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MACHINE FOR REDUCING RUBBER OR SIMILAR MATERIAL TO AN IMPALPABLE POWDER.
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984,758.

Patented Feb. 21, 1911.

Fig. 1.

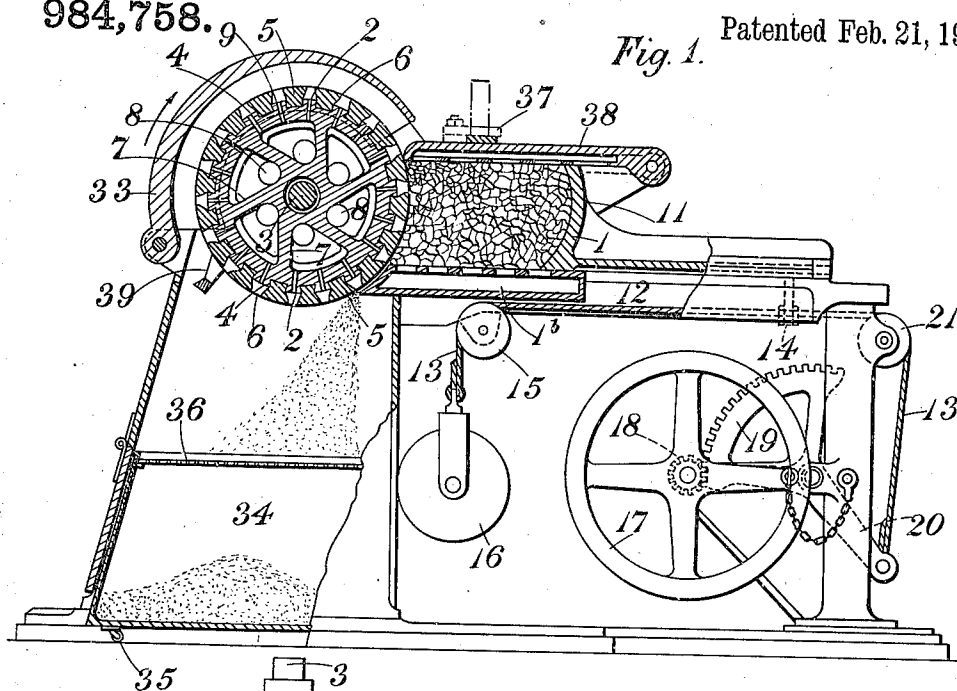
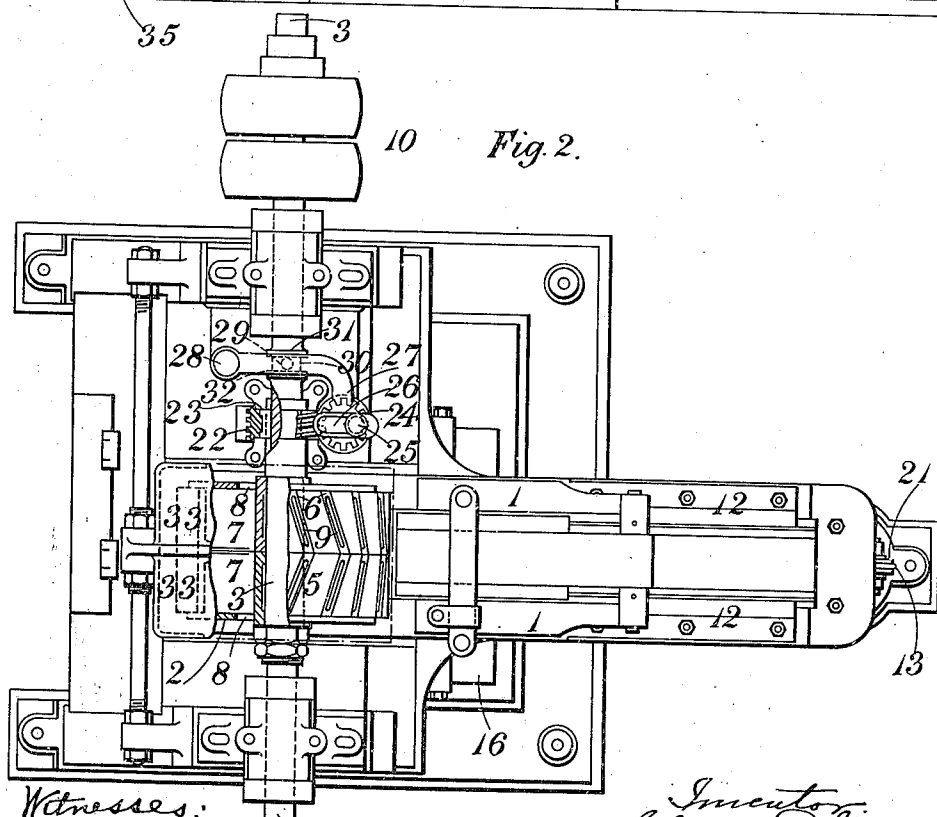


