No. 647,081. Patented Apr. 10, 1900.

M. J. FUCHS.

MACHINE FOR MAKING BRONZE POWDER.

(Application filed Oct. 30, 1899.)

(No Model.) 4 Sheets—Sheet 1.

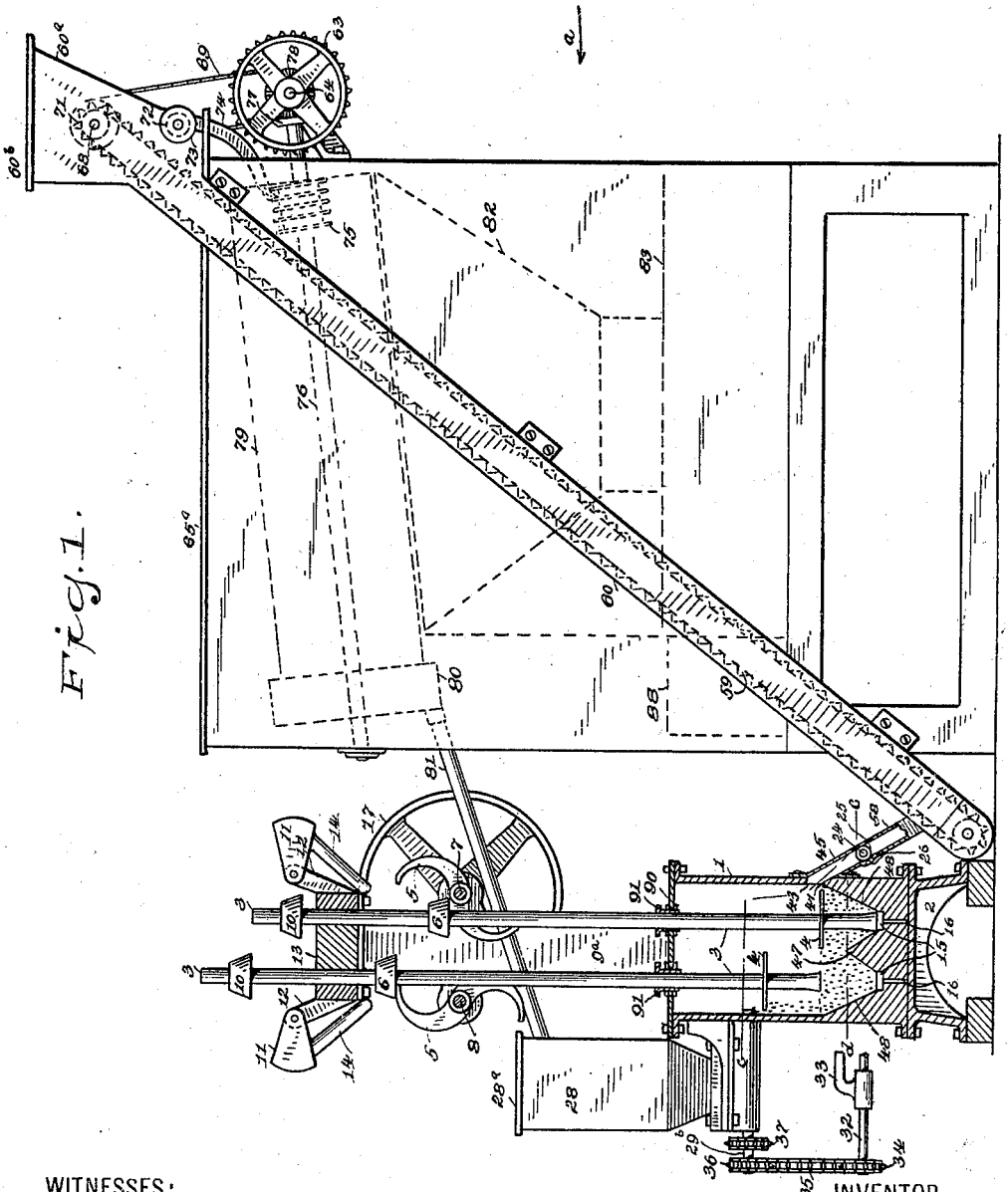

Fig. 1.

