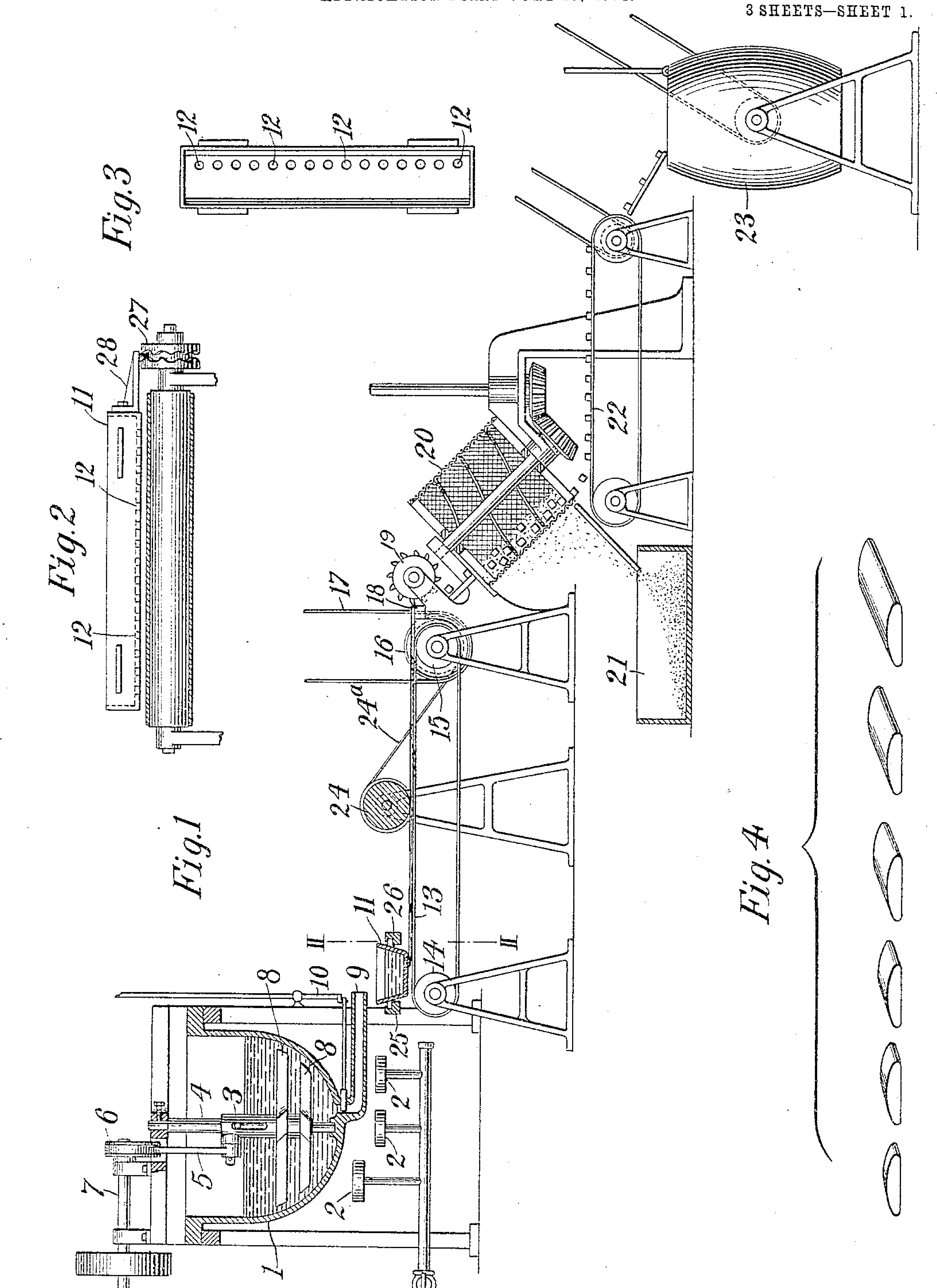
PATENTED DEC. 27, 1904.

C. A. MEADOWS.

METHOD OF PREPARING METALLIC MIXTURES FOR PRINTERS' TYPES, BEARINGS, &c.

APPLICATION FILED JULY 15, 1904.

3 SHEETS—SHEET 1.

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3 SHEETS—SHEET 2.

