J. E. KENNEDY.

GYRATORY CRUSHING APPARATUS.

APPLICATION FILED OCT. 23, 1917.

1,310,798.

Patented July 22, 1919.

4 SHEETS—SHEET 1.

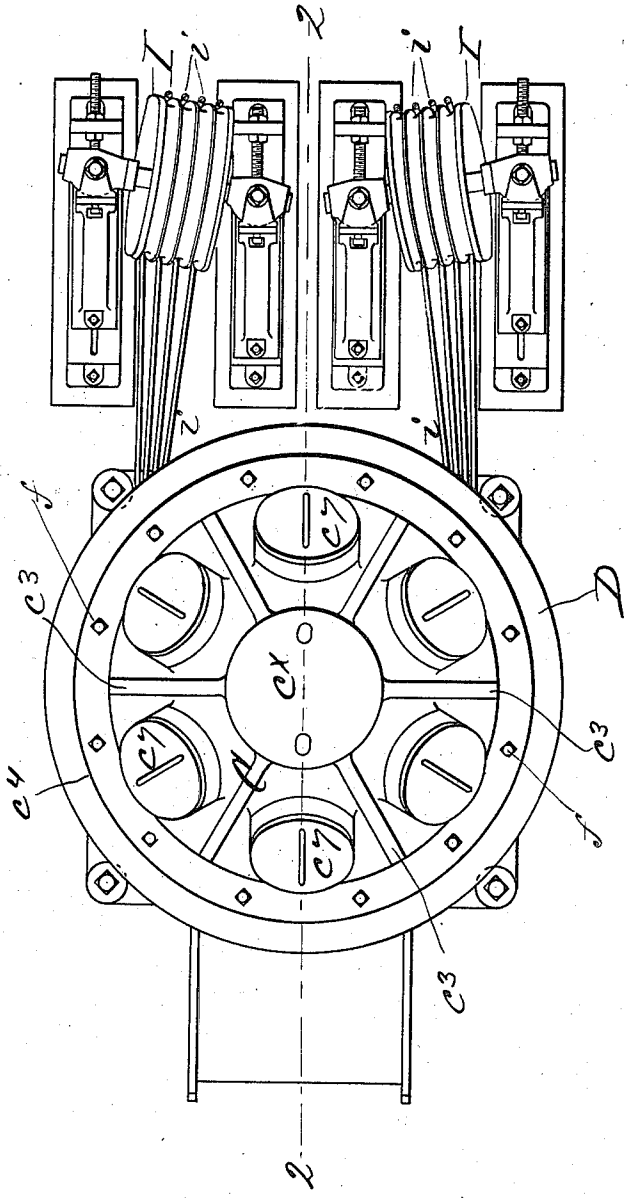


Fig. 1.

Witnesses:
Dorothy Mott
Frank W. Peirson

Inventor:
by Joseph E. Kennedy,
Geo. Jno. Mott
Atty

J. E. KENNEDY.

GYRATORY CRUSHING APPARATUS.