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MACHINE FOR MAKING BRONZE POWDER.

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(No Model.) 4 Sheets—Sheet 2.

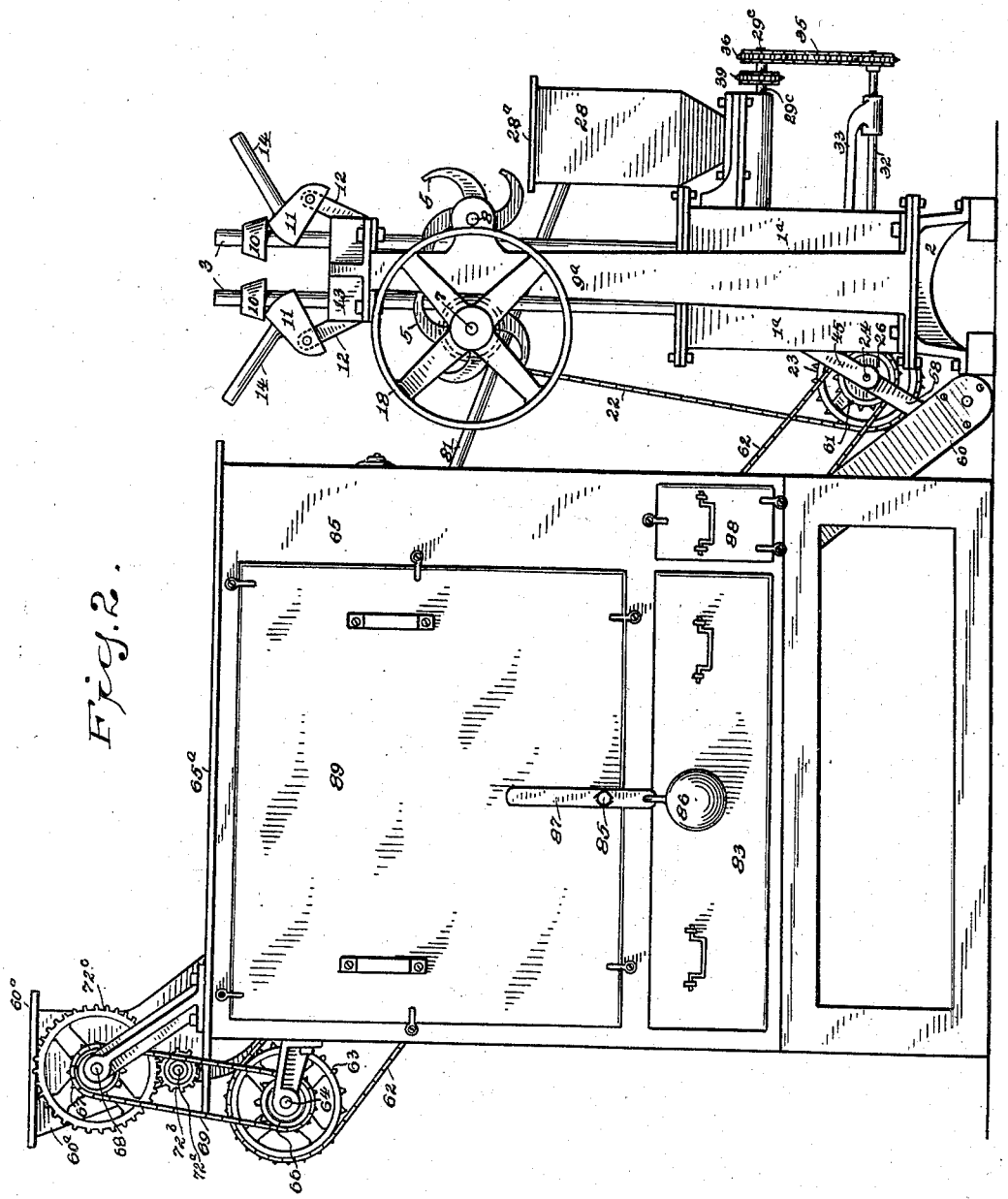

Fig. 2.