Fig. 5

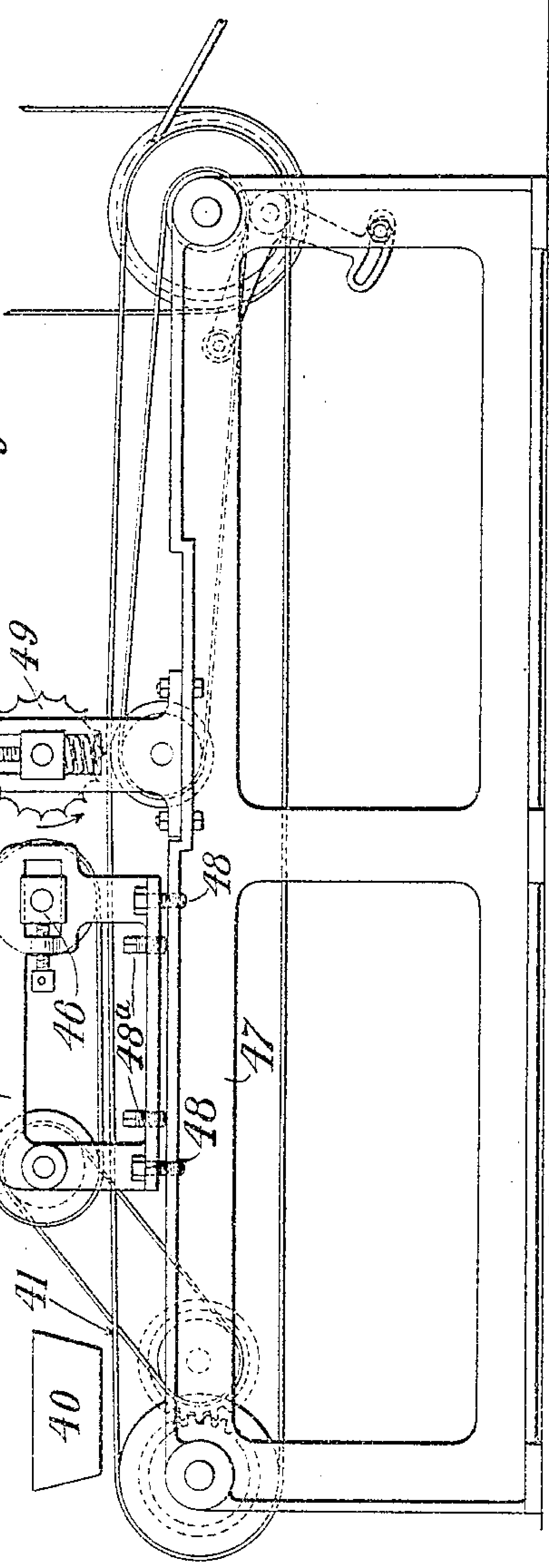


Fig. 7

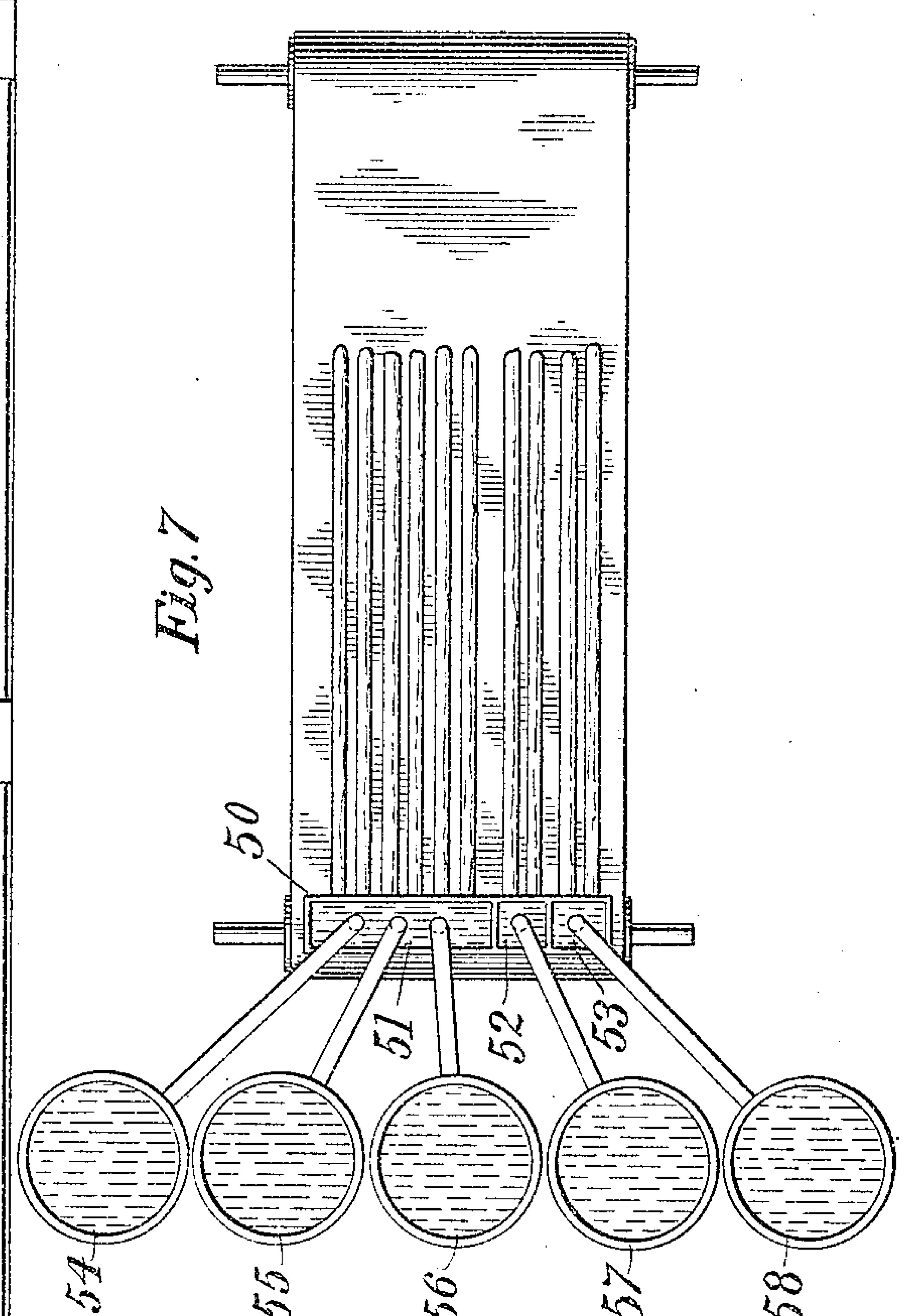


