No. 676,419. Patented June 18, 1901.

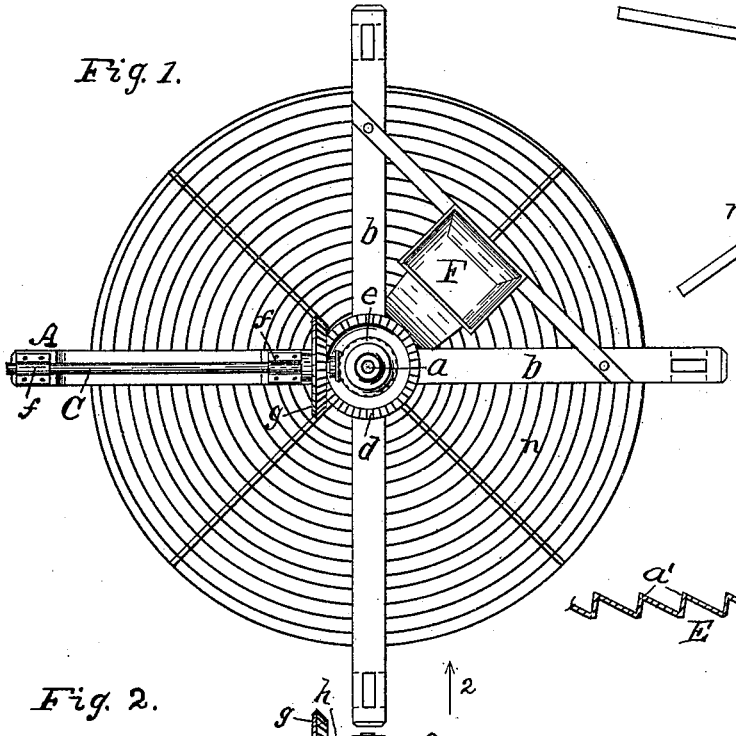
L. D. CARTER.

GOLD SEPARATOR.

(Application filed Nov. 1, 1900.)

(No Model.) 2 Sheets—Sheet 1.

Fig. 1.



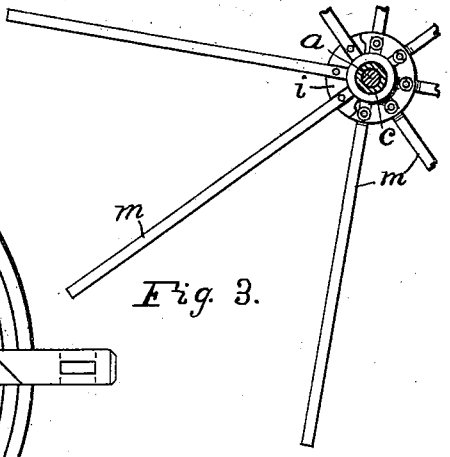


Fig. 3.

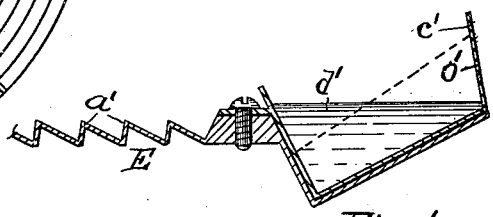


Fig. 4.

Fig. 2.