Fig. 2.



Witnesses:
May 4, 1910.
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UNITED STATES PATENT OFFICE.

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MACHINE FOR REDUCING RUBBER OR SIMILAR MATERIAL TO AN IMPALPABLE POWDER.

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Specification of Letters Patent.

Patented Feb. 21, 1911.

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To all whom it may concern:

Be it known that I, CHARLES EDWARD GARDNER, of the firm of William Gardner & Sons (Gloucester) Ltd., engineers, a subject of the King of Great Britain, residing at Bristol Road, Gloucester, in the county of Gloucester, England, have invented a certain new and useful Improved Machine for Reducing Rubber or Similar Material to an Impalpable Powder, of which the following is a specification.

This invention relates to machines for reducing or disintegrating substances by submitting same to the action of a revolving surface of suitable abrading material, and to which means may be applied for imparting a movement to the abrading surface in a plane at right angles to the direction of rotation, the substance to be disintegrated being automatically fed to such abrading surface, and the present improvements are for the purpose of rendering this class of machine especially suitable for the reduction of rubber or similar material or compositions to an impalpable powder and are particularly applicable for reducing scrap or waste material with the object of bringing same to a condition for enabling it to be readily utilized for reworking into a new product or other purposes, but which may be also used for reducing new material to the desired state of disintegration. With this object the revolving surface and also the box containing the material are so constructed as to permit of the circulation or passage of air therethrough during the reducing action, for the purpose of preventing the melting of the material during the operation.

The improvements further consist in an improved arrangement of the means for imparting movement to the abrading surface in the direction of its axis of rotation, and finally in the special construction of the means for returning the box containing the material to be reduced back to the charging position and raising the weight whereby same is automatically fed toward the abrading surface. The accompanying drawing illustrates a suitable construction of my machine for this purpose, in which—

Figure 1 is a longitudinal section partly

in elevation, and Fig. 2 a part plan and part horizontal section thereof.

In carrying out my invention the rubber or other material it is desired to reduce is confined within a box or receptacle 1 the bottom and sides of which are ventilated all around, either by means of perforations through same or by forming the castings with openings and providing said box with suitable coverings through which a circulation of air is established for the purpose of maintaining such box and its contents at a low temperature and prevent the rubber melting and running under the abrading or reducing action to which it is submitted, for which purpose the space 1^b below the bottom of the box may be connected with a fan. This box 1 is automatically and continuously fed toward a rapidly revolving wheel 2 or a series of wheels composed of or faced with emery, carborundum, stone or other reducing agent. The periphery of these wheels may be fluted or corrugated to reduce friction and heat, while improving their cutting efficiency. These wheels are preferably made up in solid sections or in sectional rings with hollow cylindrical centers provided with vanes so constructed as to provide an air space between them to permit of an automatic circulation or ventilation of same and thus prevent overheating and the consequent interference of their reducing action which would occur with any considerable rise of temperature when dealing with material of the nature which rubber presents.

In the drawing the wheel 2 is shown as composed of two sections mounted side by side on and secured to the axle 3, the periphery of said sections being cast with a suitable number of dovetailed helical or other suitable shaped recesses to receive correspondingly shaped blocks or bars 5 or other abrading blades of carborundum or other suitable abrading material. The spaces 6 between the blocks 5 are also of dovetailed section and serve to assist the cutting or abrading action and also form recesses serving for clearing the powder as ground away. The blocks 5 may form double helices as shown so as to overlap and so present a continuous grinding surface, or the same result

may be attained by the employment of blocks continued diagonally across both faces of the sections at an angle to insure the necessary overlap between the contiguous blocks.

