

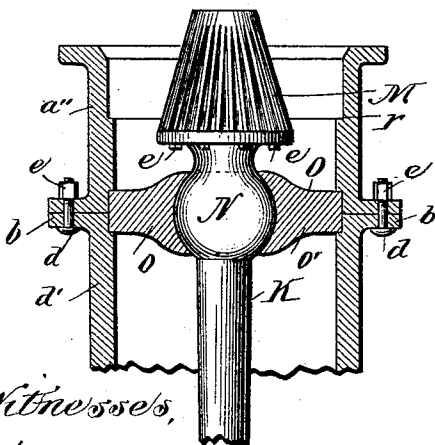
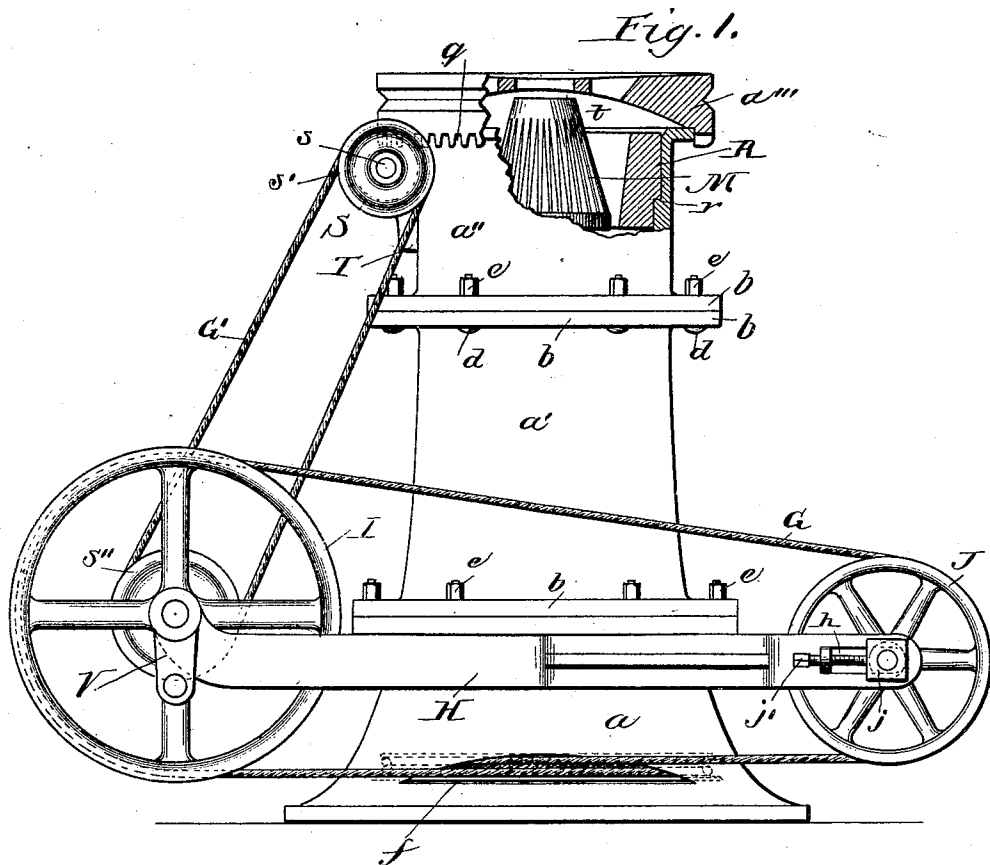
(No Model.)

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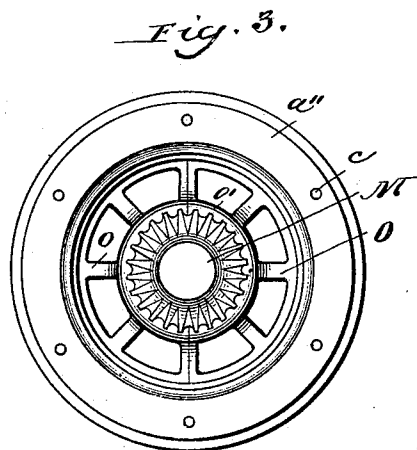
G. LOWRY.
STONE CRUSHER.

No. 475,330.

Patented May 24, 1892.



Witnesses,
Helle McKebben.
John L. Jackson.



