Feb. 7, 1961 J. B. DUTY 2,970,779

GRINDING MACHINE

Filed Sept. 27, 1957 2 Sheets-Sheet 1

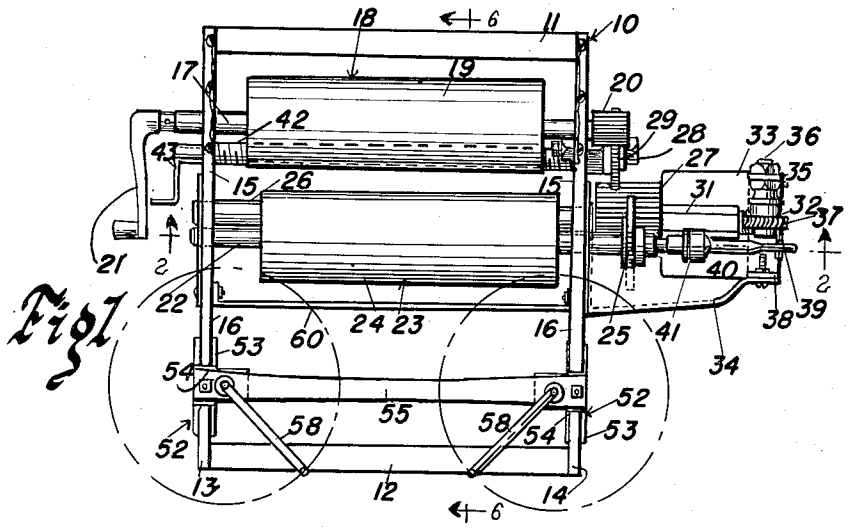


Fig 1

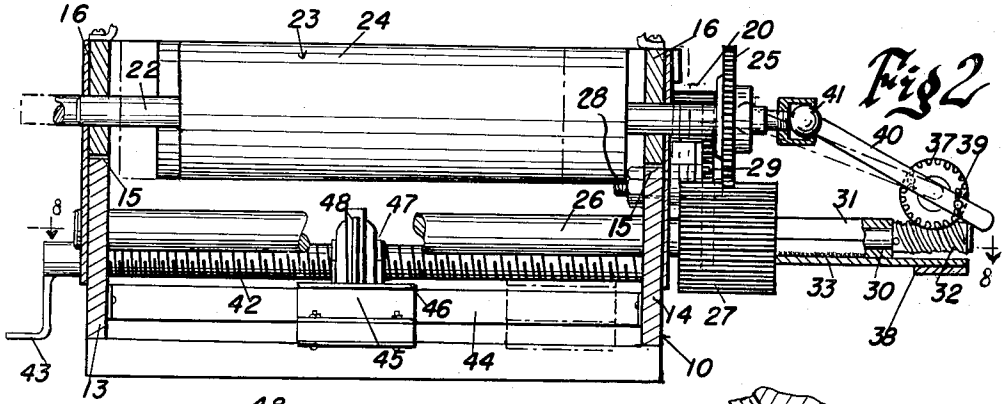


Fig 2

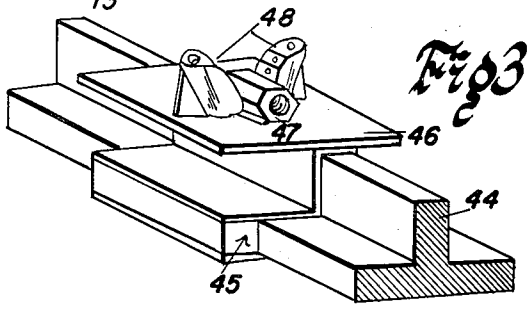


Fig 3

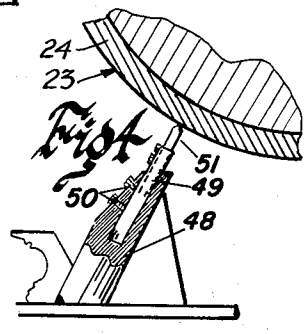


Fig 4

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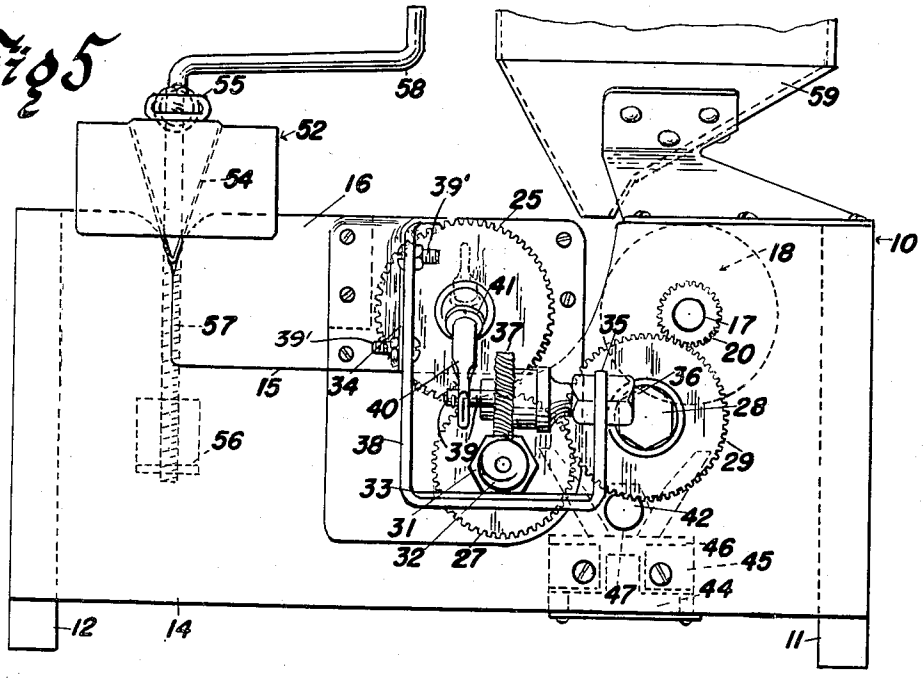
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Feb. 7, 1961 J. B. DUTY 2,970,779

