3 Sheets—Sheet 1.

G. BARNARD.

Carriage.

No. 748. Patented May 25, 1838

Fig: 1.

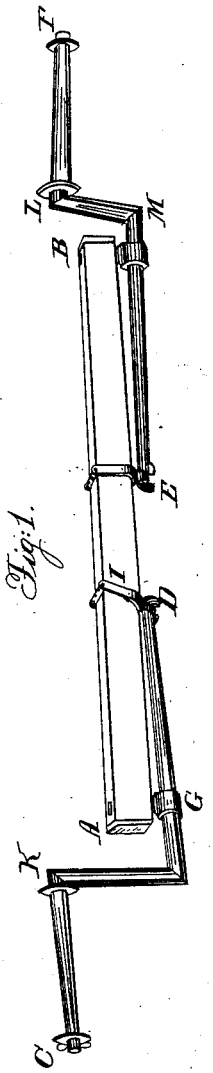
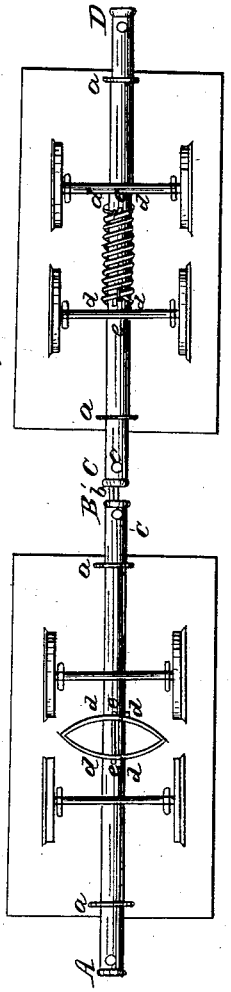


Fig: 2.



Witnesses

W Fisher
William B Boyd

Inventor:

George Barnard

3 Sheets—Sheet 2.

G. BARNARD.

Carriage.

No. 748. Patented May 25, 1838

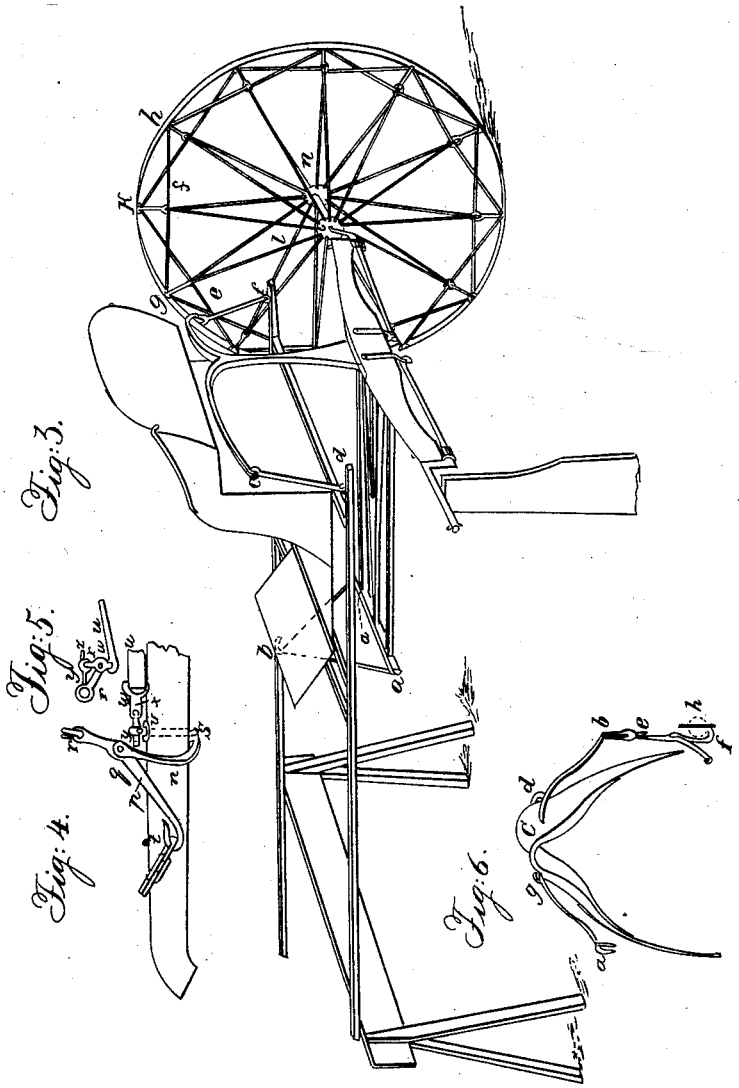


Fig: 3.

