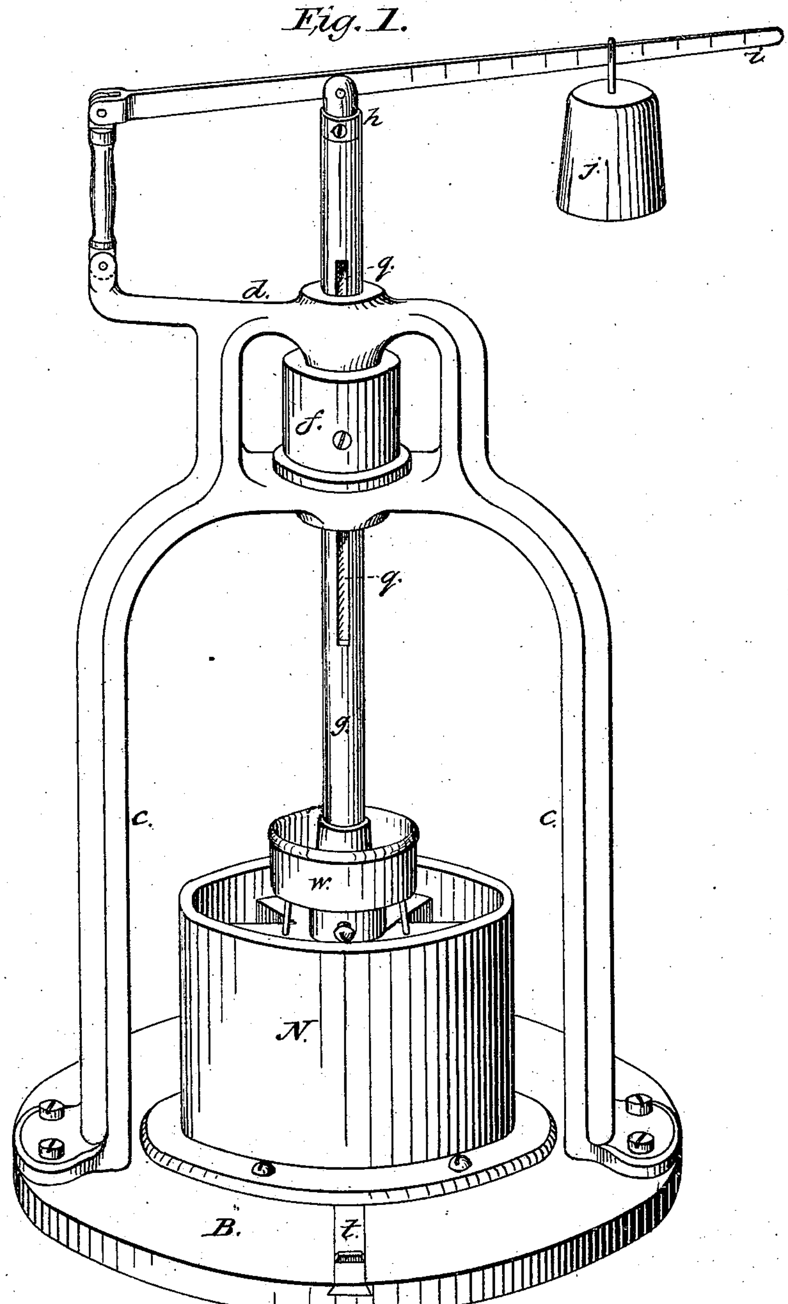
D. D. PARMELEE.

MANUFACTURE OF METALLIC PAINT AND POWDER.

No. 187,303. Patented Feb. 13, 1877.

Fig. 1.



Witnesses:

Lebbeus H. Rogers

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Fig. 2.

