Machining and Mounting Wheels and Axles*

Smooth Wheel Fits Advocated; Gaging Worn Axles and Rolled Steel Wheels; Welding Cast Steel Wheels

By Charles Petrau

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CAST iron wheels to be properly machined and for the safety of the railroad should be carefully fabricated at the foundry. The iron should be of the best material, so that the wheels come out perfect both in shape and in composition. A wheel coming to the wheel shops which has a hard hub invariably comes in a low tape measurement, and the hub is usually full of blow holes. This is a dangerous wheel to apply and it is money in the company's pocket immediately to place it in the scrap pile. We have had hard wheels of this description burst at 20 tons pressure; we have had the same kind of wheel broken in two in service.

If the wheel has a high tape measurement, the hub is soft, and it is perfectly safe in every respect.

Boring and Mounting Cast Iron Wheels

All wheel shop foremen should check up the chucks of their boring mills at least once a month to satisfy themselves that the jaws of the chuck are perfectly safe.

In placing the wheels in the machine, the operator should, after closing the chucks, see that he has a five-point contact to the flange of the wheel, and if not, that is the time to investigate for a warped flange.

If the wheels come from the foundry properly fabricated, the mills should be operated for boring wheels at 30 ft. per minute. In starting the cut the operator should use hand feed until the cutter gets a start. This prevents the cutters from following the bore of the wheel, if it is out of center. While it will not insure a perfectly central cut, it helps to bring it much more nearly central than if the cutters are jammed into the wheel and the feed thrown in. What little the wheel is out of true with this first cut is removed with the second cut. It is absolutely essential that all wheels be bored with two cuts, for the above reason.

While the second cut is primarily to bring the bore of the wheel central, it is also intended that the operator fit the bore of the wheel to an axle, if there be any. An allowance of 0.006 in. will give the fit the proper tonnage. After boring the wheel for the second cut, the bore should always be chamfered to give the operator an opportunity to start the wheel on the axle fit. All wheels should be bored in pairs so that two wheels with the same tape may be applied to the axle.

All axles, whether new or second-hand, should be carefully machined on the journal. The machining must consist of a roughing cut, a finishing cut with water and rolling the journal. The journal should be smooth, perfectly round, should not be tapered, and the fillets should be smooth.

A great many operators feel that the fit of an axle should be rough. I disagree with them. The best fit that we can give an axle is to have it as smooth as possible. This gives a long, perfect wheel fit, and a most reliable one. When the fit is made with a coarse feed, in mounting the wheel an accurate tonnage is not shown on the gage, as the wheel plows down the threads formed by the tool. Dismount this same pair of wheels and you would find a loss of tonnage at the second mounting.

A pair of cast iron wheels should be mounted at a pressure of eight tons for every inch of wheel fit diameter. This works out as follows:

Capacity	Wheel fit dia.	Pressure
160,000 lb.	7 in.	56 tons
80,000 lb.	4½ in.	32 tons
60,000 lb.	3¾ in.	24 tons
80,000 lb.	5½ in.	44 tons

For all-steel wheels the rule is 10 tons to every inch of wheel fit diameter, plus ten tons, as shown below:

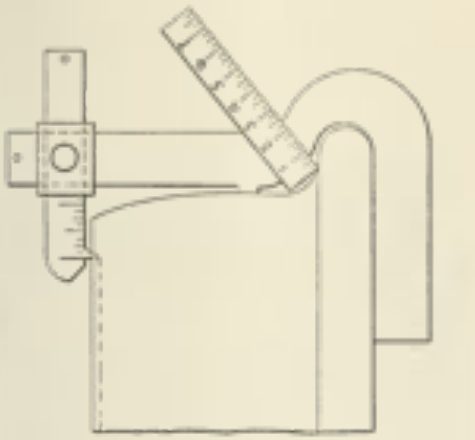
Capacity	Wheel fit dia.	Pressure
160,000 lb.	7 in.	80 tons
80,000 lb.	4½ in.	55 tons
60,000 lb.	3½ in.	45 tons
80,000 lb.	5¼ in.	62½ tons

*Abstracted from a paper presented before the Car Foremen's Association of Chicago, November 13, 1919.

We should have recording gages at all wheel shops as these gages not only give the correct pressures but also show any defects in the wheel fit. For a perfect wheel fit, the recording gage would show a perfectly straight line moving upwards and continuing as long as the pressure is on, but with wheels mounted without a recording gage we have to rely on the honesty of the operator, and you all know that would not hold good in a court of law.

A pair of wheels should be mounted perfectly central to prevent the wheels from climbing frogs and wearing flanges thin. This is so important that the wheel shop foreman should check the wheel mounting operator daily to see that this is properly done. It is also essential that a good coating of white lead and oil be painted on the inside of wheel fit and the axle fit prior to mounting. Otherwise there is a liability of the wheel dragging on the axle fit, piling up metal in front of it and thus falsifying the mounting pressure and causing a loose wheel.

