B. L. BENSON.

TILE SORTING MACHINE.

APPLICATION FILED MAY 10, 1920.

1,369,377.

Patented Feb. 22, 1921.

4 SHEETS—SHEET 1.

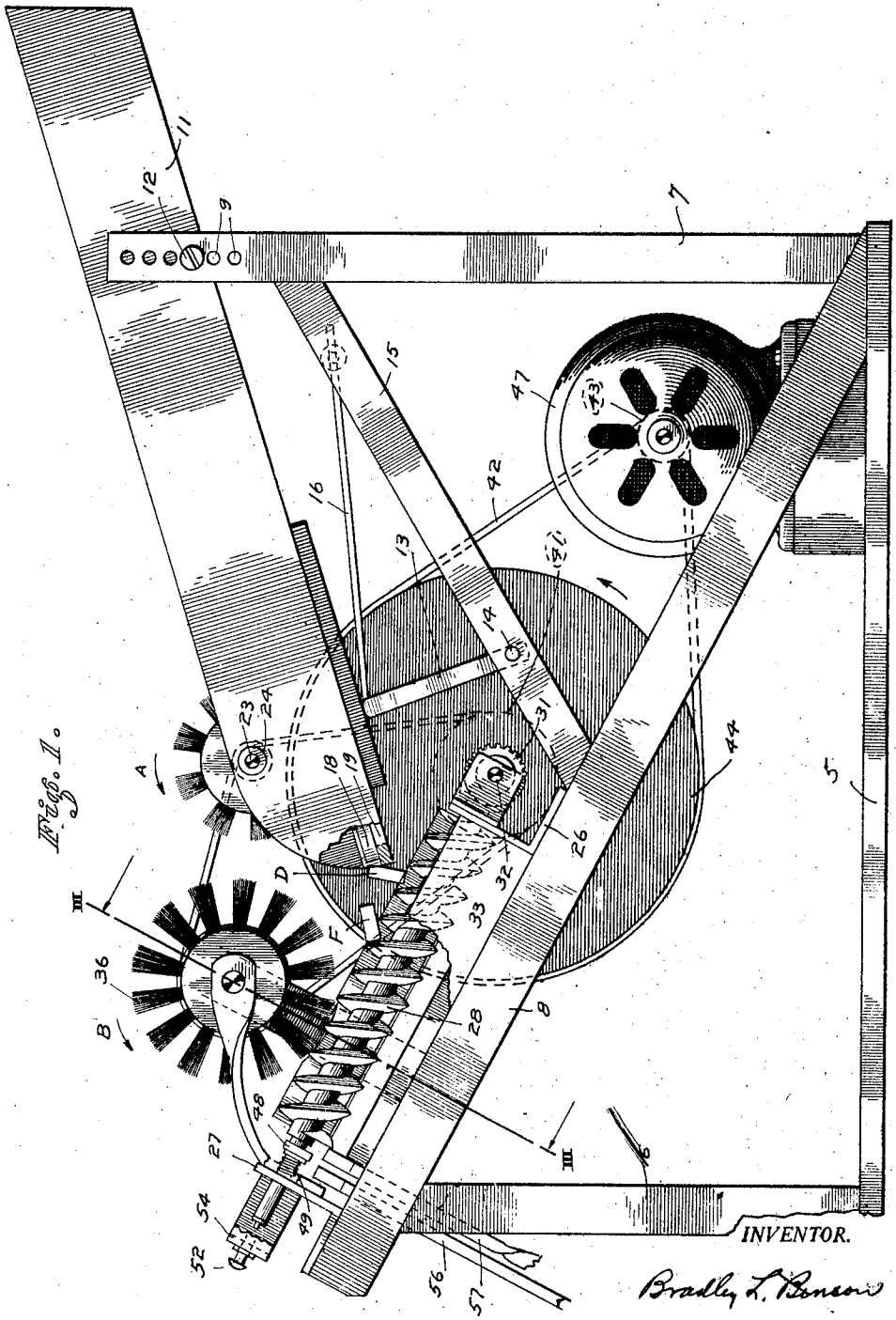


Fig. 1.