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MACHINE FOR MAKING BRONZE POWDER.

(No Model.) (Application filed Oct. 30, 1899.) 4 Sheets—Sheet 3.

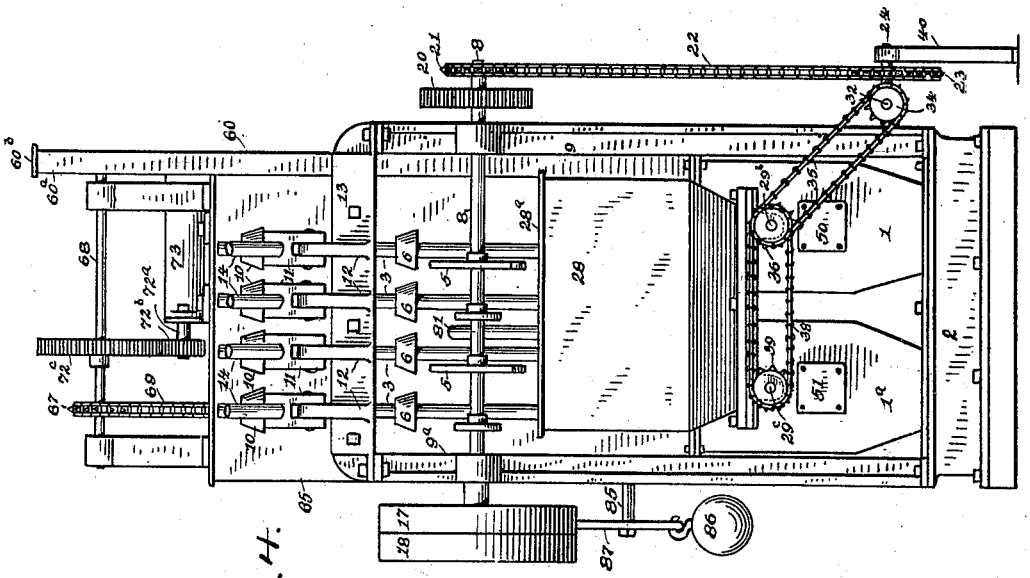

Fig. 4.

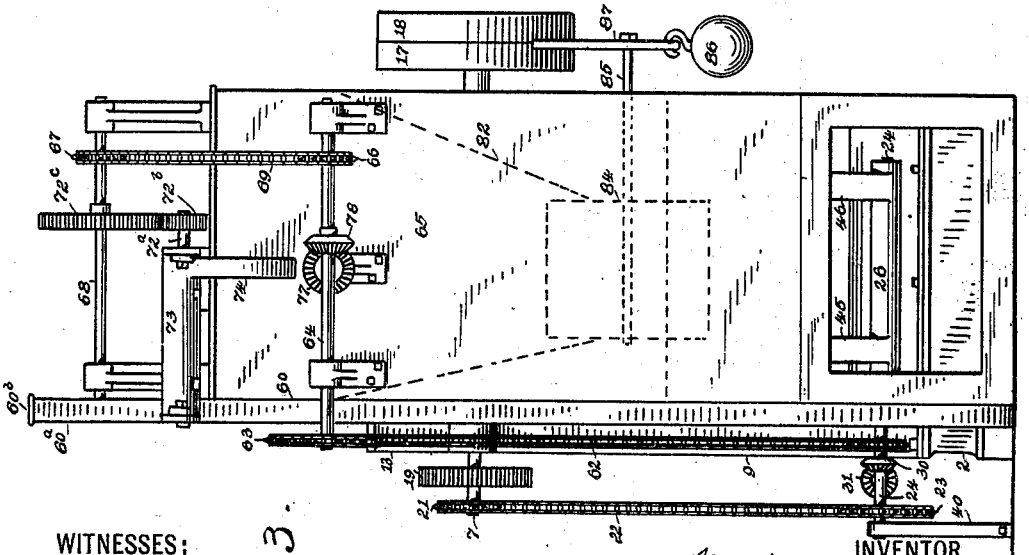

Fig. 3.

