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METHOD AND APPARATUS FOR BENDING SPOKES

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INVENTOR

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The invention relates to wheel manufac-
tures and refers more particularly to a meth-
od and apparatus for bending the spokes of
wheels.

An object of the invention is to provide
means for quickly bending the spokes of a
wheel preparatory to placing the rim in posi-
tion. In manufacturing wheels, after the
spokes have been connected with the hub
and especially when the spokes are cast in
the hub, the spokes are disarranged and must
be straightened or bent into proper position
preparatory to receiving the wheel rim. My
invention provides a simple means for quick-
ly bending or straightening all of the spokes
of a wheel simultaneously. The invention
further contemplates means for permitting
quick replacement of a wheel on the machine
after the bending operation has taken place.

With these and other objects in view, the
invention resides in the novel features of
construction and combinations and arrange-
ments of parts as more fully hereinafter de-
scribed and claimed.

Referring to the drawings:

Figure 1 is a front elevation of the ma-
cine showing the spider in cross-section.

Figure 2 is a plan view of the table of
the machine showing the spider in operative
position.

Figure 3 is a side elevation of the machine
base.

Figure 4 is a plan of the machine base
along 1—1 of Fig. 3.

Figure 5 is a plan of the die block ring.

Figure 6 is a section view of the same
along 6—6 of Fig. 5.

Figure 7 is a plan of the spider, and

Figure 8 is a section view of the same
along 8—8 of Fig. 7.

In the drawings reference A indi-
cates the base of the machine which may be
cast of suitable metal and having a table B.

C represents a spider which is adapted to
be reciprocated to bend the spokes of the
wheel E preferably about a cooperating sta-
nary die block D.

For reciprocating the spider C, I provide
a suitable source of power such as the motor
10, adapted to drive a gear 11 through a
pinion 12, the drive then progressing through
suitable reduction gearing such as pinion 13
and gear 14. The latter gear is provided
with clutch jaws at 15 adapted to cooperate
with complementary clutch jaws carried by
a clutch member 16 splined at 17 to a driven
shaft 18. The clutch member 16 is normally
urged forwardly into driven contact with the
clutch jaws of gear 14 by reason of a spring
19 one end of which bears against a station-
ary set collar 20. The clutch member 16 is
preferably provided with actuating means
for permitting driving engagement with
gear 14 for one revolution of the clutch
member 16. With this in view the clutch
member 16 may be provided with a circum-
ferentially extending groove 21 terminating
in an offset 22. Engageable with the groove
21 is a pin 23 normally urged forwardly into
engagement with the groove by reason of
a spring 24. The pin 23 may be withdrawn
from the groove by any suitable operating
means (not shown) connected with the pin.
It will be noted that, with the motor 10 con-
tinuously rotating gear 14, the pin 23 will,
after a revolution of the clutch member 16,
engage the offset 22 and automatically move
the clutch member 16 to the right, thus with-
drawing the clutch member from driven en-
agement with gear 14. Whenever it is de-
sired to cause a revolution of the shaft 18
the pin 23 is momentarily withdrawn from
the offset 22 whereupon the spring 19 will
move the clutch member into driven engage-
ment with the clutch jaws of the gear 14
thereby rotating the shaft 18 for a single
revolution or until the offset 22 again comes
into engagement with pin 23 to disengage
the clutch.

The shaft 18 terminates in a crank disc
25 having a driving pin 26 engaged by a
connecting rod 27. The driven end of the
connecting rod operates a wrist pin 28 con-
nected with a suitable crosshead 29 recip-
rocable in vertical guides 30. Connected
with the crosshead 29 is a spider pull rod
31 adjacent the upper end of which is a re-
duced portion 32 adapted to receive the bi-
furcations 33 of a key 34 for temporarily
holding the wheel in position and at the
same time permitting quick removal of the
key 34 as will be hereafter understood.

The table B may be provided with an an-
nular seat 35 for receiving the die block D,
and a portion 36 for supporting a mandrel
37 which slidably receives the rod 31. The
mandrel may be tapered at 38 in accordance
with that of the hub 39 of the wheel E.
An annular portion 40 of the mandrel en-
gages the portion 46 for supporting the

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mandrel and wheel hub in position to be acted on by the spider C.

