Lacing and Truing a Bicycle Wheel

S. D. V. Burr, 1896

Selected pages from Bicycle Repairing.

An early bicycle mechanic shows how to hold the rim, string spokes and locate a wobble as the wheel turns.

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CHAPTER VII.

The Wheel.

The device shown in Fig. 1 is intended for holding the wheel while the spoke nipples are being tightened up and the spokes brought under tension. While such a device is peculiarly applicable to the needs of the manufacturer it would be found to be of great service in the ordinary repair shop, as it is



Fig. 1.—Assembling a Wheel.

so simple in construction and as it is so conveniently operated. It is not intended, with the use of this machine, to bring all of the spokes to their final perfect condition of strain.

The hub of the wheel is placed over a rod projecting from the center of the revolving table and the rim is laid on the

frame, about in the position it will occupy when all the spokes are in place. The wheel is then "strung up" as it is termed, each spoke being placed in its correct position. The operator then screws up all the nipples, one after another, and without gauging gets the wheel as nearly true as possible.

The apparatus itself consists of the table mounted upon a spindle, about which it is free to revolve, it being considered better to turn the entire table, and so bring nipple after nipple within reach, than to turn the wheel itself, particularly when the spokes are all loose.

This is another one of those devices upon which a good many dollars could be expended and much time taken in constructing it, while at the same time an equally efficient one could be built in half a day and with an expenditure of only a few cents. Little devices like this, which can be made by the Bicycle repairer himself at odd times, are in a great many cases of much more real value than the same thing would be if made to order and by an expert.

Frame for Stringing Up a Wheel.

A frame for holding the rim of a wheel while the spokes are being inserted and tightened is shown in Fig. 2. The frame is so formed as to be carried by a Bicycle stand, and is shown in its working position in the engraving on page 29. It is a more elaborate affair than the one just described, and is designed to bring the wheel much nearer its true form. It consists first of a yoke or oblong shaped frame carrying a flat cast iron ring, as indicated. Projecting in the same line from the side bars of the frame are two adjustable centers, A and B, the inner ends of which are cone shaped, so as to enter and hold the hub. These two centers may be placed at any distance apart in order to hold a wide or narrow hub, and by means of set screws passing through their sleeves may be held in any required position. The frame carries in a plane perpendicular to its own plane a flat cast iron ring 23 inches inside diameter and 32 inches outside. One face of this ring is turned perfectly flat and is in line with the center of the carrying frame. Concentric circles ¼ inch apart are marked on the surface of this

ring. At four equidistant points on the face of the ring are the adjustable stops C, which consist merely of slotted pieces of iron held in place by set screws.

In stringing up the wheel the hub is first placed between the centers A and B. The stops C are then adjusted so as to hold the rim firmly and at the same time in a position concentric with the hub, after which the spokes are inserted and screwed up in the usual way. It will be observed from the dimensions given that this device permits of the handling of all

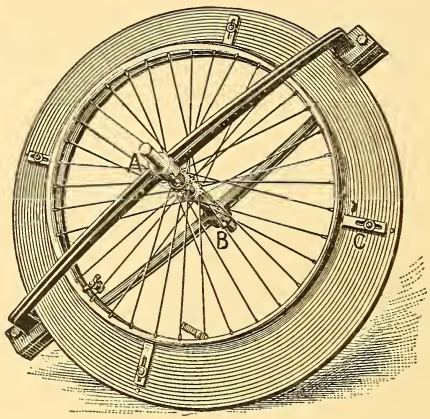

Fig. 2.—Frame for Stringing up a Wheel.

the ordinary sizes of rims, and since the rim and its hub are held in their true positions the spokes can be so tightened that the final adjustment and actual truing up of the wheel will occupy but little time.

Truing a Wheel.

Two methods are shown in Figs. 3 and 4 of truing up the front and rear wheels of a Bicycle. In the first engraving the wheel is shown mounted in its own fork, the same as if for actual service. The shank of the fork is grasped in a vise, which should preferably be of the swivel type in order that the jaws may be brought in a line perpendicular to the edge of the bench, so as to bring the wheel out clear of the bench and thereby permit its free revolution and convenient handling.

The wheel is turned, and a piece of chalk, rested on one of the legs of the fork, is held alongside of the rim so as to touch that part of the wheel projecting toward the side against which the chalk is held. The mark thus made on the rim serves as a guide for the workman, who then loosens or tightens the spokes necessary to bring back the projecting portion of the rim into the true plane of the wheel. As a further precaution the chalk is afterward held against the opposite side of the rim, then resting, of course, upon the other leg of the fork. The advantage possessed by this method is that the wheel is trued in its own fork and that when the work is done the true turning of the wheel, when finally mounted in the frame, is assured.

