Dec. 6, 1927. 1,651,382

E. B. GARDNER ET AL

GRINDING MACHINE

Filed Nov. 6, 1924 3 Sheets-Sheet 1

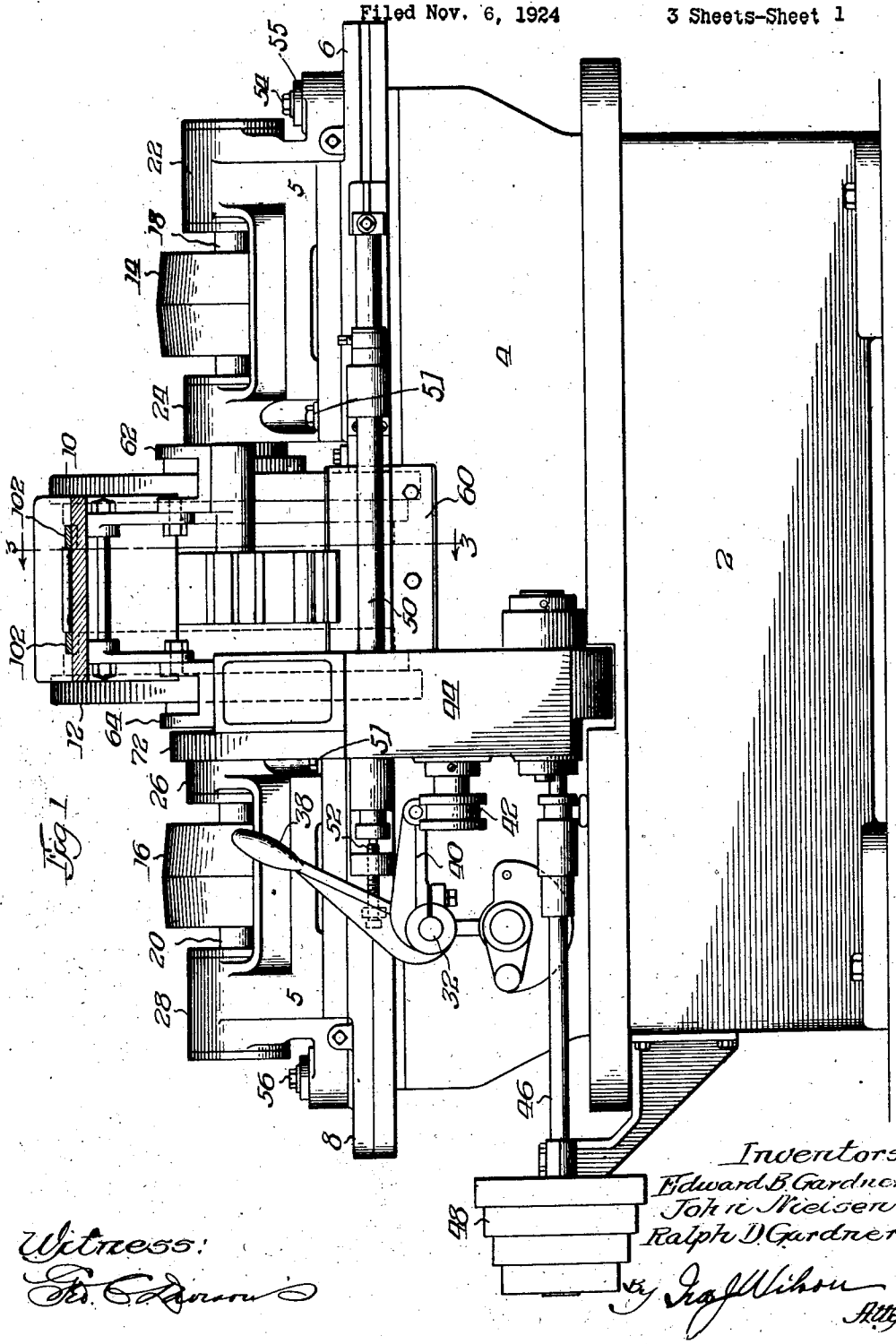


Fig. 1

Witness:

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Filed Nov. 6, 1924 3 Sheets-Sheet 2

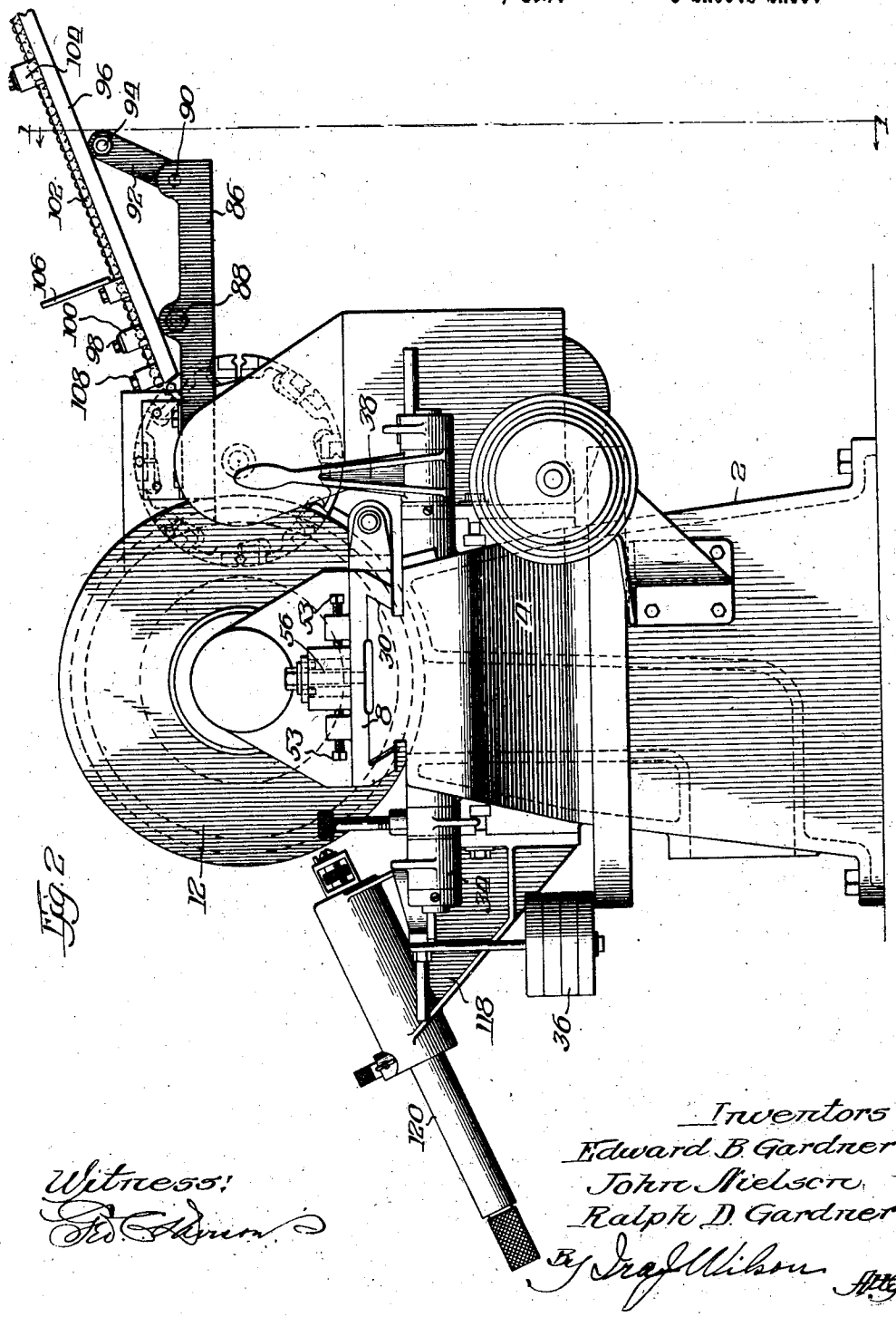



Fig. 2

Witness:

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Filed Nov. 6, 1924 3 Sheets-Sheet 3

Fig. 3.