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(No Model.) (Application filed Oct. 30, 1899.) 4 Sheets—Sheet 4.

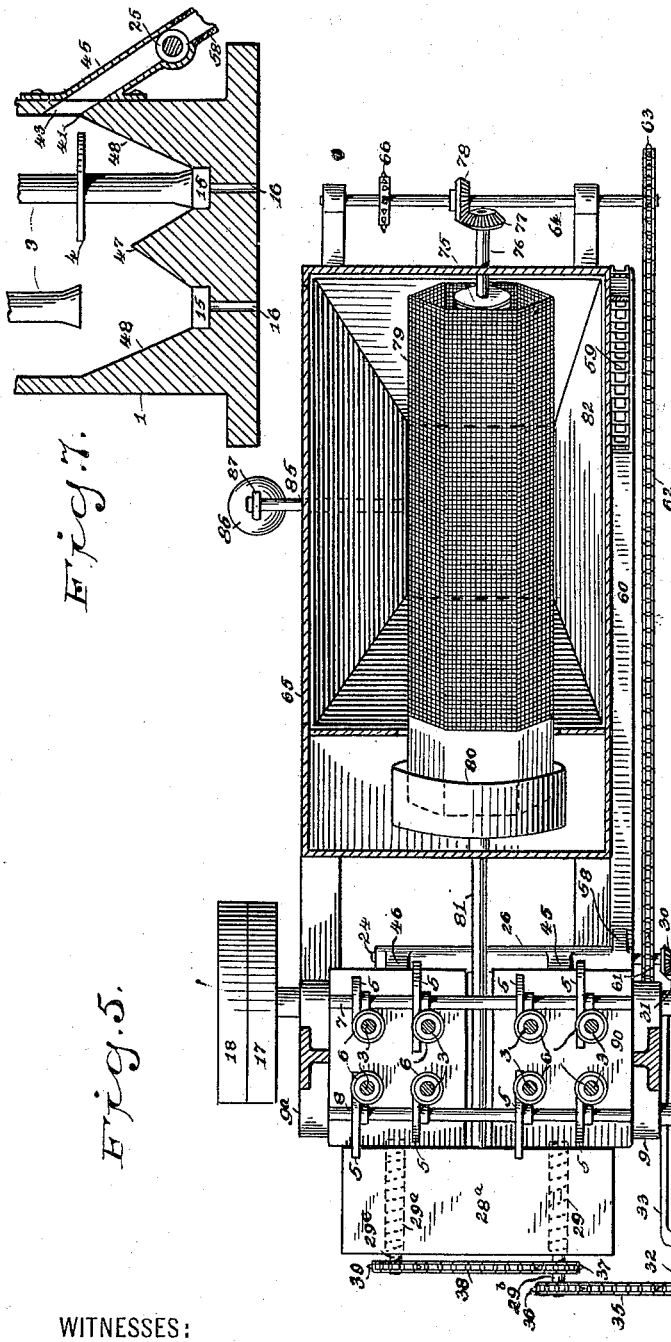

Fig. 7.

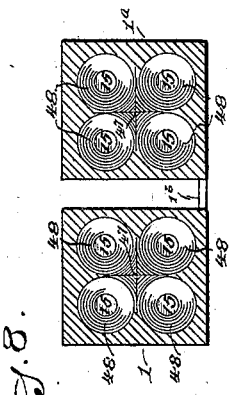

Fig. 8.

Fig. 5.

