W. BLACK.

WHEEL.

APPLICATION FILED NOV. 5, 1910.

1,026,783. Patented May 21, 1912.

2 SHEETS—SHEET 1.

Fig. 1.

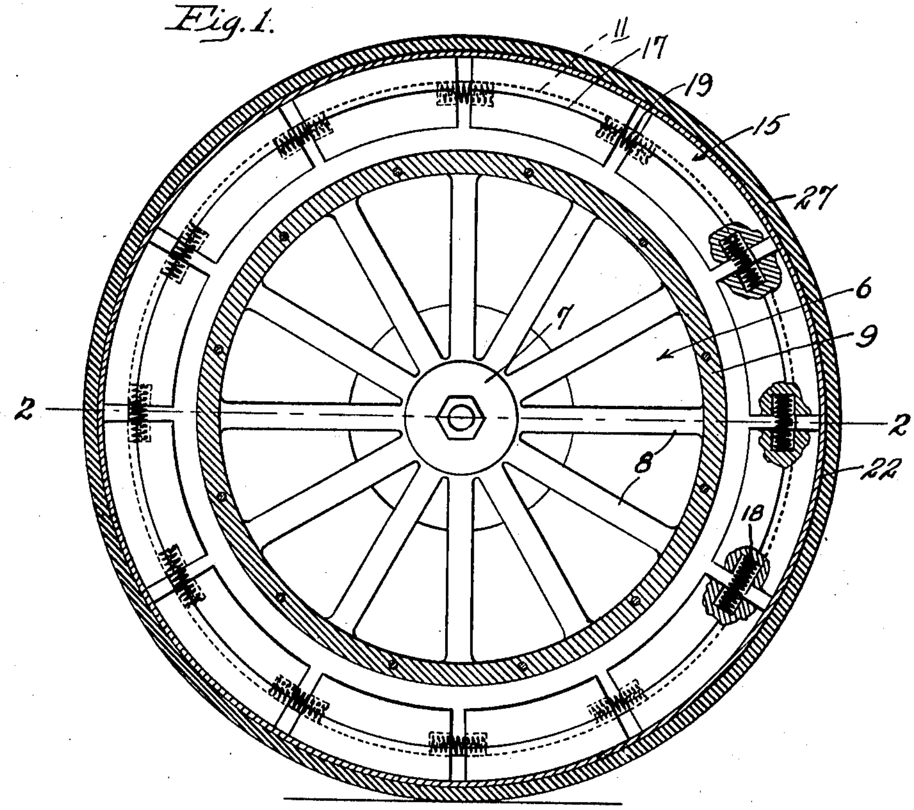
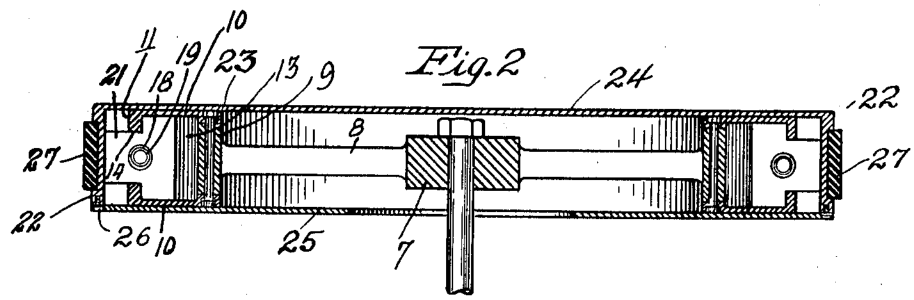


Fig. 2



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2 SHEETS—SHEET 2.

Fig. 3.