The die block D may be formed with cut out portions or slots 41 leaving the raised lower spoke guides 42 between successive slotted portions. The slotted portions 41 are adapted to receive the upper spoke guides 43. The guides 42 and 43 preferably have their upper faces curved and inclined outwardly to conform readily with the angle of bending of the spokes, the guides thus serving as fulcrums. The die block D is adapted to be secured to the annular seat 35 by means of the screws 44 passing through the holes 45. Holes 46 extend through the slotted portions 41 for accommodating screws 47 by means of which the upper spoke guides 43 are held seated within the slotted portions 41. It will thus be noted that the die block D is formed of alternate lower spoke guides 42 and relatively higher upper spoke guides 43, the guides being spaced to conform with the spokes of the wheel E.

The wheel E is shown having a hub 39 formed with an upper annulus 48 and a lower annulus 39. Secured to the upper annulus 48 and extending radially therefrom are the upper spokes 50, the lower spokes 51 extending radially from the lower annulus 49. The upper spokes 50 and the lower spokes 51 are vertically offset so that if projected vertically the upper and lower spokes would alternate. The spokes may be secured to the hub in any manner desired although it is preferred to cast the ends of the spokes with the wheel hub. After the spokes have been formed to the hub they are disarranged, my invention providing means for readily bending them into a proper predetermined position for receiving the rim (not shown).

The spider C is provided with a central hub portion 52 adapted to slidably receive the pull rod 31. Extending radially from the spider hub 52 are a plurality of arms 53 terminating in a curved at 55 for engagement with the upper spokes 50. The arms 53 are preferably the same in number as the lower spokes 51 and are provided with downwardly extending fingers 56 terminal curved for engagement respectively with the lower spokes.

In operation the wheel E, comprising the hub 39 and the disarranged upper and lower sets of spokes 50 and 51 respectively, is placed on the rod 31, being guided thereby until it engages the mandrel 37. The wheel is thus positioned and supported with the upper spokes 50 lying above the upper spoke guides 43, and the lower spokes 51 lying above the lower spoke guides 42. While the pull rod 31 is shown in Fig. 1 in its lowermost position as just completing the extreme bending of the spokes, it should be understood that at the completion of a cycle of operation, the parts are brought to rest with the pull rod 31 preferably in its uppermost position. Thus the wheel E is positioned preparatory to the bending operation when the pull rod 31 is in its uppermost position as determined by the uppermost travel of the crosshead 29. The spider C is then lowered into position on the pull rod 31, the arms 53 being positioned above and aligned with the lower spokes 51 whereby upon the downward movement of the spider, the fingers 56 will engage the lower spokes 51 and the ring 54 will engage the upper spokes 50. In large forms of my machine, the spider C may be quite heavy, making it desirable to employ a suitable hoist (not shown) above the spider for lifting the same off and on the pull rod to permit positioning of the successive wheels. If desired suitable guides might be provided for automatically properly positioning the spider and wheel as the former is placed into position on the pull rod. After the spider has been lowered into position the key 34 is placed as shown in Fig. 1 with the bifurcations 33 engaging the reduced portion 32 of the pull rod 31. The parts are then ready for the downward movement of the spider which is accomplished by momentarily withdrawing the pin 23 establishing a driving connection between gear 14 and the clutch member 16. Thus rotation of shaft 18 is produced, causing the pull rod 31 to move downwardly by reason of the pin 26 and connecting rod 27. As the pull rod moves downwardly the spider C is carried with it by reason of the key 34, causing all of the upper spokes 50 to be bent over the spoke guides 43 to the same extent by reason of their engagement with the ring portion 54. At the same time the fingers 56 engage the lower spokes 51 to bend them over the guides 42, the bending of such spokes being also all to the same extent.

After a single revolution (which will ordinarily be sufficient) the machine is automatically brought to rest by the movement of the clutch 16 produced by engagement of the pin 23 and the offset slot 22. The key 34 is then withdrawn permitting ready removal of spider C and wheel E preparatory to positioning of the next wheel.

