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PROCESS AND APPARATUS FOR FINISHING MILL ROLLS

Filed July 19, 1924

2 Sheets-Sheet 1

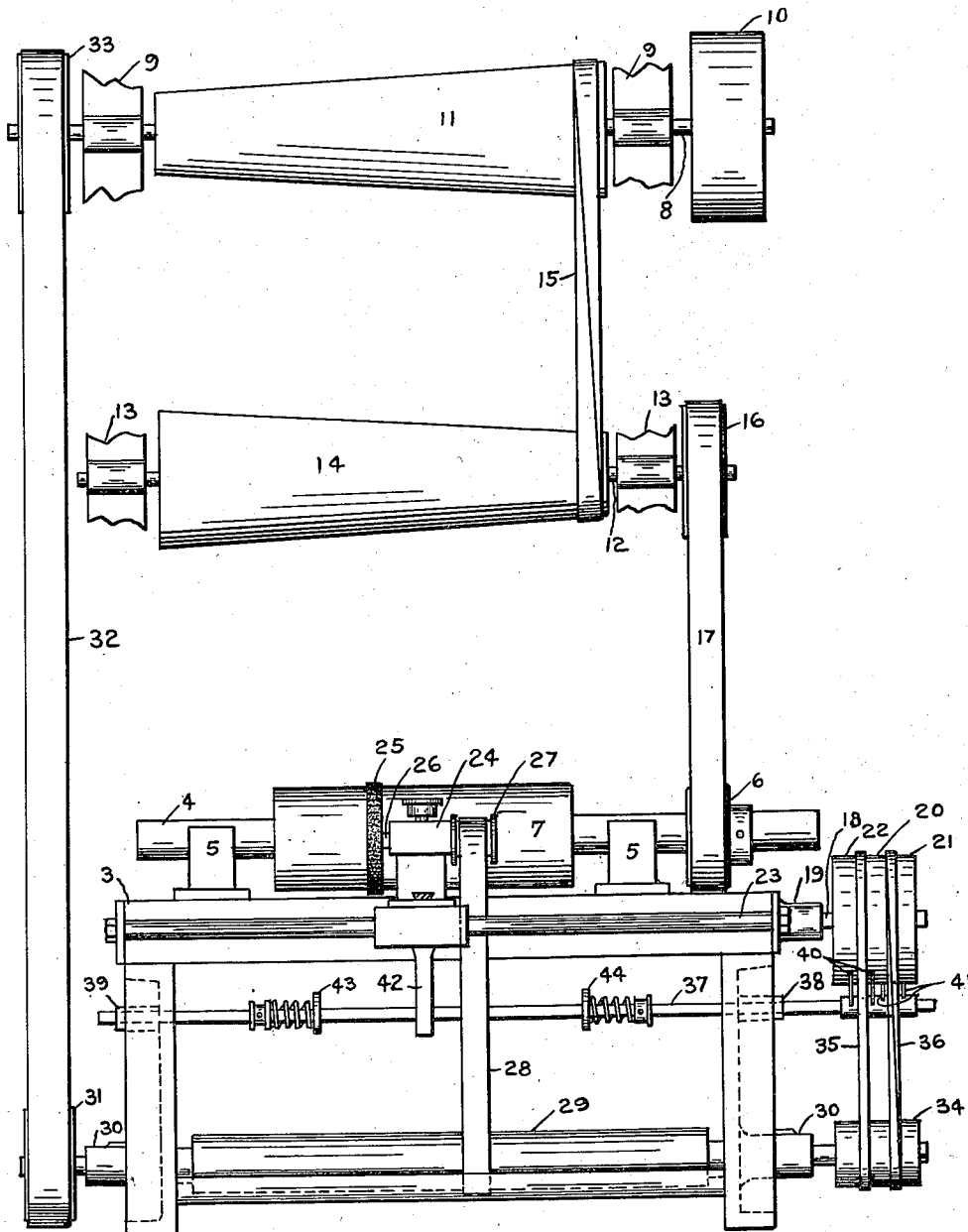


Fig. 1

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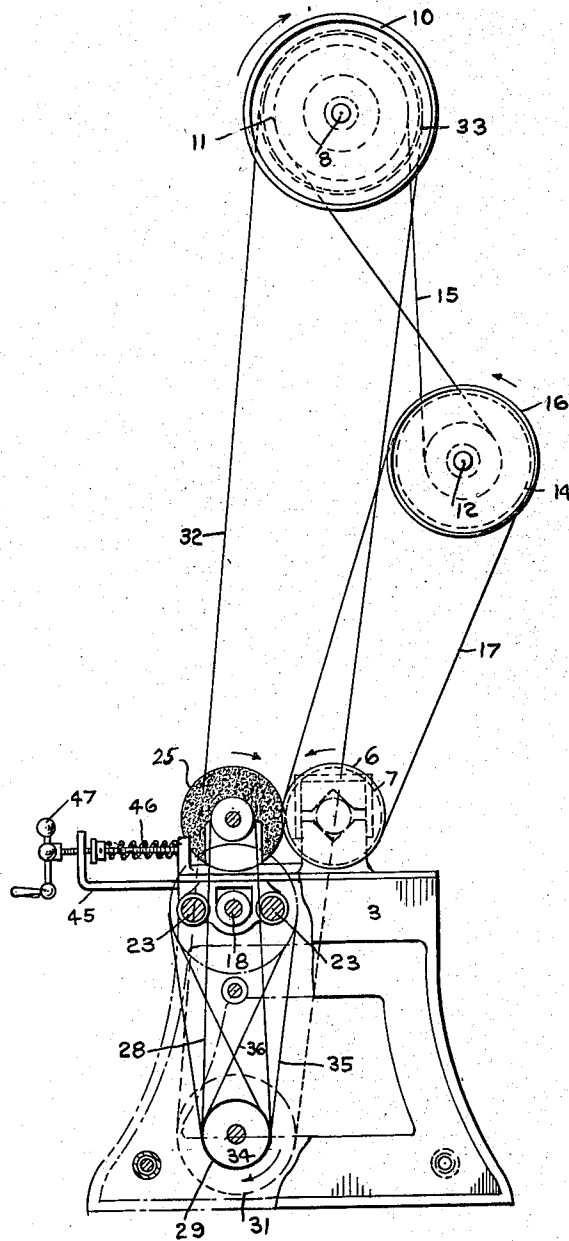


Fig. 2

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UNITED STATES PATENT OFFICE.

JOHN W. CORNELIUS, OF SALINA, KANSAS, ASSIGNOR TO THE SHELLABARGER MILLS & ELEVATOR COMPANY, OF SALINA, KANSAS, A CORPORATION OF KANSAS.

PROCESS AND APPARATUS FOR FINISHING MILL ROLLS.

Application filed July 19, 1924. Serial No. 727,028.

This invention relates to an improvement in a process of finishing the surface of chilled iron mill rolls and the machine for carrying out said process and the novelty lies in the steps of the process and the adaptation and arrangement of parts of the device for carrying out said process.

In order to use chilled iron mill rolls it is necessary to take said mill rolls as they are cast and first removing all burrs or imperfections from the casting to place said roll in a precision grinding machine of usual and well known construction whereby the roll is reduced on its surface to exact trueness. This operation is usually carried out on a two wheel precision grinding machine which wheels are arranged on opposite sides of the roll and one of the two wheels is of a coarse material which is used for the rough cutting and the other wheel is of a finer substance and is used for the fine cutting or finishing. These wheels are usually of carborundum or some similar composition and the peripheral speed of the wheels on this machine is between 6,000 and 7,000 feet per minute, while the peripheral speed of the roll being ground is but 40 to 50 feet per minute, and running in the opposite direction to the wheel the grit of the face of the wheels has a very positive cutting action. Only one of these wheels is adapted to be used at a time but because of the substantial differential between the speed of the roll and the speed of the wheel the finer wheel will leave the surface of the roll not only in an exact trueness of cylindrical precision but will leave the surface very highly polished.

This high polish is undesirable as it causes hotter grinding and bearings, requires greater horse power and will cause less granular middlings reductions, flour which is not so clean and a flour having a much higher percentage of ash. Our problem is, therefore, to obtain a porous or roughened surface on such chilled iron mill roll after it has been ground and finished in the precision grinding machine without interfering with the precision and exact trueness of said roll.

My process and the machine adapted to carry out my process will take the chilled iron rolls as they come from the precision grinding machine and effect a porous or roughened surface on said rolls without effecting in the slightest degree the precision and exact trueness of said rolls. The chilled

iron rolls as re-finished by my process and machine also furnish higher and cooler grinding, cooler bearings, require less horse power, effect more granular middlings reductions, produce cleaner flour and less ash contained in the flour produced.

