


1,204,163.

FIG.2. *3a* *2* *1f* FIG.5.

FIG. 6.



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POWDER-BLENDING MACHINE.

1,204,163.

Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, ANTON K. KUSEBAUCH, of Pittsburgh, in the county of Allegheny and State of Pennsylvania, have invented a certain new and useful Improvement in Powder-Blending Machines, of which improvement the following is a specification.

My invention relates more particularly to means for thoroughly and safely blending granulated or comminuted material, more particularly powders used in projectiles, and its object is to provide an inclosed dust proof machine in which any desired number of blending treatments can be applied, as may be deemed necessary to obtain any desired degree of perfection, or ultra refinement, in the blend of powders, or ingredients forming their composition.

Further objects of my invention are to avoid the danger and labor of repeatedly handling powder during the process of blending, and to provide a machine which will be continuous in its operation; of a wide range in capacity; and requiring only a minimum volume of space, thereby materially reducing the danger from explosions.

The improvement claimed is hereinafter fully set forth.

In the accompanying drawings: Figure 1 is a side view, partly in section, of an apparatus embodying my invention; Fig. 2, a plan view thereof, with the parts above the plane *x x* removed; Fig. 3, a section, on an enlarged scale, taken on the vertical plane *y y* of Fig. 4; Fig. 4, a plan view of a series of inclined chutes, disposed and united to form three blending labyrinth units; and, Figs. 5 and 6, enlarged detail plan views of chutes and fingers, which, when assembled, form the labyrinth units.

In the practice of my invention, referring descriptively to the specific structural embodiment thereof which is herein exemplified, a dust proof casing, 1, is suspended by suspension rods, 2, from any suitable supporting object in such manner as to permit a free lateral movement when vibrated by a pair of any well known form of vibrators, 4, which are attached by bolting through the holes, 3 and 3^a, in supporting plates fixed to the casing, and are disposed on adjacent sides of the casing, so that they will transmit vibration to the casing and the labyrinth units, 6, contained therein, in lateral direc-

tions at an angle of 90° one to the other. The casing incloses any desired number of labyrinth units, eight being shown in this instance, each of which comprises a multiplicity of united and interlocked inclined chutes, 5 and 5^a. These chutes are disposed in an inclined position, which disposition will cause any powdered material to slowly flow from their outer upper ends, downward toward their lower ends, when vibrated in the direction of their length, by the corresponding vibrator transmitting motion thereto in the same direction. The bottom of each chute, 5, terminates in a tapered end, 5^a, near the opposite side of a unit section, indicated as 6, 6^a, and 6^b, formed by the X shaped arrangement of an interlaced set of chutes. The three adjoining sections, indicated as 6, 6^a, and 6^b, which lie in the same horizontal plane, form a labyrinth unit, a plan of which is shown in Fig. 4.

When layers of powder mixture flow downward from the upper ends of the chutes, 5 and 5^a, the layers will approach each other near the middle of the section and the powder from the chute, 5^a, will drop off the lower end of the corresponding chute bottom, and fall layerwise upon the layer of powder coming down the chute, 5, as it passes under the lower end, 5^a, of the chute, 5^a. Inasmuch as all the chutes are arranged in like manner, all the powder coming down the chutes, 5^a, will be layered upon that coming down the chutes, 5. The double layer formed by this action continues down and gradually falls over the opposite edges of the tapered chute bottom and the last remnant drops off the extreme end, 5^a, so as to evenly distribute the powder into the plurality of lower chutes disposed transversely with respect to the upper chutes and which form the next lower labyrinth unit. These units are disposed one upon the other so as to place the next lower chutes transversely with respect to those above, and cause the powder mixture passing down each section to repeatedly relayer and redistribute itself, as many times as may be necessary to obtain ultra refinement in the blend of the powders forming the mixture. To obtain such results, it is essential that the mixture is delivered to the blender properly and be accurately proportioned. The powder mixture is fed from any suitable source into the spherically formed cloth bag, 7, which is fastened to the top of the casing, 1, and

supported by the inclined and upwardly projecting fingers, 7^a, which are formed on the casing. The bottom of the bag terminates in a four ported rectangular member, 8, each of the ports, 8^a, of which, registers with a corresponding labyrinth unit section so as to deliver the powder mixture over the center of the section. Inclined intersecting slopes, 8^b, are formed on the member, 8, between the ports, for the purpose of guiding the powder mixture downward from the bag into the ports. The flexibility of the bag readily causes it to change form as it fills with powder, and thereby gives an indication of any tendency to crowd the feeding and clog the labyrinth, in ample time to permit shutting off the supply. The ports, 8^a, are preferably made much smaller in area than that of a labyrinth section for the purpose of controlling the rate of feed and prevent clogging. The flow through the ports is caused by vibration, and ceases when the vibrators are stopped.

