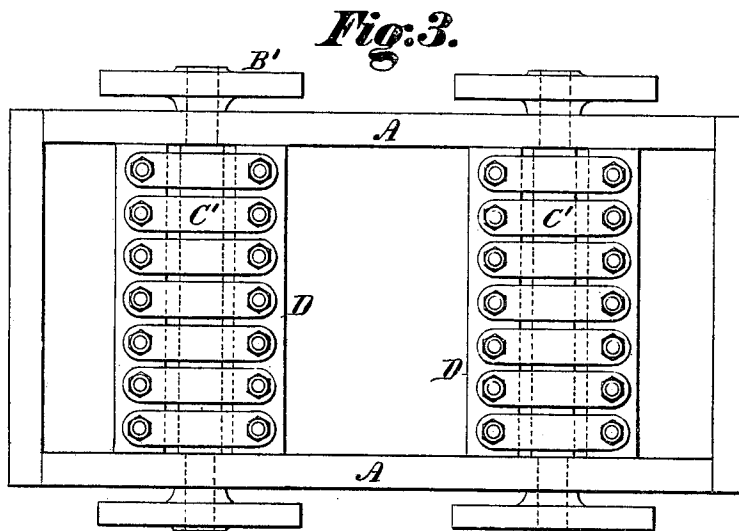
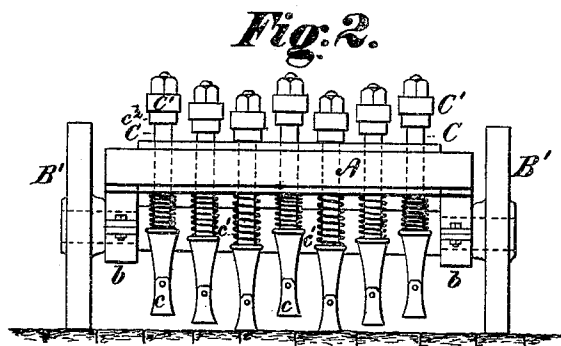
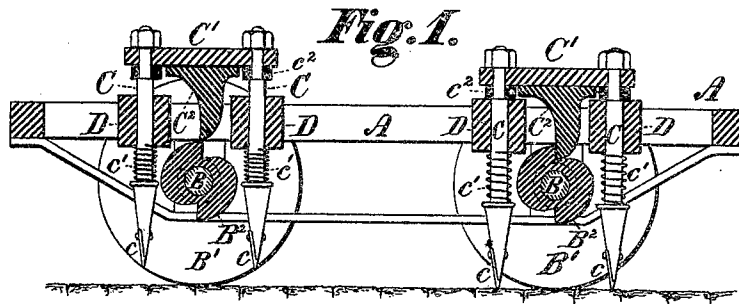


J. W. STARR, Jr.

APPARATUS FOR ROUGHENING PAVEMENTS.

No. 175,190.

Patented March 21, 1876.



WITNESSES:

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# UNITED STATES PATENT OFFICE.

JESSE W. STARR, JR., OF CAMDEN, NEW JERSEY.

## IMPROVEMENT IN APPARATUS FOR ROUGHENING PAVEMENTS.

Specification forming part of Letters Patent No. **175,190**, dated March 21, 1876; application filed February 24, 1876.

*To all whom it may concern :*

Be it known that I, JESSE W. STARR, JR., of the city and county of Camden, in the State of New Jersey, have invented a certain new and useful Apparatus for Roughening Pavements, of which the following is a specification:

The object of my invention is to provide a simple and efficient machine for roughening the surface of stone or other pavements to prevent the slipping of horses' feet thereon, to which end my improvements consist in the combination of a car or carriage, cams secured upon an axle or axles thereof, lifters operating weighted knife rods, and driving and cushioning springs connected with the knife-rods, as hereinafter more fully set forth.

In the accompanying drawings, Figure 1 is a vertical longitudinal section, Fig. 2 an end view, and Fig. 3 a plan or top view, of an apparatus for roughening pavements embodying my improvements.

To carry out the object of my invention, I provide a carriage, A, of any suitable form, having one or more axles, B, turning freely in bearings, b, and carrying wheels B<sup>1</sup>, made fast upon them. The wheels may be either flat upon their peripheries or be flanged and set at proper distance apart to suit the gage of a railway-track. Each axle carries a series of cams, B<sup>2</sup>, made fast upon it by keys or set screws. Vertical knife-rods C are arranged in pairs transversely upon the carriage, in front and rear of each of its axles, the members of each pair being united at top by connecting-bars C<sup>1</sup>, formed in a piece with or secured to lifters C<sup>2</sup>. Each of the cams B<sup>2</sup> in its revolution elevates one of the lifters C<sup>2</sup>, and with it the knife-rods C, to which it is connected, and upon the release of the lifter from the cam the knife-rods fall a corresponding distance. The cams should be adjusted in different positions relatively upon the axles, so as to prevent the simultaneous contact of the different pairs of knives with the pavement, and the consequent undue resistance to the movement of the carriage.

Each knife-rod has a knife or cutter, c, secured upon its lower end, the cutting-edges of

the knives being transverse to the carriage, and the knife-rods being of such length as to admit of the cutting or indentation of the pavement by the knives in their descent. The knife-rods are maintained in line vertically by transverse guide-bars, D, in which they move freely, and are, preferably, weighted at their lower ends.

In order to increase the force of the impact of the knives upon the pavement, driving-springs, c<sup>1</sup>, which may be plate or spiral, are interposed between collars on the knife-rods and the guide-bars D. The springs are compressed in the elevation of the knife-rods, and their resilience is exerted to accelerate the descent of the latter when released from the cams. Cushioning-springs c<sup>2</sup> are placed between the connecting-bars C<sup>1</sup> and the guide-bars D, the object of this provision being to quickly relieve the knives after making a cut and prevent them from dragging along the pavement. The knives, being removable, can be readily sharpened or replaced by others, if broken, and any one of the several knife-rods can likewise be removed with facility, when desired.

I claim as my invention and desire to secure by Letters Patent—

1. The combination, of a car or carriage, a series of cams secured upon and rotating with the axles thereof, and a series of vertically-moving knife-rods having knives or cutters on their lower ends, and connected at top to lifters elevated by the cams, substantially as set forth.

2. The combination of a car or carriage, a vertically-moving knife-rod and knife elevated by a cam on the axle thereof, and a driving-spring acting to increase the momentum of the knife-rod in its descent, substantially as set forth.

3. The combination of a vertically-moving knife-rod and knife, and a cushioning-spring, substantially as set forth.

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Witnesses:

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