In carrying out my process I take a chilled iron mill roll as it is cast and after removing the burrs or rough edges usual in casting I grind the cylindrical surface of said roll in a precision grinding machine running the roll in one direction at a very low speed (50 peripheral feet per minute) and running a grinding wheel of a rough grinding material in an opposite direction at a very high speed (7000 peripheral feet per minute) and finishing the precision grinding by using a grinding wheel of a finer texture, running at said high speed until absolute precision is obtained in said roll and a highly polished surface is also obtained. I then place the roll having the high polished precision finish in my roll surface finishing machine and using a wheel of various grits, from 36 to 60, with a fixed peripheral speed of not over 1,500 feet per minute I rotate the roll in the opposite direction at a peripheral speed of 200 peripheral feet more or less than the peripheral speed of the wheel. The great differential in speed between the roll and wheel in the grinding machine causes a sharp cutting action which cuts off the surface of the roll whereas the slight differential in speed in my roll surface finishing machine between the speed of the roll and the wheel causes the wheel to open up pores in the surface of the roll and thereby roughen it without interfering with the precision of said roll.

Referring to the drawings Figure 1 is a front elevation of my device and Figure 2 is an end view of the same looking in from the right hand side of Figure 1.

In the drawings 3 is a base or table of the usual construction on which is mounted a shaft 4 supported in bearings 5 and adapted to be secured to the fixed pulley 6 and on said shaft 4 is adapted to be mounted a chilled iron roll 7 so as to rotate with the said shaft 4. A driving shaft 8 is supported in brackets and bearings 9 of usual construction which are broken away for convenience in illustration and the shaft 8 has a pulley 10 of usual construction rigidly mounted thereon which is adapted to receive

power through a belt from a source of power not shown. On the shaft 8 is also mounted a conical pulley 11 which rotates with said shaft 8, and a second shaft 12 is mounted below said shaft 8 by means of brackets and bearings 13 of usual construction which are broken away for convenience in illustration. On the shaft 12 is mounted a conical pulley 14 having its base at the opposite end from the base of the pulley 11 and a cross belt 15 is mounted over said conical pulleys 11 and 14. The shaft 12 also has a pulley 16 rigidly mounted to its outer end and an open belt 17 connects the pulley 16 and the pulley 6. The feed screw 18 is mounted in suitable bearings 19 at each end of the table 3 and has mounted on its outer end a fixed pulley 20 and a loose pulley 21 and a second loose pulley 22. Guide rods 23 are rigidly secured on either side of the feed screw 18 and a carriage 24 is adapted to travel longitudinally on said guide rods 23 in the usual manner and a cutting wheel 25 is mounted on a shaft 26 which is mounted in said carriage 24 and a pulley 27 is mounted on the opposite end of said shaft 26 over which an open belt 28 is adapted to be mounted being mounted on its opposite end over a drum pulley 29 which is mounted in bearings 30 in the base of said table 3 and is driven by a pulley 31 mounted on its outer end and being connected by an open belt 32 to a pulley 33 mounted on the opposite end of shaft 8 from the pulley 10. On the opposite end of the drum pulley 29 from the pulley 31 is a second pulley 34 and an open belt 35 is mounted over the pulley 34 and a pulley 22 or 20, and a cross belt 36 is mounted over the pulley 34 and the pulley 21 or 20. A shifter rod 37 is mounted in bearings 38 and 39 in said table 3 so as to be readily shifted longitudinally therein and on the outer end of said shifter rod 37 are shifting forks 40 and 41, 40 being adapted to shift the open belt 35 between the loose pulley 22 and the fixed pulley 20 and shifter fork 41 being adapted to shift the cross belt 36 from the loose pulley 21 to the fixed pulley 20. By the shifting of said belts 35 and 36 the direction of the pulley 20 and the feed screw 18 on which it is mounted will be changed and a shifter fork 42, attached to the carriage 24, is adapted to contact with the spring collar members 43 and 44 so as to push the shifting rod 37 in opposite directions thereby effecting a shifting of the belts 35 and 36 through the shifting of forks 40 and 41. The carriage 24 also carries a fixed nut of usual construction and threaded over the feed screw 18 whereby the carriage 24 and the wheel 25 mounted thereon is moved longitudinally of the roll 7.

A spring tension device 45 is also mounted on the carriage 24 having a spring 46 and a handle 47 adapted to be operated manually

whereby the tension of the wheel 25 against the roll 7 may be varied by the adjustment of said handle 47 compressing or releasing the spring 46 as may be desired.