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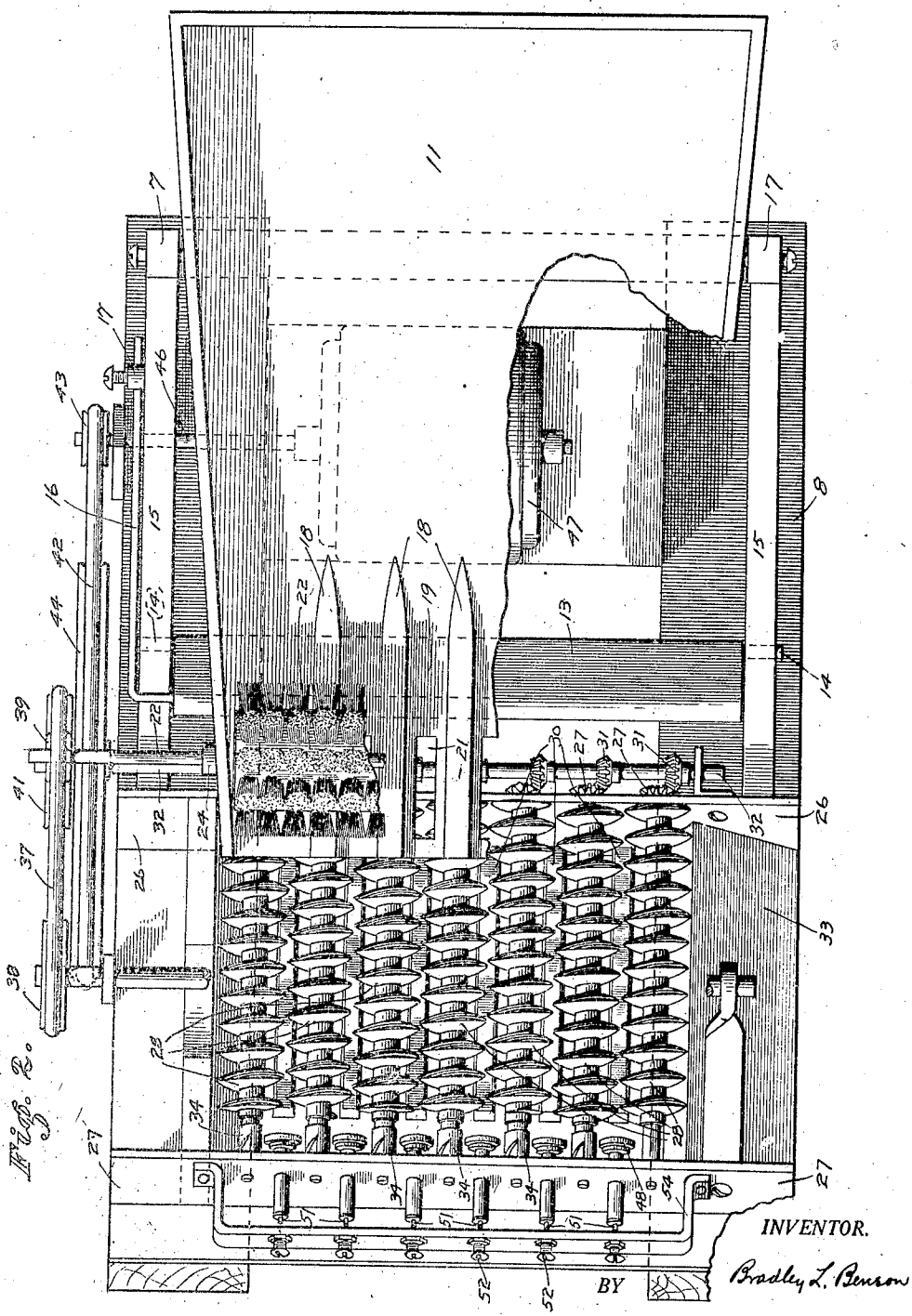


Fig. 2.

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4 SHEETS—SHEET 3.

Fig. 3.