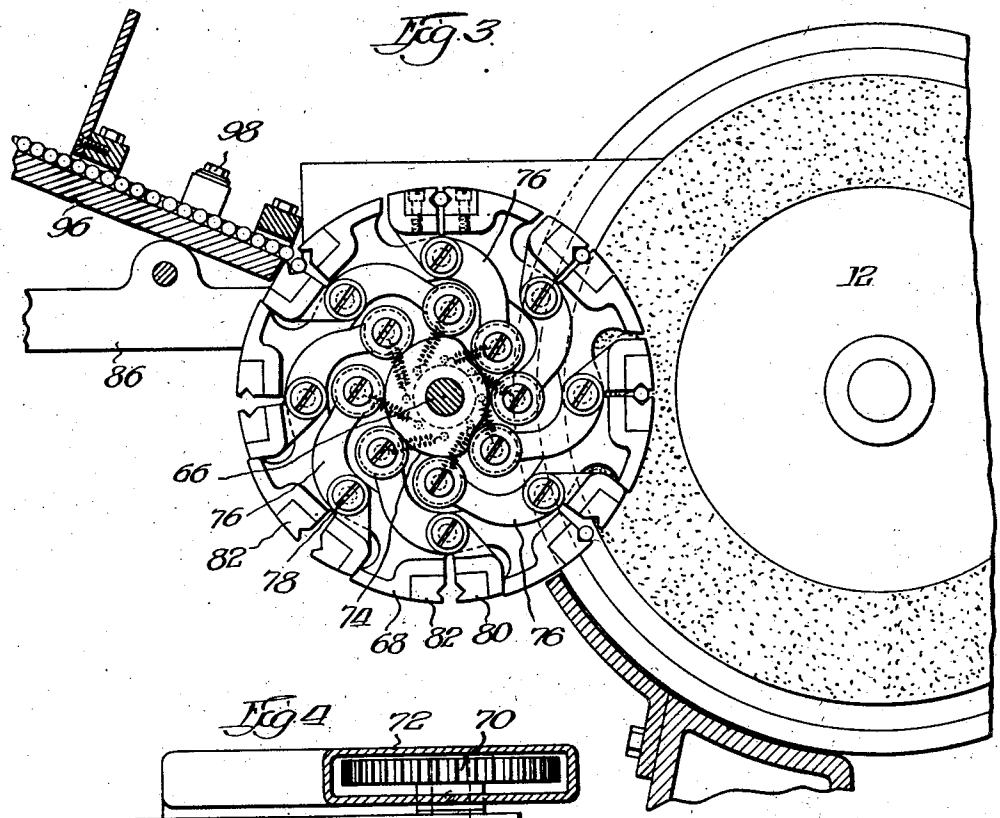
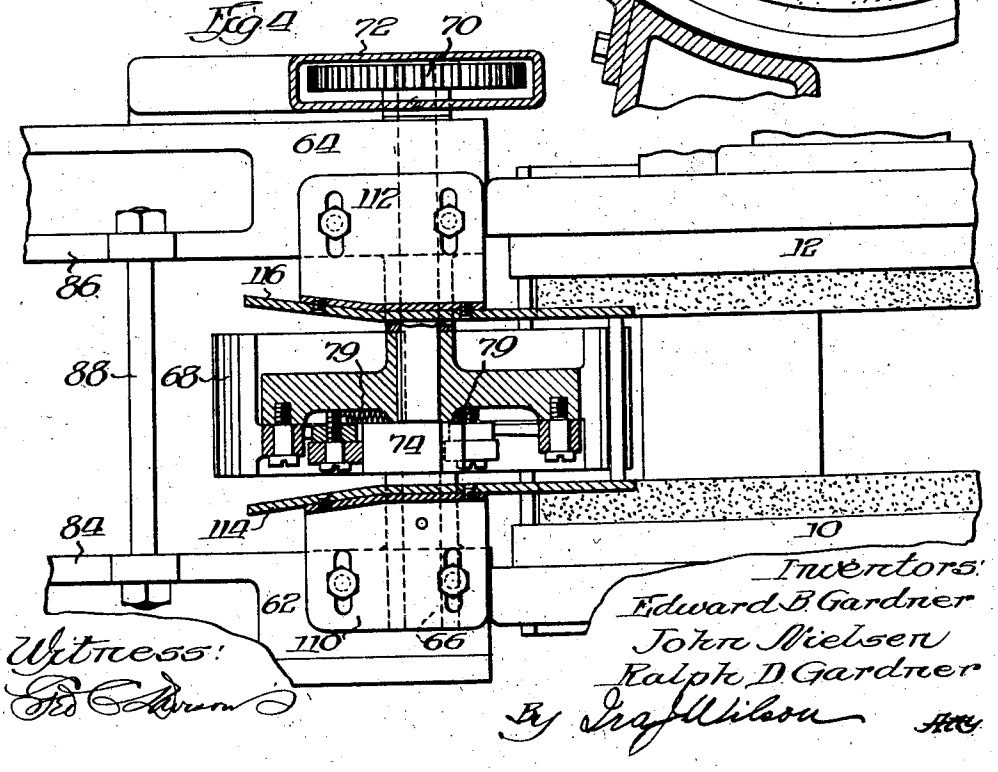