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Fig. 8

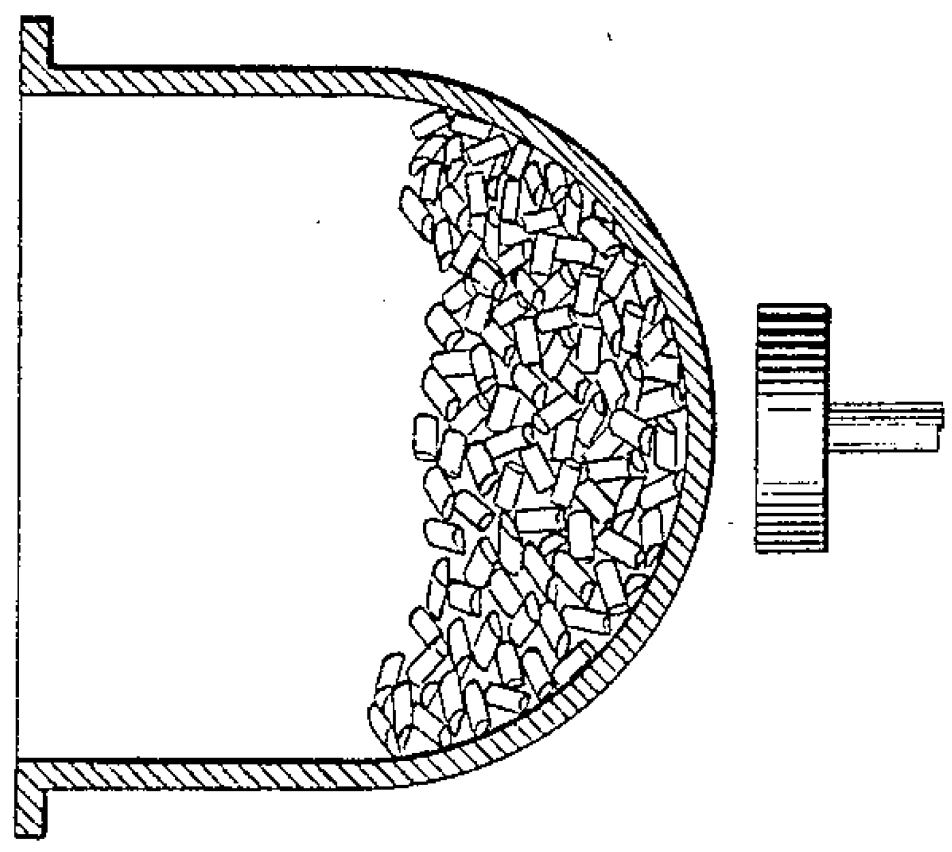


