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J. J. ROSS

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PROCESS FOR MAKING GRINDING ROLLS FOR FLOUR MILLS

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Fig. 1.

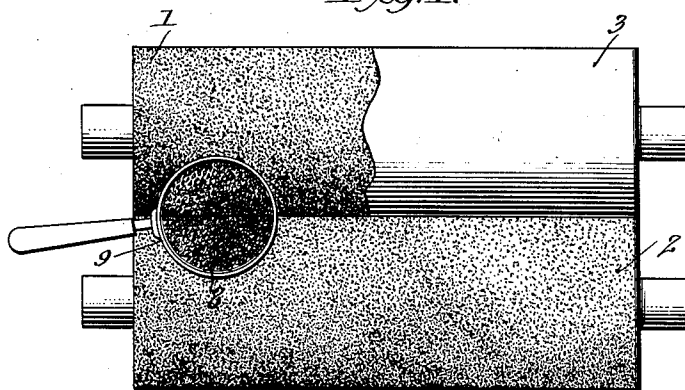


Fig. 2.

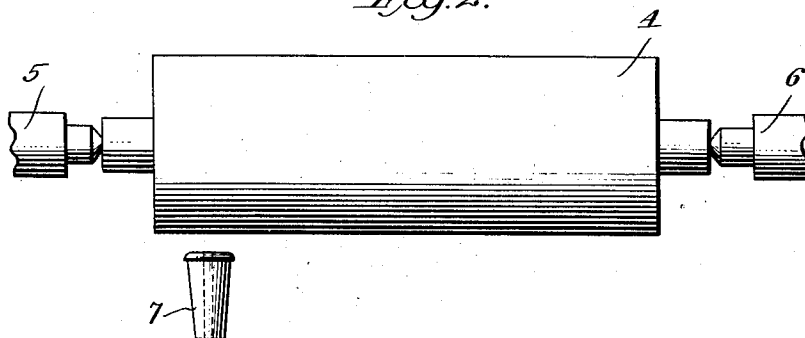


Fig. 3.



Fig. 4.



Fig. 5.

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PROCESS FOR MAKING GRINDING ROLLS FOR FLOUR MILLS

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My invention relates to roller grinding mills, and has for its object the production of a process for making improved grinding rolls therefor, and of improvements in the rolls themselves.

In respect to the process, my invention consists in imparting to one or both of a pair of smooth rolls what may be denominated from its appearance a "frosted finish", said finish having characteristic features that give it functionally distinctive qualities, as hereinafter specified.

In the milling art, smooth chilled rolls as well as those called dull finish rolls, and also rolls having surfaces roughened by longitudinally disposed grooves or riblike corrugations having sharp edges produced as by cutting or grinding, have long been employed in practice.

There are objections, well recognized by those skilled in the art, to the use, on the one hand, of smooth rolls or such as have smooth grinding surfaces, and, on the other hand, to the use of rolls roughened in the manner above indicated. A chief objection to smooth rolls is that they depend for performance of the grinding function required of them, mainly upon the porosity (discoverable by aid of a microscope) of their surfaces. It is found that in use a perfectly smooth roll, when it comes fresh from the roll grinding shop, does not functionate satisfactorily as a milling element until it has been used some weeks. The reason appears to be that the milling operation at first closes up the pores of the rolls, rendering their surfaces too smooth, until the action upon them, for a sufficient period, of the material to be ground, opens the superficial ends of the pores of the rolls to a degree which will give them good grinding surfaces. It will thus appear that so called smooth rolls must not be absolutely smooth, but only smooth in comparison with rolls having coarsely roughened surfaces.

Again, after a period of use, say of some months, the surface ends of the pore-defining walls in the smooth rolls will, by reason, for example, of impairment of their sharpness, lose their functional efficiency, so as to

necessitate a regrinding or other restorative treatment of the rolls.

There results, in consequence, not only expense, but also gradual variation between high and low efficiency during periods while the rolls are actually in service. So much for smooth rolls.

Corrugated or grooved rolls, that is to say those whose surfaces are distinctly roughened by methods employed in the art prior to my invention, are not open to some of the objections which obtain against smooth rolls, but are open to others, and particularly to a definite objection, namely, that they do not reduce grain to the degree of fineness desirable in the production of the best quality of flour.

My invention is designed substantially to combine, and does so combine the advantages of smooth rolls with those of roughened rolls, without the disadvantages of either. My rolls are, in fact, as compared with smooth rolls, roughened rolls, but roughened in a manner that is novel in the art, and only to a degree that is, in detail, discernable only under the microscope.

My method of producing a "frosted finish" roll is susceptible, at will, to variation of the indentations employed therein, in depth or extent, or in both, and such indentations may be made substantially uniform in depth and extent, and in distribution over the entire surface of each roll.

What constitutes my invention will be hereinafter described in detail, and succinctly defined in the appended claims.

In the accompanying drawing,

Figure I is a side elevation of portions of two contacting rolls provided with "frosted finish" surfaces produced by my process, and made visible in detail by the aid of a microscope or magnifying glass shown, for purpose of better illustration, in said figure.

Figure II is a side elevation of a bearing-supported roll, and in operative relationship to it an example of a blast nozzle such as is used in my process for producing a "frosted finish" upon the roll.

Figure III illustrates a particle of "angu-

lar grit" of such size as I employ in the practice of my process.

Figure IV is a view corresponding to that in Figure III, showing the particle of "angular grit" magnified.