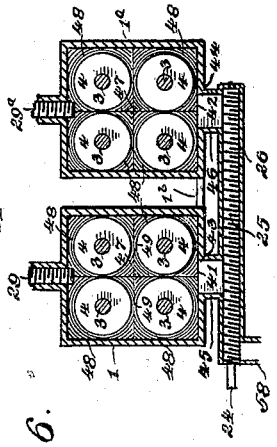

Fig. 6.

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UNITED STATES PATENT OFFICE.

MAXIMILIAN J. FUCHS, OF STAMFORD, CONNECTICUT.

MACHINE FOR MAKING BRONZE-POWDER.

SPECIFICATION forming part of Letters Patent No. 647,081, dated April 10, 1900.

Application filed October 30, 1899. Serial No. 735,169. (No model.)

To all whom it may concern:

Be it known that I, MAXIMILIAN J. FUCHS, a citizen of the United States, and a resident of Stamford, in the county of Fairfield and State of Connecticut, have invented certain new and useful Improvements in Machines for Making Bronze-Powder, of which the following is a specification.

My invention relates to an automatic machine for making bronze-powder; and it consists in certain details of construction, to be hereinafter more fully explained, whereby copper, brass, and other like metals are carried to the beaters to be operated upon and the reduced portions discharged from the beater-receptacle in small quantities and sifted, and such portions as have not been sufficiently reduced to the proper consistency for use as bronze-powder are reconveyed to the beaters, while the finished product is discharged into a receptacle prepared therefor.

So far as the use of vertically-operating beaters and certain other mechanical constructions common to all stamp-mills is concerned the making of bronze-powder resembles ore-crushing; but the peculiar nature of bronze-powder requires a combination of elements not found in or applicable to the crushing of ores. One of the most essential features in making bronze-powder is to avoid overstamping, for the slighest excess in this respect will overheat and discolor the metal to such an extent that its commercial value is entirely destroyed. Therefore my machine is so constructed that metal is never overheated, as the metal is kept at a certain height within the beater-receptacle, and this height is always maintained by means of flanges on the beater-rods to engage with the upper surface of the powdered metal, so as to force the surplus through a lateral orifice in the side of the said receptacle at each stroke of the beaters.

As will hereinafter appear, my machine is entirely automatic, so that when a sufficient quantity of metal is put into the hopper it will continue to operate until the whole has been reduced to the proper degree of fineness and color.

To enable others to understand my invention, reference is had to the accompanying drawings, in which—

Figure 1 represents a side elevation, partly in section, of my improved machine, showing two of the beaters in operation. Fig. 2 is an elevation of the reverse side of the machine shown at Fig. 1, with two of the beaters held temporarily elevated. Fig. 3 is an end elevation of the machine looking in the direction of arrow *a* of Fig. 1. Fig. 4 is an elevation looking in the direction of arrow *b* of Fig. 1. Fig. 5 is an upper plan view of the beater mechanism and sectional view of the cabinet adjacent thereto containing the revolving sieve and receptacle for the finished product. Fig. 6 is a detail sectional view of the beater receptacles or mortars and beater-rods and broken view of the metal-feeding worms that discharge into the mortar-chamber through line *c c* of Fig. 1. Fig. 7 is an enlarged detail broken sectional view of the mortars, also broken view of two of the beater-rods, one up and the other lowered, also sectional view of the delivery-spout and the worm-shaft. Fig. 8 is a detail sectional plan view of the mortar through line *d* of Fig. 1.

The construction and operation are as follows:

1 1^a represent two mortars resting upon the base or foundation 2, and they are joined together, Figs. 6 and 8, by the thin web 1^b.