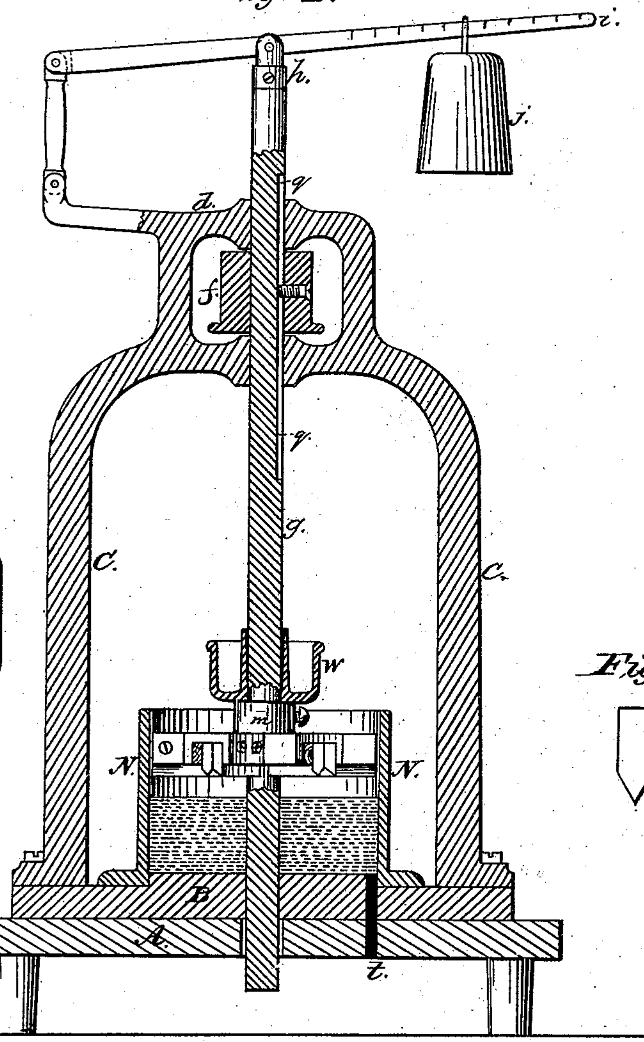


Fig. 4.

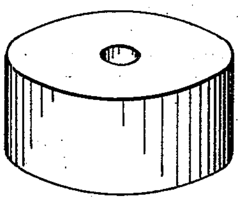


Fig. 5.

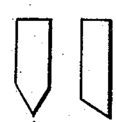
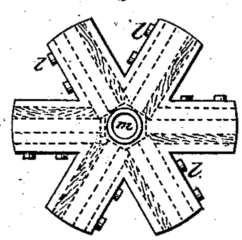


Fig. 3.



Witnesses:

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4 Sheets—Sheet 3.

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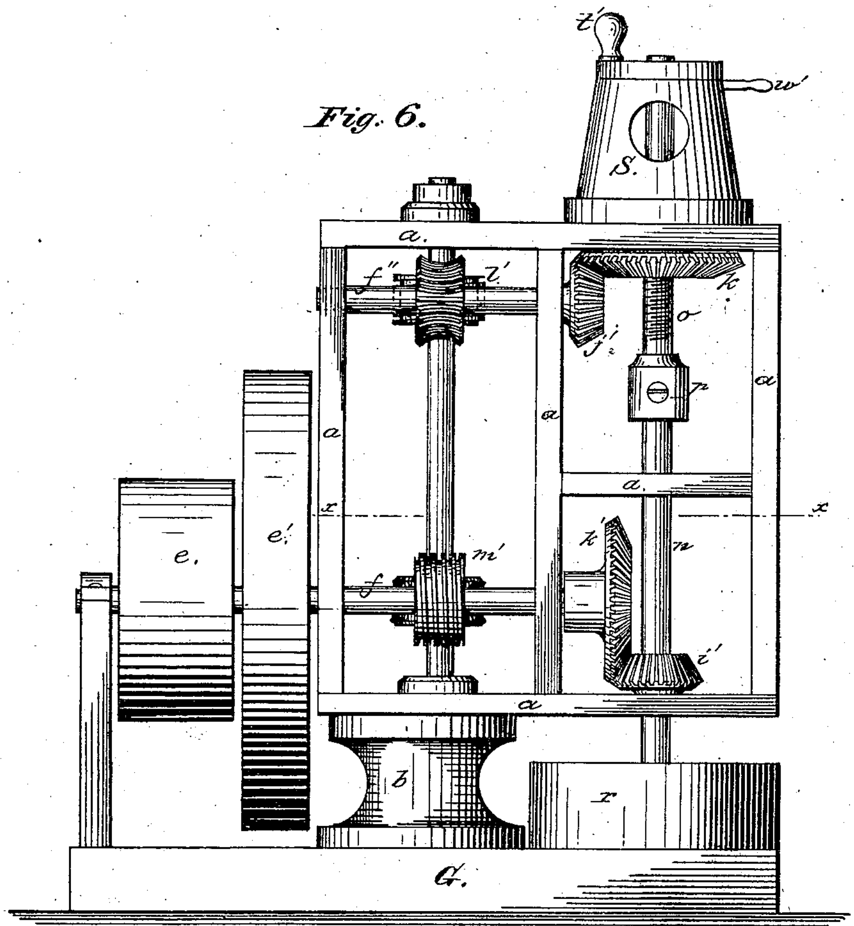
Fig. 6.



