(No Model.) 2 Sheets—Sheet 1.

G. W. MEIGS & E. LEYDEN.

CRANK MECHANISM.

No. 473,942. Patented May 3, 1892.

Fig. 2.

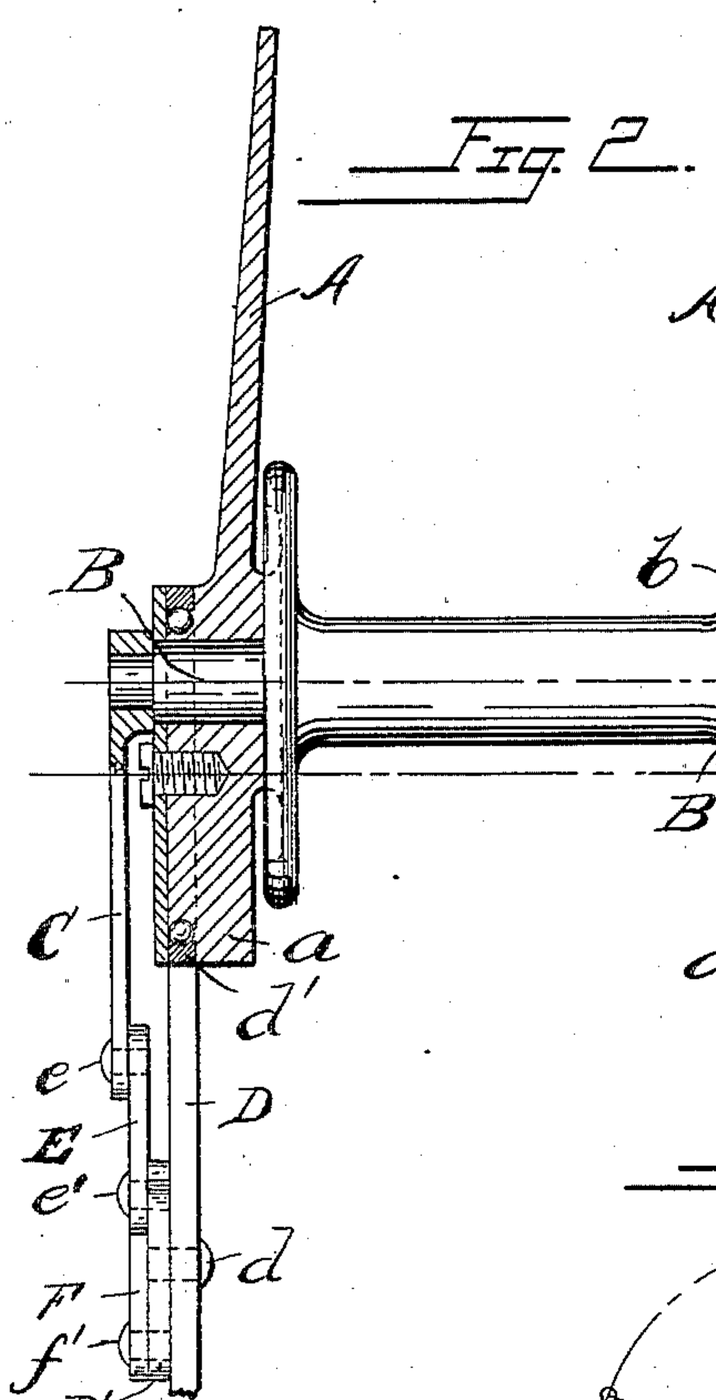


Fig. 1.