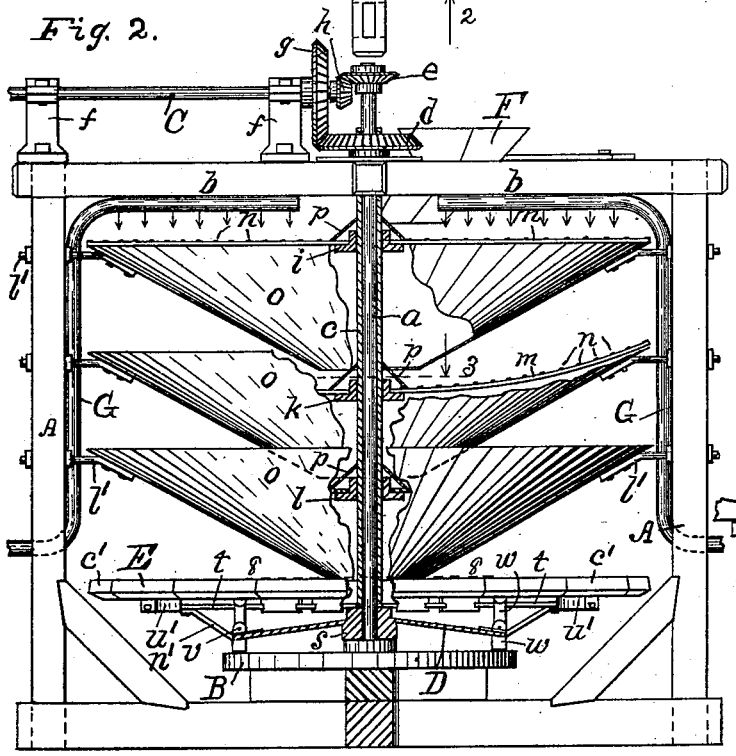


Fig. 5.

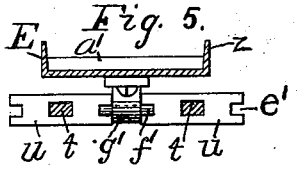
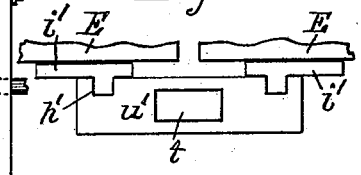


Fig. 6.



Attest:

M. Smith.

L. Williams.

Inventor:

L. D. Carter.

By C. B. Whitmore, Atty.

No. 676,419. Patented June 18, 1901.

L. D. CARTER.

GOLD SEPARATOR.

(Application filed Nov. 1, 1900.)

(No Model.) 2 Sheets—Sheet 2.

Fig. 7.

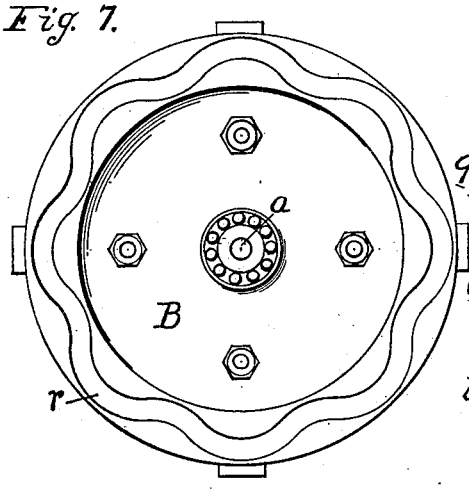
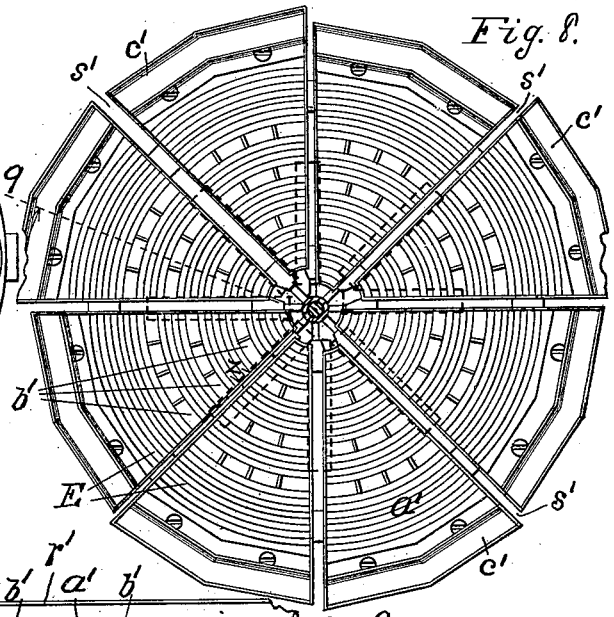


Fig. 8.



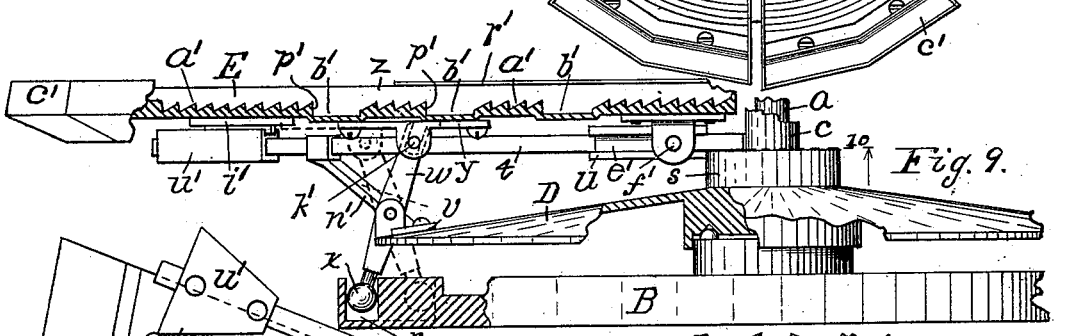


Fig. 9.