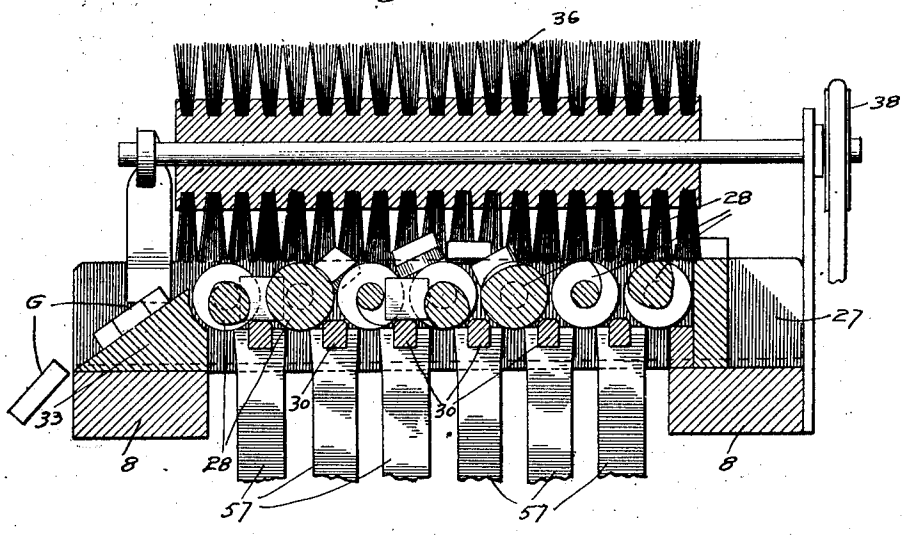


Fig. 4.

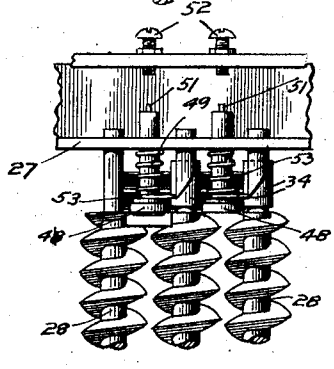
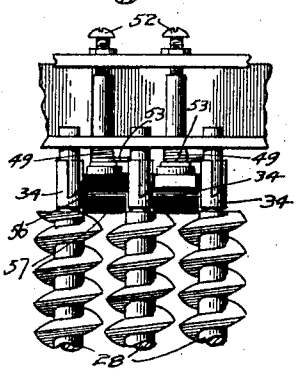


Fig. 5.



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4 SHEETS—SHEET 4.

Fig. 6.

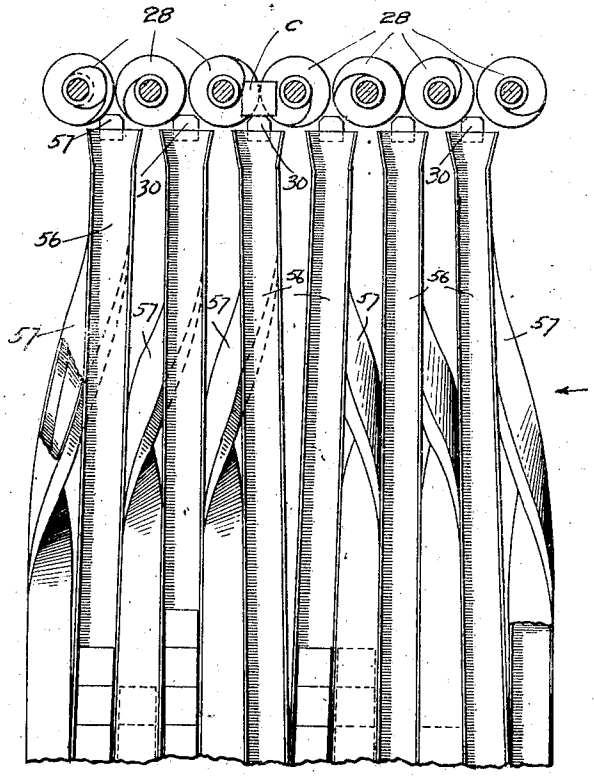


Fig. 7.

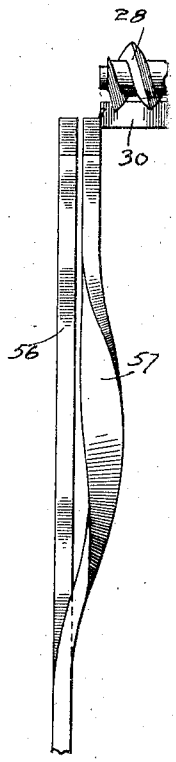
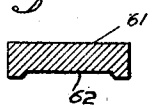


Fig. 8.



INVENTOR.

Bradley L. Benson

UNITED STATES PATENT OFFICE.

BRADLEY L. BENSON, OF SAN FRANCISCO, CALIFORNIA.

TILE-SORTING MACHINE.

1,369,377. Specification of Letters Patent. Patented Feb. 22, 1921.