Referring to the numerals on the drawing, 1 indicates one and 2 the other of a pair of cooperatively juxtaposed mill rolls. In use, according to my invention, the two rolls are, preferably, made substantially identical in respect to their respective surfaces, each being provided with my "frosted finish", as that term has already been explained, although it is practicable to make one roll of a smooth surface, and the other roll of "frosted finish" if found desirable. In the drawing, however, for the purposes of this description, one end 3 of the roll 1 is shown in the smooth state, that is the state to which the entire roll is reduced before the application of the "frosted finish", and the roll 2 is shown with the said finish applied over its entire surface, as it is preferably applied over both rolls in the practice to the best advantage of my invention.

Further reference to what constitutes my "frosted finish" will be hereinafter made in the specification which follows the detail description of my process.

Proceeding with said description it is specified that in carrying out said process, the same practice is followed as that ordinarily used in properly equipping a mill with a pair of rolls such as are essential elements in roller mills generally. Such rolls being, by my invention, differentiated from other kinds of rolls in respect to their surfaces and to the process of producing the same, I provide, in carrying out my invention, two rolls which are preferably made as usual of surfaced chilled or otherwise hardened metal, and which are ground to a surface of cylindrical contour, as perfectly smooth and regular as may be.

I then take one of such rolls, surfaced as illustrated at 3 in Figure I of the drawing, and having revolubly mounted it, as indicated by the numeral 4 in Figure II, between ordinary or suitable bearing-supports 5 and 6, impart rotative movement to it at a given speed. During such rotation, I cause to be discharged, as from a suitable blast nozzle 7 of any usual or preferred type, against its revolving cylindrical surface, a blast of air which is kept uniformly charged with sharp cornered or edged particles of a metallic substance, substantially as hard as tool steel, which particles have been previously screened or otherwise assorted to sizes of substantially exact uniformity. Such particles are manufactured and sold in the open market under the commercial name "angular grit", and, in view of the foregoing description, that name is elsewhere, in the specification and claims hereof, employed as a generic term to design-

nate the kind of material I use in carrying out the process which constitutes, in part, my present invention. The nozzle 7 is assumed of course to be in continuing operative communication with a source of compressed air supply or the like and with a source of supply of "angular grit".

The impact against the smooth surface of the roll of the blast-delivered, hard substance, applied substantially in the manner just described, forms in the surface metal of the hardened roll 4, minute indentations 8 of substantially uniform depth and of substantially uniform distribution, said indentations being shown on an enlarged scale under a magnifying glass 9 in Figure I.

The finish which is given to the surface of the roll 4 by the indentations 8 therein, constitutes that which is elsewhere herein denominated the "frosted finish" which constitutes, in part, my present invention. Those indentations, visible but not in detail to the naked eye, clearly appear under the microscope to have, on all sides of each indentation, well defined sharp cutting edges, which constitute the grinding elements in the surfaces of one or both of the rolls 1 and 2. Minute though they are, the superficies of the indentations 8 are large by comparison with the exposed ends of the pores of smooth rolls, including what are known in the art as "dull finish" rolls which have been hereinbefore referred to by way of differentiation from my "frosted finish" rolls. The grinding surfaces of rolls provided with indentations 8 are not only superior in efficiency to those of dull finish or other smooth rolls, but do not lose their efficiency in consequence of their becoming clogged by the material which is being ground between them, as the pores of the smooth rolls do become clogged in the manner and with results already specified. Consequently, my "frosted finish" roll, while it gives as good or better results than smooth or dull finish rolls give, has a much longer life than smooth or dull finished rolls have, being in that regard comparable to corrugated rolls which, although long lived, are, as aforesaid of inferior grinding capacity, in respect particularly to quality of flour products. The ordinary life of a pair of my rolls runs, without requiring restoration, as high as two or three years, and often longer.

The sharpness of the edges of the indentations 8, as well as the depth to which the indentations extend below the surface of the roll in which they are formed by my process, depends, in part, upon the hardness of the said roll; in part, upon the hardness as well as the size of the particles of the blast-delivered substance which, as aforesaid, forms, by impact against the surface of the roll, the indentations 8; and, in part, upon the degree of air pressure from which the blast is derived. The degree of such air pressure is, as

has been specified, subject, within determinable limits, to variation at will, but a pressure maintained at from 100 to 140 pounds to the square inch I regard at the present time as one satisfactory for delivery of "angular grit", say, for example, of commercial size or number 10. A heavier pressure might be employed, if it were found, in any instance, desirable to use a larger sized grit.

What I claim is:

1. The improved method for making milling rolls which consists in preparing a hard smooth roll, directing against the roll a pneumatic blast charged with sharply formed hard metallic particles of substantially uniform size, the blast being of sufficient force to cause the impact of the particles to impart indentations to the surface of the roll, and the uniform size of the particles providing indentations of substantially uniform size, regulating the force of the pneumatic blast whereby to control the force of impact and the depth of indentations on the surface of the roll, and simultaneously with the application of the blast revolving the roll at a given speed, whereby to obtain substantially regular distribution of indentations over the surface.

2. The improved method for making milling rolls which consists in preparing a hard smooth roll, directing against the roll a pneumatic blast uniformly charged with sharply formed hard metallic particles of substantially uniform size, the blast being of sufficient force to cause the impact of the particles to impart indentations to the surface of the roll and the uniform size of the particles providing indentations of substantially uniform size, and simultaneously with the application of the blast revolving the roll at a given speed, whereby to obtain substantially regular distribution of indentations over the surface.

3. The improved method for making milling rolls which consists in preparing a hard smooth roll, and directing against the roll a pneumatic blast charged with sharply cornered, hard, metallic, cutting particles of substantially uniform size, the blast being of sufficient force to cause the impact of the particles to cut in the surface of the roll indentations having sharply defined angular walls.

In testimony whereof, I have hereunto set my hand.

JAMES JESSE ROSS.