H. Harper,

Axle Gage,

No. 36,951. Patented Nov. 18, 1862.

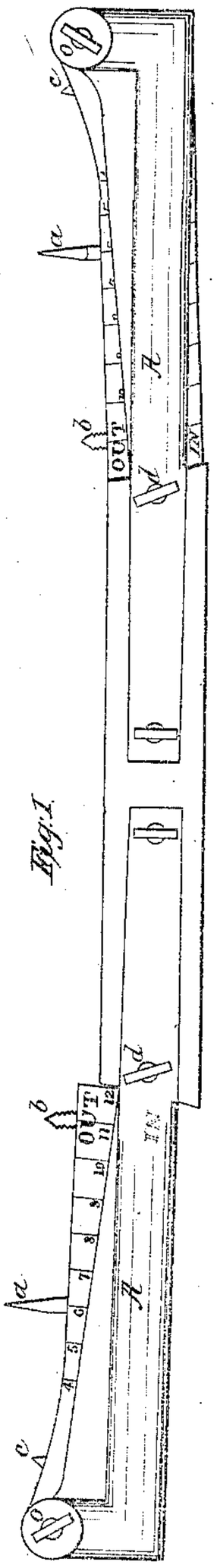

Fig. 1.

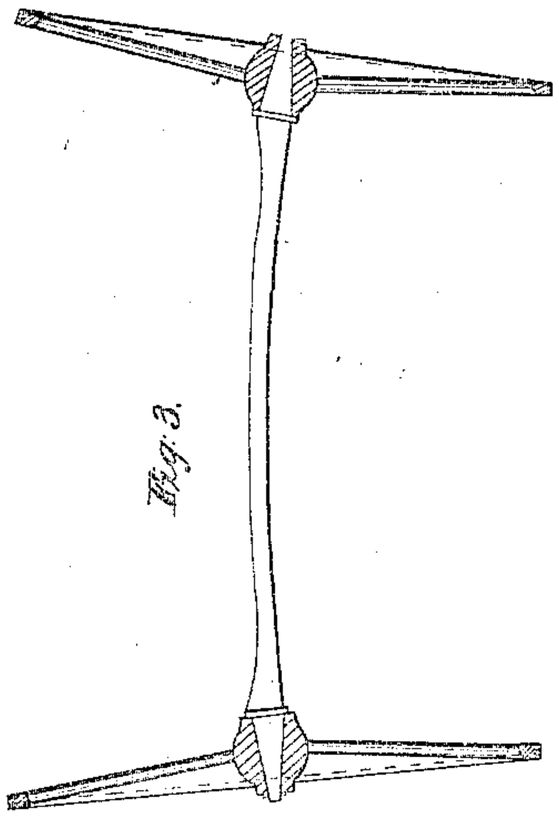

Fig. 3.

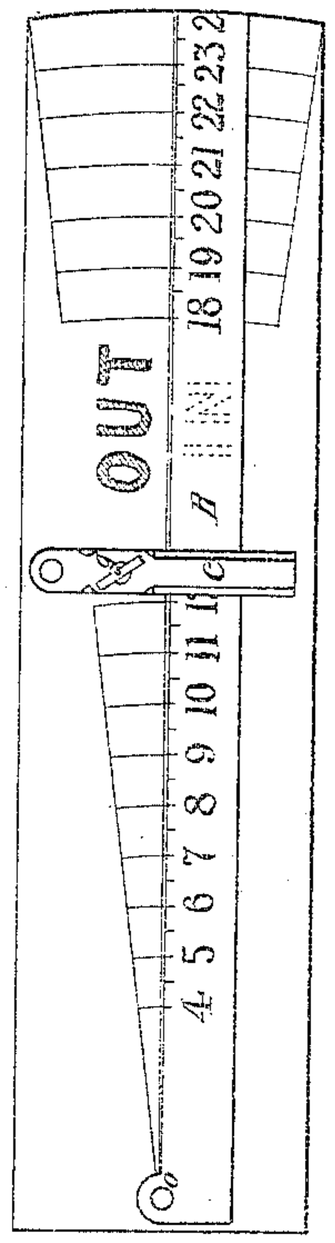

Fig. 2.

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UNITED STATES PATENT OFFICE.

HENRY HARPER, OF BERLIN, WISCONSIN.

IMPROVEMENT IN GAGES FOR CARRIAGE-AXLES.

Specification forming part of Letters Patent No. **36,951**, dated November 18, 1862.

To all whom it may concern:

Be it known that I, HENRY HARPER, of the city of Berlin, in the county of Green Lake and State of Wisconsin, have invented a new and useful improvement in the manner of giving the proper pitch to the axle-arms of carriages; and I do hereby declare the following to be a true and exact description of my invention, which will be more fully understood by reference to the accompanying drawings.

It is very important that the bearing on the axle-arm should be the same at both extremities of the axle-box. In order to secure this object, the middle spoke in the lower half of the wheel should stand perpendicularly when the carriage is on level ground. If the axis of the axle-arms is made horizontal, the "dish" that is given to a wagon-wheel will make the spokes of the wheel incline outward from a perpendicular position, which would bring the bearing more on the point than on the shoulder of the axle-arm. To obviate this difficulty, the end of the axis of the axle-arm is inclined downward, which brings the bottom of the spoke inward.