Application filed May 10, 1920. Serial No. 380,230.

To all whom it may concern:

Be it known that I, BRADLEY L. BENSON, a citizen of the United States of America, residing at San Francisco, in the county of San Francisco and State of California, have invented certain new and useful Improvements in Tile-Sorting Machines, of which the following is a specification.

The present invention is a new and useful improvement in tile sorting machines.

The principal object of the invention is to provide a machine which will sort tiles such as ceramic floor tiles from a miscellaneous mass or pile and deliver them, smooth side up, and selectively obtain control of the tiles for subsequent delivery to other machines, trays or receptacles for inspection or for pasting.

Another object is to provide a machine for selecting tiles with regard to size, one of which will reject over size tile or misshapen or malformed tiles. Ceramic floor tiles are made in various sizes and shapes, the principal forms being square and hexagon. Conforming to present day practice, these tiles are manufactured with one smooth face and one rough face. The rough side usually contains a groove for the purpose of clearing the dies in which the tiles are formed and also to provide a bond for the tile, when set in cement. It is customary to assemble the tiles and paste them with the smooth face in contact with a sheet of paper. This enables the tile setter to handle approximately two square feet of tile so pasted, which are properly spaced apart in all directions at a time, and by matching the edges of these sheets, the tile setter is able to match the sheets and cut joints to cover any desired area. The assembling, sorting and spacing of these tiles has hitherto been accomplished by hand labor. Boards are provided with metallic spacers embedded therein, and the tile is shaken loosely into these boards and agitated until the tile seeks the pockets in the boards. This is a slow laborious process and obviously a great number of the tiles will be wrong side up, necessitating their reversal by hand. The present invention contemplates a mechanical means for selecting from a mass of tile, such tiles as are suitable for pasting and providing means for delivering the same, all smooth side up, in rows or chutes, for inspection or delivery to pasting machines which are adapted to paste the same to sheets of paper. The device hereinafter described also provides means for eliminating sand and debris which may be contained with the tiles.

Other objects and advantages will be seen as the description proceeds.

In this specification and the annexed drawings, the invention is illustrated in the form considered to be the best, but it is to be understood that the invention is not limited to such form, because it may be embodied in other forms and it is also to be understood that in and by the claims following the description it is desired to cover the invention in whatever form it may be embodied.

In the drawings:

Figure 1 is a side elevation of my machine partly broken away.

Fig. 2 is a top plan view of Fig. 1.

Fig. 3 is a fragmentary cross section taken on the line III III of Fig. 1.

Figs. 4 and 5 are fragmentary detail views illustrating the vacuum tile gripping mechanism.

Fig. 6 is a detail view of the chute mechanism, and

Fig. 7 is a side view looking in the direction of the arrow of Fig. 6.

Fig. 8 is a cross section of a floor tile showing the smooth face on top and the groove in the back.

In the drawings, like numerals correspond to similar parts in the different views.

The numeral 5 designates a base to which are secured uprights 6 and 7. The uprights 6 support inclined side rails 8 which carry my sorting mechanism to be later described. The uprights 7 are each provided with a series of orifices 9 for the purpose of adjustably supporting the rear end of a hopper 11 through the medium of screws 12. The forward end of this hopper is preferably supported by a cam 13 pivoted at 14 in inclined members 15. This cam 13 is moved about its pivot point by means of a rod 16 adjustably secured at 17 as shown in Fig. 2. The hopper 11, see Fig. 2, is provided with a series of raised spacing bars 18, the same being tapered toward their rear end for the purpose of providing a flared entrance to the grooves 19. These grooves 19 are each provided with an orifice 21, the purpose of which is to allow broken tile and foreign matter to drop therethrough.

The numeral 22 designates a brush car-

ried upon a shaft 23 which shaft is journaled in the sides of the hopper 11 as shown at 24. This brush is rotated in a counter clockwise direction as indicated by the arrow A of Fig. 1.

The numerals 26 and 27 refer to angle iron members supported upon the inclined side rails 8. These angle irons in turn support a series of worms 28 journaled therein carrying beveled gears 29 secured to the lower ends. These beveled gears in turn mesh with beveled gears 31 mounted upon a shaft 32 suitably journaled on a bracket carried by the angle iron 26. The gears 29 and 31 are so arranged that when the shaft 32 is rotated in a counter clockwise direction, all of the worms will rotate in the same direction, with the result that a block placed upon the worms would be caused to move toward an inclined member 33. The purpose of this movement will be later described.