Fig. 9

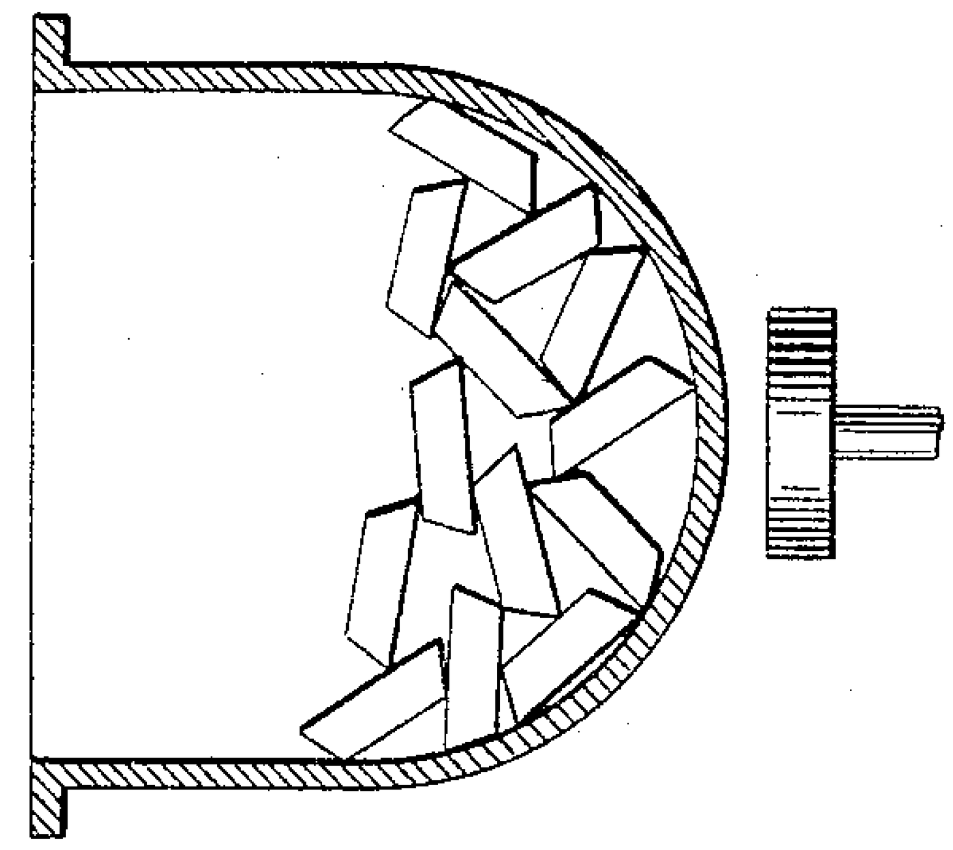
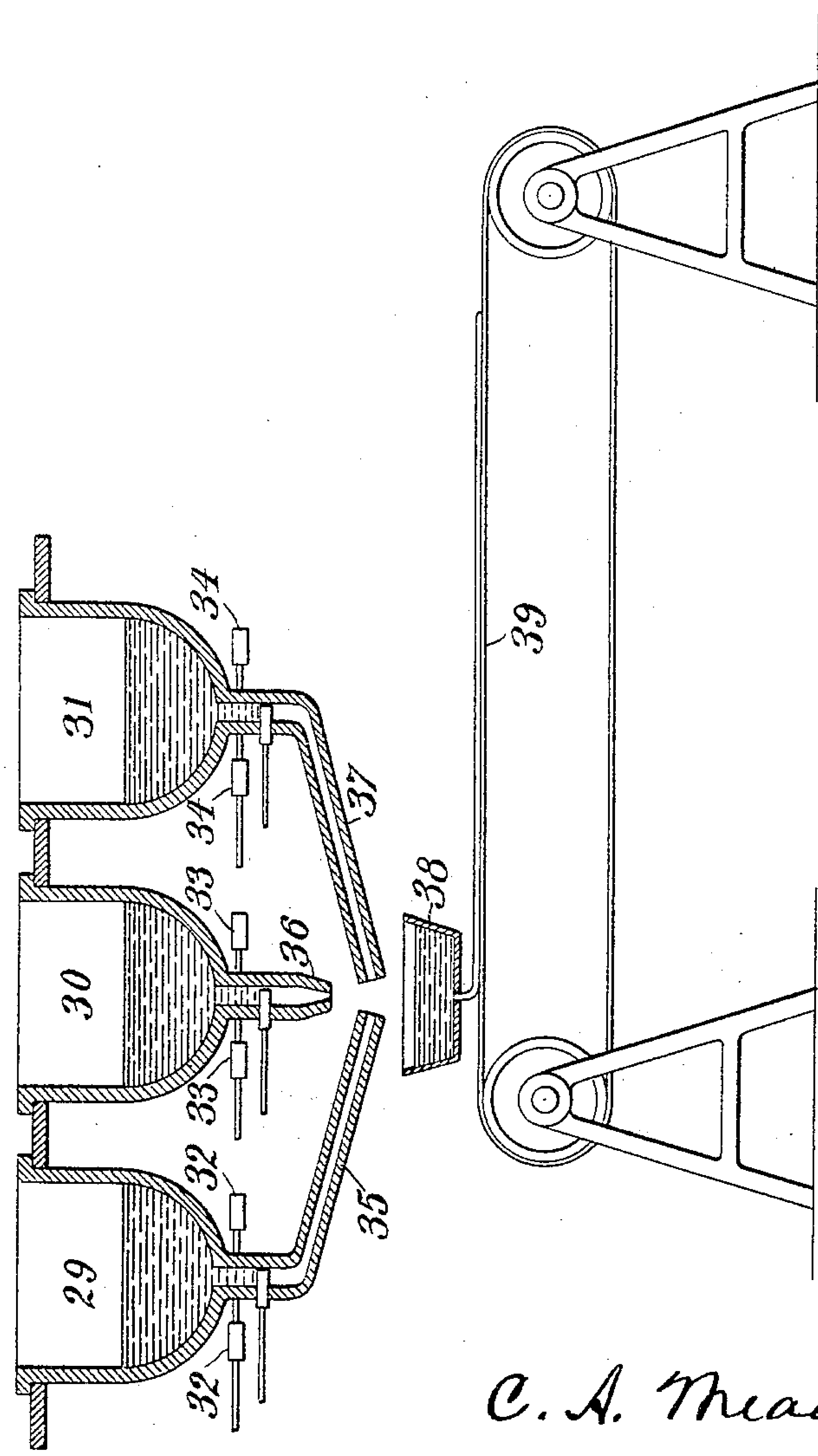