GRINDING MACHINE

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Fig 5



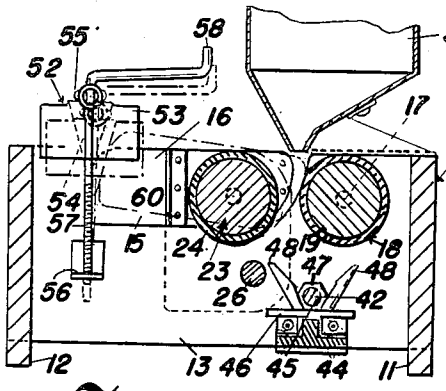


Fig 6

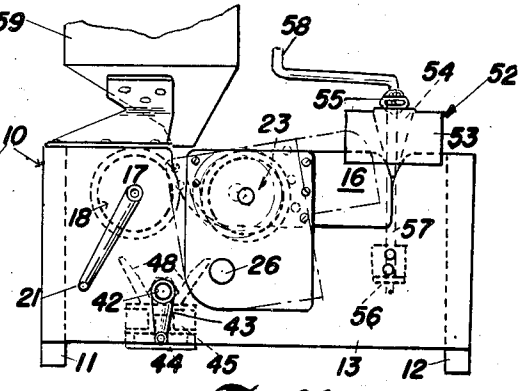


Fig 7

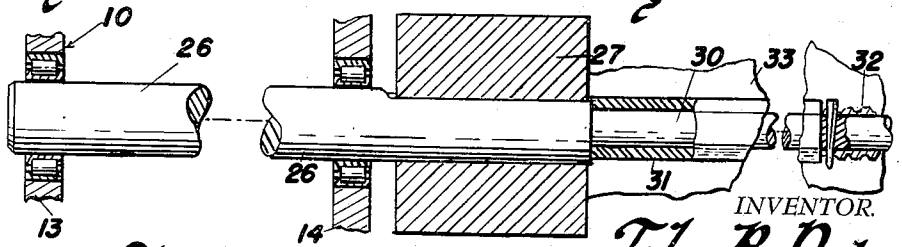


Fig 8

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GRINDING MACHINE

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4 Claims. (Cl. 241—101)

This invention relates to a grinding machine.

