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MACHINE FOR AND METHOD OF TREATING MATERIAL

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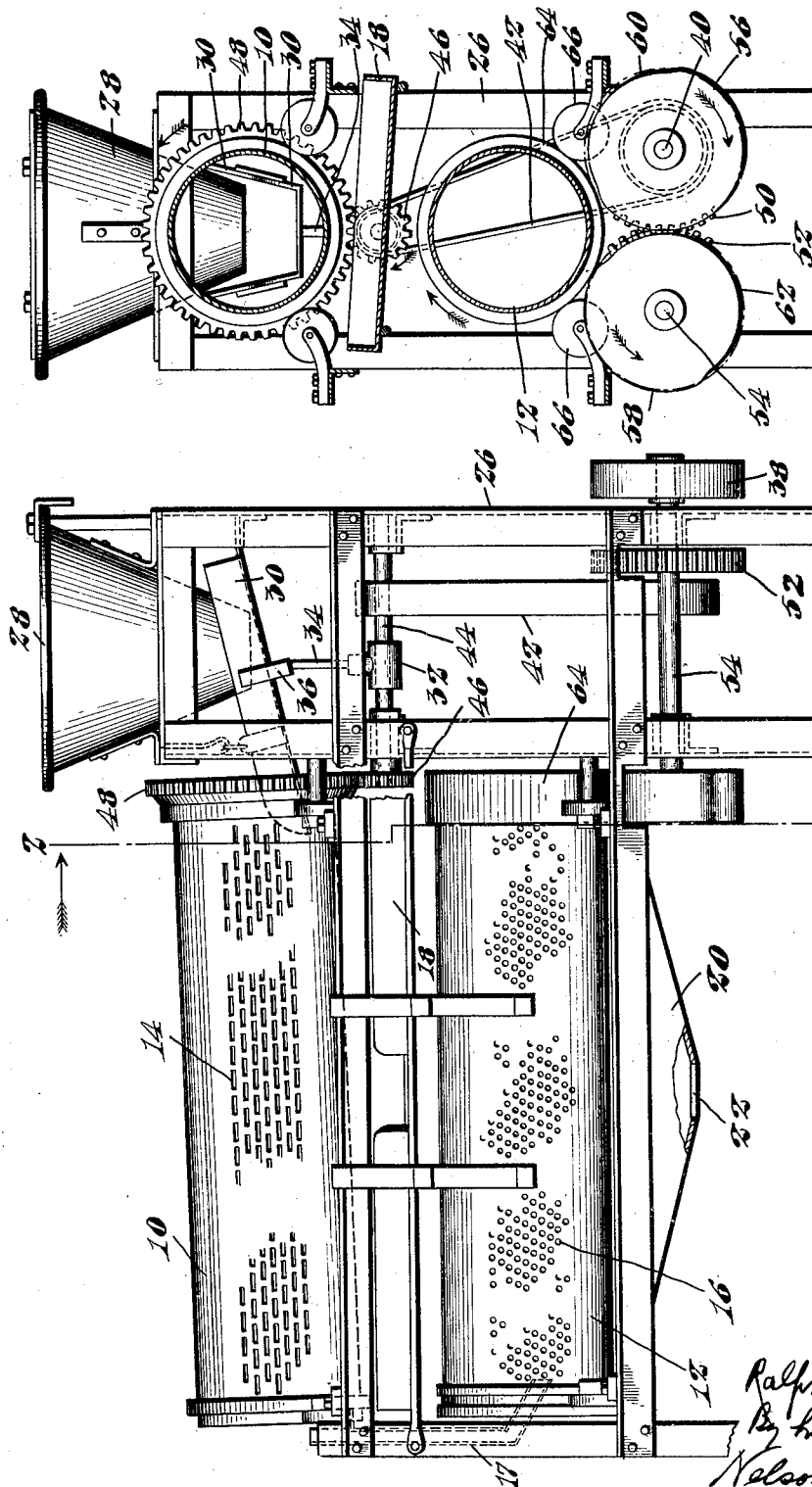


Fig. 2.

Fig. 1.

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UNITED STATES PATENT OFFICE

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MACHINE FOR AND METHOD OF TREATING MATERIAL

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This invention relates to methods of and machines for treating material and is herein disclosed with reference to a screening machine particularly adapted for use in the manufacture of cut nails or tacks. As a matter of convenience, the word "nails" will be used herein as including also "tacks", as well as other articles to the screening of which machines embodying this invention may be applicable.