The numerals 34 refer to cams carried on the ends of the worms 28, the purpose of which will be later described. A brush 36 is mounted above the worms 28 and is adapted to rotate in a counter clockwise direction as indicated by the arrow B.

The numeral 37 designates a belt passing around pulleys 38, 39 and 41, the purpose of which is to drive the brushes 22 and 36.

The numeral 42 designates a belt passing over a motor pulley 43 and over a pulley 44, which pulley 44 is mounted upon the end of the shaft 32.

The numeral 46 designates a motor shaft which is adapted to be driven by a motor 47. Thus it will be seen as the motor 47 rotates the shaft 46 the pulley 43 will transmit power through the belt 42 to the pulley 44 which, in turn, will rotate the shaft 32, gears 31, gears 29, worms 28 and through the belt 37. Rotation will also be imparted to the brushes 22 and 36.

The numerals 48 refer to vacuum cups, the action of which is best illustrated in Figs. 4 and 5. The vacuum cups are positioned in the angle iron 27 so as to lie in a plane between the ends of the worms 28. An expansion spring 49 is provided around the stem of each vacuum cup for the purpose of normally retaining the same in the position shown in Fig. 4. A relief valve of ordinary construction is contained within each stem and has a protruding end 51 which end is adapted to contact with release screws 52. An arm 53 is provided on each stem, which arm is adapted to engage the cam 34 carried on the adjacent worm. The operation of these vacuum cups will be later described. The release screws 52 are carried upon a yoke 54 attached to the angle iron 27. In Fig. 1 it will be noted that a series of chutes 56 and 57 are provided adjacent the ends of the worms, the purpose of which is to receive tile delivered by the worms and deliver the same to any desired point. The chutes 57 are so bent as to cause the tile delivered thereto to make a half turn in going from one end of the chute to the opposite end, the purpose of which will be hereinafter described. By referring to Fig. 6 it will be noted that guides 30 are positioned between each set of worms and at a point below the axis of same, the purpose of which is to support the tile between the worms 28 as illustrated by the tile C, Fig. 6.

In operation, bulk tile is dumped into the hopper 11; the cam 13 is then moved so that the forward end of the hopper 11 rests upon the worms 28. This imparts a vibratory movement to the hopper 11 and causes the tile to slide through the grooves 19. The brush 22 then encounters any tile which may be liable to go through, except the tile which are in the grooves. Any broken tile or under size tile will be caused to drop through the openings 21 with the result that the tile delivered to the worms 28 will be perfect tile. A tile is shown about to be delivered at D of Fig. 1. These tile drop to the worms and in most instances take a position in the worm as shown at E of Fig. 3 directly. Some, however, ride on the worms as shown at F of Figs. 1 and 3 until they encounter the brush 36. This brush acts to throw the tile F backward until the same does take a position similar to that shown at E. Tile which may be over size will be caused to move toward inclined member 33 and discharged down the same out of the machine as shown at G of Fig. 3. The reason for this tile being discharged to the side is that the worms are all rotating in a direction toward that side of the machine and at the same time the worms are on an incline. This action is very rapid and positive in actual operation. When the tiles reach the upper end of the machine and are about to be discharged from the worms as shown at H of Fig. 4 the vacuum members will be in a retracted position as shown at Fig. 5, due to the action of the arms 53 and the cams 34. At this point the vacuum member shoots forward under the action of the spring 49 with the result that the tile is engaged by the vacuum member. Should the smooth side of the tile be toward the vacuum member, the vacuum will then act to retain the tile thereon, with the result that as the cam 34 acts upon the arm 53, the vacuum cup and its engaged tile will be drawn away from the ends of the worms until the projection 51 engages the release screw 52. This contact breaks the vacuum and the tile drops by gravity into one of the chutes 56. Should, however, a tile be presented to the vacuum cup so that its rough side comes in contact therewith, the vacuum will not operate and as soon as the vacuum cup starts

to recede from the end of the screws, the tile will drop into the chute 57. It will now be noted that the chute 57 is twisted as before mentioned, which results in the tile making a half turn so that at the lower end of the chutes all of the tile will have the smooth face presented upwardly with the result that I have sorted out the imperfect tile, those being under size, and those being over size, and have delivered the perfect tile to a series of chutes in such a manner that all of the tile emerge from the machine sorted and turned right side up to traverse the chutes for inspection or delivery to other machines.