After a pair of wheels is mounted the operator should test the wheels to see that they are not mounted crooked on the axle. This is done by tramming on the top and two sides of the wheels before removing them from the wheel press. A heavy coat of grease should then be applied to the journals to prevent them from rusting, and when the store department loads up these wheels for shipment they should again be touched up on the journals with this grease.



Gage Used to Measure Vertical Flange to Determine Service Metal to be Removed from Rolled Steel Wheels

Wheels should be loaded on cars so that the inside journal of each pair is inside of the wheels on the adjoining pairs. This prevents the journals from being cut or bruised while in transit.

Instructions for the Inspection of Axles

1—Caliper the wheel fit.

2—Caliper the center.

3—Caliper the journal in the center and at both ends.

4—Gage the collar of the journal. If the collar is close to the limit, the inspector must examine the inside of the collar and see if the collar is cut, making allowance for turning it up. If, in his judgment, there is not enough metal after truing up, mark the axle scrap.

5—The same rule will apply to a journal. Let us take a 60,000 lb. capacity axle. The limit is 8½ in. long, but a journal 8¼ in. long with a 3-16-in. fillet would be a scrap axle, so the inspector must use good judgment and not look for the 8½ in. journal nor the 7½ in. collar as laid down by the rule, but rather the 8⅞ in. journal and the 8 in. collar, and then see what these sizes and lengths would be after being machined at the shops. The same is true of the diameter of a journal. A 5½ in. journal on a 60,000 lb. capacity axle should be condemned, but I believe the condition of the journal should always be considered—whether it is cut or tapered and if in your judgment it would require a journal 4 in. in diameter to true up to 5½ diameter. If a 4 in. journal would have to be turned to less than 5½ in. charge it out as scrap. If you do not, it will be done at the machine shop, and the railroad will be the loser.

This flanges, small wheel fits and long journals have been passed by our inspectors too much, and in consequence we have to carry a big loss which, with proper inspection, would have been money in the pockets of the company. The money involved in wheels and axles runs up to such a high figure that I believe every supervisor should give this his personal attention. Train your inspectors to the fact that the machine shops is going to remove metal from the axles and they will, in consequence, be smaller in diameter, the journals longer and the collars thinner than when they are examined by the car inspectors.

Rolled Steel Wheels

The Eastern railroads have quite a number of their freight cars equipped with rolled steel wheels, and as the charges for turning are very high, car inspectors should be given very explicit instructions as to how to determine a change of steel wheels on a car without losing any money.

The first move of an inspector is to determine whether the witness groove on a 33 in. steel wheel is correct. The correct measurement is 29⅞ in. but we have found many wheels with the groove 28½ in. and we have found some 30 in., so it is absolutely essential that the inspector make this his first check. You will appreciate that if the witness groove should only measure 28½ in. that we would be giving the foreign road ¾ in. of metal, on the replacement wheel, which he would not be entitled to. This amounts to $17.63 at the price of $2.21 per 1/16 in. In other words, we would be giving him a replacement wheel ¾ in. larger in diameter for the wheel removed.

We have a gage that shows the service metal by measurement and gives an accurate measurement of the amount of metal to be removed. The gage is set on the wheel with the heel on the tread. The indicator is then dropped so that the point meets the witness groove in the side of the wheel. The distance from the flange contour of the gage at about ⅝ in. above the throat of the wheel is measured to the flange of the wheel. This would be the amount of metal necessary to remove. This amount is then deducted from the distance shown on the indicator of the gage. For example, if the indicator shows that there is 1½ in. of service metal on the wheel and the measurement from the gage to the flange ⅞ in. this would indicate that when the wheel is turned and a full contour flange again appears, there will be ⅞ in. of service metal left, just enough to place the wheel again in service.

If a pair of wheels of this description is removed from a freight car, the inspector should apply a pair of wheels with 7/8 in. of service metal. In our passenger wheels, we do not take out all the metal in the flange of the wheel, to make a full contour. We make the throat of the wheel full size and allow this full size to run ⅝ in. above the tread. Should a spot appear above ⅝ in. from the tread of the wheel, we do not remove any more metal on this flange, thereby saving possibly two turnings of metal for further service. Of course the top of the flange is again full size, the worn spot appearing in the center of the flange. I believe the American Railway Association should investigate this matter and allow the same rule to apply to freight wheels. When the throat of

the wheel has a full contour ¾ in. up there can be no danger of any description as a result of allowing a proof mark to appear.