Fig: 5.

Fig: 4.

Fig: 6.

Witnesses
W. Forbes
William B Boyd

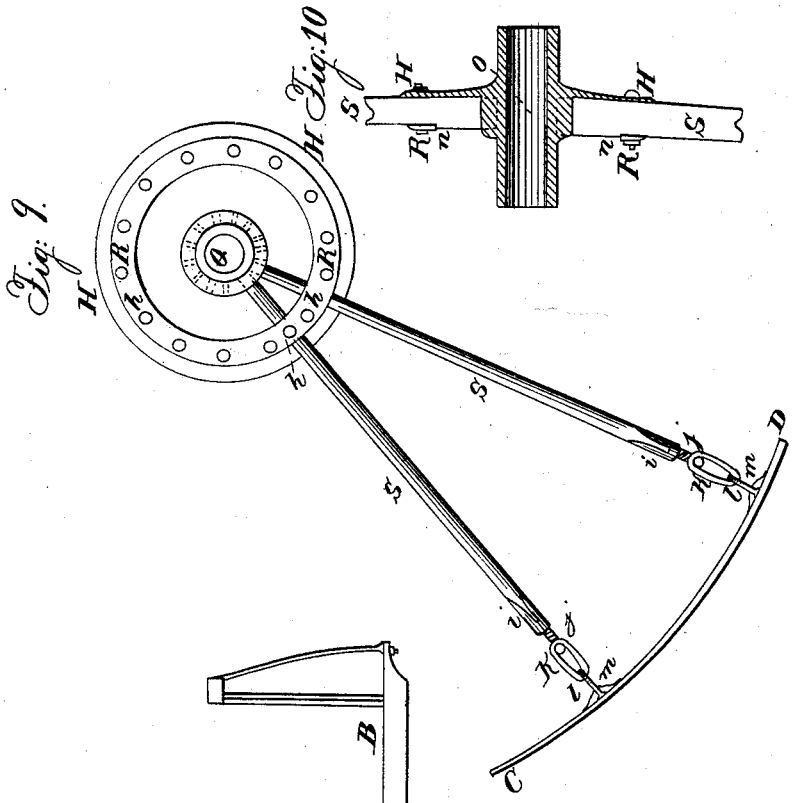
Inventor
George Barnard

3 Sheets—Sheet 3.

G. BARNARD.

Carriage.

No. 748. Patented May 25, 1838.



Witnesses:
Geo. W. Blake
Henry B. Shadeford

Inventor
George Barnard

UNITED STATES PATENT OFFICE.

GEORGE BARNARD, OF WASHINGTON, DISTRICT OF COLUMBIA.

WHEEL-CARRIAGE AND HARNESS.

Specification of Letters Patent No. 748, dated May 25, 1838.

To all whom it may concern:

Be it known that I, GEORGE BARNARD, an alien, who have resided in the United States during one year next preceding the day of the date hereof, and have made oath of my intention to become a citizen of the United States, have invented new and useful Improvements in Wheel-Carriages and Harness, of which the following is a full and exact description, reference being had to the drawings which accompany and make a part of this specification.

A leading object and property of the invention is to facilitate the running of a carriage, by attaching the wheels with a degree of mobility, so that the shocks and irregular motions, in passing over an uneven surface, may not be directly received, nor equally shared, by the rest of the carriage. For this purpose, instead of the common stiff axletree serving for a pair of wheels, I make, of iron, cast steel, or other suitable metal, a separate axle to each wheel, bent down between the wheel and carriage in the form of a crank, the two turns being right angles or very nearly such, making the directions of the arms or parts on each side of the crank-wrist quite or nearly parallel. The inner and lower of these arms is fastened as a pivot under the carriage, thereby letting the other arm, which is the axis of the wheel, swing or rock back to a certain extent, when the wheel is borne against a prominence, or impeded by any obstacle in its course. The manner in which I attach the separate axle under the carriage, also allows the wheel, with its axle, to yield or move, on occasion, to a certain extent, laterally, that is toward or from the carriage, so as considerably to facilitate the progress in difficult passages.