3 are a series of eight beater-rods, four in each mortar. 4 are flanges rigidly mounted on said rods at a distance from the stamping-faces of said rods for the purpose to be hereinafter more fully set forth. Each of said rods is alternately elevated by the wiping-cams 5 engaging the under side of the fixed collars 6. The cams 5 are mounted, Figs. 1, 4, and 5, on the shafts 7 and 8, which shafts are journaled in the standards 9 and 9^a, resting upon the base 2. 10 are other collars near the top of the beater-rods, which serve the purpose, in connection with the cams 11, to temporarily suspend the beater-rods out of action. These cams or lifters are pivotally supported to the short arms 12, projecting from the cross-rail 13 of the standards 9 and 9^a. 14 are handles for operating the cams 11. When, therefore, it is found desirable to tem-

porarily suspend any or all of said beater-rods, the lifters 11 are thrown into the position shown at Figs. 2 and 4, and when disengaged from said rods such lifters will assume the position shown at Fig. 1.

15 are the anvils, located (see also Figs. 1 and 7) at the bottom of the mortars, and 16 are a series of holes through the base of said mortars, whereby said anvils may be driven out of their seats when necessary to do so.

17 is the driving-pulley, and 18 the loose pulley, mounted on the cam-shaft 7. 19 is a gear mounted on the opposite end of said shaft and registering with the gear 20 on the other cam-shaft 8, by means of which said latter shaft is rotated. 21 is a sprocket-wheel also mounted on shaft 7, which carries the chain 22, adapted to engage with the sprocket-wheel 23, mounted on the end of the worm-shaft 24, which worm-shaft carries the metal-feed worm 25, operatively mounted in the housing 26. This feed-worm conveys the beaten metal from the mortars to the cabinet in the manner hereinafter to be more fully described.

28 is a hopper provided with the removable cover 28^a, which hopper is adapted to receive a sufficient quantity of metal to be reduced to powder and to which is reconveyed such portions as are not sufficiently reduced for further treatment. At the bottom of this hopper are rotatively placed the two feed-worms 29 and 29^a, which worms convey the metal into the mortar. These worms are driven, as all of the rest of the mechanism is, through the medium of the driving-pulley 17 and shaft 7.

30 is a bevel-gear, Fig. 5, on the worm-shaft 24, which registers with the bevel-gear 31, mounted on the small shaft 32, journaled in the bracket 33, attached to the standard 9. On the opposite end of said shaft (see also Fig. 4) is the sprocket-wheel 34, carrying the chain 35 for transmitting power to the worm 29 through the medium of the sprocket-wheel 36, which wheel is mounted on the end of the shaft 29^b of said worm. 37 is another sprocket-wheel on said shaft that transmits power to the other worm 29^a through the medium of the chain 38 and the sprocket-wheel 39, which wheel is mounted on the shaft 29^c of said worm 29^a.

40 is a standard that rests on the floor to support the end of the feed-worm shaft 24.

As before mentioned, the success or failure in making bronze-powder depends entirely on how it is treated in the mortar, and the arrangement of the different elements must be nicely adjusted or failure will be the inevitable result. If it is allowed to accumulate in the mortar beyond a certain predetermined depth, it will overheat, and any excess of temperature beyond a certain point will cause discoloration and thereby destroy its commercial value. By experiment I find that placing the lips 41 and 42 of the outlets 43 and 44 in the side of the mortars (see Figs. 1, 6, and 7) about four and three-eighths inches above the anvils 15 will prevent an accumulation of powder above that point of the outlets. I find, too, that this depth cannot be exceeded in any appreciable degree without danger of discoloration, as the powder is susceptible to the slightest rise in temperature, due to overstamping. For this purpose the flanges 4 on the beater-rods are provided, whereby this depth of powder can at all times be rigidly maintained. The distance from the under side of these flanges to the stamping-faces of the beater-rods is exactly the distance represented from the lips 41 and 42 to the upper face of the anvils 15, so that when the beaters are down the lower face of said flanges will be on a line with the before-mentioned lips. The diameters of these flanges, it will be observed, are sufficient to nearly reach the sides of the mortars, so as to cover as much of the surface of the powder as possible. When, therefore, one of the beaters is down, or, in other words, strikes its anvil, any excess of powder in the mortar immediately beneath the flange of said beater-rod will be forced over one of the lips of the outlets into the spouts 45 and 46, as the case may be, and from thence delivered to the feed-worm 25. By this means the uniform depth of the powder in the mortars is absolutely and rigidly maintained.