Cast Steel Wheels

Do not scrap a cast steel wheel because it has a slid flat spot and is considered a one-run wheel. We have a very simple method of reclaiming these wheels at the Milwaukee shops. We take a piece of the flange of a cast steel wheel and draw it out for welding sticks about ½ in. in diameter. As these wheels come in on account of being slid flat, we weld in this metal on the flat spot, flatten it down with a hammer, and again place the wheel in service. We have watched these welded spots and find them to be equally as sound as the balance of the wheel. The cost of welding in a flat spot is about 50 cents. The wheels with worn flanges are held until we have a carload, and the manufacturer grinds them for us without charge, the only expense being for transportation and loading.

Discussion

In answer to a number of questions relative to the welding of cast steel wheels, it was explained that the hard metal, which is deposited in the surface of the tread and flange in the casting process, has a thickness of about ⅜ in. in the flange. This hard metal, reclaimed from scrap wheels and drawn out into welding rods, makes a sufficiently hard weld to wear well with the hard tread metal. It lacks the water treatment by which the wearing surfaces are hardened in manufacture, but this is made up in a measure by the hammering which the weld receives. No one reported any success in attempts to turn cast steel wheels.

The possibility of finishing journals by grinding was suggested by several speakers. Although no direct experience with this process was brought out, its successful use in other industries, on bearings of similar material was mentioned. The use of emery on car journals was objected to because of the possibility that abrasive material might remain imbedded in the unhardened surface of the journal and cause trouble.

Considerable objection was raised to the practice of determining the service metal in rolled steel wheels, outlined by the author. The general practice of those who discussed this subject, is to leave the determination of this dimension to the wheel shop, where it can be made by actual measurement after the wheels have been turned. It was pointed out that, with the exception of metal removed on account of flat spots, the allowance for which is specified, the interchange rules call for actual measurements and not for an estimate by the inspector on the basis of a gage measurement at the time the wheels are removed from service. This point was referred to the M. C. B. Committee of the association with the suggestion that it be taken up with the A. R. A. Arbitration Committee.

Angle Cock Holder Blocks

By E. A. Miller

THE dismantling and reassembling of angle cocks is quite an important item in air brake maintenance work. In many shops, it is the custom to hold the cock in a vise while taking off the handle and while unscrewing the cap for the removal of the plug. The cock must be gripped by the hexagon brake pipe end and as it has to be turned over, it must be taken out of the vise and regripped for the second operation. As the points gripped are at only one end and as considerable force often is required to start the cap, the vise must be tightened with considerable force to avoid pulling the cock out of the vise. The vise jaws must not press on the body of the cock as this would tend to distort the bushing and the plug.

A device which eliminates the use of a vise will materially reduce the time required for dismantling and reassembling air brake angle cocks and at the same time considerably reduce the physical effort required. The blocks shown in the illustration have been used for some time by one of the large railroad systems and with excellent results. These blocks are made of cast iron and fastened to the bench by

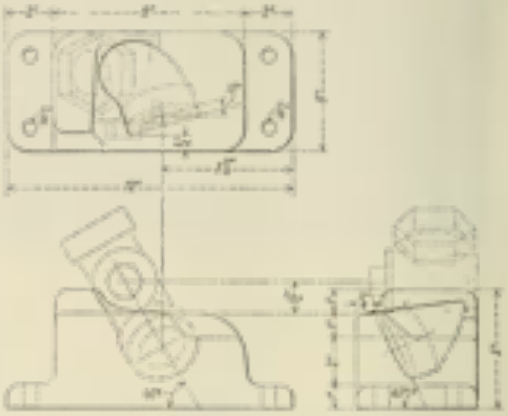


Fig. 1. Block for Holding Angle Cock When Removing and Applying Handle

four ⅝-in. bolts. Two blocks are required, the one shown in Fig. 1 being used for holding the cock while removing the handle pin and handle and the one shown in Fig. 2, while unscrewing the cap and taking out the plug. The same blocks used for taking the cocks apart are, of course, also used for putting them together again after the plugs have been ground.

Blocks of similar design are used for handling cut-out cocks. A wrench for removing the cap is shown at the right-

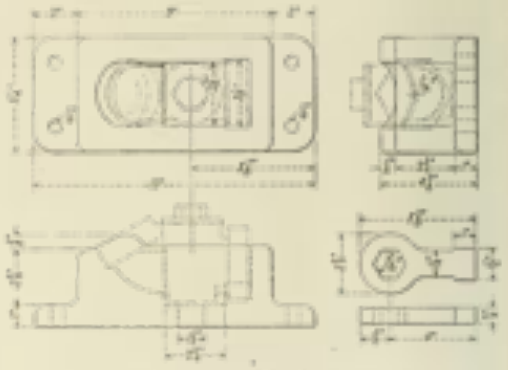


Fig. 2. Block for Holding Angle Cock When Removing and Applying Cap, Also Cap Wrench

hand side of Fig. 2. This is forged of steel and fitted to the cap. A short wrench of this type used with a hammer, is preferable to a long handled wrench and is equally effective for removing the caps from cocks and for tightening them up again when reassembling.