In the accompanying drawing Figure 1 represents a pair of these crank axles attached to the stock or bed to be fixed under the carriage. A B is the stock; C D and E F are the crank axles, of which the portions C K and L F are the arms or axes of the wheels. The wrist L M of the axle E F appears foreshortened, the arm L F being supposed to be swung out somewhat toward the spectator. The lower arm should be made truly cylindrical and smooth for several inches from the wrist, and a broad eye or clasp, fitted on this part, should be fastened under the end of the stock. G represents such an eye or clasp, in which the arm is free to slide and roll. The inward end D of the axle is shaped into a neck or crook, and jointed into a suspension iron I, hung to the stock or an iron affixed thereto, at two points above, so as to swing in a direction lengthwise of the stock, but not in any other. This suspension iron may also be made a single link running up through a mortise in the stock, which will restrict it to the requisite motion. The swinging motion of the suspension iron is to allow the wheels to move sidewise a little, when requisite, without displacing the rest of the carriage; and the wheels may be set at pleasure for a wider or narrower track simply by removing the axis of the suspension iron, two or more holes being usually made side by side in the stock for that purpose.

Carriage makers usually give the wheels an inclination called the gather, which is effected on the common straight axletree by casting the arms or axes out of a right line with one another, a little downward and forward. When the two arms of a crank axle, such as these of my invention, are parallel, the gather may be given by fixing the lower arm at the inclination required for the upper, but it may be better to give only the forward inclination by the position of the lower arm, and the downward inclination by making the upper angle, denoted in the drawing by K and L, somewhat acute, thereby giving the requisite downward cast to the upper arm, which is the axis of the wheel. In this case the lower arm will be set horizontally under the stock, but the inner end will be held by the suspension iron a little in rear of the part passing through the eye. In hanging the suspension iron a slight advantage may be gained by making it to swing truly with the direction of the stock, and not with that of the axle which has a cast at variance with the stock; as this will increase the forward gather or inclination when the wheel is forced far out, and diminish it when pressed in; the effect being to hasten the return of the wheel to its ordinary place, and to keep the wheel, in all situations, in a favorable position for the draft to act upon it. In the drawing the suspension iron I is shown as drawn from its usual position, which is perpendicular; the wheel being supposed to be running wide.

In the drawing marked Plate 2, is represented (Fig. 3,) a light two wheel carriage

with crank axles such as are described in the preceding part of this specification, and having the body hung on a new and advantageous plan; and also a wheel of a new construction. The carriage is represented as having one of the wheels removed, in order to let the mode of hanging the body be clearly seen. The body is set upon the shafts or their cross bars, and the draft is to be made on the shafts or one of their cross-bars, as is very commonly practised. The body and shafts thus connected are suspended at their rearward extremity or any other convenient station, by two rods, links, or straps, the lower ends of which are severally attached by two universal joints to the respective shafts, at points exactly opposite each other, and the upper ends in like manner to two points of support, the distance between which is somewhat less than that between the lower ends. The upper points of attachment are obtained by rearing upon the stock a structure of any kind which will secure two points of support at the required height, a little forward of the position of the stock, and nearer together in the requisite degree than the lower points, where the suspending links are jointed with the shafts.

A rack of light timbers is firmly inserted into the front side of the stock, and extends forward below the body as far as the forward cross bars, where the end is supported by suspension from a point above, central as to the distance between the shafts, and obtained by rearing a support on them or their cross bars. In the drawing this support is shown to be afforded by the sloping footboard of the body. The suspension at the upper point must be effected by a joint that will allow the rack to move back and forward, and the shafts and body to turn upon it as a pivot to some extent. The forward end of the rack is suspended by a stiff rod of iron, (or it may be a light wooden frame,) reaching between the two forward corners of the rack and the upper point of suspension, where it is jointed with an eye *b*, while the lower ends are hinged with the corners of the rack *a a*, allowing the rack to shove back and forward by working on the pivots at the said corners *a a*, and the swinging of the suspending iron (or frame) in the eye *b*.

c d and *e f* are the two suspending links at the rear of the body, by which the weight of the body and shafts is sustained.