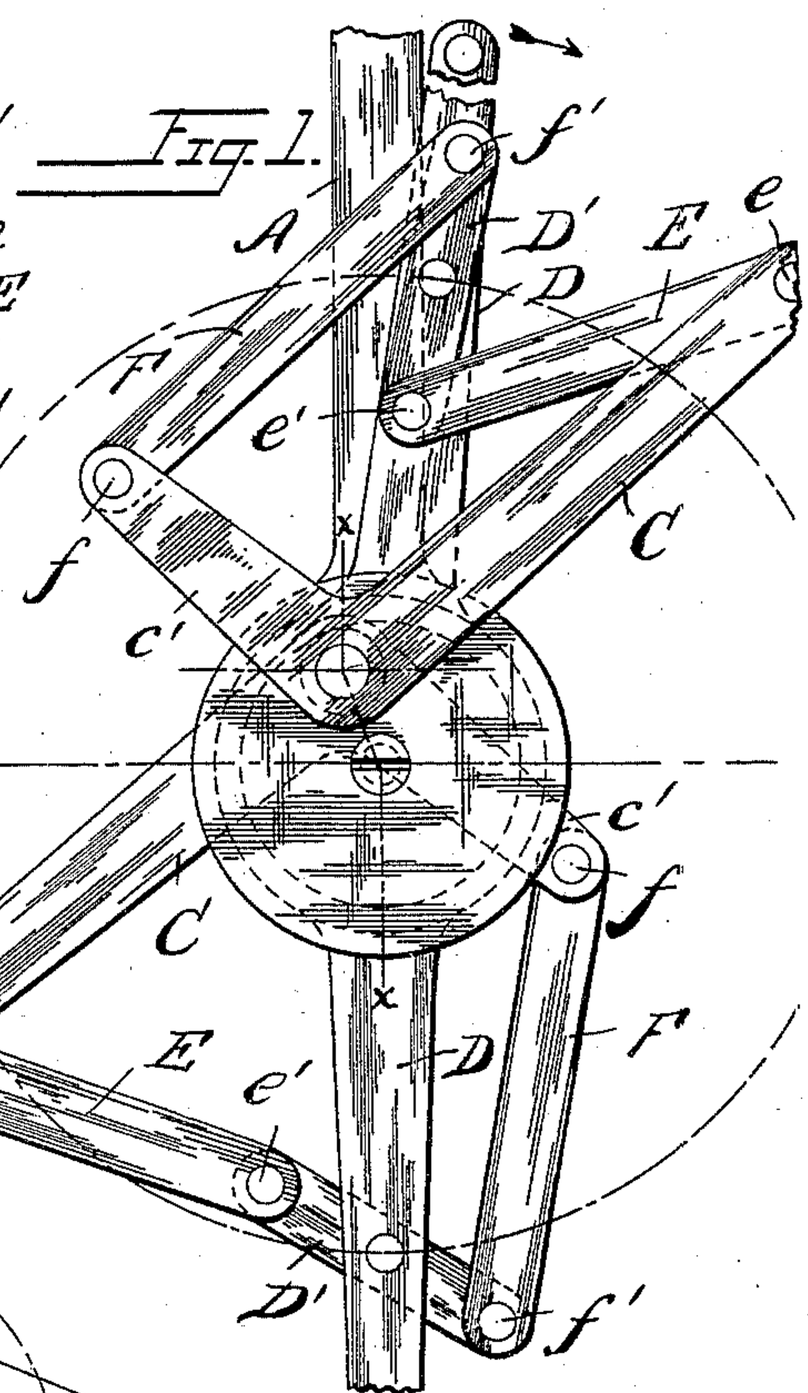


Fig. 3.

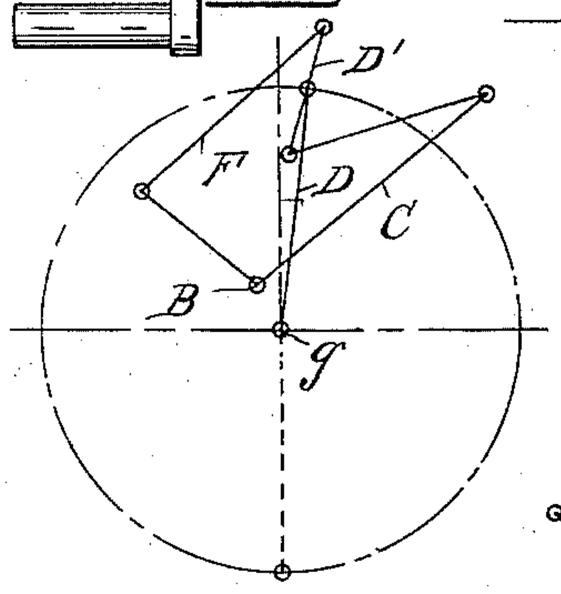


Fig. 4.