In Fig. 8 I have shown a cross section of a floor tile showing the smooth face of the tile at 61 and the grooved back at 62.

This explains the action of the vacuum cups which refuse the tile when the grooved surface is presented as the vacuum is broken.

The machine works well with either square or hexagon tile. Slight alterations in the worms accommodate them to the various sizes and shapes of tile.

It will be noted in the drawings that the helix of each of the worms is substantially triangular in cross section. This is to facilitate the gravitation of the tiles into the pockets formed between the worms.

It is essential in my invention that the apex of each helix of each worm coincides with that of the helix of the next adjacent worm so that a series of pockets is formed which travel upwardly as the worms are rotated.

Having thus described my invention, what I claim as new and novel is:

1. In a device of the character described a hopper, a series of parallel inclined worms having their lower ends positioned beneath said hopper, means for raising and lowering the end of said hopper, a rotating brush mounted within said hopper for the purpose of regulating the flow of tile therefrom, guides mounted beneath said worms, means for causing the tile to be sorted to ride upon said guides, a cam carried on the end of each of said worms, vacuum cups positioned between the ends of said worms, an arm carried on each of said vacuum cups and adapted to engage one of said cams, said vacuum cup being adapted to engage the smooth surface of the tile delivered by said worms, and withdrawing therefrom for the purpose of proper distribution and means for releasing said tile so engaged from said vacuum cup.

2. A sorting machine for tiles consisting of a hopper, a plurality of worms adapted to be rotated in one direction and deliver the tile from said hopper, guides between the worms adapted to support the tiles as they are propelled by the worms, and means near the ends of said worms for selectively inverting the tiles so that they will be delivered uniformly smooth side up.

3. In a sorting machine for articles having a rough side and a smooth side, vacuum means adapted to engage said smooth side and reject said rough side, means for retracting said vacuum means, and means for releasing said vacuum at a pre-determined point for distribution of articles engaged by said vacuum means.

4. In a sorting machine for articles having a rough side and a smooth side vacuum means adapted to engage said smooth side and reject said rough side, means for retracting said vacuum means, means for releasing said vacuum at a predetermined point for distribution of articles engaged by said vacuum means, a series of chutes adapted to conduct articles rejected by said vacuum means, and another series of chutes adapted to conduct articles engaged by said vacuum means when said vacuum is released.

5. In a sorting machine for articles having a rough side and a smooth side, vacuum means adapted to engage said smooth side and reject said rough side, means for retracting said vacuum means, means for releasing said vacuum at a pre-determined point for distribution of articles engaged by said vacuum means, a series of chutes adapted to conduct articles rejected by said vacuum means, another series of chutes adapted to conduct articles engaged by said vacuum means when said vacuum is released, and means in one of said series of chutes for inverting all of said articles so that all the articles in both chutes will be delivered with the same surfaces upward.

6. A sorting machine for tiles adapted to withdraw said tiles from a disordered mass and place same in orderly processions, consisting of a suitable frame, a series of worms, adapted to rotate in a common direction, said worms having helices substantially triangular in cross-section and of a pitch which will cause the tiles to tilt in uniformly edgewise positions between said worms on a plane at a right angle to the axes of said worms, the helix of each worm coinciding with that of the adjacent worm to form rows of pockets, and guides beneath each row of pockets for supporting said tiles in said edgewise position as they are propelled by the worms.

7. A machine for withdrawing articles from a disordered mass and placing same in orderly processions comprising a frame, a plurality of worms adapted to be rotated simultaneously in a common direction and so positioned that the helix of each worm coincides with that of the adjacent worm at all times during rotation to form a series of pockets, guides extending beneath said

pockets adapted to support said articles as they are propelled by said worms and conduits communicating with said guides adapted to convey articles from said guides.

8. A machine for withdrawing articles from a disordered mass and placing same in orderly processions comprising a frame, a plurality of worms adapted to be rotated simultaneously in a common direction and so positioned that the helix of each worm coincides with that of the adjacent worm at all times during rotation to form a series of pockets, guides extending beneath said pockets adapted to support said articles as they are propelled by said worms, the said worms and guides being inclined upwardly in such a manner that articles not engaged by said pockets will fall backward for subsequent engagement.

In testimony whereof, I affix my signature.

BRADLEY L. BENSON.