When, owing to obstructions in the road, the power of draft is necessarily increased, the body, with the shafts, will, by a swing of these suspending irons, *a b a* and *c d* and *e f*, be drawn forward from the rest of the carriage, proportionally to the resistance of the obstacle, whereby is gained the advantage of not having the horse suddenly checked by the concussion, and of not having the body receive a violent shock or jolt. And as the wheels become somewhat lightened of their burden by its being drawn forward from them, and by the line of motion of the body being changed from a straight forward to a slightly upward direction, they will surmount the obstacle the more easily; and then the gravity of the load will immediately force them up to their usual station alongside of the body.

The suspending links *c d* and *e f* being hung at their upper extremities somewhat nearer together than at their lower ends, is attended with advantage in two respects; the body cannot swing too freely from side to side; and whenever one wheel is running higher than the other, the body will have a position more nearly horizontal than that of a right line between the stations of the two wheels on the ground. In this movement, the pivot action takes place at *b*, and there is a corresponding swing from the points *c* and *e*, the body swaying by its weight toward the wheel which is running lowest, and thus bringing the suspending link of the higher side more nearly to a perpendicular, and that of the lowest side more nearly to a horizontal position; that is, reducing the height of the higher and increasing that of the lower, side of the body, or making it more nearly level.

The wheel represented in the same drawing is of my invention, and can be made elastic in a considerable degree. I use for the rim of each wheel a circle of spring steel, resembling in shape the common iron whole tire. It is conveniently made by bending into a circle a plate of coach-spring steel, of suitable length, width, and thickness, and welding the ends together. This forms the rim of the wheel, and may either run directly on the ground or be tired with another such plate of spring steel to receive the wear. At equal distances on the inside of this rim I fasten firmly an even number of short eyes, staples or plates, of iron or other metal, which will yield a fastening; these are at points or stations answering to the insertion of the spokes into the felloes of the common wheel; they may be welded or brazed on the steel, or each one may be riveted on through two or more holes about an inch apart, drilled in the center of the plate of which the rim is made, and properly countersunk to make the riveting strong. The pipe that is to run upon the axis of this wheel may be in length nearly equal to one fifth of the diameter of the rim; and on each end of the pipe is a flanch or circular projection, *l* and *m*, perforated around near its periphery with holes corresponding in number and situation to the eyes on the rim. Between these holes in the flanches and the eyes on the rim, connection

is made by rods or wires of tough iron or other metal, which may be from an eighth to a quarter or half an inch in diameter. The arrangement of these must be such as to cause the weight at the axis to be sustained by the upper half of the rim, and to keep the upper half and much of the lower half of the rim in a circular shape, and yet allow the lower part some liberty to flatten or spring inward, in order to destroy the sharpness of the shock when a prominence is encountered; thereby facilitating the progress of the wheel as well as rendering both the draft and riding more easy and pleasant.

One mode of disposing the wires to connect the rim with the pipe is exhibited in the drawing. Each eye on the rim is connected with the second one from it by a rod or wire forming as it were, the chord of the arch of the rim between those two eyes. This rod is jointed about the center or opposite to the eye between the two connected by it. *g* and *h* show two eyes thus connected by the rod *g*, *h*, which is jointed in the center at *j*. The connecting rod *g h* does not form quite a right line between the eyes at *g* and *h*, but at the joint *j* makes a very obtuse angle toward the center of the wheel. From the eye at *k*, a short rod or link runs to *j*, and embraces the rod *g h* in a loop or hole of sufficient length to compass also a right line between the points *g* and *h*. A rod or wire, bent in its center at an acute angle, is passed through the long loop in the rod *j k*, and between the rod or wire *g h* and the rim, and has its extremities fastened severally to the flanches on the ends of the pipe, at the holes corresponding to the eye *k* on the rim. By this arrangement of the wires, when the arch *g k h* is the uppermost part of the wheel, the weight depending on the wire *l j m* is sustained by the rim at the three points *g*, *k*, and *h*; and when the same arch *g k h* is at the bottom of the wheel, the wire *l j m* being then released, if any part of the arch between *g* and *h* strikes against a prominence, or if the load weighs heavily, the arch may flatten, straighten, or spring inward until the rod *g h* is extended in a right line between the points *g* and *h*, and no farther. I sometimes omit the rod *g h* for light wheels, and then the number of connections between the pipe and rim needs not be an even number.