In the manufacture of cut nails, it is usual to screen the nails at least twice, once to separate from the nails small chips and headless nails or nails with heads unduly small and again to separate out larger objects, such as pieces of the strips of material from which the nails are formed and nails with excessively large heads. For this purpose, the nails are first screened through a perforated drum, the perforations of which are in the form of elongated slots having a width greater than the diameter of the shanks of the nails and of the thickness of the material from which the nails are formed but less than the diameter of the head of a perfectly formed nail. After this, the nails are screened by a second drum having circular perforations of a diameter which will pass the head of a perfectly formed nail but will prevent the passage of any larger object. Thus the perfect nails pass through the first drum from end to end and pass out through the perforations in the second drum.

The second screening operation is particularly slow and tedious and ordinarily has to be performed several times since there is a strong tendency for a large number of perfect nails to pass out with the waste material through the end of the drum. The nails are greatly inclined to mass together, and the openings in the drum are closed to a greater or less extent by nails which enter the holes point first and are caught by their abnormally large heads.

It is accordingly an object of the present invention to provide an improved method adapted, for example, to the screening of nails which shall obviate, so far as possible, the tendency of the nails to mass together and to stick in the perforations of the screen.

As herein set forth, a rotary screen is given a pilgrim step movement, that is to say is rotated step by step alternately in opposite directions with the steps in one direction greater than those in the opposite direction, and while so rotating the velocity of rotation is maintained constant substantially throughout the entire period of rotation in each direction. Thus the direction of movement of the screen is reversed suddenly thereby agitating the contents of the drum with considerable violence.

It is a further object of the present invention to provide an improved screening machine for use in nail-screening and analogous operations. With this object in view, a feature of the invention comprises a drum provided with improved driving mechanism arranged to give it a pilgrim-step movement. To facilitate and speed up the action of the drum, gearing is provided by which the velocity of rotation of the drum is maintained uniform, in accordance with my novel method, throughout substantially the entire duration of each step of movement of the drum, the direction of movement being reversed suddenly so as to agitate the nails in the drum with considerable violence. With this in view, the illustrated machine is provided with operating mechanism comprising a circular friction gear member fast upon the drum to be given the pilgrim-step movement and a pair of friction gear members co-operating therewith and driven in opposite directions, each having a portion of its circumference elevated and a portion depressed, with one of the elevated portions longer than the other, so that the elevated portions co-operate alternately with the friction gear member fast upon the drum. The difference of radius between the elevated and depressed portions of these friction gear members is but slight and the drum is supported to pass rapidly from the control of one of the gear members to that of the other so that the reversal of the direction of rotation of the drum is sudden.

While the pilgrim-step movement of the drum of the herein disclosed machine is transmitted by friction gearing, it should be clearly understood that in various of its ma-

chine aspects the invention is not limited to a machine having friction gearing since clearly other mechanism may be used. Nor is the invention limited to a machine for screening nails or tacks.

5 With the above and other objects and features in view, the invention will now be described in connection with the accompanying drawings and pointed out in the claims.

10 In the drawings,

Fig. 1 is a side elevation of the screening machine embodying the present invention; and

Fig. 2 is a transverse section on the line 2—2 of Fig. 1.

15 The illustrated machine is provided with a pair of superposed screens in the form of perforated drums 10 and 12, the upper of these being provided with elongated perforations 14 of a width greater than the diameter of the shanks of the nails to be screened and than the thickness of the stock from which the nails are formed but slightly less than the diameter of the heads of perfect nails. The lower drum 20 12, on the other hand, is provided with circular perforations 16 of such a diameter that they will pass nails having perfectly formed heads but will prevent the passage of larger objects. A chute 17 receives the nails from the left-hand end of the upper drum 10 and guides them to the corresponding end of the lower drum 12. Thus the upper drum will separate small chips, headless nails or nails with incomplete heads from the perfect nails, 25 such material dropping into a tray 18 provided beneath the drum for that purpose, while perfect nails pass through the perforations of the lower drum into a chute or hopper 20 having an opening 22 beneath which may be placed any suitable receptacle. 30 Nails having inadmissably large heads and other extraneous objects too large to pass through slots 14 in drum 10, for example such pieces of the sheet metal strips from 35 which the nails are made as may be too long to pass out through openings 14 in drum 10, will ultimately pass out or be removed through the right-hand end of drum 12.

Drums 10 and 12 are mounted for rotary 40 movement, for example on rollers carried by a suitable frame 26 which carries also a hopper 28 from which the nails to be treated pass to a chute 30, which may conveniently be vibrated, as by means of an eccentric 32 reciprocating a rod 34, the latter being positioned to knock against a member 36 rigidly connected to chute 30.