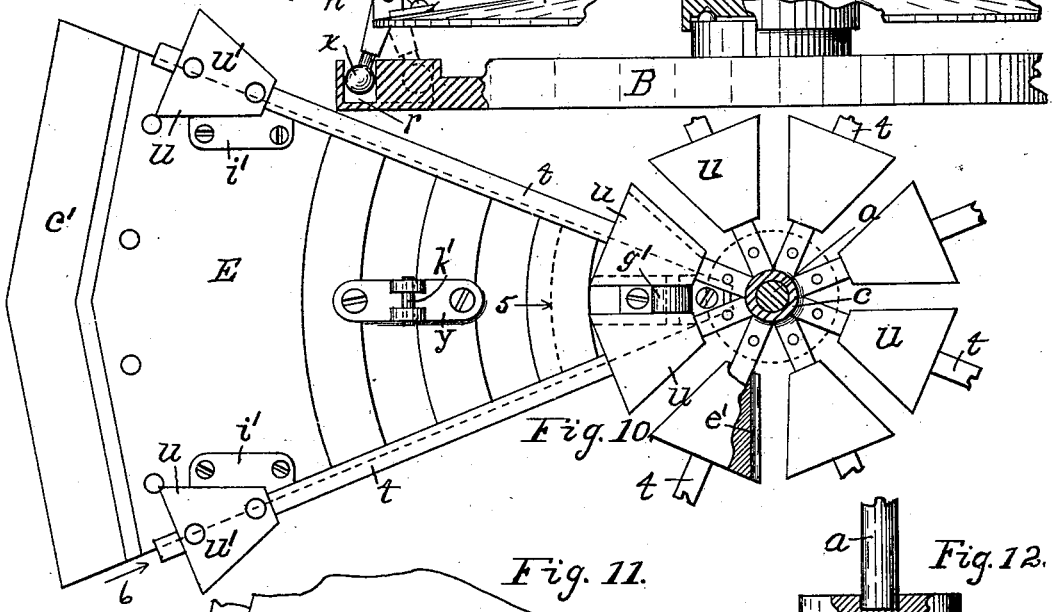


Fig. 10.

Fig. 11.

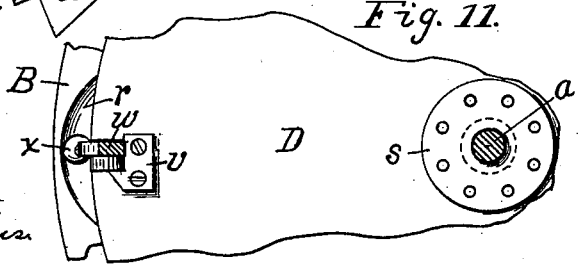


Fig. 12.

Attest:
M. Smith.
L. Williams.

Inventor:
L. D. Carter.
By C. B. Whitmore, Atty

UNITED STATES PATENT OFFICE.

LLEWELLYN D. CARTER, OF WAUSEON, OHIO.

GOLD-SEPARATOR.

SPECIFICATION forming part of Letters Patent No. 676,419, dated June 18, 1901.

Application filed November 1, 1900. Serial No. 35,154. (No model.)

To all whom it may concern:

Be it known that I, LLEWELLYN D. CARTER, a resident of Wauseon, in the county of Fulton and State of Ohio, have invented a new and useful Improvement in Gold-Separators, which improvement is fully set forth in the following specification and shown in the accompanying drawings.

My invention is a machine or device for separating gold or other metals either in the form of nuggets or flour from auriferous gravel or sand, working the same either dry or with water, as may be necessary in any given case.

The object of the invention is to produce a device with revolving parts which by means of centrifugal motion and gravitation and other means, all hereinafter fully described, the separation of the metal from the coarser elements is rapidly and cheaply effected, the gold or metal product being collected free from extraneous matter and with little or no loss of the precious metal in the operation.