Fig. 6

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# UNITED STATES PATENT OFFICE.

CHARLES A. MEADOWS, OF YONKERS, NEW YORK, ASSIGNOR TO UNITED STATES ALLOY COMPANY, OF JERSEY CITY, NEW JERSEY, A CORPORATION OF NEW JERSEY.

## METHOD OF PREPARING METALLIC MIXTURES FOR PRINTERS' TYPES, BEARINGS, &c.

SPECIFICATION forming part of Letters Patent No. 778,789, dated December 27, 1904.

Application filed July 15, 1904. Serial No. 216,753.

*To all whom it may concern:*

Be it known that I, CHARLES A. MEADOWS, a citizen of the United States, residing at Yonkers, in the county of Westchester and State of New York, have invented certain new and useful Improvements in Methods of Preparing Metallic Mixtures for Printers' Types, Bearings, and General Commercial Uses, of which the following is a specification, reference being had to the drawings accompanying and forming part of the same.

My invention relates to the manufacture of metallic alloys and mixtures for the well-known purposes for which they are used in the arts. Alloys are artificial mixtures of two or more metals combined while in a state of fusion, such as bronze, composed of copper and tin, or type-metal, composed of lead and antimony. Others—as, for example, the brasses, solders, gun and bell metals, &c.—might be mentioned. The constituent metals used in the various alloys are numerous, among which are lead, tin, antimony, bismuth, zinc, copper, nickel, aluminium, magnesium, &c. In every case the character of the alloy is determined not only by its qualitative composition, but also by the relative proportions of its constituents.

In compounding alloys great difficulty has been experienced in securing the most important characteristic—namely, that of uniformity of homogeneity of composition. This is due to the fact that the mixed molten metals tend to separate rather than to unite. This tendency results from a lack of affinity between the metals, producing eutectiferous alloys, which solidify selectively, and also from differences of specific gravity. For example, lead has a higher specific gravity than antimony or tin and will in consequence sink to the bottom of the fluid mass. Even where the metals have been very thoroughly agitated in the molten state they have ample opportunity for separating in greater or less degree in the mixing vessel after the agitation has ceased in the pouring-ladle or during the cooling of the bricks or pigs in which the alloy is cast. Even a slight variation in the formula causes the greatest differences in the points of fusion and solidification, wearing qualities, texture, and general characteristics of these alloys. The efficiency of a machine depends to a considerable extent upon the evenness of its operation and smooth-running bearings, and durable frictionless journal-boxes contribute greatly to this result. It will therefore be readily seen that non-uniformity of composition in these alloys seriously impairs their usefulness or even renders them worthless for particular purposes. Examples of the evils resulting from such defects may be observed in linotype and analogous machines, in stereotype and electrotype metals, and in metals for engraving and etching, in all of which uniformity of composition is of the greatest importance. In such machines as the linotype a supply of molten metal is maintained, from which the slugs or type are cast. As previously noted, variations in the quantative constitution of an alloy affect its melting and solidifying points, so that a temperature in the pot just sufficient to melt one lot of metal may be considerably higher than that sufficient to melt the next addition of cold metal unless the latter be of the same composition as the former. The melting and solidifying points thus become uncertain, and hence it frequently happens that the temperature is allowed to become too high and the molten metal is overheated. This condition is responsible for the production of bad slugs, as the overheated metal has not time to lose its excess heat in the mold and only part of it is solidified by the time the slug is ejected. The uncongealed metal runs back into the pot, leaving a slug resembling a sponge or honeycomb in structure. Such slugs are crushed or distorted in locking up the form or break down under the pressure of printing. Furthermore, this overheating is also injurious to the delicate and costly matrices from which the letters are cast, and frequently other parts of the machine are also damaged from the same cause.