Invented
by George Lowry.
Bond & Aldrich.
N.Y.

(No Model.)

2 Sheets—Sheet 2.

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Fig. 4.

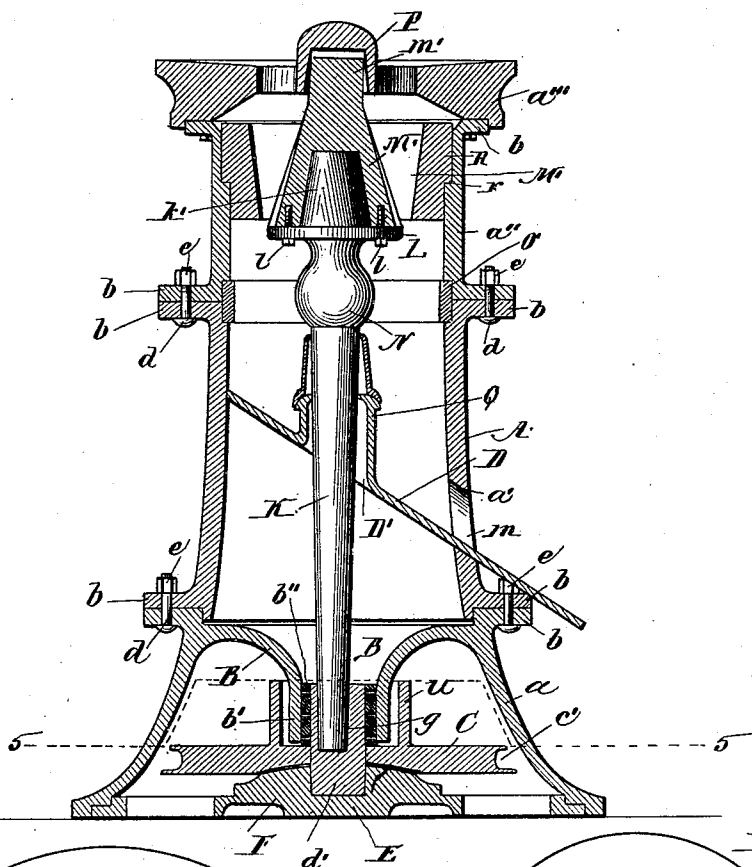


Fig. 5.

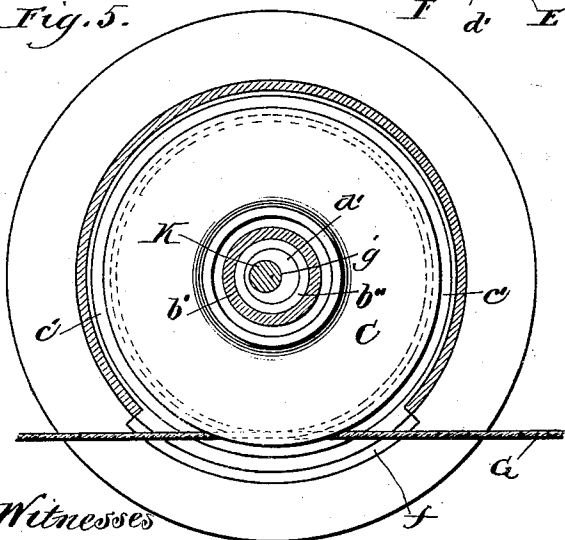


Fig. 6.

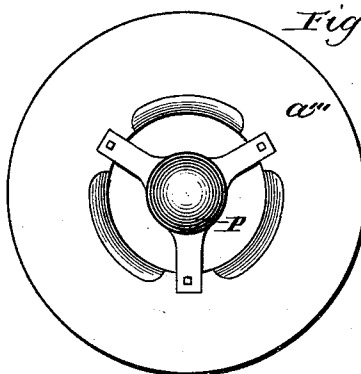


Fig. 7.



Witnesses

Hellie McKibben
John L. Jackson

Inventor
George Lowry
By Fred W. Adams
Att'y's.

UNITED STATES PATENT OFFICE.

GEORGE LOWRY, OF NORTHAMPTON, ENGLAND.

STONE-CRUSHER.

SPECIFICATION forming part of Letters Patent No. 475,330, dated May 24, 1892.