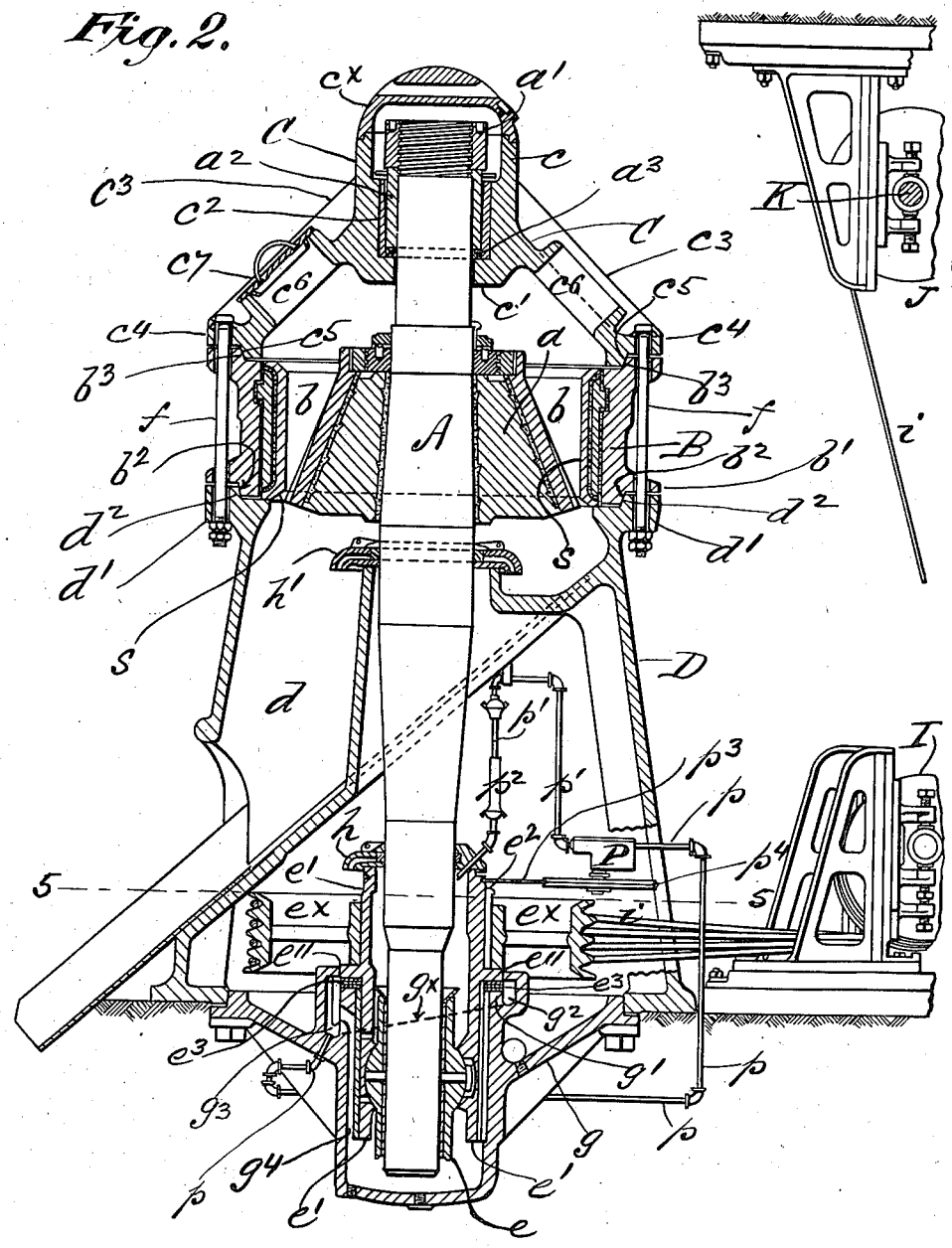
APPLICATION FILED OCT. 23, 1917.

1,310,798.

Patented July 22, 1919.

4 SHEETS—SHEET 2.

Fig. 2.



Witnesses:

Dorothy Mott

Frank W. Pierson

Inventor:

Joseph E. Kennedy,

By Leo. Fr. Miatt,

Atty.

J. E. KENNEDY.

GYRATORY CRUSHING APPARATUS.

APPLICATION FILED OCT. 23, 1917.

1,310,798.

Patented July 22, 1919.

4 SHEETS—SHEET 3.

Fig. 3.