The object of the invention is to provide a machine which can be used for grinding different types of materials such as ores, grains or any other suitable material.

Another object of the invention is to provide a grinding machine which includes a pair of grinding rollers that are adapted to co-act whereby material which is fed into the space between the rollers will be effectively ground, and wherein at least one of the rollers is capable of movement towards and away from the other roller, and wherein the grinding machine of the present invention further includes a means for maintaining the surfaces of the rollers of uniform diameter.

A further object of the invention is to provide a grinding machine which is extremely simple and inexpensive to manufacture.

Other objects and advantages will be apparent during the course of the following description.

In the accompanying drawings, forming a part of this application, and in which like numerals are used to designate like parts throughout the same.

Figure 1 is a plan view of the grinding machine of the present invention.

Figure 2 is a sectional view taken on the line 2—2 of Figure 1.

Figure 3 is a fragmentary perspective view illustrating the slider and track member.

Figure 4 is a fragmentary sectional view illustrating one of the tools for use in keeping the surface of the sleeve on a roller of uniform diameter.

Figure 5 is a side elevational view of the grinding machine.

Figure 6 is a sectional view taken on the line 6—6 of Figure 1.

Figure 7 is a side elevational view looking at the opposite side from that shown in Figure 5, Figures 5 and 7 being taken from the right and left hand side of Figure 1 respectively.

Figure 8 is a fragmentary sectional view illustrating certain constructional details of the machine.

Referring in detail to the drawings, the grinding machine of the present invention includes a rectangular frame 10 which embodies a pair of vertically disposed spaced parallel end walls 11 and 12, and the frame 10 further includes a pair of spaced parallel vertically disposed side walls 13 and 14. Each of the side walls is provided with a cut-out 15, and movably mounted in each cut-out 15 is a support member 16.

Extending between the pair of side walls 13 and 14 and journaled therein is a first shaft 17 which has a first roller 18 mounted thereon, Figure 1. The roller 18 is provided with an outer covering or sleeve as indicated by the numeral 19. A first gear member 20 is connected to an end of the shaft 17, and the other end of the shaft 17 is adapted to have a drive means connected thereto whereby the shaft 17 can be rotated. As shown in Figure 1 the drive means comprises a hand crank 21, but it is to be understood that other forms of drive means can be utilized, as for example a suitable motor or engine can be connected to the shaft 17.

The numeral 22 indicates a second shaft which is journaled in the pair of support members 16, and the second shaft 22 has a second roller 23 thereon, the roller 23 including an outer covering or sleeve 24. The roller 23 is mounted for movement towards and away from the roller 18, and also the roller 23 is capable of longitudinal shifting movement with respect to the roller 18 so that wear on the rollers will be uniform so that excessive indentations or the like in the rollers will be prevented. A second gear member 25 is mounted on an end of the shaft 22.

The numeral 26 indicates a third shaft which is journaled between side walls 13 and 14, and a third gear member 27 is connected to the shaft 26, the pinion 25 sliding laterally on the pinion or gear member 27. The numeral 28 indicates a fourth shaft which is journaled in the side wall 14, and the fourth shaft 28 has a fourth gear member 29 thereon. As shown in the drawings, it will be noted that the fourth gear 29 meshes with the first gear 20, and the fourth gear 29 also meshes with the third gear 27. Furthermore, the second gear 25 meshes with the third gear 27 for a purpose to be later described.

Extending outwardly from the shaft 26 is a shaft extension 30 of reduced diameter, and a spacer member 31 is mounted on the shaft extension 30. The numeral 32 indicates a worm gear which is mounted on the shaft extension 30, Figure 2, and the spacer member 31 is supported by a base 33. The numeral 34 indicates an arm which extends outwardly from the frame 10 and which is secured thereto, and the arm 34 supports the base 33 through the medium of a strap 38. The numeral 35 indicates an upstanding finger which supports a fifth shaft 36, and the shaft 36 has a worm wheel 37 thereon which meshes with the worm gear 32. Extending outwardly from the worm wheel 37 is an eccentric pin 39, and a rod 40 has one end connected to the eccentric pin 39, while the other end of the rod 40 is connected to the second shaft 22 through the medium of a universal joint 41. The roll 23 is moved laterally by the pin 39 through the elements 40 and 41.