Fig. 4




Witness:

Inventors:
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Patented Dec. 6, 1927. 1,651,382

# UNITED STATES PATENT OFFICE.

EDWARD B. GARDNER, JOHN NIELSEN, AND RALPH D. GARDNER, OF BELOIT, WISCONSIN.

## GRINDING MACHINE.

Application filed November 6, 1924. Serial No. 748,029.

This invention pertains to grinding machines and is more particularly related to those machines wherein opposed grinding wheels are adapted to simultaneously work on two or more faces of an article disposed between them.

Our machine is primarily adapted to grind the ends of rods, tubes, bars and the like, to smooth or completely finish them as desired. It is particularly and peculiarly adapted to grind the ends of valve stems, push-rods and other automotive mechanism which may require a standard length for a large number of like parts and may require that the ends be finished at particular angles with respect to one another. While we are aware that Patent #878,685 issued February 11, 1908, discloses a machine for grinding the ends of corncob pipes, this machine, while in some respects is similar to our own, is not adaptable for our purposes nor could it be arranged therefor. For this and other reasons we have devised a machine to be hereinafter described, embracing within its broader aspects novel and invaluable features.

In view of the foregoing, it is an object to provide a machine which will finish the ends of bar, rod, or other stock in any manner desired and which will be automatic in its operation.

Another object is to provide a machine construction whereby the ends of the stock, regardless of its character, may be finished flat and parallel at substantially any angle to the stock sides.

Still another object is to provide a continuously operating automatic machine wherein the work is automatically fed, guided, positioned, clamped, ground or finished and discharged.

Further objects will be readily appreciated from the description and claims and from the drawing in which:

Fig. 1 is a front elevation of the grinding machine shown in Fig. 2, taken along the line 2—2 thereof and embodying a preferred form of our invention,

Fig. 2 is a left-hand end elevation of the machine shown in Fig. 1,

Fig. 3 is a partial section taken along the line 3—3 of Fig. 1, showing the feed mechanism and work-holding chuck, and,

Fig. 4 is a top plan view of a part of the mechanism shown in Fig. 3 with associated parts.

The machine illustrated is composed of a number of preferred mechanisms which may be classified and described separately, but which cooperate one with the other for the attainment of the foregoing objects. For convenience we will hereinafter refer to them under the headings "Grinding wheels", "Work holding chuck", and "Feed chute".