The upper drum 10 is rotated continuously. This may conveniently be accomplished by 45 gearing such as that shown, which comprises a pulley 38 rotated from any suitable source of power and mounted upon a shaft 40 suitably journaled in frame 26. Shaft 40 is connected by belt gearing 42 with shaft 44, which 50 has mounted upon it a toothed gear 46 mesh-

ing with a corresponding large circular gear 48 fast upon drum 10. Conveniently eccentric 32 may also be mounted upon or driven from shaft 44. The lower drum 12 is driven with a pilgrim-step movement by mechanism 55 which will now be described. Fast upon shaft 40 is a spur gear 50 meshing with a corresponding spur gear 52 mounted upon counter shaft 54, this arrangement causing shafts 40 and 54 to rotate at the same speed 60 but in opposite directions. Fast upon shafts 40 and 54 is a pair of mutilated friction gear members having elevated portions 56 and 58 and depressed portions 60 and 62 respectively. The elevated portions 56 and 58 of these gear 65 members are arranged to contact alternately with a friction gear member 64 carried by drum 12, idle rolls 66 being arranged to support drum 12 in such position that friction gear member 64 cannot ever contact with the depressed portions 60 and 62 of the mutilated 70 friction gear members. Since the elevated portion 56 is longer than elevated portion 58, drum 12 will be driven through a greater distance each time that gear member 64 contacts with elevated portion 56 than it will 75 when friction gear member 64 contacts with elevated portion 58 so that drum 12 will be given a pilgrim-step movement. Since the elevated portions 56 and 58 are formed as arcs of circles having their centers upon shafts 40 and 54 respectively, and since the difference in radius of the depressed and elevated portions is very small as compared to 80 the length of either of the elevated portions, drum 12 will be driven at a uniform speed substantially from the beginning to the end of each step, and its rotation will be reversed suddenly so that the mass of nails in the drum 85 will be agitated violently each time the direction of rotation is changed. This breaks up the masses into which the nails tend to adhere and also is very effective in jarring loose from the perforations in the drum nails 90 whose heads are too large to permit the nails to pass through, as well as nails which are able to pass through but with difficulty, and, accordingly, is conducive to an effective and speedy sorting operation.

Having described the invention, what I 95 claim as new and desire to secure by Letters Patent of the United States is:

1. A machine for treating material having, in combination, a drum, and means for agitating the contents of the drum comprising a 100 gear member carried by the drum and a pair of gear members alternately co-operating therewith and driven in opposite directions.

2. A screening machine having a perforated drum, and means for rotating the drum with a pilgrim-step movement comprising a 105 gear member carried by the drum and a pair of gear members alternately co-operating therewith and driven in opposite directions.

3. A machine for treating material having 110

a drum, and means for agitating the contents of the drum comprising a gear member carried by the drum and a pair of gear members alternately co-operating therewith and driven in opposite directions, said gear members being formed to give the drum alternate movement in opposite directions with the movements in one direction longer than the movements in the other direction.

4. A machine for treating material having, in combination, a drum, and operating means for the drum comprising a friction gear member carried by the drum and a pair of friction members driven in opposite directions and formed and arranged alternately to co-operate with the friction gear carried by the drum to rotate the drum alternately in opposite directions with its movements in one direction greater than its movements in the other direction.

5. A machine for treating material comprising a drum, and means for giving the drum a pilgrim-step movement comprising a friction gear member carried by the drum and a pair of friction gear members driven in opposite directions and formed and arranged alternately to co-operate with the friction gear member carried by the drum to rotate the drum alternately in opposite directions.

6. A screening machine comprising a perforated drum, and means for agitating the contents of the drum comprising a friction gear member carried by the drum and a pair of friction gear members driven in opposite directions and formed and arranged alternately to co-operate with the friction gear member carried by the drum to rotate the drum alternately in opposite directions.

7. A machine for treating material having, in combination, a drum, and means for agitating the contents of the drum comprising a gear member carried by the drum, a pair of gear members arranged alternately to co-operate therewith, and means for driving said gear members in opposite directions, said gear members being arranged to reverse the movement of the drum suddenly so as to agitate violently the material in the drum.

8. A machine for treating material having, in combination, a drum, and means for giving the drum a pilgrim-step movement comprising a friction gear member carried by the drum and a pair of friction gear members rotated in opposite directions and each provided with an elevated portion arranged to drive said first-named friction gear member when in contact therewith and a depressed portion arranged for rotation out of contact with said first-named friction gear member, the rotation of said oppositely rotated friction gear members being synchronized so that their elevated portions contact alternately with said first-named friction gear member.

9. A machine for treating material comprising a drum, a circular friction gear member carried thereby, a pair of friction gear members, the periphery of each of which has an elevated portion formed on an arc of a circle and a depressed portion, said last-named gear members being rotated in opposite directions and arranged alternately to co-operate with said circular gear member to move the drum alternately in opposite directions, and a pair of idle rolls arranged to prevent said circular gear member from contacting with the depressed portion of either of the other gear members.

10. A screening machine comprising a perforated drum, a circular friction gear member carried thereby, a pair of friction gear members the periphery of each of which has an elevated and a depressed portion, said last-named gear members being rotated in opposite directions and arranged alternately to co-operate with said circular gear member to move the drum alternately in opposite directions, and a pair of idle rolls arranged to prevent said circular gear member from contacting with the depressed portion of either of the pair of gear members.