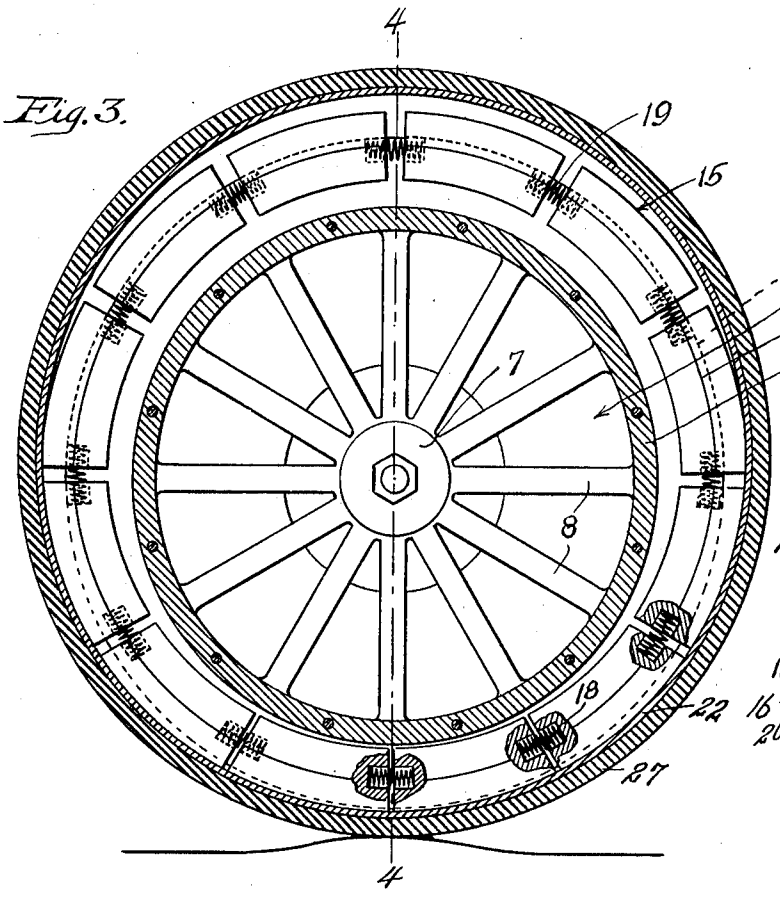


Fig. 4.

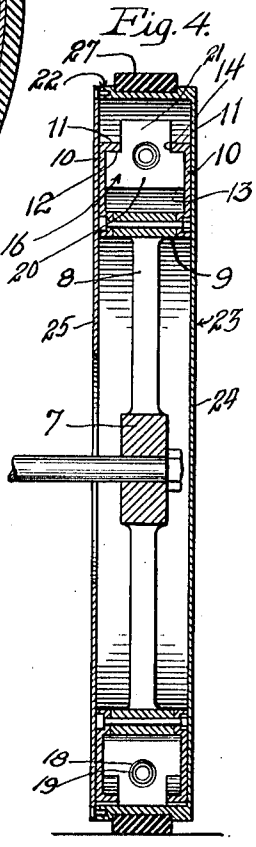
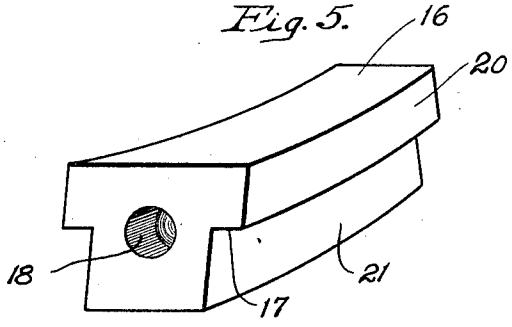


Fig. 5.



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UNITED STATES PATENT OFFICE.

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WHEEL.

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Application filed November 5, 1910. Serial No. 590,841.

To all whom it may concern:

Be it known that I, WALTER BLACK, a citizen of the United States, residing at Mendota, in the county of Lasalle and State of Illinois, have invented certain new and useful Improvements in Wheels, of which the following is a specification.

The present invention relates to a wheel adapted to be used on various sorts of vehicles, and relates more especially to the construction of a wheel embodying a compressible section which absorbs all jolts and jars incident to travel.