The object of my invention is to provide a simple and practical method by which the end of this axis may be bent downward just enough to bring the spokes perpendicular when they point downward. This could more readily be done if the axle-arm were made of uniform size throughout; but for several reasons, some of which will be hereinafter alluded to, these axle-arms are usually, if not always, constructed with a considerable taper. One object of this tapering form is to secure greater strength by the use of the same weight of material, as the strain is greater near the shoulder than near the point of the axle-arm. Another object is to bring the lower side of this axle-arm as nearly horizontal as possible. When this bearing-surface of the axle-arm is exactly horizontal, there will be no tendency in the wheel to crowd either inward or outward, and it will therefore work with the least possible amount of friction. This position is attained when the dish of the wheel is such that the spokes stand perpendicular to the tapering surface of the axle arm, or, in other words, when the angle made by the side of this tapering axle-arm and its axis is equal to the outward inclination of the spokes of the wheel which forms its dish. It is not practicable to secure this exact relation between the dish of the wheel and the taper of the axle-arm, for, aside from the difficulty of establishing it in the first instance, the dish of the wheel is generally increased every time the tire is reset, which would prevent the continuance of this equality unless the taper of the axle-arm were changed whenever there was a change in the dish of the wheel. This exact equality is, however, rendered of less importance by the fact that a slight crowding either inward or outward is not productive of much inconvenience; and, besides, a tendency in the wheel to crowd outward can readily be counteracted by inclining the point of the axle-arm slightly forward, and a tendency to crowd inward can in like manner be counteracted by bending the point of the axle-arm slightly backward.

I will now proceed to describe the contrivances by which I secure the object of my invention. I provide what I term a "bevel," Figure 1, and a "scale," Fig. 2. The rests *a a* are made crescent-shaped or concave on their upper sides, so as to receive and hold the respective axle-arms. The distance between these rests is equal to the intended distance between the tracks of the opposite wheels of the carriage. The points *b b* and *c c* are so arranged as to be in line with the lowest portion of the respective rests, so that when these bevels are set at the proper pitch the axle-arms may be placed thereon and readily brought to the same pitch. The scales at each end of this bevel are made to have a motion around the centers *o o* and between the clamps A A, and are made fast at any given point by means of the clamp-screws *d d*. The scale, Fig. 2, has a brass rule, B, which revolves around the center *o* and is held in any desired position by the clamp C and clamp-screw *g*. The numbers on all these scales represent inches from the center *o*.

In order to fix the bevel at the proper pitch, I lay a straight-edge across the wheel on one side of the hub. I then measure down from the point of this straight-edge opposite the center of the hub to find the distance of the spoke below that point. Suppose this to be two inches. This gives me the depression or dish of the wheel immediately outside of the hub. If, now, the distance from the outside of the hub to the outer circumference of the wheel is twenty-four inches, I then measure downward on the scale below a radial line

drawn thereon, and on the side marked "in," the distance of two inches upon the arc of a circle which is at the distance of twenty-four inches from the center *o*, and set the brass rule at that point, securing it with the clamp. This gives me the angle of the dish of the wheel.

To obtain the angle of the taper of the axle-arm, I take the length of that arm and the difference of the diameters at its shoulder and its point. Suppose the length of the axle-arm to be eight inches and the diameter or the arm at its shoulder to be one inch greater than at its point. The difference of the semi-diameters or radii will therefore be one-half of an inch. On the scale, Fig. 2, and along the arc which is at eight inches from the center *o*, lay off one-half inch from the point where the brass rule crosses that arc. This will lack one-sixth of an inch of reaching the radial line from which the measurement commenced, and which is coincident with the upper edge of the brass rule, as shown in the drawing Fig. 2. On the scale attached to one end of the bevel, Fig. 1, and along the arc which is at eight inches from the center *o*, I now lay off one-sixth of an inch below the line, which gives a horizontal position to the under side of the axle-arm, and which is coincident with the upper edge of the clamp A, as shown on the left-hand end of the figure in the drawing. In order to do this, that scale must have been first unclamped and raised upward around the center *o* the requisite distance and then reclamped, so as to bring the upper edge of the clamp A exactly upon the point thus marked off. This gives the proper pitch to one end of the axle, and the other may be fixed in a similar manner.

Instead of measuring by inches and fractions of inches, as above shown, a better method will be, by means of a pair of common dividers, to measure off the actual distances representing the dish of the wheel and the difference of the radii of the two ends of the axle-arm along the respective arcs of circles, and then to fix the bevel accordingly, upon the same principle as is above set forth.

As the dish of one wheel may very possibly be different from that of the other, the two ends of the bevel may show different degrees of pitch for the respective axle-arms.

Having thus described my invention and the mode of its operation, what I claim as new, and desire to secure by Letters Patent, is—

1. The method herein described of giving the proper pitch to carriage-wheels by means of the bevel, Fig. 1, and the scale, Fig. 2, substantially as set forth.

2. The use of the bevel constructed as set forth, for the purpose of giving the proper pitch to carriage-wheels, substantially in the manner above set forth.

3. Scale, Fig. 2, when used in the manner above set forth, for the purpose of giving the proper pitch to a carriage-wheel.

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