Connection is made between each eye on the rim and the corresponding holes in the flanches at the ends of the pipe in manner similar to that above described. Draw-screws may be employed in any convenient way to tighten the wires, or set them to the proper tension, and to take up the looseness occasioned by wear. I sometimes make the elastic steel-rimmed wheel with wooden spokes; thus: I make a hub of common cast or malleable iron, or brass, with mortises about an inch deep to receive the ends of the spokes, which may be driven in the usual manner. The hub is cast with a flanch projecting on one side of the spokes. It is usually on the outside, or that outward from the carriage, and its periphery may be four or five inches from the center, for wheels for light work, and more for heavy work. On the other side of the spokes I place a flat ring of iron or other metal, perforated in order to be bolted to the flanch of the hub, by bolts passing through the spaces between the spokes. A bolt may also be put through every spoke, if required.

So far the plan of the hub is not new. All that is claimed as new and of my invention in the hub is the making a shoulder on each spoke, to set up inside of, and against, the metallic ring, so that the spokes cannot be drawn outward, unless the ring be first removed.

Part of a wheel of this construction is represented in the drawing Plate III, Fig. 9. H H is the hub, R R the ring; *h h h* holes for the bolts; S S the spokes; O the opening for the arm or axis of the wheel.

Fig. 10 is a sectional drawing exhibiting the shoulder of the spoke at *n;* R being a section of the ring, which confines the spoke by pressure against the shoulder. When the elastic wheel is thus made with wooden spokes, I cover the outer end of each spoke with a sheath or two-pronged cap of iron, thick at the end which abuts against the end of the spoke, and fastened on by two rivets through the prongs and spoke, as seen at *i* Fig. 9. A perforation is made in at the end of this cap or sheath, (which may at that part be half an inch or more in thickness,) and this hole is tapped with a substantial thread and a screw of sufficient strength is made to match. The screw has commonly a round head perforated with one or two holes for the convenience of turning it by inserting a small iron. The screw is put through a chain-link, flat and perforated at one end for the purpose, the head of the screw being inside of the link; the link and screw are thus hung like a common chain swivel, as may be seen at *k* and *j* Fig. 9. The swivel is joined by a common chain link to the staple or eye-plate *m*, which is fastened to the rim C D. The screw is turned or screwed into the cap *i*, and may run into the end of the spoke if requisite; and by means of it the rim is set and retained at the proper distance from the hub. The links *l* and *k* will, by gliding into one another, make room for the rim C D to spring inward a little, at the moment of striking any prominence.

Elastic-rimmed wheels and separate crank axles, such as described in the foregoing

part of this specification, are applicable to wheel carriages of every description and for all purposes, but most beneficial to common road carriages, including fire-engines and all other machines which have wheels attached for the purpose of locomotion.

In Plate III, Fig. 7, is represented a leg for hand-carts, hung to the body on a new and improved plan. It may be set under either end of the cart body, but will usually be placed under the fore end which is commonly loaded more heavily than the other. The advantage is that the body of the cart, when let down upon the leg, will be supported firmly in its station over the ground, without being liable to glide off from the support of the leg, on account of any slight push, or accidental cause of motion that is likely to occur, and yet, when the cart is under way, the leg will swing so as to pass readily over any obstacles in the line of progress. This is effected by hanging the leg on an axis a few, say about five, inches below its upper end, the axis passing through a slot about an inch long in the leg, which may be seen at *g* Fig. 8. The axis must be firmly supported in its station by being set through two pieces of wood or iron fastened into one of the timbers of the body above.