It will be noted that I have provided means for simultaneously bending all of the spokes of a wheel. Since the upper spokes and lower spokes are bent the same extent, they will all assume a final position, after springing back when the spider is removed, which will present a definite desired arrangement. By properly arranging the guides 42 and 43 with respect to the movement of the spider C, the spokes
may be made to assume any final position desired.

It is apparent that instead of having two groups of spokes termed upper and lower respectively for purpose of identification, my invention is equally adapted for bending spokes of a single group, or of any number of spokes.

While it is believed that from the foregoing description, the nature and advantages of my invention will be readily understood, I desire to have it understood that I do not limit myself to what is herein shown and described and that such changes may be resorted to when desired as fall within the scope of the claims.

What I claim as my invention is:

1. A spoke-bending machine for wheel spokes, comprising a support for said wheel, a bending element, a fulcrum adapted for contact with a spoke intermediate the point of connection of the spoke with the hub of the wheel and the outer end of the spoke, and means for relatively moving the bending element and wheel for bending a spoke about the said fulcrum.

2. A spoke-bending machine for wheel spokes, comprising a support for said wheel, a pull rod, a spider removable mounted on said pull rod, and means for axially moving the pull rod to bring the spider into contact with the spokes for bending the same.

3. A machine for bending the spokes of wheels of the kind embodying a hub and a plurality of groups of spokes extending radially in offset relation from said hub, a support for the wheel, a bending member, and means for relatively moving the bending member and wheel for simultaneously bending all the spokes in all of said groups.

4. A machine for bending the spokes of wheels including a hub and spokes extending radially therefrom, a pull rod actuable through the hub, a support for the wheel, a spider, means for detachably connecting said spider and pull rod, and means for causing reciprocation of the pull rod for bringing the spider into engagement with the spokes for bending the same.

5. In a wheel spoke-bending machine, a base, a table supported by the base, a pull rod extending reciprocally through the table, a die block secured to the table including spoke guides, means for mounting the wheel above the table with the said pull rod extending through the hub of the wheel, a bending member carried by the upper portion of the pull rod, and means for reciprocating the pull rod to cause bending engagement of the spokes by said bending member.

6. A machine for bending the spokes of wheels of the kind embodying a hub and a plurality of groups of spokes extending radially in offset relation from said hub, a support for the wheel, a spider provided with means for engaging all of the spokes of the wheel, spoke guides positioned in the line of bending of the respective spokes, and means for moving the spider into bending engagement with the spokes.

7. A machine for bending the spokes of wheels of the kind embodying a hub and a plurality of groups of spokes extending radially in offset relation from said hub, a support for the wheel, a spider formed with a hub portion and ring portion adapted to engage the spokes of one of said groups for bending the same, arms connecting the hub and ring portions and bending means carried by said arms adapted to engage the spokes of the other group, and means for relatively moving the spider and wheel for bending the spokes.

8. In a wheel spoke-bending machine, a pull rod mounted for reciprocation through the axis of the hub of the wheel, means for supporting the wheel, a bending member operably and removably connected to one end of the pull rod, means permitting quick detachment of the pull rod and bending member, and means for exerting a pull on the other end of said pull rod for bringing the bending member into engagement with the spokes of the wheel for bending the spokes.

9. The step in the manufacture of wheels consisting in subjecting the wheels, with cast hubs and spokes extending from the hubs in disarranged fashion, to the influence of bending whereby the spokes thereof are bent into a definite predetermined arranged condition preparatory to receiving the rim.

10. A machine for bending the spokes of wheels of the kind embodying a hub and a plurality of groups of spokes extending radially in offset relation from said hub, a support for the wheel, a bending member reciprocably mounted above said wheel and provided with means for engaging all of the spokes of the wheel, and means for causing a downward movement of said member for bringing the same into engagement with the spokes for bending the same.

11. A spoke-bending machine for wheel spokes, comprising a support for said wheel, a reciprocable member, and a spider removably mounted upon said reciprocable member provided with means for bending all of the spokes of the wheel simultaneously upon a downward movement of said member.

In testimony whereof I affix my signature.

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