### *Grinding wheels.*

Mounted upon any suitable foundation or bed 2 is a table 4 upon which similar standards 5, mounted upon reciprocal carriages 6 and 8, carry the grinding wheels 10 and 12 with their associated mechanism. The grinding wheels are arranged to be driven through the medium of pulleys 14 and 16 secured to the respective wheel shafts 18 and 20 carried in bearings 22, 24, 26 and 28. The carriages 8 are constructed to reciprocate alternately toward and away from one another upon the table 4, which is provided with dovetailed portions 30 for guiding and sliding engagement, the reciprocating movements being imparted to the carriages by suitable mechanism including a rockshaft 32 normally urged in one direction to cause an approaching movement of the wheels by means of an arm 34 fixed thereto and actuated by a weight 36 suspended therefrom. Relative pressure exerted by the grinding wheels upon work positioned therebetween may be varied by increasing or decreasing the number of weights 36.

The specific mechanisms connecting the rockshaft 32 and the carriages 6 and 8 whereby the carriages are moved from one another by the shaft, may be of any preferred construction although we have shown them of a similar form to that illustrated and described in the patent to Ralph D. Gardner, No. 1,465,762, issued August 21, 1923. Since ready reference may be had to this patent for a full understanding of the carriage reciprocating mechanism, it is deemed unnecessary to further describe it herein, except to say that the shaft 32 may be rocked by hand by means of handle 38 or through the medium of the arm 40, cam 42 and gearing (not shown) in a counter-

clockwise direction to move the grinding wheels apart. The gearing is inclosed within the gear box 44 and connected through shaft 46 and pulleys 48 with any suitable source of power. The approaching movement of the grinding wheels is limited by an abutment bar 50, carried by one of the carriages 6 or 8, and adapted to abut against an adjustable micrometer abutment screw 52, carried by the other of said carriages.

The grinding wheels may be adjusted to dispose them into or out of exact parallelism as desired, for purposes that will be obvious. With this end in view the standards 5 may be moved laterally of the carriages 6 and 8 by loosening opposed set screws 53 arranged in opposed relation on opposite sides of the shafts 18 and 20. The wheels may also be adjusted for vertical alignment by loosening a securing bolt 54 and turning adjustment nut 55. The details of the mechanisms for procuring vertical and lateral adjustments have not been further shown and described herein because reference may be had to the copending application of Ralph D. Gardner, Serial #648,216, filed June 28, 1923 for a full disclosure.

*Work holding chuck.*

Mounted upon the bed 4 of the machine is a single standard 60 bifurcated to form arms 62, 64, (a pair of standards may be used) in which are journaled the ends of shaft 66, upon which a chuck 68 is fixedly secured for rotation therewith. The chuck 68 is preferably positioned equidistantly between the extremities of inward movement of the grinding wheels toward one another and is arranged to project the work into engagement with the surfaces of the grinding wheels as it revolves. This is more particularly illustrated in Figures 3 and 4. To one end of the shaft 66 a gear 70 is secured and adapted to engage with a train of gears within the gear box 44. A housing 72 is disposed about the gear 70 and in connection with the gear box 44 for safety purposes.

Bearing upon the shaft 66, but fixedly connected in any suitable manner with the stationary frame of the machine is a cam 74 arranged in the path of a plurality of levers or cam followers 76, each of which is pivoted as at 78 upon the body of the chuck or work carrier 68. Each lever 76 carries at its inner end a roller or other similar anti-friction arrangement for engagement with the cam face of the cam 74 as it is revolved thereabout, and each follower is urged into contact with the cam face by means of a plurality of springs or other tension devices 79 secured at their inner ends to the hub of the chuck 68 and at their outer ends to the followers. These followers, at their outer ends, carry a movable jaw or work clamp 80, cooperative with a fixed jaw 82, each of which jaws is provided with a suitable slot whereby the work may be gripped between them. Both the fixed and movable jaws may be made removable for replacement by other cooperative jaws in accordance with the varying characteristics of the work to be received thereby.