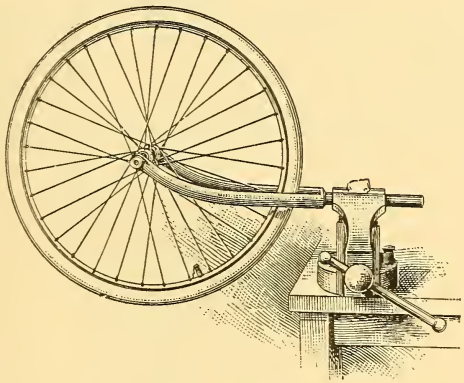

Fig. 3.—Truing Front Wheel Held in its Fork.

In the second method, Fig. 4, the wheel is shown removed from the frame and held so that it may be revolved upon its own axle. At the end of the bench is an upright flat bar of iron, about 1½ inches in width and about 3-16-inch in thickness, provided at suitable intervals with a row of holes to receive the end of the axle, which is passed through either one of these holes and held in position by its own nut. The wheel is then turned and the spokes tightened or loosened in the way described above, the hand holding the chalk being rested upon the edge of the bench.

In this, as in every other operation wherein the spokes are

changed in any way, it is of the utmost importance when finally truing the wheel to make each spoke bear its proportion of the load to be carried. In other words, it is essential that each individual spoke should be subjected to precisely the same tension as each and every one of its neighbors. A single loose spoke will, of course, throw additional strain upon those adjoining, the result being what may be called a warping of the

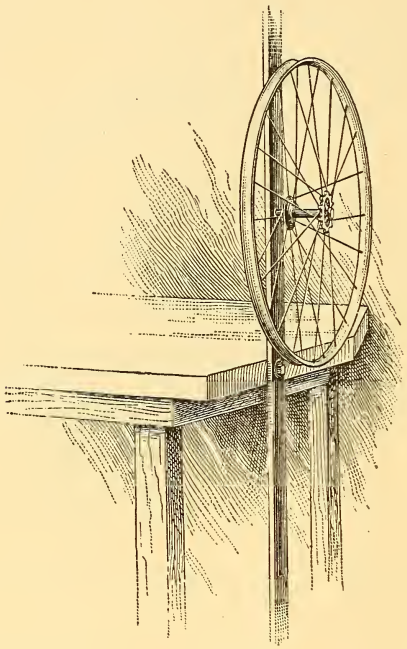

Fig. 4.—Truing a Rear Wheel.

wheel, and perhaps the rupture of some of the spokes. Although this may perhaps be carrying the illustration a little far, the principle is there, that one loose spoke is at least risky, and that a wheel in which the spokes are not under the same strain will very soon meet with disaster. The only way of testing the tension to which the several spokes are subjected is by grasping adjoining spokes in the hand and by the "feel" ascertaining if the pairs are under the same strain. This re-

quires care and a little experience, although at the first attempt the novice will be surprised how surely and quickly he can find out where any difference exists.

Device for Truing a Wheel.

The device shown in Figs. 5 and 6 consists of a hard wood board 1 inch thick, 12 inches wide and 41 inches long. In the center is an opening of the shape indicated. The opening is started 3 inches from the end B, and is 30 inches from D to C and 2 inches wide from L to M. From D to J is 6 inches and the distance across the center of the curved portion, E to F, is 8

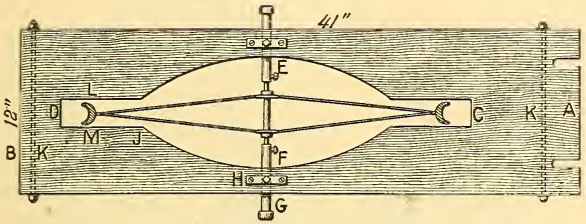

Fig. 5.—Device for Truing a Wheel.