The interior of the wheel 2 is provided with arms 7 and openings 8 are cast in the ends of the wheel toward the center thereof and communicate with the spaces between said arms, while other openings 9 are formed through the periphery of the wheel in the spaces 6 between the grooves 4 in which the carborundum blocks 5 are situated, so that as the wheel 2 is caused to rotate in the direction of the arrow shown in Fig. 1, the arms 7 will act as impellers and draw air in through the openings 8 and expel same through the peripheral openings 9, thereby causing a continuous current of air to circulate through the compartments into which said wheel is divided by said arms and to issue between the blocks of carborundum 5, and thus maintain the parts at the required temperature to prevent the melting of the rubber by the abrading action of the revolving wheel 2.

The wheel or wheels 2 are mounted on the shaft 3 and connected with any suitable motor either direct or through fast and loose pulleys 10 to permit the surface thereof to rotate at a high rate of speed and thus effectually disintegrate the rubber or material 11 presented to the action thereof by the automatic forward feed of the box 1 in which same is confined. This feed may be effected by mounting the box 1 so that same can travel in a grooved planed bed 12, and providing a cord 13 which is attached to the rear of the box at 14 and passing over a pulley 15 is provided with a counterweight 16 tending to draw the box forward to the end of the bed 12 at which the revolving wheels 2 are mounted, suitable means being provided for returning the box to its rearward position for recharging against the action of the counterweight 16 when required and at same time raise the latter to its highest position. It will be seen that such weight will insure the rubber or other material being continuously forced forward with a constant pressure against the surface of the rapidly revolving emery or other reducing wheel arranged at the end of the bed. It will also be understood that this continuous feed of the material might be effected mechanically from the driving shaft or other suitable part, or that a spring feed might be substituted for the counterweight 16.

In order to return box 1 to the position on the bed 12 for recharging same with rubber when necessary a hand wheel 17 may be provided to actuate a pinion 18 gearing with a toothed sector 19 provided with an arm 20 to which the cord 13 connected with the

counterweight 16 is attached, such cord being continued for this purpose beyond its point of attachment to box 1, and passing over a pulley 21, mounted at the rear end of the frame of the machine, and then proceeding to said arm 20. It will be seen that the descent of weight 16 will effect the automatic feed of box 1 to wheel 2, the return of such box for recharging being produced by operating hand wheel 17, and at same time through cord 13 raising the counterweight 16 back to its operative position.

A slight lateral movement is preferably imparted to the reducing wheel or surface 2 in a direction transverse to the thrust of the material against same, so as to assist the disintegrating or abrading action due to the rapid rotation of such surface. For this purpose an oscillating gear is employed which is composed of worm gearing secured by feathers on the driving shaft so as to permit of a certain relative movement between the shaft and the worm thereon under the action of a vertical crank arranged to run in a step bearing, said gearing serving as a reducing gear whereby the high rate of speed at which the driving shaft is actuated is materially diminished, so that the lateral movement imparted to the wheels is comparatively slow in relation thereto. This oscillating gear is shown in Fig. 2, where 22 is the worm mounted on shaft 3 by feathers 23 which permit of the endwise movement of the latter in relation to said worm, and which gears with a horizontal worm wheel 24 provided with a vertical pin 25 engaging a slot 26 in one arm of a horizontal bell crank lever 27 pivoted at 28, such lever carrying a downwardly depending pin 29 which engages the groove 30 between collars 31, 32 formed on shaft 3. It will be seen that by rotation of shaft 3 the worm 22 mounted thereon will cause pin 25 of worm wheel 24 to impart an oscillating movement to the lever 27 on pivot 28, and that pin 29 carried by such lever will in turn through its engagement with groove 30 impart a reciprocating longitudinal or endwise movement to shaft 3, and consequently a corresponding movement to the grinding or abrading wheel 2 mounted on said shaft, whereby the disintegrating action of such wheel upon the material presented thereto by the traveling box 1 will be materially augmented. It is apparent that the oscillating gearing serves also as a means for reducing the high rate of speed at which the shaft 3 is actuated, whereby the oscillating movement imparted to said shaft is rendered relatively slow to the surface speed of the grinding or abrading wheel 2 mounted thereon.

The revolving reducing wheel or wheels 2 are surrounded by a casing 33 and the pow-

der to which the material presented to the action thereof is reduced falls into a removable box 34 preferably fitted with wheels or casters 35, and arranged to catch same in the lower portion of such casing below said wheels 2 as shown; or the powder might be carried off by a worm conveyer or traveling tray or band to any desired point.