*Feed chute.*

Forming a part of the standards 62 and 64 or rigidly secured thereto are a pair of arms 84 and 86 connected by cross members 88 and 90 to the latter of which a pair of links 92, connected by a transverse member 94, are adjustably secured. By varying the angular relation of the links 92 with respect to the projecting arms 84 and 86, the inclination of the work feed chute 96 is varied as will be clearly observed from the showing of Figure 2. This chute is secured to a bracket (not shown) pivoted upon the transverse member 88 and may be locked in any desired position by means of set screws 98 which pass through blocks 100 disposed on opposite sides of the gravity chute and which screws, in addition to the locking function stated, serve to fixedly but adjustably secure a pair of guides 102 arranged on opposite sides for guiding the work as it passes downward. Additional blocks 104 may be provided at intervals along the length of the chute, if desired, and in some instances it may be found desirable to provide a guide and baffle plate 106 arranged to extend transversely across the chute to prevent overrunning of round pieces of work. A second guide member 108 may be placed transversely across the chute adjacent the work receiving chute. In operation, the guides 102 are moved toward or away from one another to accommodate the length of the work passing therebetween. The chute 96 is adjusted upwardly or downwardly in accordance with the desire of the operator or the frictional characteristics of the work so that when the machine is started the work will automatically feed itself between the guides and into the open jaws of the chute.

The cam mechanism of the chuck is so arranged that the jaws will be opened prior to their coming adjacent to the feed end of the feed chute, will be closed shortly after leaving the chute, and will be held closed thereafter and until the work has passed the grinding surfaces to a point where they oper to discharge the work into a hopper or the like, (not shown).

It sometimes happens that the work in passing out of the feed chute into the jaws may become slightly displaced and overhangs one side of the chuck to a greater extent than the other. If such an accident

should occur, it would not only result in undue wear of one grinding surface, but would be apt to distort the work and put undue wear on the bearings and carriage mechanism of the machine. To obviate this, we have arranged a work positioning device comprising a pair of adjustable brackets 110 and 112 to which positioning guides 114, 116 are secured in opposed relation. These two guides 114 and 116 are in the form of plates bent outwardly at their outer or feed ends and project inwardly in substantially parallel planes to a point beyond the position at which the clamping jaws of the chuck are arranged to be tightly closed by the cam. In this way the work is positioned in the chuck jaws with its ends projecting substantially equal distances on each side thereof and held in this position until the chuck jaws rigidly clamp it for the grinding operation.

For the purpose of dressing the faces of the grinding wheels when necessary, and so that it may be done during the period of operation of the machine we prefer to mount a dresser comprising an adjustable bracket 118 upon a portion of the bed 4 in order to support and guide a wheel dressing bar 120, adjustably therein. Since this dresser forms no part of the present invention, but is adaptable to the general combination thereof and is particularly illustrated, described and claimed in a copending application, Serial No. 648,217, filed June 28, 1923, it will not be further described herein.

From the foregoing description, the operation of our machine should be readily understood together with its many attendant advantages. We do not, therefore, desire to be limited to the particular mechanisms or their arrangement, but only by the spirit of our invention and the scope of the appended claims.

We claim:

1. In a grinding machine in combination, a pair of opposed grinding wheels, a movable carriage for each wheel, means for automatically moving said wheels toward and from one another, a positive adjustable stop mechanism associated with said carriage for limiting the approach of said wheels, and endless work holding means rotatably carried between said wheels.

2. In combination, a pair of opposed grinding wheels, a movable carriage for each wheel, means for automatically moving said wheels toward and from one another, means for adjusting the angle at which said wheels approach one another, means for limiting the approach of said wheels, a work holder adapted to carry work into and out of engagement with said wheels, means for automatically clamping work in said work holder, and adjustable but rigid work positioning guide-ways adjacent the work holder, and arranged to guide work received in said holder until the work is carried into engagement with said wheels.

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