The several labyrinth units are fastened securely in the casing by the thumb screws, 9, which extend downward into the casing and press upon the top unit. A space, 10, is interposed between the top unit and the ports, 8^a, for the purpose of permitting the powder mixture to spread over the uppermost of a plurality of screens, 11, one of which is placed on top of each unit. The screen vibrates with the units to spread the powder and cause it to flow gradually into the sections.

To operate the blender, it is only necessary to govern the supply; after starting the vibrators the powder will pass continuously through the labyrinth and discharge from the casing outlet at 1^a. The screens and labyrinth units may be removed for cleaning, after removing a side of the casing, by loosening the thumb nuts, 1^b. The casing may be made of metal, or wood, as desired, and the vibrators may be fastened by any well known means, preferably in a manner to transmit vibration in a direction corresponding to that of the inclined chutes as already described.

I claim as my invention and desire to secure by Letters Patent:

1. The combination, in a powder blending machine, of a pair of upper and lower inclined chutes, the discharge end of the lower extremity of the upper chute being disposed a short distance above the lower chute, at a predetermined distance from the lower extremity thereof and the discharge end formed of the lower chute being tapered from a minimum width at its lower extremity to the full width of the chute at or before reaching a point approximately beneath the discharge end of the upper chute; and means for vibrating the chutes for the purpose of flowing the powder.

2. The combination, in a powder blending machine, of a labyrinth blending unit comprising a plurality of adjacently disposed pairs of upper and lower inclined chutes which are interlaced to stand in approximately X form, with the lower extremities of alternate lower chutes pointing in opposite downward directions, the discharge ends of the upper chutes being disposed a short distance above the lower chutes and at a predetermined distance from the discharge ends thereof, so as to cause powder flowing down the upper chute to be layered upon the powder flowing down the lower chute; and means for vibrating the chutes for the purpose of flowing the powder.

3. The combination, in a blending machine, of a plurality of superimposed labyrinth blending units, each unit comprising a plurality of interlaced and inclined upper and lower chutes, the upper chutes being disposed to deposit powder layerwise upon powder flowing down in the lower chutes; said lower chutes having tapered discharge ends adapted to form curtained powder discharges, said chutes with tapered ends being disposed above and crosswise of a plurality of chutes forming a lower labyrinth unit, for the purpose of distributing the curtained powdered discharges falling from the tapered discharge ends into a plurality of chutes forming the lower unit; and means for vibrating said units.

4. The combination, in a blending machine, of a plurality of superimposed labyrinth blending units, each unit comprising a plurality of interlaced and inclined upper and lower chutes, the upper chutes being disposed to deposit powder layerwise upon powder flowing down in the lower chutes; said lower chutes having tapered discharge ends adapted to form curtained powder discharges, said chutes with tapered ends being disposed above and crosswise of a plurality of chutes forming a lower labyrinth unit, for the purpose of distributing the curtained powdered discharges falling from the tapered discharge ends into a plurality of chutes forming the lower unit; means for vibrating said units; and means for feeding powder into the upper labyrinth unit.

5. The combination, in a blending machine, of adjacently disposed tiers of labyrinth units; each tier being formed of a plurality of superimposed labyrinth blending units, comprising a plurality of interlaced and inclined upper and lower chutes, the upper chutes being disposed to deposit powder layerwise upon powder flowing down in the lower chutes; said lower chutes having tapered discharge ends adapted to form curtained powder discharges, said chutes with tapered ends being disposed above and crosswise of a plurality of chutes forming a lower labyrinth unit, for the purpose of dis-

tributing the curtained powdered discharges falling from the tapered discharge ends into a plurality of chutes forming the lower unit; means for feeding powder into the upper labyrinth unit; and means for vibrating said units.

above the inlet and secured to the casing; means for vibrating the units; and a plurality of outwardly projecting fingers, formed on the casing adjacent to the inlet and supporting the feed container.

9. The combination, in a powder blending machine, of a casing having an upper powder inlet and a lower powder outlet; a plurality of labyrinth blending units inclosed therein; means for vibrating the units; a plurality of suspension members; and means for fastening the members to the casing and to a supporting object, for giving vertical support to the casing and a determined amount of freedom to lateral vibratory movement.

10. The combination, in a powder blending machine, of a plurality of labyrinth blending units, each comprising a plurality of pairs of superimposed inclined powder chutes, the upper and lower chutes disposed crosswise to each other; and means for vibrating said chutes in the direction of their length.

11. The combination, in a powder blending machine, of a plurality of labyrinth blending units, each comprising a plurality of pairs of superimposed inclined powder chutes, the upper and lower chutes disposed crosswise to each other, a pair of vibrators disposed crosswise with respect to each other, and parallel with their corresponding chutes; and means for attaching the vibrators to the blending units.

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Witnesses:

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Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."