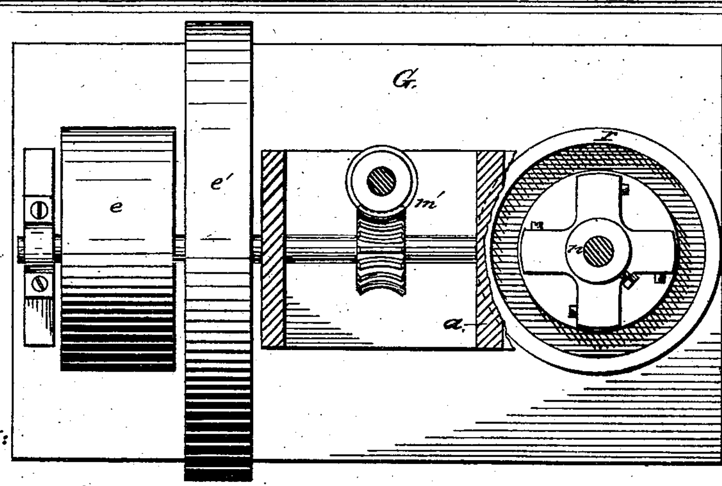


Fig. 7.

Witnesses:

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N. PETERS, PHOTO-LITHOGRAPHER, WASHINGTON, D. C.

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Fig. 8.

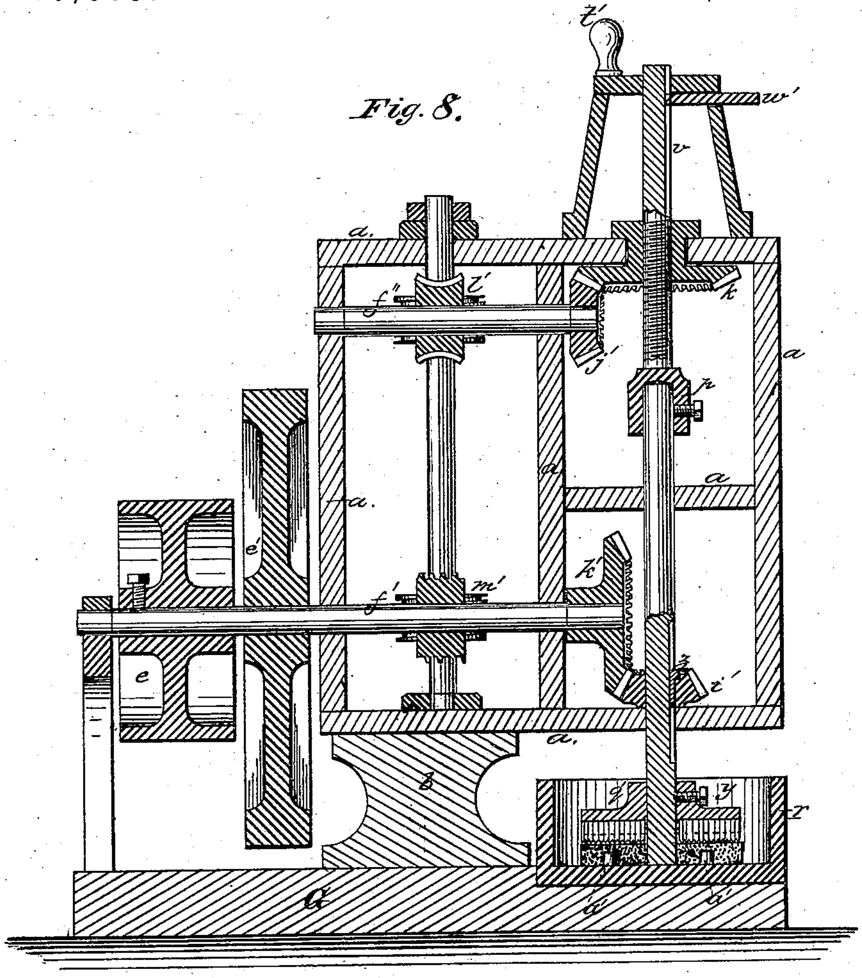


Fig. 9.