Application filed May 25, 1891. Serial No. 393,943. (No model.)

To all whom it may concern:

Be it known that I, GEORGE LOWRY, residing at Northampton, Northamptonshire, England, and a subject of the Queen of Great Britain, have invented certain new and useful Improvements in Stone-Crushers, of which the following is a specification, reference being had to the accompanying drawings, in which—

Figure 1 is a side elevation, part being broken away. Fig. 2 is a partial vertical section. Fig. 3 is a top or plan view of Fig. 2. Fig. 4 is a vertical section showing the shaft fulcrumed at the top. Fig. 5 is a section on the line 5 5 of Fig. 4. Fig. 6 is a top plan view. Fig. 7 is a detail side elevation of the removable triple-arm bearing.

My invention relates to machines for crushing stone or ore, and more especially to machines similar to those described in my former patent, No. 431,069, and in my application, Serial No. 374,942, filed December 16, 1889, which machines are provided with a gyrating crusher for crushing the stone.

The objects of my invention are to provide a new and improved fulcrum-bearing for the gyrating crusher-shaft underneath the crusher-head, whereby a steadier motion is obtained and crystallization of the shaft avoided; to provide an improved crown-cap for such machine; to provide improved mechanism for gyrating the crusher, and to otherwise improve the construction of such machines. I accomplish these objects as illustrated in the drawings and as hereinafter specified.

That which I regard as new will be pointed out in the claims.

In the drawings, A indicates the exterior shell of a stone-crusher, which shell is composed of tubular sections a a' a'' and a cap or crown section a''' . The several sections of the shell A, except the cap-section a''' , are provided with flanges b , by means of which they may be secured together. The flanges b are each provided with holes c , adapted to receive bolts d , so that by inserting the bolts d through the holes c the sections may be firmly secured together by means of nuts e , adapted to be screwed upon the ends of the bolts d , as best shown in Figs. 1 and 4. The bolts d are preferably inserted through the

holes c from the bottom, as shown in the drawings, as they may then be more easily removed. When the shaft is fulcrumed at the top the crown-section a''' may be secured upon the section a'' by means of screws or in any other suitable manner. The holes c in the meeting flanges of the sections are placed equally distant apart, so that by removing the bolts d the section containing the delivery-chute can be turned around independently of the section containing the driving mechanism and then secured in its new position in a similar manner, the holes c by this construction being adapted to register with each other. The lowermost section a forms the base of the machine and is provided with a web-plate B, cast integral with or secured to the inside walls of the section a , which web-plate is provided at its center with a boss b' , adapted to receive the bearings of a horizontal belt-pulley C, by means of which the gyrating crusher-shaft is operated, as will be more fully hereinafter described. The bearing-surface of the boss b' is provided with a brass bushing b'' , adapted to receive and support a sleeve d' . The pulley C is provided with a hub, which is keyed to the sleeve d' , which sleeve is supported in a bearing E, formed at the center of the base F of the section a and is also supported by the bushing b'' , as best shown in Fig. 4. The pulley C is preferably of such diameter as to nearly fill the space in the bottom of the section a and is provided on its periphery with a groove c' , adapted to receive a driving-belt G, which may be made in the form of a rope. The lower edge of the groove c' preferably extends a short distance beyond the upper edge, which better adapts the groove to hold the driving belt or rope G from sliding off.

The sleeve of the belt-pulley C is provided with an eccentric bearing g , adapted to receive the lower end of the gyrating shaft, as best shown in Fig. 4, and is constructed substantially as described in my former patent, No. 431,069, being a closed bush adapted to receive the lower end of the gyrating crusher. The under portion of the pulley C around the hub or bearing is preferably hollowed out to receive a corresponding enlargement of the base F, as best shown in Fig. 4. This con-

struction secures steadiness, avoids noise, diminishes friction, and prevents crystallization of the shaft.

f indicates a belt passage or opening in one side of the section *a*, on a level with the pulley C, through which opening the drive-rope G may pass to the exterior of the machine. It is preferably of such shape as to permit of the drive-belt passing out of the section *a* in a direction opposite to that at which it enters.

H indicates a beam, which is secured to the section *a* of the shell in a horizontal position, and preferably extends a short distance on each side of the machine, as best shown in Fig. 1.