The objects of the present invention are, to construct a wheel which will be composed entirely of puncture-proof material, which will have embodied in its structure a plurality of circumferentially extending cushioning members and a plurality of circumferentially extending slidable blocks; and to so arrange these cushioning members and blocks that a cushioning of the entire lower half of the wheel will be brought about when an obstruction is met by the wheel. And a further object is to utilize these cushioning members as a means for returning the movable portions of the wheel to normal position.

Further objects of the invention are, to provide the wheel with an outer casing which will serve to protect the inner portions thereof from becoming clogged by mud and dirt; to construct a wheel which will be cheap and simple of manufacture, and which will not contain any great multiplicity of parts, or which will not have an involved structure liable to become disarranged and rendered inoperative during usage; and to form the cushioning section of a plurality of parts so that in case any one of them should become damaged or broken during usage it can be removed and a new one substituted without discarding or rearranging any of the other parts.

The invention further consists in the features of construction and combination of parts hereinafter described and claimed.

In the drawings, Figure 1 is a sectional elevation showing the device of the present invention in normal position; Fig. 2, a section on line 2—2 of Fig. 1; Fig. 3, a view showing the parts in the position they assume when the wheel passes over an obstruction; Fig. 4, a section on line 4—4 of Fig. 3; and Fig. 5, a perspective view of one of the blocks.

The principle upon which the wheel of the present invention operates briefly is as follows: An inner section is provided, which is held against other than rotary movement with respect to the axle of the wheel, and an outer section which is independently movable with respect to the axle of the wheel, said inner and outer sections each being of a rigid unyielding nature. Interposing the inner and outer sections is an intermediate section, which is comprised of a plurality of independent members, each of these members being slidably mounted in the inner section of the wheel and adapted and arranged to move inwardly and radially toward the axle of the wheel, and during such movement traveling toward each other, thus forming in effect a disjointed flexible section. Interposed between each of these members is a section of resilient substance adapted to exert a spring tension in a direction tending to force the members toward the outer periphery of the rim and away from one another.

The outer section above referred to extends around and engages the peripheries of these several movable members, and when the outer section hits an obstruction, the lower end of the outer section moves inwardly toward the axial center of the wheel and moves said independent section inwardly therewith. Thus the outer section as a whole moves in the direction in which the force of the strain incident to the striking of the obstruction is exerted. Only the intermediate members on the lower portion of the wheel will move when the obstruction is hit. This is because of the fact that while the intermediate members can move freely inwardly, they are held against movement outwardly, and thus cannot follow the upper portion of the outer section which is moving away from the axial center of the wheel. The members at the lower portion of the wheel, when forced inwardly by the outer section, are moved into a position so that their circumferences lie in a plane which is described by an arc of reduced diameter from the arc of the plane in which the upper members are lying; and when these members are forced into this plane of reduced area, the loss of space incident thereto must be accounted for. This is accomplished by the movement of the blocks toward one another, whereby the space between the blocks is decreased.

In being forced inwardly toward one another, the members are forced against the tension of the resilient members interposed therebetween. Hence, such movement is against a spring tension and is therefore a cushioning movement. This cushioning extends around the entire lower portion of the wheel and acts to absorb all of the jolt and jar incident to the striking of the obstruction before such jolt or jar is communicated to the axle of the wheel. When the obstruction has been passed, the springs will tend to force the several members apart, and this will result in their being forced toward the outer periphery of the wheel, thus placing them again in normal position and restoring the outer section to normal position.

The device comprises an inner section 6, which consists of a hub 7, having spokes 8 radiating therefrom, which are connected to an outer rim 9. Attached to this rim 9 are companion circular plates 10. Each of the plates 10 is in the form of a flat ring and the outer edge of each of the plates is inturned as indicated at 11 in Figs. 2 and 4, to provide a circumferentially extending flange 12. The plates 10, as shown, project beyond the rim 9 and form a chamber 13 which extends concentrically around said rim; and the flanges 12 coöperate to provide a slot 14 of a reduced width from the width of the chamber, and in fact constitutes a reduced outer end of the chamber. It is, of course, obvious that other means might be employed for securing the plates 10 in place; in fact, the construction and arrangement of these plates can be varied materially without departing from the spirit of the present invention. Thus, the hub 7, the spokes 8, the rim 9, and the plates 10 constitute the inner section of the wheel, and all these parts are held against movement with respect to the axial center of the wheel and form a rigid integral section. The intermediate section 15 of the wheel is composed of a plurality of blocks 16, shown in detail in Fig. 5. Each of these blocks has a portion of its body reduced to provide shoulders 17 extending along either side of the block, and each block is recessed at its end to provide a chamber 18, preferably, as shown, in the form to contain a coil spring 19.