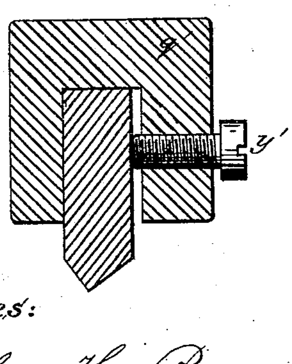
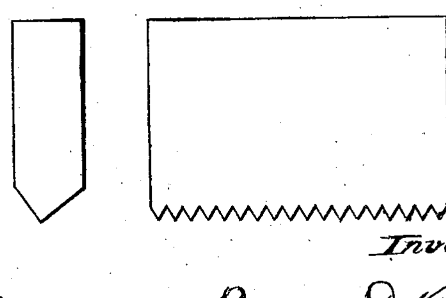


Fig. 10.



Witnesses:

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UNITED STATES PATENT OFFICE.

DUBOIS D. PARMELEE, OF NEW YORK, ASSIGNOR TO ANDREW W. BILLINGS, OF BROOKLYN, N. Y.

IMPROVEMENT IN MANUFACTURE OF METALLIC PAINTS AND POWDERS.

Specification forming part of Letters Patent No. **187,303**, dated February 13, 1877; application filed December 31, 1875.

To all whom it may concern:

Be it known that I, DUBOIS D. PARMELEE, of the city, county, and State of New York, have made a new and useful Improvement in the Manufacture of Metallic Paints or Powders, the same not having been known or used previous to my invention, of which the following is a specification:

The essential features of the processes of making metallic paints or powders of commerce are the following: First, rolling and beating metal ingots into thin foil, and then tearing and triturating this to powder, and burnishing until it becomes impalpable; or, second, by electrical or chemical precipitation from metallic salts, and then grinding the powder or crystals so obtained to an impalpable condition.

My invention relates to a method or process of making metallic powders, consisting in separating impalpable scales from a metallic ingot by means of cutters, by reason whereof fine metallic powders are produced in the place of the foil at less expense for the same weight of metal, requiring less labor in the subsequent burnishing process, and whereby the making of metallic powders is cheaper and cleaner than those produced by electrical or chemical precipitation, and also in certain mechanical devices for carrying out the process, all of which will be hereinafter more particularly set forth.

The following description, with the accompanying drawings, forming a part of the same, will enable others to carry my improvement into effect.

Figure 1 is a perspective view of the machine. Fig. 2 is a cross-section through the center. Fig. 3 is the holder of reamers or cutters. Fig. 4 is a perspective of a metallic ingot. Fig. 5 gives end views of the reamers or cutters.

On Sheet 3 of drawings, which illustrates a positive feed mechanism, hereinafter particularly set forth, Fig. 6 is a side view of the machine. Fig. 7 is a section through *x x* of Fig. 6. Fig. 8 is a vertical longitudinal section. Fig. 9 is a sectional end view of the holders of the cutters, with a knife adjusted; and Fig. 10 is an end view of one cutter and a side view of another with teeth.

Like letters in all the figures refer to the same parts.

In Fig. 2, A is a strong table or bench. B is a cast-iron disk, planed on the surface, and having a small projection in the center. This projection is six inches in diameter. Through the whole is a bore of the size of the shaft *g*, of which it is a journal-box. C is a cast-iron frame. *d* is a second frame attached to *c*. The frame C is bolted to the base B. *f* is a belt-pulley. *g* is a steel shaft. The shaft has a groove, *q*, at the part passing through the pulley *f*, so that it will freely slide up and down six or more inches over a cog or spur attached within the bore of the pulley *f*. *h* is a cap, which allows the shaft *g* to freely turn within it without itself revolving. *i i* is a lever, by which the weight of the shaft may be balanced, or downward pressure exerted by the suspension of a weight.

To the lower end of the shaft is attached a knife-holder, Fig. 3, with a shoulder, *m*, through which a screw fastens it to the shaft. On the under side of the holder are grooves for holding the reamers, Fig. 5. When these reamers are inserted thin pieces of wood or leather are adjusted behind them, the whole held firmly together by screws *l l*. N is a cylinder, having a flange at the bottom, and the inner side fits over the projection of the base B. *t* is an aperture, passing through the base B and matching a groove in the cylinder N, for the purpose of allowing the powders from the ingot to pass beneath the table.