Upon one end of the beam H is mounted a drive-pulley I and at the other end of the beam is mounted a pulley J. The pulleys I and J are each provided with a grooved periphery adapted to receive the drive belt or rope G. The pulley J is journaled in an adjustable bearing *j*, which is adapted to move in a slot *h* in the beam H, the bearing being adjustable longitudinally of the beam by means of a screw *j'*, which passes through a screw-threaded lug or lip at one end of the slot and is pivoted or swiveled at its inner end to the bearing *j* in such manner that the screw can be rotated independent of the bearing for adjusting the latter to take up slack in the drive belt or rope. The pulley I is so mounted that its lowermost point will be about upon a level with the lower portion of the groove *c'* in the pulley C, and pulley J is so mounted that its lowermost portion will be slightly above the level of the lowermost portion of the pulley I. By this construction as the belt or rope G passes from the pulley I around the pulley C to the wheel J the two portions of the belt or rope G where it crosses the outer portion of the pulley C will be held away from each other and friction and wear of the belt or rope thereby avoided.

In the drawings I have shown an ordinary crank V, adapted to be connected directly with an engine for operating the drive-pulley I, which should be used when the engine is close at hand; but it is evident that the pulley I may be operated in any other suitable manner by means of belts and pulleys, or the rope may be operated directly from the engine and passed around the pulley C and over the pulley J back to the engine.

K indicates a gyrating crusher shaft, which is similar to the gyrating shaft shown in my application, Serial No. 374,942, hereinbefore referred to, being somewhat larger at its upper than at its lower portion and tapering gradually toward the bottom. The lower end of the shaft is adapted to fit into the bearing *g*, as best shown in Fig. 4, and is substantially as described in my former application, hereinbefore referred to.

The shaft K is provided near its upper end with a collar L for supporting a crushing head or cone M, which is adapted to fit upon the

top of the shaft K and to rest upon the upper part of the collar L, as best shown in Fig. 2, where it may be secured by screws *l*, or in any other suitable manner. The shaft or crusher K is provided below the collar L with a globular section N, at which point the shaft is adapted to be fulcrumed in the shell. The gyrating shaft K is so arranged that the globular portion N will be opposite the point of union of the sections *a' a''*, as best shown in Figs. 2 and 4. The interior of the sections *a' a''* at their meeting-point is recessed to permit of the insertion of a bearing O or a ring O'. The bearing O is formed of two or more sections *o o'*, which are hollowed out at their common center, so that when the two sections are united they form a disk having a bearing at the center adapted to receive the globular portion N of the shaft K. The bearing O is also provided with openings for the passage of the broken rock to the chute or diaphragm D. By this construction, when the section *a''* is removed (which may be accomplished by removing the nuts *e* and bolts *d*) the bearing O may be easily removed by raising the shaft and bearing clear of the recess, or by removing one of the sections *o o'*. By the use of a globular bearing of this nature for the shaft K, instead of the taper bearing of my former patent, the operation of the shaft is rendered much more steady and uniform and much greater speed may be attained and better results secured than in former constructions. This construction also serves to strengthen the sections *a' a''*.

If it is desired to fulcrum the shaft K at the top of the machine, as when it is desired to break the stone into larger and irregular fragments, the sections *o o'* may be removed and the ring O' be inserted in the recess occupied by the bearing O, in order to aid in keeping the sections *a' a''* in place and to strengthen the shell. The crushing head or cone M is then replaced by a crushing head or cone M', which is provided with an upward extension *m'*, as best shown in Fig. 4, which extension is adapted to fit into a triple-arm bearing P, mounted in the crown-section *a'''* of the machine, as best shown in Fig. 4.

As shown in Fig. 6, the crown-section *a'''* is provided with openings to permit of the admission of the unbroken stone to the crushing-cylinder and the bearing P is removably secured by screws or in any other suitable manner to the top of said section. The bearing P consists of a central bearing for the end of the crushing-cone, from which extend radial arms, which are secured to the crown-section, as shown. The crushing-cones M M' are provided with recesses on the under side adapted to fit over a projection *h'* upon the upper end of the shaft K, substantially as shown in my former application, hereinbefore referred to, and are secured in place by screws, or in any other suitable manner.