There is further provided a means for working on the surfaces of the rollers so that after the outer surfaces or sleeves become worn, they can be shaved down so that the outer surfaces of the rollers will be of uniform diameter. This means comprises a screw member 42 which is journaled between the side walls 13 and 14, and a crank 43 is connected to an end of the screw member 42. As shown in Figure 3, there is provided a track member 44 which has the shape of an inverted T, and the track member 44 has a slider 45 movably mounted thereon. A platform 46 is secured to the upper end of the slider 45, and an internally threaded body member 47 is secured as by welding to the platform 46. The body member 47 is arranged in threaded engagement with the screw member 42 so that as the crank 43 is rotated, the screw member 42 will turn and this in turn will cause movement of the slider 45 along the track member 44. As shown in Figure 4, a pair of angularly arranged posts 48 extend upwardly from the platform 46 and are secured thereto, and the posts 48 serve as supports for tool holders 49 which are retained in place by the set screws 50, the holders 49 adapted to support tool bits 51 which are adapted to engage the sleeves 19 and 23 on the rollers.

There is further provided a means whereby the roller 23 can be moved towards and away from the roller 18, and this means comprises a pair of similar brackets which are each indicated generally by the numeral 52. Each

of the brackets 52 includes a pair of spaced parallel plates 53, and the plates 53 movably straddle adjacent portions of the side walls and support members 16. A wedge 54 is secured between each pair of plates 53 in any suitable manner, as for example by welding, and extending between the pair of brackets 52 and secured thererto is a horizontally disposed bar 55. The shaft 26 functions as a pivot for the support member 16, and to increase the gap between the rolls 18 and 23, the members 52 are adapted to be raised, and to decrease the gap between the rolls 18 and 23, the members 52 can be lowered. A pair of vertically disposed stems 57 extend through the bar 55, and the stems 57 include a threaded portion which threadedly engages L-shaped lugs 56 which are secured to the inner surfaces of the side walls 13 and 14. Cranks 58 are connected to the upper ends of the stems 57. Thus, by properly rotating the cranks 58, the stems 57 will be rotated and this will cause movement of the wedges 54 into the space between the support members 16 and the adjacent surface of a side wall so that the support members 16 can be moved in the cut-outs 15. Since the roller 23 is journaled on the shaft 22 and since the shaft 22 is journaled between the support members 16, it will be seen that this movement of the support members 16 will result in corresponding movement of the roller 23 so that the roller 23 can be moved towards and away from the roller 18. When the crank 58 is properly rotated, the wedge 54 moves the support member 16 as for example from the solid line position of Figure 6 to the broken line position of Figure 6. The parts such as the wedges 54 serve to prevent accidental shifting of the rolls during the grinding period. The material which is being ground serves to keep the rolls apart and the wedges 54 can be used to adjust the gap between the rolls.

The numeral 59 indicates a hopper which can be used for discharging material to be ground into the space between the rollers 18 and 23. As shown in Figure 1, a brace 60 connects the pair of support members 16 together, and the brace 60 serves to maintain the members 16 in their proper spaced apart relation with respect to each other.

From the foregoing, it is apparent that there has been provided a grinding machine which can be used for grinding different types of materials, and in use, the hopper 59 is adapted to be loaded or filled with the material to be ground, and the hopper 59 can be supplied from any suitable source of supply. Then, the shaft 17 is actuated, and the shaft 17 may be actuated by the hand crank 21, or else it may be driven by a suitable motor. As the shaft 17 rotates, it rotates the roller 18, and this rotation of the shaft 17 causes rotation of the gear 20. Since the gear 20 meshes with the gear 29, it will be seen that this rotation of the gear 20 will result in rotation of gear 29 on the shaft 28. As the gear 29 rotates, it rotates the gear 27, and since the gear 27 meshes with the gear 25, it will be seen that there will result in rotation of the shaft 22, the second roller 23 being secured to the shaft 22. Thus, as the first roller 18 is rotated, the second roller 23 will likewise be rotated so that material which is discharged into the space between the pair of rollers 18 and 23 will be effectively ground to the desired consistency.