An exhaust fan and a cyclone or other dust collector (not shown) may be provided and driven direct, or from the same shaft as the machine, or from the machine itself, and serve to keep the material cool during grinding and also carry off the heat and fumes, and to collect the ground powder if required. A sieve or grid 36 may be fitted between the wheel 2 and the box or other receptacle, which catches the finished product, the drawing showing same as being fitted to the box 34 itself, and such grid in the event of any of the rubber heating and melting will arrest same and prevent it from mixing up with the good powder which falls through, and so spoiling the whole of the latter. This grid 36 will also arrest any pieces of foreign matter which may accidentally fall into or from the machine.

As hereinbefore stated the feed box 1 is well ventilated all around, and the table or bed 12 along which same travels is also similarly ventilated in order to provide for the efficient conduction or radiation of the heat generated, and a hand lever 37 and spring catch are preferably provided to act upon the hinged lid 38 of such box (which is also ventilated), so as to keep same closed and the material tight in the box, and prevent it being forced upward out of the top thereof during the grinding action, as well as to avoid any undue friction against the automatic feed action. An adjustable brush 39 is preferably provided to bear on the surface of the grinding wheels 2 and free same from any accumulation of powder resulting from the grinding operation.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. An abrading wheel for reducing rubber or similar material to powder, comprising a rotary hollow cylinder having end openings and a slotted peripheral rim, abrading blades disposed in said rim between the peripheral slots thereof, and interior arms fixed in said cylinder and operative to induce a draft inward through said end openings and outward through the slotted traveling periphery.

2. An abrading wheel for reducing rubber or similar material to powder, comprising a rotary hollow cylinder having an end opening and a slotted peripheral rim, abrading blades disposed in said rim between the peripheral slots thereof, and partitions tangen-

tial to the hub of said cylinder, dividing the interior thereof and operative to induce a draft inward through the end opening and outward through the slots of the traveling periphery.

3. An abrading wheel for reducing rubber or similar material to powder, comprising a rotary hollow cylinder having an end opening and a slotted peripheral rim, abrading blades in the form of broad faced bars disposed between the peripheral slots of said rim, said bars being undercut to form their cutting edges, and means for inducing a draft inward through the ends of said cylinder and outward through the slotted traveling periphery thereof.

4. The combination of an abrading wheel for reducing rubber or similar material to powder, comprising a rotary shell provided with end and peripheral ventilating openings for centrifugal air draft, with means for inducing such draft, and with abrading blades disposed on the periphery of said shell between the peripheral openings, a feed box provided with ventilating openings, and means for feeding the material in said feed box against the periphery of said shell.

5. The combination of an abrading wheel comprising a rotary shell provided with end and peripheral openings for centrifugal air draft, with tangential partitions dividing the interior of said wheel, and with abrading blades disposed on the periphery of said shell between the peripheral openings, a feed box provided with ventilating holes, and means for forcing the material in said feed box into contact with the periphery of said abrading wheel.

6. The combination of an abrading wheel comprising a rotary shell provided with end and peripheral openings for centrifugal air draft, with means for inducing such draft, and with abrading blades disposed on the periphery of said shell between the peripheral openings, a feed box provided with a ventilated lid, and means for forcing the material in said feed box against said abrading wheel.

7. The combination of an abrading wheel comprising a rotary shell provided with blades disposed at intervals and with ventilating holes through said shell between said blades, a feed box provided with a ventilated lid, means for forcing the material in said feed box against said abrading wheel, and means for causing said abrading wheel to reciprocate axially during its rotation.

8. An abrading wheel for reducing rubber or similar material to powder, comprising a rotary hollow cylinder provided with grooves at intervals in its periphery, with abrading blades in the form of broad faced bars disposed in said grooves, and with intermediate openings between said grooves

for the centrifugal discharge of air between said blades.

9. An abrading wheel for reducing rubber or similar material to powder, comprising a
5 rotary hollow cylinder provided with grooves at intervals in its periphery, with abrading blades in the form of broad faced bars disposed in said grooves, said bars being undercut on opposite sides forming
10 double cutting edges, and openings between

said grooves for the centrifugal discharge of air between said blades.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

CHARLES EDWARD GARDNER.

Witnesses:

E. J. RUSSELL,

L. H. TAYLOR.