R indicates a crushing-cylinder, which may

be of any approved construction and is supported in the recesses *r* in the sections *a''* of the shell, as best shown in Fig. 2. The interior of the crushing-cylinder and the exterior of the crushing-cone are each wholly or partially ribbed in the usual manner, and, if desired, the interior of the crushing-cylinder may be provided with detachable wearing-plates, which may be removed and replaced, when desired. The crushing-cylinder may also be readily removed by removing the crown-section *a'''*.

D indicates an inclined diaphragm or chute, which is placed in the section *a'* and at its lower end projects through the opening *m* in the lower portion of said section, as best shown in Fig. 4. The diaphragm D is provided at its center with an opening D' for the passage of the crusher-shaft K, which opening is slightly larger than the shaft to permit of its gyrating. The diaphragm D is adapted to receive the crushed stone from the crushing devices and to carry it to the exterior of the machine. It is provided with a dust-ring Q, which is adapted to exclude dust from the driving mechanism in the lower portion of the machine, which dust-ring is substantially similar to that shown and described in my former application, hereinbefore referred to. Owing to the construction of the shell A and sections *a a' a''*, by removing the bolts *d* and the nutse, the section *a'* may be moved around so as to deliver the broken stone at any desired point, when it may be secured in place again by inserting the bolts *d* into the holes *c*. It is evident that the holes *c* may be made as close together as desired, so that any desired adjustment may be made. The crown-section *a'''* is adapted to fit over the top of the section *a''*, said section being preferably provided with a flange *b* to form a better bearing-surface for the section *a'''*. When the crusher is fulcrumed by means of the ball-bearing underneath the head, as shown in Fig. 2, the section *a'''* is movably mounted upon the top of the section *a''* and is provided on the under side of its periphery with cogs *q*, as best shown in Fig. 1.

S indicates a screw wheel or worm, which is mounted upon a shaft *s*, supported by a bracket T, secured in any suitable manner to one side of the section *a''*, as best shown in Fig. 1. The worm is in such position that the cogs *q* upon the crown-section *a'''* will mesh with the threads of said worm, so that by revolving the worm S it will cause the crown-section *a'''* to revolve upon the top of the section *a''*, and thereby feed in the unbroken stone regularly all around the crusher-head in proper quantity to suit the capacity of the crusher-outlet and thereby prevent any choking. The production is also increased.

s' indicates a grooved pulley, which is secured to one end of the shaft *s* and is adapted to be geared to a similar pulley *s''*, preferably mounted upon the shaft upon which is

mounted the drive-pulley I. I preferably use a rope G' for connecting the pulleys *s'* and *s''*; but any suitable belt or chain may be used for this purpose.

The crown-section *a'''* is provided at the top with one or more openings for the admission of unbroken stone, and is preferably so arranged as to form a compartment *t* between the top of the crushing-cylinder and the crown-section, as best shown in Fig. 1.

When the drive-pulley I is revolved, the motion will be communicated to the pulley C, through the belt or rope G, which is preferably passed twice around the pulley C to secure a firmer grip and the machine will consequently be set in motion. The pulley *s'* will also be operated through the pulley *s''* and belt or rope G', causing the crown-section *a'''* to rotate. This will cause the unbroken stone to be fed regularly between the crushing-cylinder and the crushing-head.

Any suitable devices may be provided for adjusting the height of the crushing-cylinder R to regulate the size to which the stone will be crushed. I prefer to use devices similar to those described in my former patent, No. 431,069; but any suitable form of adjustment may be used.

When it is desired to secure a greater leverage at the top and a wider exit-opening, the crusher-head is fulcrumed from the removable center at the top of the crown-section, as shown in Fig. 4, the crown-section being then firmly secured to the section *a''*; but when the stones are to be reduced smaller, more regular quality and better results are secured by using the arrangement of the globular fulcrum shown in Fig. 2.

In order to afford better lubrication for the axle of the pulley C in the bush *b''*, a circular flange U is cast upon the upper portion or hub of the pulley C, which flange is adapted to encircle the central portion of the web-plate B, as best shown in Fig. 4, leaving a small space between the inner portion of the flange and the outer portion of the plate. The web-plate B is so constructed that it will extend to within a short distance of the top of the pulley C, as shown. By this construction, when the lubricating material is poured either into the bush *b''* or inside the flange U, should there be an oversupply of the lubricator it will pass from the bush *b''* into the space between the flange U and the plate B, where it will remain until it is needed.