In operation my device receives its power from a source not shown and will through pulley 10 drive the shaft 8 and the conical pulley 11 from which the motion is transferred by the cross belt 15 to the pulley 14 and thence through the shaft 12 and pulley 16 through the open belt 17 to the pulley 6 and shaft 4 thereby rotating the roll 7 at the speed which may be desired through the shifting of the cross belt 15 on the conical pulleys 11 and 14 so as to increase or decrease the speed as may be desired. The pulley 33 also rotates with the shaft 8 and through the belt 32 transfers the motion to pulley 31 and thence to the drum pulley 29 from which it is transferred by means of the belt 28 to pulley 27, shaft 26 and wheel 25 thereby rotating the wheel 25 at a uniform fixed speed. The carriage 24 and wheel 25 are constantly shifted longitudinally of the roll 7 by means of the screw feed 18 which drives the carriage 24 and wheel 25 in one direction until the fork 42 contacts with one of the spring collars 43 or 44 when the shifter rod 37 will thereby be moved longitudinally so as to shift the forks 40 and 41 thereby shifting open belt 35 and cross belt 36 onto and off from the fixed pulley 20 and onto the loose pulleys 22 or 21. As this shift of belts 35 and 36 is made the direction of the feed screw 18 is accordingly changed thereby changing the direction of the longitudinal movement of the carriage 24 and the wheel 25 carried thereby and with the result that the carriage 24 and wheel 25 are automatically running longitudinally from one end to the other and back again of the roll 7. The direction of the rotation of roll 7 is the opposite to the rotation of the wheel 25 because of the use of the cross belt 15 in the train from the source of power to the roll 7 thereby changing its direction of rotation whereas the rotation of the wheel 25 is maintained from the same source of power through open belts without any change of direction.

I claim:

1. The process of finishing the surface of a chilled iron mill roll which consists in first grinding said roll until said roll is perfectly symmetrical and true and has a very high polish, then subjecting said roll to the action of a grinding machine having a single wheel automatically travelling longitudinally of said roll and rotating said wheel in a direction opposite to the direction of rotation of said roll and at a speed only slightly different from the speed of said roll until the surface of said roll is sufficiently porous and rough without varying the trueness of said roll,

2. The process of finishing the surface of a chilled iron mill roll which consists in first grinding said surface until said surface is absolutely true then placing said roll in a machine having a grinding wheel travelling automatically and longitudinally of said roll and rotating at a peripheral speed slightly greater than the peripheral speed of said roll and in the opposite direction to the direction of rotation of said roll and not changing the trueness of said roll surface.

3. The process of finishing the surface of a chilled iron mill roll which consists in first grinding said roll then finishing said roll surface in a machine having a grinding wheel travelling automatically back and forth longitudinally of said roll surface at a peripheral speed of a slight differential from that of the roll, said roll and wheel rotating in opposite directions.

4. The process of finishing the surface of a chilled iron mill roll which consists in first grinding said roll until said roll is perfectly symmetrical and true and has a very high polish, then placing said roll in a grinding machine having a single wheel automatically travelling longitudinally of said roll and rotating said wheel at a speed only slightly different from the speed of said roll, said roll and wheel rotating in opposite directions until the surface of said roll is sufficiently porous and rough without varying the trueness of said roll and varying the pressure of said latter wheel on said roll as may be desired during said finishing operation.

5. The process of finishing the surface of a chilled iron mill roll which consists in first grinding said surface until said surface is

absolutely true then placing said roll in a machine having a grinding wheel travelling automatically and longitudinally of said roll and rotating at a peripheral speed slightly greater than the peripheral speed of said roll and in the opposite direction to the direction of rotation of said roll and not changing the trueness of said roll surface and varying the pressure of said latter grinding wheel on said roll as may be desired during said finishing operation.

6. The process of finishing the surface of a chilled iron mill roll which consists in first grinding said roll then finishing said roll surface in a machine having a grinding wheel travelling automatically back and forth longitudinally of said roll surface at a peripheral speed of a slight differential from that of the roll, said roll and wheel rotating in opposite directions and varying the pressure of said latter grinding wheel on said roll as may be desired during said finishing operation.

7. The process of finishing a mill roll which consists in first grinding said roll until said roll is symmetrical and true and has a high polish, then subjecting the surface of said roll to the action of a grinding wheel traveling longitudinally of said roll while rotating the said wheel at a speed slightly different from the speed of said roll, the said differential not exceeding 25 per cent until the surface of said roll is porous and rough without varying the symmetry or trueness of the roll, said roll and wheel being rotated in opposite directions.

Witness my hand at the city of Salina, in the county of Saline, and State of Kansas.

JOHN W. CORNELIUS.