The invention consists in parts and devices and the operation of the same, all hereinafter fully described, and more particularly pointed out in the claims.

Referring to the drawings, Figure 1 is a plan of the machine. Fig. 2 is a side elevation, parts being broken away and many of the central parts vertically sectioned along the axis of the machine. Fig. 3 is a plan of a hub and series of radial arms, partly broken away, the central shaft and sleeve being horizontally sectioned, as on the dotted line 3 in Fig. 2. Fig. 4 is a vertical radial section of parts at the outer end of a riffle-board, showing the peripheral pocket for mercury. Fig. 5 is an end elevation of an inner pair of bearing-blocks for a riffle-board with associated parts, seen as indicated by arrow 5 in Fig. 10, the board being sectioned as on the dotted line at the point of the arrow. Fig. 6 is an outer end elevation of an outer bearing-block for the riffle-boards and associated parts seen as indicated by arrow 6 in Fig. 10. Fig. 7 is a plan of the cam-plate. Fig. 8 is a plan of the riffle-boards, the section being on the dotted line 8 8 in Fig. 2. Fig. 9 is a side elevation of portions of the cam-plate and coacting parts, the riffle-board being vertically sectioned in part as on the dotted line 9 in Fig. 8, other parts being sectioned by a vertical plane coinciding with the axis of the machine. Fig. 10 is a plan of the under side of a riffle-board and coacting parts, the section being on the dotted line 10 in Fig. 9, the supporting-arms being mainly broken away. Fig. 11 is a plan of a portion of the circular crown-plate, further showing the manner of holding the shake-levers. Fig. 12 shows the manner of stepping the foot of the vertical axial shaft. Figs. 1, 2, 7, and 8 are drawn to a scale about one inch to the foot, Figs. 3, 5, and 9 to 12, inclusive, to a scale about three inches to the foot, and Figs. 4 and 6 to larger scales.

In the drawings, A, Figs. 1 and 2, is a suitable frame, commonly of wood, for containing and holding the working parts of the machine.

a is a vertical shaft held at the middle line of the frame in bearings in the upper cross-timbers *b b*, with its lower end resting in the hub of a circular metal plate B, Figs. 2 and 12.

c is a tube or sleeve upon the shaft *a*, provided at its upper end with a miter-gear *d* above the cross-timbers, the shaft *a* having a bevel-gear *e* above the gear *d*.

C is a horizontal driving-shaft resting in bearings *f f* above the frame, which may be rotated by any suitable or common means, as a crank, belt and pulley, or otherwise, as may be convenient. At its inner end the driving-shaft is provided with a miter-gear *g* to engage the gear *d* and a bevel-pinion *h* to engage the bevel-gear *e*, so that the shaft *a* and the sleeve are both turned by the driving-shaft C, and as the gear *e* and driving-pinion *h* are as two to one the shaft *a* will turn at one-half the rate of speed at which the sleeve *c* turns. The sleeve *c* is provided with a series of rigid hubs *i k l*, each of which supports a series of radial carrying-arms *m*, Figs. 2 and 3, eight, more or less, in number, equally spaced around the sleeve. These arms may be straight and horizontal, as shown near the top of the frame in Fig. 2, or curved upward toward their outer ends, as shown near the middle of said figure, as may be found best, said arms, whatever their form, serving to hold wire-screens *n*. In constructing these machines I usually prefer to make the upper coarse screen flat or horizontal and the lower finer ones saucer-shaped, as shown, though I do not confine myself to any particular form of the screens. I also prefer in constructing the screens to give the wires

forming them a spiral or involute form, as shown in Fig. 1, though this particular form of screen is not essential to my invention.

Under each screen or each series of carrying-arms m is placed a sheet-metal conical hopper or gatherer o to catch whatever substances may fall through the screens and return the same to the vicinity of the sleeve, where the hoppers are open. These hoppers are stationary, being secured to the frame A by radial holders l', Fig. 2, passing through the posts of the frame. Thus the substances caught by the two upper hoppers fall upon the respective screens below them, near the sleeve, conical pieces p, covering the respective hubs $i\ k\ l$, serving to deflect the descending metals and other matter slightly away from the centers of the screens, where these masses will be subjected to the centrifugal action of the revolving screens.