What I claim as new, and desire to secure by Letters Patent, is—

1. The combination, with a shell having a belt-passage, of a horizontal beam or frame secured to the casing in juxtaposition to the belt-passage and having a belt-pulley at each end thereof, a gyrating crusher-shaft fulcrumed in the shell, a horizontally-rotating belt-pulley mounted in the lower portion of the shell and eccentrically connected with the gyrating crusher-shaft, and a drive-belt en-

circling the pulley within the shell and extending from the latter through the belt-passage to the pulleys carried by the horizontal beam or frame outside the shell, substantially as described.

2. The combination, with a shell and a gyrating shaft fulcrumed therein, of a horizontal pulley mounted in the lower portion of said shell, said pulley having an eccentric bearing adapted to receive the lower end of the shaft, an opening *f* in the lower portion of said shell, pulleys I and J, mounted at the exterior of said shell, and rope-gearing for driving the horizontal pulley from one of the drive-pulleys I or J, the wheels I and J being so arranged that the rope will enter and pass out of the opening *f* on different levels, substantially as and for the purpose specified.

3. The combination, with a shell and a gyrating shaft fulcrumed therein and mechanism for gyrating said shaft, of pulleys I and J, mounted at the exterior of said shell, one of said pulleys being adjustable to and from the other, and a belt or rope for operating the shaft-driving mechanism from the pulleys I and J, substantially as described.

4. In a stone-crusher, the combination of an exterior shell A, composed of flanged sections *a a' a''*, adapted to be secured together, an opening *m* in the section *a'*, and an inclined diaphragm D in said section and extending through said opening *m*, whereby the crushed stone may be delivered at any point without moving the driving mechanism, with a gyrating shaft mounted in said shell, and devices for gyrating said shaft, substantially as and for the purpose specified.

5. The combination, with an exterior shell, a crusher-head, and a gyrating shaft mounted in said shell and having a spherical portion N underneath the crusher-head, of a bearing O, composed of two or more sections supported in the interior of the shell beneath the crusher-head, and mechanism for gyrating the shaft, substantially as and for the purpose specified.

6. In a stone-crusher, the combination, with an exterior shell composed of sections *a a' a''*, removably secured together, and a gyrating shaft mounted in said shell, said shaft having a spherical portion N near its upper end, of a removable bearing adapted to receive the spherical portion N of the shaft, said bearing being composed of two or more sections

adapted to be supported in the shell at the meeting-point of the sections *a' a''*, substantially as and for the purpose specified.

7. The combination, with an exterior shell, of a gyrating shaft fulcrumed at its upper portion, devices engaging the lower portion of the shaft for gyrating the shaft, a crown-cap resting upon the top of the shell and having an opening for the passage of unbroken stone, and means for rotating the cap, substantially as described.

8. The combination, with an exterior shell, of a gyrating shaft fulcrumed at its upper portion, devices engaging the lower portion of the shaft for gyrating the same, a crown-cap resting upon the top of the shell, having cogs and provided with an opening for the passage of unbroken stone, and a worm engaging the cogs to rotate the crown-cap, substantially as described.

9. The combination, with an exterior shell, of a gyrating shaft fulcrumed at its upper portion, devices engaging the lower portion of the shaft for gyrating the same, a crown-cap resting upon the shell and having cogs, a worm for rotating the crown-cap, and belt-and-pulley mechanism for operating the gyrating shaft and rotating the worm, substantially as described.

10. The combination, with a shell, of a gyrating shaft fulcrumed at its upper portion in the shell, mechanism for gyrating the shaft, a revolving crown-cap mounted upon the upper portion of the shell and having cogs on the under portion of its periphery, a worm journaled on the upper portion of the shell and engaging the cogs of the crown-cap, and means for rotating the worm, substantially as described.

11. The combination, with an exterior shell, of a gyrating shaft mounted in the shell, a crushing-head on the shaft, mechanism for gyrating the shaft, a rotating crown-cap mounted upon the upper end of the shell, means for rotating the crown-cap, and a removable and replaceable triple-arm bearing supported by the rotating crown-cap and in which the upper end of the crushing-head is fulcrumed, substantially as described.

GEORGE LOWRY.

Witnesses:

ALBERT H. ADAMS,
JOHN L. JACKSON.