Fig. 6.—The Cone.

inches. The two gas pipes G are ⅜ inch in diameter by 5 inches long and their outer ends are capped. They are inserted in holes in the edges of the board, as shown in the drawing. The two pieces H are made of half round iron 3 inches long and are screwed to the face of the board in such position that the set screws carried by them will engage with and hold the pipes G in the desired position. A set screw is put in each end of the pipe to hold the ends of the shaft. A small bolt, K, is passed through each end of the board to prevent splitting. Two notches are made in the end A in order that the board may be secured to the bench by lag screws, and thus brought into convenient position for working. If the wheel is removed from its axle it may be held in the board by means of two cones, Fig. 6,

one in each of the gas pipes G. These cones are made of ¾ inch iron, formed with a shank to fit in the pipe and having a cone turned upon the opposite end.

Jack for Truing a Wheel.

A simple and convenient jack for holding a wheel for truing is shown in Fig. 7.

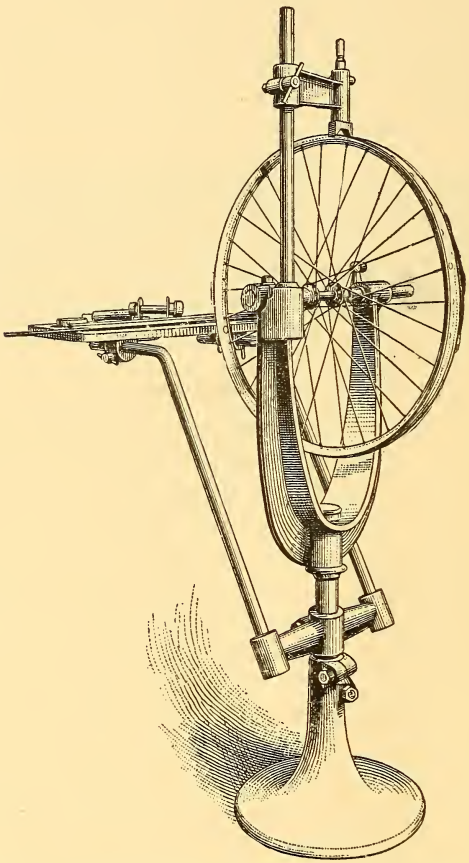

Fig. 7.—Jack for Holding a Wheel for Truing.

Resting upon the top of the base is a cast iron U-shaped fork, the shank of which enters a hole in the top of the column.

The upper part of the device can be turned to any desired position and held in place by the clamp nut shown at the top of the base. Bracket arms extend upward from a cross piece carried by the shank of the fork and hold the table at their upper ends, as shown.

In the top of each branch of the fork is a ball bearing similar in every way to that of the Bicycle. The balls are held in place by an exceedingly thin margin of metal, so that they are perfectly free to operate when the wheel is placed in position. The wheel is thus trued under precisely the same conditions as if held in its own frame. One of the shafts carrying the ball bearings can be moved in or out to admit the entrance and

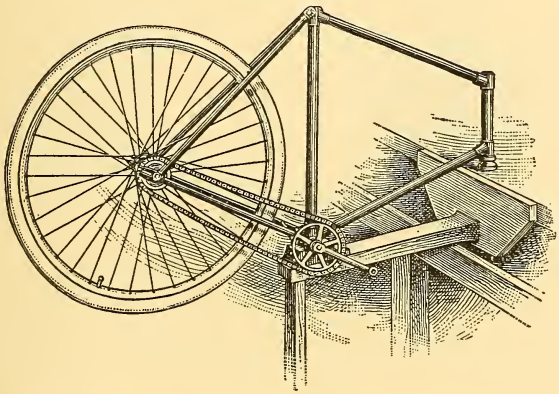

Fig. 8.—Holding a Frame for Truing the Rear Wheel.

removal of the wheel. A nut holds it in place after the wheel has been inserted. An adjustable gauge is held by a standard mounted on one of the branches of the fork, as indicated. The wheel is trued by revolving it and then marking the projecting parts of the rim with chalk in the way already described.

Holding the Frame While Truing the Rear Wheel.

A method of holding the frame on the bench while the rear wheel is being trued is illustrated in Fig. 8. Near the edge of the bench is placed a short stud or bar, projecting 2 or 3 inches above the top, and of such size as to enter freely in the socket

head of the frame. A rest projecting from the front of the table and supported at its outward end by a standard reaching the floor serves to hold the middle portion of the frame. By this arrangement the frame is held with sufficient firmness to permit any desired examination to be made and to admit of ready access to all of the parts.

Removing a Broken Radial Spoke.

When the spoke of a radial wheel has been broken so as to leave the threaded part in the hub it is a more or less difficult

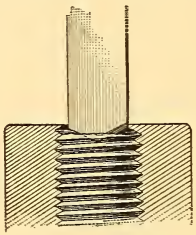

Fig. 9.