Furthermore, there is provided a means for causing the roller 23 to shift back and forth with respect to the roller 18 so that wear on the rollers is uniform. This longitudinal shifting of the roller 23 is brought about as follows. As the shaft 26 is rotated by the gear 27, it will be seen that the shaft extension 30 will likewise be rotated, and since the worm gear 32 is connected to the shaft extension 30, Figure 8, it will be seen that the worm gear 32 will be constantly turning. The worm wheel 37 is arranged in meshing engagement with the worm 32, so that there will be a resulting rotation of the worm wheel 37 on the shaft 36. The eccentric pin 39 extends outwardly from the worm wheel 37 and has the rod 40 connected thereto, and one end of the rod 40 is connected to an end of the shaft 22 by means of the ball and socket or universal joint 41. Thus, as the shaft 26 is rotated, it will be seen that the rod 40 will move to and from the solid and broken line positions shown in Figure 2 and this will result in longitudinal shifting movement of the shaft 22 in the support members 16 and since the roller 23 is secured to the shaft 22, it will be seen that there will be a consequent or similar shifting of the roller 23. In other words, the roller 23 not only rotates but it also shifts back and forth and this has the practical effect of maintaining wear on the rollers rather uniform since the material being ground will come in contact with various portions of the rollers rather than in contact with only the intermediate or end portions of the rollers.

After the sleeves or cover members 19 and 24 on the rollers 18 and 23 become worn from excessive use, they may readily be turned down or smoothed out by means of the tool bits 51 as shown in Figure 4. When it is desired to smooth down the sleeves 19 and 24, the tool bits 51 are positioned in the holders 49, and the holders 49 are mounted in the posts 48 by means of the screw members or set screws 50. Then, with the body member 47 arranged in threaded engagement with the screw member 42, it will be seen that upon rotation of the crank 43, the screw member 42 will be turned and this in turn will cause movement of the slider 45 along the track member 44. As the slider 45 moves along the track member 44, the platform 46 will move and consequently the tool holders and tool bits 51 will move so that the entire surfaces of the sleeves 19 and 24 can be smoothed down and caused to have a uniform diameter, as for example after they have become worn from excessive use or from contact with hard or gritty material. The tool bits 51 are adapted to be moved into contact or engagement with the sleeves while the rollers are rotating.

The parts can be made of any suitable material.

The brace 60 prevents the element 16 from moving sideways or from lifting up during grinding. The roll 23 is moved laterally by pins 39 through 40 and 41, and the pinion 25 slides laterally in the pinion 27. When the cranks 58 are rotated, the wedge 54 moves the plate 16 to the right (dotted location). The material being ground keeps the rolls apart and the wedge 54 adjusts the gap between the rolls. The tool holder should be on the center line between rolls.

The parts can be made of any suitable material and in different shapes or sizes. Furthermore, the grinding machine can be used for grinding different types of materials such as ores, cement, lime, grains such as corn, wheat and the like. The machine is constructed so that the roller 18 can rotate faster than the roller 23, and the roller 23 moves back and forth with respect to the roller 18 so as to help prevent formation of grooves or indentations in the rollers when grinding hard materials. The lathe arrangement shown in Figures 3 and 4 can be used to smooth out or remove uneven surfaces which may occur, since it is well known that the middle portions of the rollers will have a tendency to wear faster than the end portions, and the lathe arrangement can be used for compensating for this uneven wear. Suitable roller bearings or ball bearings can be used wherever desired or required. After one of the rollers such as the roller 23 becomes worn, the wedges 54 can be moved downwardly so as to move the roller 23 closer to the roller 18 in order to compensate for the worn surface on the roller. Furthermore, the rollers may be removed when the sleeves thereon are to be replaced.

As shown in Figure 5, there is provided a support pin or bolt 39' so that when the lathe assembly is being used for smoothing off the rollers, the arm or rod 40 can be disengaged from the eccentric pin 39 and con-

nected to the support pin 39'. This has the practical effect of preventing longitudinal shifting of the roller 23 while the lathe is operating, but nevertheless the pair of rollers can still continue to rotate in unison due to the intermeshing gears. In other words, by disconnecting the rod 40 from the pin 39, and connecting the rod 40 to the pin 39', the roller 23 will rotate but will not have any side movement and this arrangement can be used when the lathe assembly of Figure 4 for example, is being used.