Fig. 7 shows the manner of hanging the leg to the body. A B is the bottom of the body; *c*, *c*, are the pieces supporting the axis *f*, which passes through the slot in the leg L. The upper end *d* of the leg L is conically shaped to fit a hole sunk into the timber above, represented by the dotted line *e*. On the body being let down to be supported by the leg, the sunk hole *e* falls upon the conical head *d* of the leg, the axis *f* gliding down in the slot for that purpose; and when the body is raised to be moved again, it is lifted up from the leg until the axis *f* comes against the upper end of the slot, at which point the leg will swing clear of the body, in case the foot is borne against a stone, or any prominence in its course.

Improvements in harness.—For two-wheel carriages which have thills or shafts, and rest a portion of their load upon the horse's back, I employ draft irons of a new construction, which afford ease to the horse, as well as comfort to the passenger, and are cheap, convenient, safe and durable. I have each shaft or thill to rest its weight on the back bearing by means of a crook which comes down between the shaft and the horse's side.

In the drawing, Plate II, Fig. 4, *n* is the crook, and has its lower end jointed with a bolt *o* set up through a hole bored in the shaft. The upper end of the crook is jointed with another iron *p*, at *q*, about three inches from the upper end of the iron *p* which is hung to the back bearing at *r*. The iron *p* is bent at an obtuse angle at *q*, where the crook is hung to it, and the lower limb, which may be about four inches in length, projects somewhat forward, and has attached to it the chain or strap for draft from the collar at *t*. These draft irons allow free movement to the horse's shoulders; and by their means the usual slight shake of a two-wheel carriage at every step of the horse on a trot, is done away; and a horse may even gallop in them without producing any violent twitch of the carriage at each leap.

When by a step of the horse the lower end *t* of the iron *p* is drawn forward, a pivot action takes place at *q*, the upper end of the crook *n* being pulled forward, and the upper end *r* of the iron *p* being forced backward from the joint as at *q*. And whenever the draft at *t* is released the weight upon the shafts, which is upheld by the horse's back, brings all the irons to their former position.

The strap or chain which serves for a back bearing should have two or three inches of play room, whereby it may glide, on occasion, so far over the horse's back. This provision is common with harness for two-wheel carriages. A new, elegant, and convenient way of effecting the purpose is by substituting for the strap or chain a light iron or steel bar, the central part of which forms an arch of a circle where it rests on the pad or saddle.

Fig. 6 in Plate II exhibits such a bar *a b*, set upon the pad or saddle C, and having the draft iron *e f* attached to the bar by the strap buckled from *b* to *e*. The little crooks *d*, *g*, are to limit the sliding of the bar upon the saddle or pad. The dotted circle *h* shows the position of the shaft upon the draft iron. *u* is the strap leading from the breeching by which the carriage is held back in descending hills. It is attached to and draws upon the bolt *o* by the irons *x* and *v*. The simplest, and probably the best, plan is to have a single iron instead of the two *x* and *v;* to have the strap seized into the rear end of this iron, and have the forward end set over the bolt *o*, it being provided with a hole fitted to receive the bolt; the whole being confined by a narrow strip of leather thrust through the upper end of the bolt *o*. But the plan represented in the drawing, which is the same in principle, remains to be described.

It has been mentioned that the breech strap is connected with the bolt *o* by the irons *x* and *v*, Fig. 4. One end of *v* is turned up and runs through *x*, forming a joint with it at *w;* the other end, being perforated or shaped into a ring to admit the bolt *o*, is let down upon the end of the same, and re-

tained in its place by the pin *y*, running through a small hole in the upper end of the bolt *o*. The pin *y* is jointed with the end of the iron *x* attached to the breeching. To insert this pin, or to withdraw it when inserted, it is necessary to turn the iron *x*, the iron *v* swinging also on the bolt *o* as a center. Fig. 5 shows the irons as seen from above at the instant of this movement.

Z is a spur projecting on one side at the rear of the pin *y*, to prevent the iron *x* being turned more than one way, as the fastening is thus better secured against accidents.