None of the disadvantages incident to non-uniformity of composition are found in metal prepared according to my invention by which the constituents of the mixture are distributed with substantial uniformity throughout the mass. The result is that each lot of metal is the same as every other, and articles cast from one lot will be the same in quality as those cast from another.

The method consists, essentially, in mixing the constituent metals in the molten state, then forming the resultant product into small solid blocks or pieces of any convenient form or size, and finally thoroughly commingling or intermixing the small solid blocks or pieces.

I prefer to prepare my metal by first mixing the constituents in the molten condition but the pure molten constituents may be formed into small solid pieces or bits and these pieces or bits of pure metal commingled so that the constituents of the mixture are evenly distributed throughout the mass or charge. I have found that after melting such a charge very little, if any, stirring or agitation is needed to produce an alloy admirably suited for casting. The constituent metals I have found to be well distributed in the molten mass and in castings made therefrom. This I attribute to the fact that the metals were uniformly distributed before melting. The bits or pieces of pure metal are small and when melted unite or mix more readily with the contiguous melted bits of different metal than where large masses of pure metal are melted together and mixed or where large masses are melted separately and then poured together and mixed. In other words, the production of homogeneous alloy is greatly facilitated by bringing the solid constituents thereof into close contact at a great many points throughout the mass. This condition is secured in the highest degree by mixing the metals in the form of small solid pieces or particles, as above described. Another advantage of great importance in metal prepared according to my method resides in what may be termed its "flexibility." By adding solid particles of metal of different composition the composition of the mass or charge may be varied at will. For example, having an alloy or mixture in the form described, containing lead and antimony in certain proportions, if it is desired to vary the proportion of either metal this may be readily effected by adding and mixing therewith the proper quantity of particles of pure metal or particles of lead and antimony alloy containing the desired metal in a known different proportion. By adding a sufficient amount of either the composition of the resulting mixture, considered as a whole, will be made that desired. In this way the mixture may be readily varied at any time—a capability of considerable value to the user, who may thus prepare a metal best suited for a particular purpose.

For a more complete understanding of the essence of my invention, as well as certain details which are of value, reference may now be had to the accompanying drawings, which show convenient apparatus for practicing my method.

Figure 1 is a side elevation of such an apparatus, partly in section. Fig. 2 is a section on line II II of Fig. 1, showing more in detail the receptacle or pan from which the molten metal issues in thin streams. Fig. 3 is a plan view of the receptacle shown in Fig. 2. Fig. 4 is a view illustrating the small bits or blocks of metal which may be produced by the above apparatus. Fig. 5 shows in side elevation a machine for practicing certain details of my process, in which the streams of metal are cooled on their upper surfaces by a moving belt in contact therewith. Fig. 6 shows diagrammatically an apparatus in which modification the constituents of the alloy are separately melted and then mixed in the distributing-pan. Fig. 7 is a diagrammatic plan view of an apparatus for running out one or more pure metals simultaneously with a mixture or alloy of similar or different metals. Fig. 8 is a section of a melting-pot containing metal made by my method, showing how it packs; and Fig. 9 is a section of a pot containing large masses or bars, showing the considerable surface left in the midst of the connection, from which heat may radiate readily.

Referring now to Fig. 1, the constituents of the alloy are melted in a suitable pot or caldron 1, heated in any convenient way, as by gas-burners 2. In order to mix the molten metals thoroughly without imparting a rotary motion to the same and a consequent tendency to centrifugal separation, I prefer to use a reciprocating stirrer. In the figure the stirrer consists of a sleeve 3, mounted to slide on a standard 4 and connected by a pitman 5 to an eccentric 6 on the shaft 7. Revolution of the shaft will therefore reciprocate the sleeve, and the blades 8 thereon will thoroughly agitate the molten contents of the pot. The outlet-spout 9, controlled by any suitable valve devices, as 10, discharges the molten mixture into the distributing-pan 11. In the bottom of the pan is a series of apertures 12, from which the metal flows upon a belt or conveyer 13, preferably of steel, carried on drums 14 15. The latter are rotated by any convenient mechanism, as a pulley 16 and belt 17, connecting the same with the source of power. As the conveyer 13 moves forward the metal flows down upon the same through the apertures 12 and is carried forward in the form of streams. The size of the streams depends, of course, upon the size of the discharge-openings 12 and the speed of the conveyer. The streams of metal cool rapidly, and by the time the drum 15 is reached they have solidified into solid bars or strips. As the latter project over the edge of the shear-blade 18, a revolving cutter 19 cuts bits or pieces therefrom, the length of the same depending upon the distance between the knives and their speed of revolution. Pieces or bits of typical shape and various sizes are shown in Fig. 4. The severed pieces drop into a cleaning-cylinder 20 of wire-gauze, in which any rough edges or loosely-adhering flakes of metal are removed and discharged into a receptacle 21. The cleaned bits or blocks fall from the cylinder 20 upon a conveyer 22 and are carried to a commingling-barrel 23. When a suitable quantity of blocks or bits has accumulated in the barrel, the latter is closed and revolved until the pieces of alloy are thoroughly intermixed, after which the mass or charge is emptied out and is then ready for use.