The cam-plate B is concentric with the axial shaft a and rigid with the bottom timbers of the frame, being formed near its periphery with a sinuous groove or channel r, Figs. 7 and 9. Above this plate and resting upon the hub thereof, preferably by means of some form of antifriction-bearing, as balls, is a concentric circular crown-plate D, Figs. 2, 9, and 11, rigid with the shaft a. To the upper end of the hub s of the plate D are secured horizontal radial supporting-arms t, Figs. 2, 9, and 10, equally spaced and equal in number to the carrying-arms m of the respective screens. These arms are stiffened by inclined braces n', reaching outward from the plate D to points near their outer ends, as shown. Supported by these arms t is a series of horizontal riffle-boards E, sectoral in form, resting upon tapered bearing blocks or bodies $u\ u'$, rigid with the respective supporting-arms, there being two blocks, an outer and an inner, on each arm, as shown. The riffle-boards are adapted to have independent radial motions upon these bearing-blocks and to be removed from the machine when necessary.

At is periphery the crown-plate D, preferably made slightly conical in form, is provided with a series of rigid brackets v, Figs. 9 and 11, each of which holds pivotally a short vertical shake-lever w, adapted to swing in a vertical plane. The lower end of each lever is provided with a freely-moving roller or ball x, occupying the sinuous groove r in the plate B, as shown. The upper end of each shake-lever engages a pin k' of a bracket y, secured rigidly to the under surface of each riffle-board. From this description of the parts it will be understood that as the plate D is revolved by the shaft a, carrying the levers w along the groove r in the plate B, the sinuations of the groove will cause the shake-levers to swing to and fro upon their bearings on the brackets v and cause the riffle-boards to move rapidly upon their bearings alternately forward and back for the purpose of shaking or agitating the substances resting upon them. These riffle-boards are preferably made of thin light material, as aluminium, so as not to materially resist the vibratory motions given them by the levers w, and are formed with low vertical retaining-flanges z at their tapered sides and inner ends. The floor of each riffle-board is formed with circular ridges a', alternated with depressed channels b', and at the outer end of each board is secured a metal cup or pocket c', overhanging the board, as shown. These pockets are for the purpose of holding mercury d', Fig. 4, to catch flour-gold or other small particles that might otherwise be liable to escape from the revolving riffle-boards and be lost, this gold being saved in the form of an amalgam. The pockets c' are made of sheet copper or silver to better hold the mercury, for which these metals have an affinity, and prevent it from being thrown out by the revolving boards. Also the outer walls o' of the pockets, Fig. 4, are inclined inward, as shown, for the purpose of more certainly holding the mercury, the surface of which takes substantially a slant (shown by the dotted line) when the machine is running.

The ridges or corrugations a' are preferably made with abrupt or nearly vertical inner faces, as shown in Fig. 9, with longer slants at the outer sides, so as to better hold the particles or nuggets of gold against centrifugal action, which masses, on account of their comparatively greater weight, occupy the channels of the corrugations, while the gravel, sand, or other bodies of less specific gravity float outwardly over the gold on account of the revolving of the parts and pass off of the riffle-boards. There is, however, on account of centrifugal action, a tendency for the heavy gold masses or particles to move outward from the inner ends of the riffle-boards, where they, with the extraneous matter, are primarily received; but such outwardly-moving masses are caught and held in the deeper channels or pockets b', the outer walls or sides p' of which are made practically vertical, as shown in Fig. 9.

In using the machine the auriferous sand and gravel are primarily thrown into a hopper F, Figs. 1 and 2, which conveys them to a point near the middle of the upper flat screen n. The smaller masses pass through this screen, while the coarsest gravel or other bodies are carried toward the periphery of the screen on account of the motion of the parts and pass out of the machine. The matter that falls through this screen is caught by the funnel or hopper immediately thereunder and deposited upon the finer middle screen near the center, said screen being saucer-shaped, as shown. Here a further separation of the gold nuggets or metal from the gravel takes place, the latter being thrown outward, as before, over the edge of the screen by centrifugal action, the smaller masses, including the gold or other metal particles, falling through onto the middle hop-

per and by means of that deposited upon the lower yet finer screen near the sleeve *c*, which screen is saucer-shaped, like the one above it. The action of this lower screen is to clear the gold particles nearly completely from the gravel and other base matter, which pass off from the screen at its outer edge by the centrifugal force imparted to them by the revolving screen. The particles or masses passing through the lower screen are conveyed by the lower hopper onto the inner ends of the riffle-boards E, where they are again subjected to centrifugal action, this time accompanied by an agitation or shaking motion, as already described. This treatment of the gold-bearing gravel is without the aid of water; but in separating flour-gold from sand water is more commonly used, being supplied through pipes G, Fig. 2.