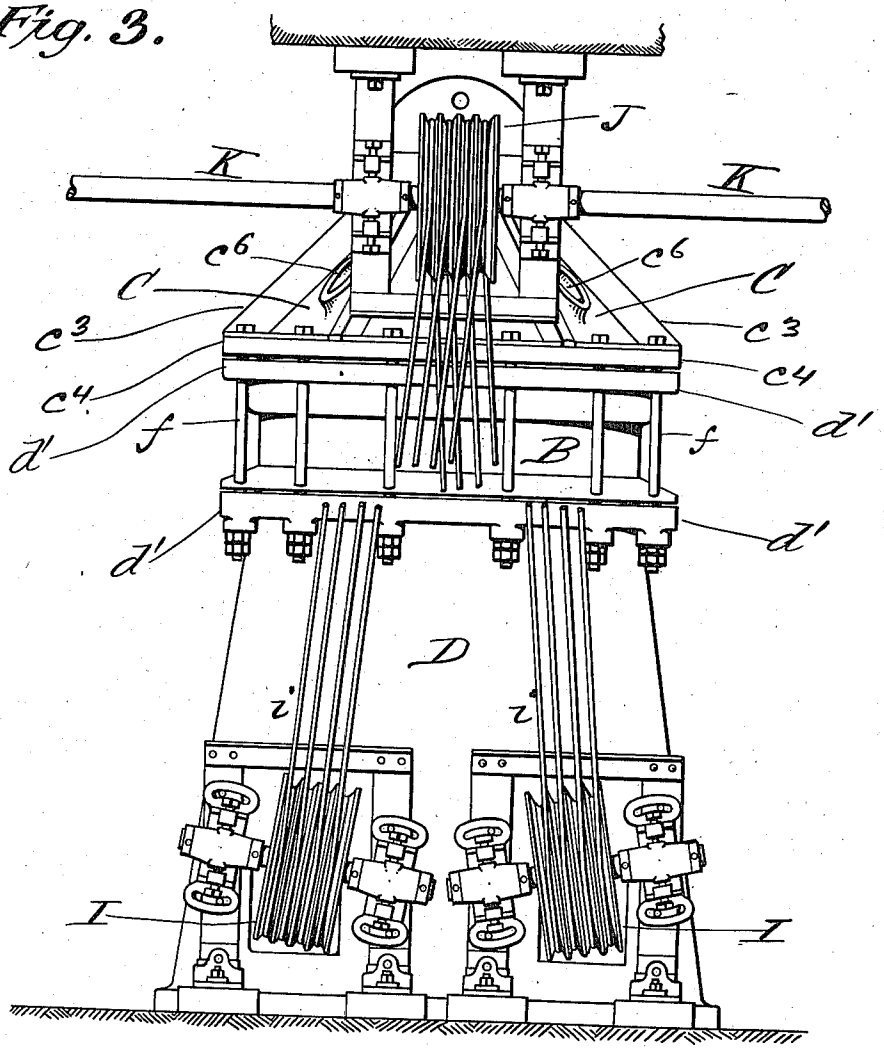
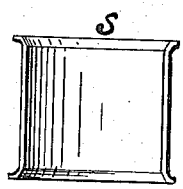


Fig. 6.



Witnesses:
Dorothy Miatt
Frank W. Peterson

Inventor:
by Joseph E. Kennedy,
Geo. Jno. Miatt
Atty

J. E. KENNEDY.

GYRATORY CRUSHING APPARATUS.

APPLICATION FILED OCT. 23, 1917.

1,310,798.

Patented July 22, 1919.

4 SHEETS—SHEET 4.

Fig. 4.

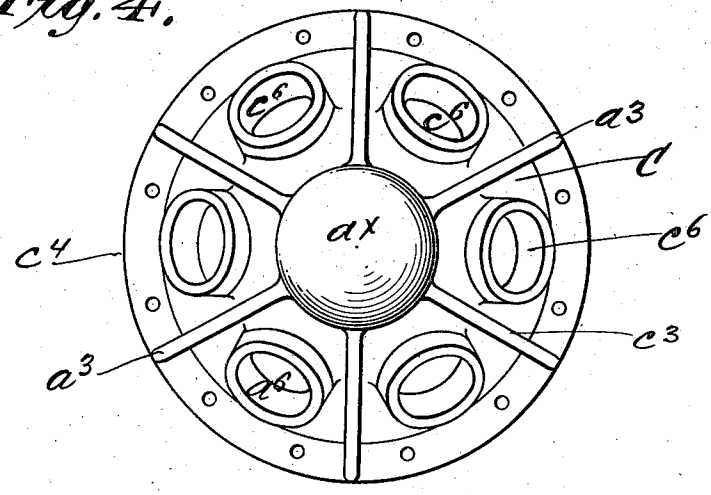
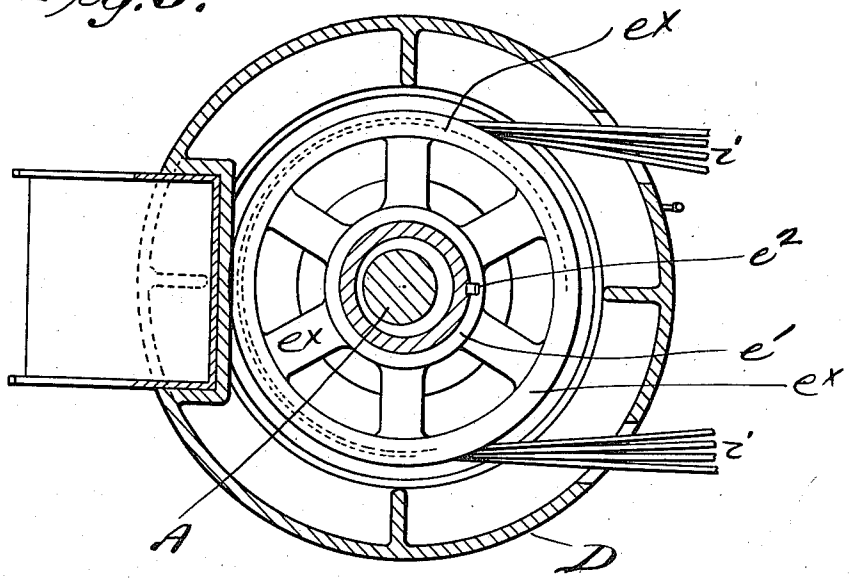