It frequently happens, especially in the case of alloys containing zinc, that as the streams of molten alloy solidify a "frosting" makes its appearance on the top of the same. This, I believe, is due to selective solidification—a crystallization, as it were, of one of the constituents out of the alloy. Such formation of "frost" can be largely, if not entirely, prevented by buffing or rubbing the streams after they have been cooled to at least the plastic state. For this purpose I provide a rotary buffer 24, mounted over the conveyer 13 to bear on the metal streams and rotated by a belt 24ª from the shaft on which the drum 15 is carried. As the streams pass under the buffer the crystallizing or crystallized metal is rubbed down and the frosting is thus overcome. As shown in Figs. 1 and 2, the distributing-pan 11 is mounted on guides or rails 25 26, in which it is reciprocated endwise by a cam 27, engaging a pin or stud carried by an arm or extension 28 on the pan. This movement of the pan causes the streams of metal to take a wavy or sinuous form on the conveyer, as will be readily understood, so that the buffer 24 not only buffs the upper surfaces of the streams or bars, but also those parts of the surface of the belt which would always be covered by the bars if the latter were formed straight instead of wavy or sinuous. By properly proportioning the cam 27 and regulating its speed the sinuosities of the metal may be made such as to expose the entire surface of the conveyer in this manner as often as desired—that is, in one, two, or more complete passages of the conveyer under the buffer. The conveyer is thereby kept in a smooth and polished condition, insuring that the under surface of the metal bar will also be smooth and bright. The sinuous form of the bars or strips is also of advantage in causing the cutter-knives to be dulled less quickly. A straight bar would always strike the knife edge at the same point, whereas a wavy bar strikes the blade at a different point each time, thus distributing the work over a greater extent of the cutting edge. Another and in some respects more satisfactory method of preventing frosting of the bars is to cool the stream more equally on top and bottom. A convenient apparatus for this purpose is shown in Fig. 5. The distributing-pan is indicated by 40 and the conveyer by 41. Mounted above the latter is a belt 42, preferably of sheet-steel, carried on drums 43 44, supported in bearings in the frame 45. One or both of said bearings may be adjustable, as at 46, to give the belt 42 any desired tension. The frame 45 is adjustably mounted on the conveyer-frame 47 by means of screws 48 48ª to vary the pressure of the belt 42 on the streams of metal, and consequently the extent of the flattening of the same. The belt 42, pressing upon the fluid or semifluid metal, absorbs heat therefrom just as does the conveyer 41, so that both the upper and lower surfaces of the streams are cooled at the same time and practically to the same extent. The result is that no frosting separation occurs. The cutter 49 for dividing the metal into pieces or blocks may be located in the same place as in Fig. 1; but I have shown it in a position close to the belt 42, where it will operate on the streams while they are in a more or less plastic condition, so that the pieces will be "pinched" off, as it were, and take more or less a form corresponding to the contour of the cutter between its ribs or blades. Pieces produced in this manner are of more uniform shape than those produced by the apparatus of Fig. 1. From the conveyer 41 the pieces or blocks may be delivered to a mixing barrel or receptacle, as in the former case.

Instead of charging the pot 1 with solid metal the constituents of the alloy may be melted separately and then commingled in another vessel—as, for example, in the distributing-pan itself. In Fig. 6 I show diagrammatically an apparatus convenient for this purpose. The metals are melted in pots 29 30 31, heated by gas-burners 32 33 34. The discharge-spouts 35 36 37 deliver the molten metals to the distributing-pan 38, in which they may be mixed by any suitable mechanism. (Not shown.) From the pan the mixture runs out upon a conveyer 39 in the manner described in connection with Fig. 1.

Instead of mixing two or more metals in the melting-pot or in another vessel and then running the resulting alloy out in bars the apparatus may of course be used to make pieces or bits of a pure metal. These pieces or bits are then mixed with one or more other metals or with an alloy in the same form, producing a mixture which may be melted and cast just as if the various constituents had been first mixed in the molten state and the resultant alloy then divided into the small blocks. As hereinbefore explained, bits of pure metal or bits of an alloy of any desired composition may be mixed with other metals, as alloys, in the same form to produce a solid mixture adapted for a particular purpose. This flexibility I consider one of the most valuable capabilities possessed by the present invention.