Fig. 10.

Removing a Broken Radial Spoke.

job to remove this part. Boring the part out enlarges the hole so that the new spoke must be of larger size than the others and the wheel will present a patched appearance. In almost every instance the threaded part may be removed in the way shown

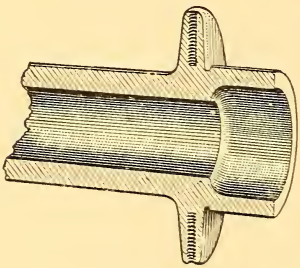

Fig. 11.

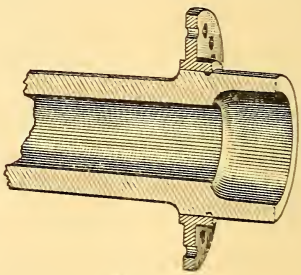

Fig. 12.

Changing a Radial to Tangent Spoke.

in Figs. 9 and 10. These drawings are greatly enlarged in order to make the operation plain. The tool used is a flat drill, Fig. 10, having a very blunt diamond point. The cutting edges, *a a*,

are left handed—that is, the drill must be turned to the left when boring with it. The drill is applied to the screw as indicated in Fig. 9. A slight recess is cut in the top of the screw by moving the drill back and forth through a small arc. This raises a ridge in front of the two cutting edges and presents an obstruction to the turning of the drill which is sufficient to permit the screw to be backed out, changing a Radial to Tangent Spoke.

A radial spoke wheel can be changed to a tangent spoke in the following way : The flange of the radial spoke hub shown

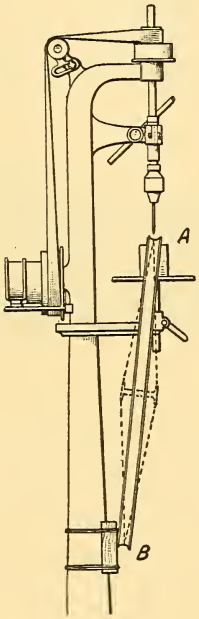

Fig. 13.—Rim Drilling in an Upright Drill.

in Fig. 11 is turned down about even with the face of the hub and a brass disk is formed with a series of peripheral holes and bored to fit the turned down portion of the hub, and is then placed on the hub and brazed in position. The holes in the disk receive the ends of the spokes and the wheel is strung up in the usual way.

Rim Drilling in an Upright Drill.

While drilling a new rim for the reception of the spokes two things should be kept in mind—the holes must be accurately spaced, one from the other, and they must be drilled in line with the hub flanges. The first is essential mainly to preserve the symmetry of the wheel, while the second is important because the spokes should pull in a straight line throughout their entire length. If the holes are not bored in the proper direction the spokes will be bent at the rims, and while this may not be of much account it is not the proper way to do the work. Although the holes can be drilled with a bit and brace and good results attained, a much easier and better job can be done with either an upright drill or a lathe.

Rim drilling with an upright drill is illustrated in Fig. 13.

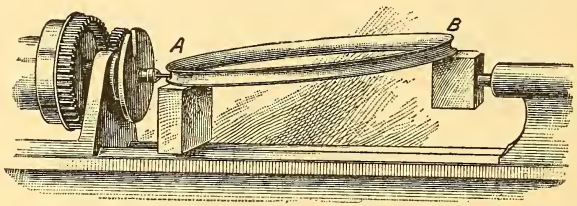

Fig. 14.—Rim Drilling in a Lathe.

On the table of the drill is secured a wooden block, A, having a groove in its upper side to receive and hold the rim in place. Fastened to the drill column at B is a second block of wood, against which the lower part of the rim rests. The plane of the rim is by this means placed at an angle with the axis of the drill spindle, so that the extended axis of the spindle will pass through one of the flanges of the hub. While in this position one-half of the holes are drilled, every alternate hole being skipped. The wheel is then reversed and the remaining holes drilled.

Rim Drilling in a Lathe.

Rim drilling with the aid of a lathe is shown in Fig. 14. Under the drill held in the chuck is placed a block, which is secured to the bed of the lathe. This block, A, is of such hight

as to bring the rim central with the drill. In the block B is a hole to receive the tail spindle. This block serves the same purpose as the one fastened to the column of the drill—it throws the rim out of line with the drill a sufficient distance to bring the drill in line with the lower flange on the hub. Every alternate hole is then drilled, after which the rim is turned over and the others drilled.