Fig. 5.



Witnesses:

Dorothy Matt

Frank W. Truman

Inventor:

Joseph E. Kennedy,

By Geo. Wm. Matt

Atty.

UNITED STATES PATENT OFFICE.

JOSEPH E. KENNEDY, OF NEW YORK, N. Y.

GYRATORY CRUSHING APPARATUS.

1,310,798. Specification of Letters Patent. Patented July 22, 1919.

Application filed October 23, 1917. Serial No. 198,023.

To all whom it may concern:

Be it known that I, JOSEPH E. KENNEDY, a citizen of the United States, and a resident of the borough of Manhattan, city, county, and State of New York, have invented certain new and useful Improvements in Gyratory Crushing Apparatus, of which the following is a specification.

My improvements relate to crushing apparatus, for the reduction of stones, ore, etc., of the class in which a gyratory shaft is pivotally suspended at its upper extremity while its lower extremity is journaled in an eccentric bearing mounted in a rotatable sleeve. The invention consists in the specific construction and arrangement of parts herein described and claimed, distinctive features being the peculiar formation of the cover plate on which the gyratory shaft is suspended; the means for securing together the component parts of the casing; the use of reversible concaves opposed to the conoidal crushing head and with attrition surfaces substantially parallel to the main vertical axis of rotation of the gyratory shaft; and in other details of construction, all as hereinafter more fully set forth.

In the accompanying drawings,

Figure 1, is a plan of my improved crushing apparatus, with means for driving same;

Fig. 2, is a central vertical sectional elevation taken mainly upon plane of line 2—2, Fig. 1;

Fig. 3, is a rear elevation showing the driving means;

Fig. 4, is a plan of the cap plate, with the covers removed;

Fig. 5, is a horizontal section taken upon plane of line 5—5, Fig. 2.

Fig. 6, is a front elevation of one of the concave crushing sections.

In general characteristics the apparatus illustrated in the drawings is primarily the same in principle and operation as set forth in Letters Patent No. 1,085,867, issued to me Feb. 3, 1914, No. 1,090,216, issued to me March 17, 1914, and No. 1,176,833, issued to me March 26, 1916, to which reference may be had as showing the type of gyratory crusher to which my present improvements are especially applicable. Thus the truncated conical crushing head a, is rigidly secured to the shaft A, and is gyrated thereby within a concave crushing chamber b, from the lower portion of which the reduced material drops into the chute chamber d, in the usual manner.

The shaft A, is suspended on an inclosed top or cover C, of special construction, having a central hub c, formed with an inturned bottom flange or annular shoulder c', on which the said shaft A, is fulcrumed in such manner as to allow of its gyration by means of the eccentric bearing e, in which the lower end of said shaft A, is mounted. The upper extremity of the shaft A, is screw threaded and provided with a nut collar a', which bears on a sleeve a^2, resting in turn on a gasket a^3, interposed between it and said annular shoulder c', of the hub c, of the cap plate C, as shown particularly in Fig. 2,—a bushing c^2, being interposed between the hub c, and the bearing sleeve a^2.