It will be understood of course that the invention contemplates such other embodiments or modifications as may occur to those skilled in the art.

I claim:

1. In a grinding machine, a frame including a pair of spaced parallel vertically disposed end walls and a pair of spaced parallel vertically disposed side walls, a first shaft journaled between said side walls, a first roller mounted on said first shaft, a first gear member connected to an end of said first shaft, drive means connected to the other end of said first shaft, there being a cut-out in the upper portion of each of said side walls, a support member movably mounted in each of said cut-outs, adjusting means for moving said support members, a second shaft journaled between said support members, a second roller mounted on said second shaft and said second roller being mounted for movement towards and away from said first roller, a second gear member connected to said second shaft, a third shaft journaled between said side walls, a third gear member connected to said third shaft, a fourth shaft journaled in one of said side walls, a fourth gear member connected to said fourth shaft, said fourth gear member meshing with said first and third gear members, said second gear member meshing with said third gear member, a shaft extension of reduced diameter extending from an end of said third shaft, a spacer member mounted on said shaft extension, a worm gear mounted on said shaft extension and abutting said spacer member, a base positioned below said shaft extension, a fifth shaft supported above said base and said fifth shaft having a worm wheel thereon meshing with said worm gear, an eccentric pin extending from said worm wheel, a rod having one end connected to said eccentric pin, and a universal joint connecting said rod to said second shaft.

2. The structure as defined in claim 1, and further including a sleeve on each of said rollers.

3. The structure as defined in claim 1, and further including a sleeve on each roller and means for maintaining the surfaces of the sleeves in a uniform diameter, said last named means comprising a screw member journaled between said side walls, a crank connected to said screw member, a track member positioned below said screw member, a slider movably connected to said track member, a platform on said slider, a body member secured to said platform and arranged in threaded engagement with said screw member, a pair of angularly arranged posts extending upwardly and outwardly from said platform, a tool holder supported by each post, and a tool bit supported by each tool holder.

4. In a grinding machine, a frame including a pair of spaced parallel vertically disposed end walls and a pair of spaced parallel vertically disposed side walls,

a first shaft journaled between said side walls, a first roller mounted on said first shaft, a first gear member connected to an end of said first shaft, drive means connected to the other end of said first shaft, there being a cut-out in the upper portion of each of said side walls, a support member movably mounted in each of said cut-outs, adjusting means for moving said support members, a second shaft journaled between said support members, a second roller mounted on said second shaft and said second roller being mounted for movement towards and away from said first roller, a second gear member connected to said second shaft, a third shaft journaled between said side walls, a third gear member connected to said third shaft, a fourth shaft journaled in one of said side walls, a fourth gear member connected to said fourth shaft, said fourth gear member meshing with said first and third gear members, said second gear member meshing with said third gear member, a shaft extension of reduced diameter extending from an end of said third shaft, a spacer member mounted on said shaft extension, a worm gear mounted on said shaft extension and abutting said spacer member, a base positioned below said shaft extension, a fifth shaft supported above said base and said fifth shaft having a worm wheel thereon meshing with said worm gear, an eccentric pin extending from said worm wheel, a rod having one end connected to said eccentric pin, a universal joint connecting said rod to said second shaft, a sleeve on each of said rollers, means for maintaining the surfaces of the sleeves in a uniform diameter, said last named means comprising a screw member journaled between said side walls, a crank connected to said screw member, a track member positioned below said screw member, a slider movably connected to said track member, a platform on said slider, a body member secured to said platform and arranged in threaded engagement with said screw member, a pair of angularly arranged posts extending upwardly and outwardly from said platform, a tool holder supported by each post, a tool bit supported by each tool holder, and wherein the adjusting means for moving the support members comprises a pair of brackets, each of said brackets including a pair of plates movably straddling an adjacent portion of each side wall and support member, a wedge secured between each pair of plates and said wedges being mounted for movement between adjacent surfaces of the support members and side walls, a horizontally disposed bar extending between said pair of brackets and secured thereto, an L-shaped lug secured to the inner surface of each of said side walls, vertically disposed stems projecting through said bar and having threaded portions engaging said lugs, and manually operable cranks connected to the upper ends of said stems.

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