As shown more clearly in Figs. 2 and 4, the enlarged portion 20 of the body of the blocks lies within the chamber 13, and the reduced portion 21 extends through the slot 14 and lies outside of the outer edge of the plates 10. The flanges 12 engage the shoulders 17 and serve to limit the outward movement of the blocks 16, but inward movement of the blocks is permitted by reason of the enlarged portion 20 of the blocks being of a less depth than the depth of the chamber 13, it being understood that the blocks have a sliding fit between the plates of the chamber 13. Extending around the blocks 16 is a rim 22, which, when the parts are in normal position, contacts the surface of each of the blocks; and this rim 22 forms a portion of an outer casing 23. The casing 23, as shown, is formed of two sections 24 and 25, the section 25 being in the form of a disk, and the section 24 being in the form of a shell-like housing. Fastening means 26 are provided for securing the two sections together, whereby a complete housing is produced around the wheel.

It is understood that the precise construction of the housing and the arrangement of the parts of the housing shown are not a limitation upon the invention, as this portion of the device may be changed without departing from the spirit of the invention. The housing may, if desired, be provided with a tread 27, which may be of rubber or any other suitable substance, to enable the wheel to attain the necessary gripping action upon the road-bed. The housing serves the function of preventing mud and dirt from accumulating between the blocks and thus interfering with their movement, and it further serves the function of preventing displacement of the blocks during the operation of the wheel. It also serves the function of distributing onto a plurality of blocks the strain incident to the striking of an obstruction, so that said strain is communicated to a plurality of the blocks and is not sustained by any one single block.

The operation of the device briefly is as follows: When the parts are in normal position, as shown in Figs. 1 and 2, all of the blocks 16 will be at their farthest position from the axial center of the wheel; the shoulders 17 of all of the blocks will be resting against the flanges 12; the blocks 16 will all be separated a like distance from one another; the springs 19 will all be compressed a like degree, and all portions of the outer rim will be lying an approximate equidistance from the axial center of the wheel. Although in Fig. 1 all of the blocks and all parts of the rim are shown as lying an equal distance from the center of the wheel, it will be understood that the weight of the body of the vehicle will tend to compress these somewhat, even when the vehicle is passing over level ground. When an obstruction is hit, the parts will assume the positions shown in Figs. 3 and 4. The outer rim will have its lower end forced in toward the axial center and its upper end forced out from the axial center; that is, the entire outer casing as a whole will move in the direction in which the force of the strain incident to the striking of the obstruction is traveling. The movement of the lower portion of the outer casing being inward, such movement will carry with it the blocks 16 lying below the axial center of the wheel,

the blocks at the upper portion of the wheel being unaffected by this movement because of the fact that the outer section is moving away from these blocks; and they are unable to follow in its movement because of the shoulders 17 engaging the flanges 12 and limiting the outward movement of the blocks. All of the blocks which lie below the horizontal axial center of the wheel will be moved inwardly, since the portion of the outer section lying below the axial center of the wheel will move toward the axial center of the wheel and the portion of the outer section above said axial center will move away from the axial center. The forcing inwardly of the blocks below the axial center will reduce the circumference of the circle described by the outer edges of the blocks; that is to say, with the blocks as shown in Fig. 1, the inner and outer faces of said blocks are lying in a plane which is described by circles concentric to the rim of the inner section. But when the lower blocks are moved inwardly, their upper and lower faces will be lying in a plane which is described by a circle eccentric to the rim of the inner section. Thus, when the blocks are in the position shown in Fig. 3, their peripheries will be lying in a plane described by an ellipse and not by a true circle. This decreasing of the circumference of the circle, which describes the plane in which are lying the upper and lower edges of those blocks below the axial center of the wheel, necessarily forces these blocks into a smaller space, and in doing this, the blocks are crowded toward one another, thus accommodating themselves to the smaller space. The forcing in of the blocks toward one another will compress the springs 19 interposed between the blocks, and thus this movement of the blocks toward one another will be resisted by the action of the springs, and hence a cushioning effect will be produced by this movement. It is in this cushioning that the shock and jar incident to the striking of the obstructions are absorbed, the action in all respects being similar to the absorption of the shock by the compressed air in a pneumatic tire, the springs 19 in the present instance taking the place of the air.