The cap plate C, is reinforced by means of radial ribs or webs c^3, and is formed with an extra heavy flange c^4, which overlaps the upper edge of the medial shell B, the bottom flange b', of which latter in like manner overlaps the top flange d', of the bottom shell D. The superposed flanges of the cap plate C, medial shell B, and bottom shell D, are formed with vertically coincident cored bolt holes through all of which pass bolts f, f, by means of which all three of said parts C, B, and D, of the casing are rigidly secured together. To insure perfect alinement of these parts, and hence of the gyratory shaft A, the upper flange of the bottom shell D, is formed with a concavo conoidal seat d^2, into which fits the convexo-conoidal bearing b^2, on the lower edge of the medial shell B. In like manner the upper edge of the said medial shell B, is formed with a concavo-conoidal seat b^3, into which fits the convexo-conoidal bearing c^5, at the inner side of the aforesaid annular flange c^4, on the cap plate C. Thus the tightening of the bolts f, wedges and centralizes the frame work B, C, D, into a unitary structure, so that the gyratory shaft A, is suspended in accurate operative alinement with the rotatable sleeve e', in which the eccentric bearing e, is mounted.

To the upper part of this eccentric bearing sleeve e', is rigidly secured, as by the key e^2, the driven pulley e^x, by which said sleeve e', is rotated to impart a gyratory rotation to the shaft A, through the medium of the aforesaid eccentric bearing e,

the operation and functions of which latter are clearly set forth in the Letters Patent hereinbefore referred to, particularly Letters Patent No. 1,176,833, the means for effecting the lubricating circulation being essentially the same as disclosed in that patent except that in the present case I supplement the automatic system of lubrication by positive means for transferring the lubricant from the exterior of the rotatable sleeve e', to the interior thereof. Thus, the sleeve e', is formed with an annular flange e'', by which it is rotatably supported on the lower casing or bottom plate g,—a floating ring e^3, being interposed between said annular flange e'', and the actual rest or seat g'. Surrounding the seat g', is an annular gutter g^2, to receive the oil which passes out around the floating ring e^3. The bottom of this annular gutter g^2, is inclined as indicated by the dotted line g^x, in Fig. 2, to conduct the oil thus received into a pocket g^3, from which the oil is returned in part through the duct g^4, to the space in the casing below the shaft, bearing and sleeve, to again percolate upward by capillary attraction between the opposed surfaces to be lubricated, as set forth in said Letters Patent No. 1,176,833. The rotation of the parts thus insures an automatic circulation of the oil which is most effective for their lubrication. In order however to positively insure a supply of lubricating oil to the sleeve e', above the eccentric bearing e, and thereby effect a gravity feed to said bearing e, to supplement the upward capillary feed to the annular gutter g^2, I abstract a portion of the oil from the pocket g^3, by means of the pipe p, leading to the pump P, by which it is returned by the pipe p', through the filter p^2, to the sleeve e' as indicated in Fig. 2. This utilization and combination of both capillary and gravity attraction obviates all danger of injury from lack of lubrication through failure of ample supply of oil to the contacting surfaces and safeguards the apparatus in this respect against carelessness or indifference on the part of attendants.

The force pump P, is driven by motion derived from an operative part, as by a belt p^3, passing around a drive pulley p^4, attached to the pump P, and around a groove formed for it in the upper part of the bearing sleeve e'. The upper end of the latter is closed by a dust guard h; and the inlet pipe p', from the pump P, may enter the said sleeve e, through said dust guard h, as shown in Fig. 2. h', is a dust guard which closes the opening in the upper part of the drive chamber in the usual manner.

The eccentric sleeve pulley e^x, is preferably grooved peripherally to receive one or more drive belts i, usually in the form of ropes which pass under deflecting idler pulleys I, (Fig. 3) to a driving pulley or rope sheave J, on the power shaft K. The bearings of the idler pulleys I or rope sheaves, are mounted in bearings which may be regulated in inclination as well as vertically and horizontally so as to afford practically universal adjustment as related to the eccentric sleeve pulley e^x. By this means also taut and accurate service of the ropes or belt i, to the said pulley e^x, is attained, so that the eccentric sleeve e', may be rotated at a relatively high speed as compared with the old method of driving it by miter gearing. Thus by my new method of gyratory drive the speed and capacity of the apparatus may be safely increased one hundred per cent. or more. The provision of the universally adjustable idlers I, also enables me to readily install the crushing apparatus, at a much lower level than the available power, as is frequently necessary in practice.