Another feature of importance to be considered in the manufacture of a good grade of bronze-powder is to prevent the powder drifting away from the reduction-field represented by the stamping-face of the beaters and the upper surface of the anvils. Therefore any nooks or corners where it could lodge or accumulate outside of the reduction-field would enable it to follow its natural tendency and form itself into balls, which will also destroy its efficiency as commercial powder. This tendency of the powder to form itself into balls when not directly agitated by the beaters is due to the presence of a small quantity of oil which is put into the hopper 28. Now when the whole mass of powder is being agitated this small quantity of oil is so evenly distributed throughout the mass that there is no tendency for it to collect into small compact globular masses, and it therefore remains in substantially a dry powdered form.

As the several anvils are circular in form, it is evident that there would be spaces between them notwithstanding the form of the mortar, where the powder would lodge. To obviate this, I have so constructed the bottom of the mortar and also the sides as far up as the powder will reach as that the material will always gravitate toward the anvils. The large central position (see Figs. 1, 6, 7, and 8) between the anvils is filled by the cones 47. These cones will be joined to each other and to the inclinations 48 of the sides of the mortar by the ribs 49.

After the batch of metal placed in the mor-

tar 28 has been fully treated and it is found desirable to run through metal of another grade the powder remaining in the mortars is taken out by removing the doors 50 and 51, Fig. 4, which doors cover openings directly on a line with the before-mentioned delivery-outlets in the opposite side wall of the mortars. By this means the mortars can be thoroughly cleaned out, and the material thus removed is laid aside until another batch of metal of the same grade is again treated.

The powder discharged from the mortars will undoubtedly carry with it more or less coarser or unfinished material, all of which will pass down the inclined spouts 45 and 46 to the feed-worm 25 and from this worm will be delivered, Figs. 1 and 6, through the end spout 58 to the bucket conveyer 59, traveling within the casing 60. This conveyer is operated through the medium of the sprocket-wheel 61, Figs. 2, 3, and 5, located on the worm-shaft 24, chain 62, and large sprocket-wheel 63, which latter is mounted on the shaft 64 at the rear of the cabinet 65. 66 is a sprocket-wheel on this shaft, and 67 is a sprocket-wheel on the upper shaft 68, which wheels are connected by the chain 69 for operating the bucket conveyer 59.

The upper end of the casing 60 has the funnel-shaped extension 60^a and cover 60^b, which cover is lifted when required to get a view of the mechanism connected with the upper discharge. The buckets of the conveyer empty into said extension, at the bottom of which is another feed-worm 72^a, operating in the housing 73. At the end of this housing is the spout 74, into which the worm deposits the material, and such material is conveyed by said spout on to the large but shorter worm 75, mounted on the sieve-shaft 76, which shaft is rotated by means of its bevel-gear 77 meshing with the bevel-gear 78 on shaft 64.

79 is a sieve embracing shaft 76 and open at the front end to receive the material and at the rear end to discharge the coarser particles. This sieve is set on an incline to fully separate the fine from the coarse. Embracing the rear end of this sieve is the hood 80, adapted to receive the coarser and unfinished product and redeliver such product through the spout 81 to the hopper 28 to be re-treated. It will be understood that the hood 80 is large enough for the sieve to rotate freely therein. The spout 81 is adapted to be temporarily removed from said hood, so as to fully and completely empty the contents of said hood when metal of another grade is to be treated for the purpose, as before mentioned.

The object of the worm 75 on the shaft 76 is to cause the delivery of the material to the sieve in small quantities, which combined with the long and slowly-revolving sieve will cause a thorough separation of the fine and finished powder from the unfinished product. This finished powder will be discharged into the hopper 82 within the cabinet 65 and from thence into the drawer 83.