What I claim as of my invention, and wish to secure by Letters Patent, is comprised in the following nine articles, reference being had to the foregoing specification for particular descriptions.

1. A separate crank-shaped axle to each wheel of a carriage, with the lower arm thereof attached under the carriage so as to roll or turn like a pivot, thereby making the upper arm or axis of the wheel movable to a certain extent, in a sweep, backward or forward.

2. The method of affixing to the carriage a separate axle to each wheel, by the outward bearing sliding through an aperture, and the inward end being suspended from above, so as to let the axle slide more or less out from or in under the carriage, but not let the part confined under the body move or twist backward or forward;—thereby providing for the occasional running of either wheel nearer to or farther from the carriage.

3. The manner of hanging or suspending the body of a carriage herein before set forth, whereby it is allowed to move or swing forward from its station, whenever the wheels are resisted.

4. The manner of suspending the body of a carriage by links or straps, each pair of which are set nearer together at their upper, than at their lower points of attachment, thereby holding the body in a position more nearly level than a right line between the stations on the ground of the two wheels, whenever one wheel of the pair is running on higher ground than the other.

5. A carriage wheel, which may be elastic to any required extent, made with a spring-steel rim, from the inner surface of which, at stations corresponding with the insertion of the spokes into the rim of the common wheel, connection is made to each end of the pipe which is to run upon the axis, by means of rods or wires of iron or other metal, or straps or cords, whereby the axis is always supported by suspension from the upper part of the wheel

6. The confining a spoke in the hub by a metal ring, the inside of which bears against a shoulder cut for the purpose on every spoke of the wheel.

7. A leg for a hand cart, hung below its upper end, so that it may swing and glide over any obstacle struck by the foot when the cart is in motion; and having the upper end fitted to enter a cavity made for the purpose in the framework of the body directly over the leg, so that the whole may stand firm when the body is let down upon the leg, provision being made for the leg to run up into the cavity, by the axis of suspension being allowed room to glide downward as far as may be required.

8. Draft irons such as herein before described, applicable to the harness for carriages which have a part of their burden resting on the horse's back; that is, two-wheel carriages. These draft irons are applied at the side of the horse, where the shafts are supported by the back-bearing, and allow free action to the horse's shoulders, by the draft strap or chain from the collar being attached to an iron which, at each forward movement of the shoulder on that side, acts as a lever in slightly raising the shaft, or virtually shortening the back-bearing.

9. The application, to harness for two-wheel carriages, of a steel or iron bar over the horse's back, resting on, or running through, the pad or saddle, in place of the back band or chain commonly employed.

Among the advantages, hitherto unmentioned, which are afforded by the separate, movable crank axles, and yielded in some measure by the manner of hanging the body of a carriage heretofore described, are these: A carriage may be more easily turned around in a small compass, as each wheel may move in some measure independently of the others, in any direction required by the moving power and the formation of the ground. A horse or team will start a loaded carriage with more ease, as the body and load may be moved a little while the wheels remain stationary, thereby lightening the wheels, and getting the majority of the weight in motion. The power of draft may be greatly increased to draw out one or more of the wheels, should they get stuck in the mud or sunk into a hole too far to be extricated by the usual draft. This is done by attaching a chain or rope, one end to the top of the obstructed wheel, and the other to the forward part of the carriage; the rope being made taut. As the carriage may be drawn forward to a certain extent without moving the wheel, this rope or chain will, on the draft being applied, operate at the top of the wheel to the same extent; at which place the power applied has nearly double the effect it has at the center where it usually operates. A disadvantage of

such carriages is that the carriage break to retard the motion in the descent of hills, is not so conveniently applied in front of the wheels, though it may be made to operate on the same principle, by pressing down upon the top of the wheels.

In testimony that the above and foregoing is a true specification of my improvements in wheel carriages and harness, I hereunto set my signature, this twelfth day of May, in the year of our Lord, one thousand eight hundred and thirty-eight.

Newark, N. J., May 12, 1838.

GEORGE BARNARD.

Witnesses:
GEO. W. BLAKE,
HENRY C. STUDDIFORD.