Heretofore, so far as I am aware the concaves opposed to the conoidal crushing head a, have been inclined with relation thereto at an acute angle as in my patents hereinbefore referred to, the concavo-conoidal wearing surface thus formed necessitating the use of concave sectors which are of truncated V-shape in general outline, the top edges being wider than the bottom edges. The maximum of wear on such sectors is at and adjacent to their lower edges, so that when the latter are reduced by wear to a prescribed degree the sectors have to be removed and replaced by new ones. I obviate this difficulty in the present case by making the concave surface of the crushing chamber b, cylindrical, it being built up of a series of concave sections, s, each forming a part or division of the cylinder. Hence, when the lower edge of the concave cylinder is worn to the limit the concaves s, may be reversed in position to bring the unworn edge adjacent to the lower portion of the crushing head a. The concave plates s, are preferably of manganese steel, paneled out in the back and fitted with cast-iron filler blocks, as is customary with the inclined "concaves" heretofore used in conjunction with gyratory crushers of this class.

The cover plate C, is formed with a cap c^x, which may be removed to effect the vertical adjustment of the gyratory shaft A, by means of the nut a'; and it is formed with a plurality of openings c^6, c^6, some of which may be used for feed and some for observation, covers c^7, being provided for those not in actual use, and since the cover plate C, is otherwise of continuous, closed structure it is obvious that the crushing chamber b, may be practically isolated and sealed above during the operation of the apparatus so as to prevent the escape of dust, etc., in that

direction. The ribs c^3, on the cover plate C, reinforce and sustain the hub c, upon which the gyratory shaft A, is suspended.

What I claim as my invention and desire to secure by Letters Patent is:

1. In crushing apparatus of the character designated, a crushing chamber, a closure plate provided with feed openings and closures and covering the upper part thereof and made with a hub the lower interior portion of which is formed with an inturned annular bearing shoulder constituting the fulcrum for the gyratory shaft, said gyratory shaft, a nut collar on the upper extremity thereof, and a bearing sleeve interposed between said nut collar and said inturned bearing shoulder on the closure plate, for the purpose described.

2. In crushing apparatus of the character designated, a crushing chamber, a closure plate provided with feed openings and closures and covering the upper part thereof and made with a hub the lower interior portion of which is formed with an inturned annular bearing shoulder constituting the fulcrum for the gyratory shaft, said gyratory shaft, a nut collar on the upper extremity thereof, a bearing sleeve interposed between said nut collar and said inturned bearing shoulder on the closure plate, and a cap fitted on the top of said hub and protecting said nut collar and bearing sleeve, for the purpose set forth.

3. In crushing apparatus of the character designated, a crushing chamber, a closure plate provided with feed openings and closures and covering the upper part thereof made with a feed opening and having a hub the lower interior portion of which is formed with an inturned annular bearing shoulder constituting the fulcrum for the gyratory shaft, said gyratory shaft, a nut collar on the upper extremity thereof, and a bearing sleeve interposed between said nut collar and said inturned bearing shoulder on the closure plate, for the purpose described.

4. In crushing apparatus of the character designated, a crushing chamber, a closure plate provided with feed openings and closures and covering the upper part thereof and formed with a plurality of feed openings and closures therefor and with a hub the lower portion of which is made with an inturned annular bearing shoulder constituting the fulcrum for the gyratory shaft, said gyratory shaft, a nut collar on the upper extremity thereof, and a bearing sleeve interposed between said nut collar and said inturned bearing shoulder on the closure plate, for the purpose described.

5. In crushing apparatus of the character designated, a crushing chamber, a closure plate provided with feed openings and closures and covering the upper part thereof and formed with a plurality of feed openings and closures therefor and with a central hub from which project radially reinforcing ribs positioned between said feed openings, the lower interior portion of said hub being made with an inturned annular bearing shoulder constituting the fulcrum for the gyratory shaft, said gyratory shaft, a nut collar on the upper extremity thereof, and a bearing sleeve interposed between said nut collar and said inturned bearing shoulder on the closure plate, for the purpose described.

6. In crushing apparatus of the character designated, the combination with the crushing chamber and gyratory shaft, of a closure plate formed with feed openings and closures and covering the upper parts of said crushing chamber and said gyratory shaft, for the purpose described.

JOSEPH E. KENNEDY.

Witnesses:
GEO. WM. MIATT,
DOROTHY MIATT.