In Fig. 7 is illustrated diagrammatically a convenient apparatus for running out bars of alloy and bars of pure metal simultaneously. The distributing-pan 50 is divided, preferably, by movable partitions into any desired number of compartments—as, for example, three—indicated by 51 52 53. Into compartment 51 two or more melting-pots, as 54 55 56, discharge. These pots may contain different metals, which are mixed together in the appropriate division of the pan. From the compartment 51 the alloy is discharged in streams, as shown. The pots 57 58, which contain the same or different pure metals, discharge into compartments 52 and 53, respectively, so that the streams therefrom are of pure metal. The cutter (not shown in the figure) divides the streams of alloy and pure metal. By diverting the particles from one or more of the bars of pure metal into the receptacle in which the alloy pieces are mixed the composition of the resulting mixture may be varied at will, as previously explained. By shifting the movable partitions in the distributing-pan a greater or less number of discharge-apertures may be included in a particular compartment to increase or decrease the number of streams therefrom, and consequently vary the quantity of pieces or bits of that particular metal or alloy.

The thorough blending of the constituent metals of the alloy or mixture by the intermingling the solid particles, which is characteristic of my method, makes a product whose composition as a whole is substantially uniform throughout, whatever may be the differences due to one cause or another in the constitution of individual pieces or blocks. Furthermore, metal in this form may be packed in bags or kegs, and so more conveniently handled in shipment than metal in the form of bars or pigs. It is also more convenient for use in the arts in which it is employed — as, for example, where different measured quantities are needed. In such cases it is easier to measure either by weight or volume a quantity or charge of my metal in small bits or particles than to break up one or more pigs to provide the same quantity. Also metal in this form is more quickly melted, since it packs solidly in the melting-pot, touching the heated sides of the pot at numerous points—as shown, for example, in Fig. 8—whereas a large bar or several of them touch the pot at few points, as in Fig. 9, and also leave a large part of their surface exposed to the air, thereby wasting considerable heat by radiation. The quick melting of the small particles also prevents chilling when they are fed to a vessel containing a supply of molten metal, while a large bar extracts heat rapidly from the melted metal adjacent to it, and so chills the same.

The various forms of apparatus herein specifically described are of course merely convenient devices for practicing my invention, which, being a method, is independent of any particular apparatus.

What I claim is—

1. The method of making metallic mixtures for casting, which consists in mixing the constituent metals in the molten state, forming the resultant product into small solid pieces or bits, and thoroughly commingling the pieces or bits, whereby the constituent metals are distributed with substantial uniformity throughout the mass, as set forth.

2. The method of making metallic mixtures for casting, which consists in mixing the consitituent metals in the molten state, forming the resultant product into small solid pieces or bits, adding thereto small solid pieces or bits of pure metal, and thoroughly commingling all the pieces or bits, whereby the constituent metals are distributed with substantial uniformity throughout the mass, as set forth.

3. The method of making metallic mixtures for casting, which consists in reducing the constituent metals to the molten state, running the same out in thin streams, cooling the streams to form solid bars, dividing the bars into small pieces or bits, and thoroughly commingling the pieces or bits, whereby the constituent metals are distributed with substantial uniformity throughout the mass, as set forth.

4. The method of making metallic mixtures for casting, which consists in mixing the constituent metals in the molten state, running the mixture out in thin streams, cooling the streams to form solid bars, dividing the bars into small pieces or bits, and thoroughly commingling the pieces or bits, whereby the constituent metals are distributed with substantial uniformity throughout the total mass, as set forth.

5. The method of making metallic mixtures for casting, which consists in mixing the constituent metals in the molten state, running the mixture out in thin streams, cooling the streams to form solid bars, dividing the bars into small solid pieces or bits, adding pieces or bits of pure metal, and thoroughly commingling all the pieces or bits, whereby the constituent metals are distributed with substantial uniformity throughout the mass, as set forth.

6. The method of making metallic mixtures for casting, which consists in mixing two or more metals in the molten state, running the mixture out in thin streams, simultaneously melting a pure metal and running it out in streams, cooling all the streams to form solid bars, dividing the bars into small solid pieces or bits, and thoroughly commingling the pieces or bits of alloyed metals with the pieces or bits from one or more of the bars of pure metal,

whereby the constituent metals are distributed with substantial uniformity throughout the mass, as set forth.

7. The method of making metallic mixtures for casting, which consists in mixing the constituent metals in the molten state, running the mixture out in thin streams, cooling the streams simultaneously on top and bottom, dividing the congealed streams into small solid pieces or bits, and thoroughly commingling the pieces or bits, whereby the constituent metals are distributed with substantial uniformity throughout the mass, as set forth.

8. The method of making metallic mixtures for casting, which consists in mixing the constituent metals in the molten state, running the mixture out in streams on a conveyer, applying a solid cooling medium to the upper surfaces of the streams, permitting the streams to congeal, dividing the congealed streams into small solid pieces or bits, and thoroughly commingling the pieces or bits, whereby the constituent metals are distributed with substantial uniformity throughout the mass, as set forth.

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