11. A machine for treating material having, in combination, a drum, and means for giving the drum a pilgrim-step movement comprising a friction gear member carried by the drum and a pair of friction gear members rotated in opposite directions and each provided with an elevated portion arranged to drive said first-named friction gear member when in contact therewith, and a depressed portion arranged for rotation out of contact with said first-named friction gear member, the rotation of said oppositely rotated friction gear members being synchronized so that their elevated portions contact alternately with said first-named friction gear member, one of said elevated portions being of greater amplitude than the other so that the steps of rotation of the drum in one direction are greater than its steps of rotation in the opposite direction.

12. A machine for treating material comprising a plurality of drums, means for rotating said drums to agitate the material therein, and means for transferring material from one of the drums to another of the drums, the rotating means for one of the drums being arranged to give that drum a pilgrim-step movement with the velocity of rotation of the drum constant throughout substantially the entire period of each step of its movement.

13. A screening machine comprising a plurality of perforated drums, means for rotating said drums to agitate the material therein, and means for transferring material from one of the drums to another of the drums, the rotating means for the latter drum being arranged to give that drum a pilgrim-step

movement with the velocity of rotation of the drum constant throughout substantially the entire period of each step of its movement.

14. A screening machine comprising a plurality of superposed perforated drums, means for rotating the drums, and means for transferring material from an upper drum to a lower drum, the rotating means for said lower drum being arranged to give that drum a pilgrim-step movement with the velocity of rotation of the drum constant throughout substantially the entire period of each step of its movement.

15. A screening machine comprising a pair of superposed perforated drums, means for introducing material into one end of the upper drum, means for transferring material from the other end of the upper drum to the lower drum, and gearing for rotating the drums, said gearing being arranged to give the lower drum a pilgrim-step movement.

16. A screening machine comprising a pair of superposed drums, means for introducing material into one end of the upper drum, means for transferring material from the other end of the upper drum to the lower drum, and gearing for rotating the drums, the gearing for the lower drum comprising a circular gear member carried by said lower drum and a pair of mutilated gear members co-operating therewith and rotating in opposite directions, the effective portions of said mutilated gear members co-operating alternately with said circular gear member so as to move said lower drum alternately in opposite directions.

17. A screening machine comprising a pair of superposed drums, means for introducing material into the upper drum, means for transferring material from the upper drum to the lower drum, and gearing for rotating the drums, the gearing for the lower drum comprising a circular friction gear member carried by said lower drum and a pair of mutilated friction gear members co-operating therewith and rotating in opposite directions, the effective portions of said mutilated friction gear members co-operating alternately with said circular gear member so as to move said lower drum alternately in opposite directions.

18. A screening machine comprising a perforated drum, and means for rotating said drum alternately in opposite directions, said rotating means including automatic means for changing the direction of said rotation and for maintaining the velocity of rotation of the drum without change throughout substantially the entire period of its rotation in each direction.

19. In a screening machine the combination with a rotary perforated drum, of gearing constructed and arranged to impart to the drum a pilgrim-step movement at a rotational velocity maintained constant through-

out substantially the entire period of each step of the movement imparted to the drum.

20. An improved method of separating from a promiscuous assortment of articles those having desired characteristic dimensions which consists in feeding the assortment along an apertured surface rotating at a substantially constant speed, abruptly stopping the rotational movement and thereafter rotating the surface at a substantially constant speed in the opposite direction, the speed in each direction being such that those articles having desired characteristic dimensions are discharged through the apertures in said rotating surface.

21. An improved method of screening nails and like objects which comprises repeatedly carrying the nails upwardly against the side of a separator by imparting a movement of rotation of constant velocity to the separator, the velocity being such that free nails fall toward the bottom of the separator, and then imparting abruptly a movement of rotation of constant velocity to the separator in the opposite direction, the velocity also being such that the masses of nails in the separator are broken up and those adhering to the surface of the separator are loosened to fall to the bottom of the separator from which those nails having certain desired characteristic dimensions are ultimately discharged.

22. An improved method of screening which comprises delivering the material to be screened to a separator, repeatedly carrying the nails upwardly against the side of the separator by imparting a movement of rotation of constant velocity to the separator, the velocity being such that free material falls downwardly toward the bottom of the separator, and then imparting abruptly a greater movement of rotation of constant velocity to the separator in the opposite direction to overcome the tendency of the centrifugal force of the separator to prevent the pieces of material adhering to the surface of the separator from falling back to the bottom of the separator from which pieces of material having desired characteristic dimensions are ultimately discharged.

In testimony whereof I have signed my name to this specification.

RALPH F. KNIGHT.