In operation, the metallic ingot of the required composition is first cast in a solid cylinder form, excepting a bore through the center corresponding to the size of the shaft. This ingot is placed in a common turning-lathe and faced smoothly on the ends and side. The bore is also smoothly turned. The ingot is then placed on the projection of the base B. The cylinder N, as shown in Fig. 2, is then placed over the ingot, also an oil-cup, *w*. The shaft to which the reamers are attached is then inserted in the bore of the ingot. The weight *j* on the lever *h* is adjusted so that little pressure is exerted on the shaft, and when the belt has been adjusted to the pulley *f*, and is in motion, the pressure is increased until the required action of the reamers has been attained. The oil cup or reservoir *w* is filled with oil, which passes in suitable quantity through the small pipes at the bottom of it to the center of the ingot. The oil is spread over the face of the ingot by the action of the knives, thereby oiling the whole surface. The fine powders thus reamed off are thrown to the outer edge of the ingot and against the cylinder N, and fall through the aperture *t* into a receptacle under the bench A.

The quantity of oil required is little more than equal to the weight of the powders produced.

By this process copper, tin, and composite metal ingots are reduced to a fine powder.

The speed or number of revolutions of the shaft with its reamers depends upon the composition of the ingot.

A composition of copper and zinc of the best gold color may be advantageously operated upon at eight hundred revolutions a minute.

I do not confine myself to the precise form of apparatus described, as it is obvious that there are other forms which could be employed—as, for example, the ingot could be revolved instead of the reamers, although such requires more complication of apparatus, and performs the conditions required less perfectly.

A plane rectangular or square ingot might be employed, with reamers acting upon it with straight, direct, and back action, instead of circular, with less completeness of exsiccation, however, but still within the scope of my invention.

Instead of a lever and weight to give pressure to the vertical shaft holding and moving the cutters, the shaft and knives may be stationary in regard to moving down or up, and the ingot to be operated on be forced upward against the knives either by a lever or by "worm-gearing" in such a manner that the upward speed of the ingot will be governed by the revolutions of the shaft or knives. For example, the shaft with knives makes six hundred revolutions a minute by means of worm-gearing. The ingot may be elevated one thirty-six-hundredths of an inch at each revolution, and consequently this thickness is reamed off at each turn of the shaft with the knives. If the speed of the shaft is slower the ingot is correspondingly more slowly elevated, and the above thickness will be reamed or cut off, whatever the speed.

Another modification is to give either a reciprocating or a revolving motion to the cutters and to the ingot, both feeding them toward each other by any very slowly moving or micrometric gear. The object will not be obtained if the cutters and the ingot approach at such speed as to give shavings or chips instead of impalpable scales, as herein described.

A positive pressure by a screw instead of a weight may be also employed, as the following description will make plain.

In Sheets 3 and 4 of drawing, the letter *a* shows the frame of cast-iron for holding the moving parts of the machine. *b* is a cast-iron pin or column supporting the frame. *e'* is a balance-wheel. *e* is a pulley for the driving-belt. *f'* and *f''* are shafts. *k k' i' j'* are cog-wheels. *l'* and *m'* are worm-gearing. *n* and *o* are shafts, the former revolving in a socket of the latter, as shown at *p*. *q'* is the holder of the knives or reamers. *r* is the receptacle for the metal ingot to be acted upon, and for holding the oil for lubricating the face of the ingot, and prevent its heating. S is the journal-box for the upper end of the shaft *n o*. *t'* is a crank attached to the shaft *n o*. The dimensions of the whole machine are about five feet in height, the same in depth, and three in width. All the shafts are one and a half inches in diameter, and of steel. Each at its bearing rests in journal-boxes lined with Babbit metal.

The diameters of the cog-wheels marked *i'* and *j'* are six inches each. Those marked *k* and *k'* are twelve inches each. The number of cogs in each are as their diameters—that is, *k* and *k'* have twice as many as *i'* and *j'*. The diameters of the worm-gearing wheels are three inches, and three inches and six-eighths of an inch.

The whole diameter of the knife-holder is six inches. The knives are two and a quarter inches long, four answering the purpose.

The cog-wheel *k* has cast with it a hollow journal revolving in a box of the frame *a*, as shown in Fig. 8. The bore in the center of the wheel has a screw-thread cut to match the threads of the shaft *o*.