As shown in Fig. 3, when the outer rim is moved by the contacting of an obstruction, all of the blocks lying below the axial center of the wheel are moved inwardly toward the center of the wheel and crowded toward one another, the amount of the inward movement decreasing from the point of contact of the obstruction and the rim toward the horizontal axial center of the wheel. This cushioning resistance is imparted to all of the blocks lying below the axial center of the wheel, and the entire strain of the jolt is not centered upon any single cushioning member, but is communicated to a plurality of these members and distributed over a substantially wide area, whereby a more efficient and greater cushioning action is produced, and whereby no single block is liable to become broken by reason of an excessive strain placed thereon. After the obstruction has been passed over, the outer rim will be relieved from the pressure exerted thereon and the pressure of the springs 19 will tend to force apart the blocks lying below the axial center of the wheel. This forcing apart of these blocks will naturally tend to slide them away from the axial center of the wheel, since in forcing them apart, a greater space is produced between them, and thus additional space must be provided. When the blocks below the axial center of the wheel slide outwardly, their peripheries then lie in a plane described by a circle of increased circumference, or a circumference equal to the circumference of the circle describing the plane in which the upper blocks are lying; and thus, of course, additional space is provided for the lower blocks to rest in and movement of the blocks apart from one another is permitted. The outward movement of the blocks forces the rim in a reverse direction from which it was forced by the blow incident to the striking of the obstruction, and hence the rim is again placed in the normal position shown in Fig. 1. Thus an action is produced in which, when an obstruction is encountered and a blow is imparted to the rim of the wheel, the force of the blow is absorbed in a plurality of cushioning members before it is transmitted to the axle. And by arranging these cushioning members circumferentially of the wheel, a continuous cushioning action is exerted around the entire lower part of the wheel; and they are so arranged that when the force of the blow has passed by, they will exert a pressure tending to force the rim and the other movable parts back into normal position.

Since all of the blocks are separable and independent, it will be readily seen that should any of them become broken or mutilated, the same can be removed and another substituted without disarranging any of the other portions of the wheel.

I claim:

1. In a wheel, the combination of an inner section, including a hub, a rim, and connections therebetween, all fixed against diametrical movement with respect to the axle of the wheel, an outer section in the form of a tread member movable diametrically with respect to said axle, a section intermediate the outer and inner sections, composed of a series of unattached members adapted to move toward one another and toward the axle of the wheel, shock-

absorbing mechanism, consisting of a series of springs, one spring being interposed between each of said members, said springs extending circumferentially of the axle of the wheel and exerting a force tending to space the members apart and hold them outwardly from the axle of the wheel, substantially as described.

2. In a wheel, the combination of an inner section, including a hub, an inwardly flanged channeled rim, and connections therebetween, all of which are fixed against diametrical movement with respect to the axle of the wheel, an outer section in the form of a tread movable diametrically with respect to the axle of the wheel, a series of blocks adapted to rest in said channeled rim and provided with shoulders adapted to engage the flanges of said rim, and shock-absorbing mechanism, consisting of a series of springs, said springs extending circumferentially of the axle of the wheel, one spring being interposed between each of said blocks, the inner faces of the tread member and flanges providing a series of faces against which the blocks rest and upon which they slide, substantially as described.

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