The form of the bearings of the riffle-boards upon the supports below is not material to my invention; but I prefer to employ the tapered blocks *u' u'*, as described, and shown in Fig. 10. The inner blocks *u* have horizontal grooves *e'*, Fig. 5, in their inclined edges, in each two opposite ones of which a horizontal pin *f'* is adapted to slide, the pin being held by a hanger *g'*, Figs. 5 and 10, rigid with the under surface of the riffle-board. The similar blocks *u'* at the outer ends of the arms *t* are formed with grooves *h'*, Fig. 6, upon their upper surfaces, near to and parallel with the respective edges of the blocks, riders *i'*, rigid with the under surfaces of the riffle-boards, being provided to occupy and slide in said grooves *h'*. Furthermore, the upper ends of the shake-levers *w* are forked onto the pins *k'* of the brackets *y*, so that in removing the riffle-boards their outer ends are first raised off of the outer bearings and clear from the levers and then moved endwise outwardly to draw the bearing-pins *f'* out of the blocks *u*. The form or taper of all of the blocks *u u'* is such that their opposing edges are parallel, so that the riffle-boards have free horizontal radial motions upon their bearings on said blocks.

The riffle-boards are provided with horizontal lap-over strips or pieces *r'*, Fig. 9, and shown by dotted lines in Fig. 8, reaching outward from the inner ends of the sections to cover the spaces *s'* between the latter alternately formed and closed on account of their radial motions. Each strip *r'* is secured to the upper edge of a flange *z* of one riffle-board in position to extend laterally over the intervening space *s'*, and the flange of the adjacent riffle-board serving to prevent the substances falling from the lower hopper onto the riffle-boards from passing through between the latter.

What I claim as my invention is—

1. A device of the kind described, comprising a holding-frame and a central vertical shaft, a sleeve upon the shaft, hubs secured to the sleeve provided with radial carrying-arms, and screens supported by the arms, and a plate in sections controlled by said shaft, beneath the screens, and means embodying a cam-plate and connections for reciprocating said plate and means to revolve said shaft and the sleeve at different rates of speed, substantially as shown and described.

2. A device of the kind described, comprising a holding-frame and a central vertical shaft, a sleeve upon the shaft, hubs secured to the sleeve provided with radial arms, and screens supported by the arms, and a plate in sections controlled by said shaft, and a cam-plate and pivotal connections beneath the screens, and means for revolving said shaft and the sleeve at different rates of speed, substantially as and for the purpose specified.

3. A machine for separating gold or other metals from baser material, comprising a series of revolving screens, and a revolving plate in sections beneath the screens, and means embodying a cam-plate carried by said shaft, and pivotal connections with said sections for giving said sections of the plate reciprocal motions, as and for the purpose specified.

4. A machine for separating gold or other metals from baser material, comprising a series of revolving screens, and a revolving plate in sections beneath the screens, and means embodying a cam-plate carried by said shaft and pivotal connections with said sections for giving said sections of the plate reciprocal motions, the floors of said sections being corrugated, substantially as shown and described.

5. A machine for separating gold or other metals from baser material, comprising a series of revolving screens, and a revolving plate in sections beneath the screens, said sections being each formed with sets of corrugations alternated with depressed spaces or lodges, said corrugations being provided with abrupt vertical inner faces, substantially as shown and described.

6. A machine for separating gold or other metals from baser material, comprising a series of revolving screens, and a revolving plate in sections beneath the screens, said sections being provided with peripheral cups or pockets, said pockets having their outer walls inclined, substantially as and for the purpose specified.

7. The combination with the revoluble shaft and the cam-plate with sinuous groove, of the plate in sections, and pivoted shake-levers having one end engaged in said groove and the other loosely connected with the sections of said plate, as set forth.

In witness whereof I have hereunto set my hand, this 17th day of October, 1900, in the presence of two subscribing witnesses.

LLEWELLYN D. CARTER.

Witnesses:
H. H. DOWNS,
W. G. HAHN.