In addition to the screw-threads on the shaft O there is a slot about eight inches long. (Shown in Fig. 8 at *v*.) A steel spur or slide fitting into this slot is shown at W', Fig. 8. The lower section of the above shaft, marked *n*, Fig. 8, has a slot, corresponding to that of the upper section, into which is fitted a spur attached to the cog-wheel *i'*, as shown at *z*, Fig. 8. This slides freely within the slot or groove.

The knife-holder is cast in one piece, and consists of a hub with four arms projecting from it, with slots for holding the knives. The holder is fastened to the bottom of the shaft by a screw, as shown at *y*. The metal ingot to be operated upon is six inches diameter, and shown at *a'*, Fig. 8.

In practice, a metal ingot or cylinder six inches diameter and the same height is cast of the required composition, with a bore one and a half inches through the center, for receiving a projection of the shaft below the edge of the knives. The ingot is faced, and the sides turned in a lathe to remove any adhearing sand, oxide, or scoria. In the bottom of the ingot are drilled two holes a half-inch deep and the same diameter, to fit over pins at the bottom of the oil-receptacle to prevent the ingot from turning round while being acted upon by the knives.

The steel spur w' having been drawn from the slot V, the crank v' is turned so as to screw the shaft upward, when the spur w' is returned and the ingot placed in the receptacle. The knives being adjusted in the holder and fastened by the screw y, olive-oil is poured into the receptacle, so that it will cover the top of the ingot to a depth of about one-eighth of an inch. The belt is then placed on the pulley e, and the machine put in motion. Extra holders and sets of knives are provided to replace those in use when the edges require "retouching" by grinding.

The frequency of change depends upon the composition of metal being worked and the quality of the steel and temper of the knives. The screw-threads on the feeding-shaft are one-sixteenth of an inch.

The speed or revolution of the cutters or reamers depends upon the metal or composition of the ingot. The depth, however, of the reaming at each revolution is the same, whatever the speed of the cutters, as the feed is positive and governed by their motion.

If the driving-pulley has a motion of three hundred revolutions a minute, the knives make six hundred during the same time, and the threads of the feeding-screw being sixteen to the inch the knives are forced downward one seventy-two thousandths of an inch at each revolution. The theoretical thickness of the scales reamed off is therefore the above fraction.

For some alloys knives, represented by Fig. 10, having teeth are employed. The teeth are cut so that when the knives are adjusted in the holder their tracks are different. Two of them are used with two of the plane-faced. In other respects the two kinds of knives for a given composition of metal are alike in regard to form. The angle of the sides of the reamers or the bevels vary with the hardness, softness, or brittleness of the metal to be treated. The drawing, Sheet 4, shows the proper form for a composition of copper and zinc, in which the former greatly exceeds in proportion the latter.

The same practice is required in the forming and setting of the knives as practiced by skillful makers of tools for working metal. Attention to the principles learned by practical metal-workers cannot be neglected without impairing the completeness of the results. These are found in many works on mechanical manipulations, so that it is not required to repeat them here, particularly as to do so would require diagrams.

The scales or fine reamings made by the mechanism hereinbefore described are placed with the oil in a filter, which separates a large proportion of the oil. The next treatment is to place the powder with the remaining adhering oil in a suitable triturating and burnishing machine, for which another application for a patent will be made by me. The whole of the oil is finally separated or removed from the powders by a suitable solvent, which will not corrode or impair the natural color of them. The light volatile liquid derived from petroleum answers the purpose well. The oil and solvent are placed in a common still heated by steam and separated by simple distillation, the former remaining in the still, while the latter passes over through a condenser, and is collected in a receiver. Both the oil and solvent are reused by repeated operations.

It will be seen that, by properly regulating the feed, every degree of fineness of the powder may be obtained by the direct action of the machine.

The act of scraping or cutting in the manner described gives the particles the form of minute impalpable scales crushed in a horizontal direction, which clearly distinguishes them from ordinary broken foil.

Generally the best results are obtained with the use of oil during the cutting, as it forms a film over the freshly-cut scales, and protects them against tarnishing; but with soft metals, which do not oxidize readily, the oil is not essential.

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

1. The process herein described for the manufacture of fine metallic powders suitable for paints or varnishes, consisting in separating impalpable scales from a metallic ingot by means of cutters, substantially as specified.

2. In a machine for making metallic powders, a sectional shaft provided with cutters to one section and a male and female screw to the other, and operated by appropriate gearing, whereby one section is made to exert a continuous, uniform, and advancing pressure on the other, regardless of the number of revolutions by the latter, substantially as set forth.

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