84 is a butterfly-valve on the rod 85, which valve is normally held open by means of the ball 86, suspended from the shorter end of the lever 87 on the projecting end of said valve-rod. When, therefore, the drawer is to be removed, the ball is detached and the lever 87 is tilted to a horizontal position to close the lower end of the hopper 82 and thus prevent further discharge therefrom until the drawer is again replaced and the ball reattached. This feature of the ball and lever will prevent the drawer being carelessly opened, which is of vital importance in the matter of handling so frail a product as bronze-powder, as the drawer cannot be opened without first removing the ball.

88 is a smaller drawer in the cabinet 65, whereby the material dropping from the hood 80 is caught when the spout 81 is temporarily detached.

89 is a large removable door in the side of the cabinet 65, whereby a clear view may be had of the interior of such cabinet.

90 is a cover over the mortars, and 91 are stuffing-boxes therein through which the beater-rods operate. This feature will prevent the escape of the powdered metal.

The construction above described is especially adapted and designed, as previously mentioned, solely for making bronze-powder and is not applicable for crushing ores any more than an ore-crusher or stamp-mill is applicable for the making of bronze-powder. When the proper quantity of metal is put into the hopper 28, the machine is calculated to make a continuous run until such metal is reduced to powder, which process may require a week to accomplish. In the meantime the machine requires no attention unless some part should break down. Should this happen, the machine will be stopped and all movable parts brought to a state of rest. This is an important feature, as it will prevent either the mortars or sieve from becoming choked should one or the other continue running.

While I show two separate mortars, it will be understood that one large mortar could be used. I prefer, however, to employ two or more mortars, with a gang of beaters in each mortar, so that, if necessary to stop the beaters in one of the mortars, the others can continue in operation.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. The combination, in an automatic machine for making bronze-powder, consisting of a series of vertically-operating beaters and means for alternately operating them, mortars in which such beaters operate, said mortars having anvils at the bottom thereof, a hopper and feeder for said mortars, discharge-openings in the side of said mortars, whose lower lips are placed a predetermined distance above said anvils, which openings, combined with flanges on the beater-rods whose

height from the face of said beater-rods to the lower face of said flanges equals the distance from the lower edge or lips of said openings to said anvils, so that the surplus material in the mortars will be forced through said openings at every stroke of said beaters, substantially as described.

2. The combination, in an automatic machine for making bronze-powder, consisting of a series of vertically-operating beaters and means of operating them, mortars having anvils, a hopper and feeder for said mortars discharge-openings in the side of said mortars whose lower edge or lips is placed a predetermined distance above said anvils, flanges on said beaters whose height from the face of said beaters to the lower face of said flanges equals the distance from said lips to the face of said anvils, so that the surplus material is not allowed to accumulate above such point in the mortars and thus suffer overstamping, a closed cabinet, means for conveying the material from said mortar to the upper part of said cabinet, a rotatable sieve in said cabinet, an intermediate hopper or other like receptacle between the receiving end of said sieve and the discharging-point of said conveyer, combined with a feed-worm on the sieve-shaft to receive the discharge of said intermediate hopper for the purpose set forth, a hood enveloping the discharge end of said sieve to receive the coarser material and means connecting said hood with the mortar-hopper whereby such coarse material is returned to the mortars, substantially as shown and described.

3. In a machine of the character described, the combination with the closed cabinet 65 having the hopper 82 therein and the drawer 83 below such hopper, of the butterfly-valve 84 adapted to close the discharge-orifice of said hopper, rod 85 on which said valve is mounted, said rod projecting outside said cabinet and carrying the lever 87, on one end of which lever is hung the detachable weight 86 so as to keep said valve open and prevent the withdrawal of the said drawer while said valve is in an open position, as shown and for the purpose set forth.

Signed at Stamford, in the county of Fairfield and State of Connecticut, this 19th day of September, A. D. 1899.

MAXIMILIAN J. FUCHS.

Witnesses:
F. W. LOCKWOOD,
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