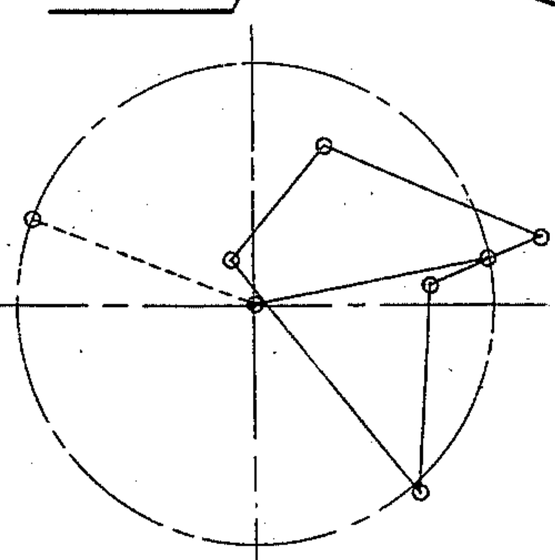


Fig. 5.

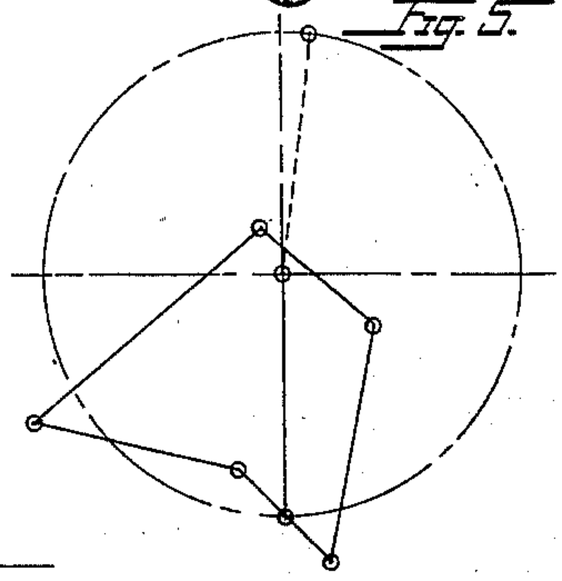
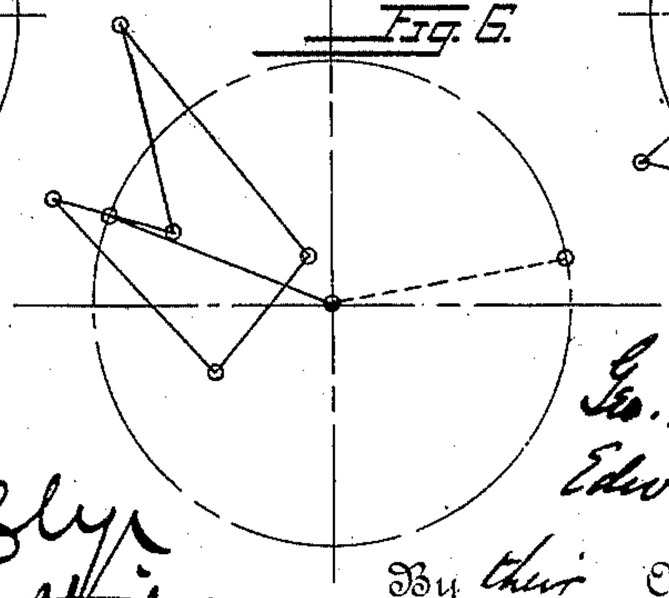


Fig. 6.



Witnesses

E. A. Tebbutt

Adam L. Otterbein

Geo. W. Meigs } Inventors

Edward Leyden

By their Attorney J. H. Stallworth

(No Model.) 2 Sheets—Sheet 2.

G. W. MEIGS & E. LEYDEN.

CRANK MECHANISM.

No. 473,942. Patented May 3, 1892.

Fig. 7.

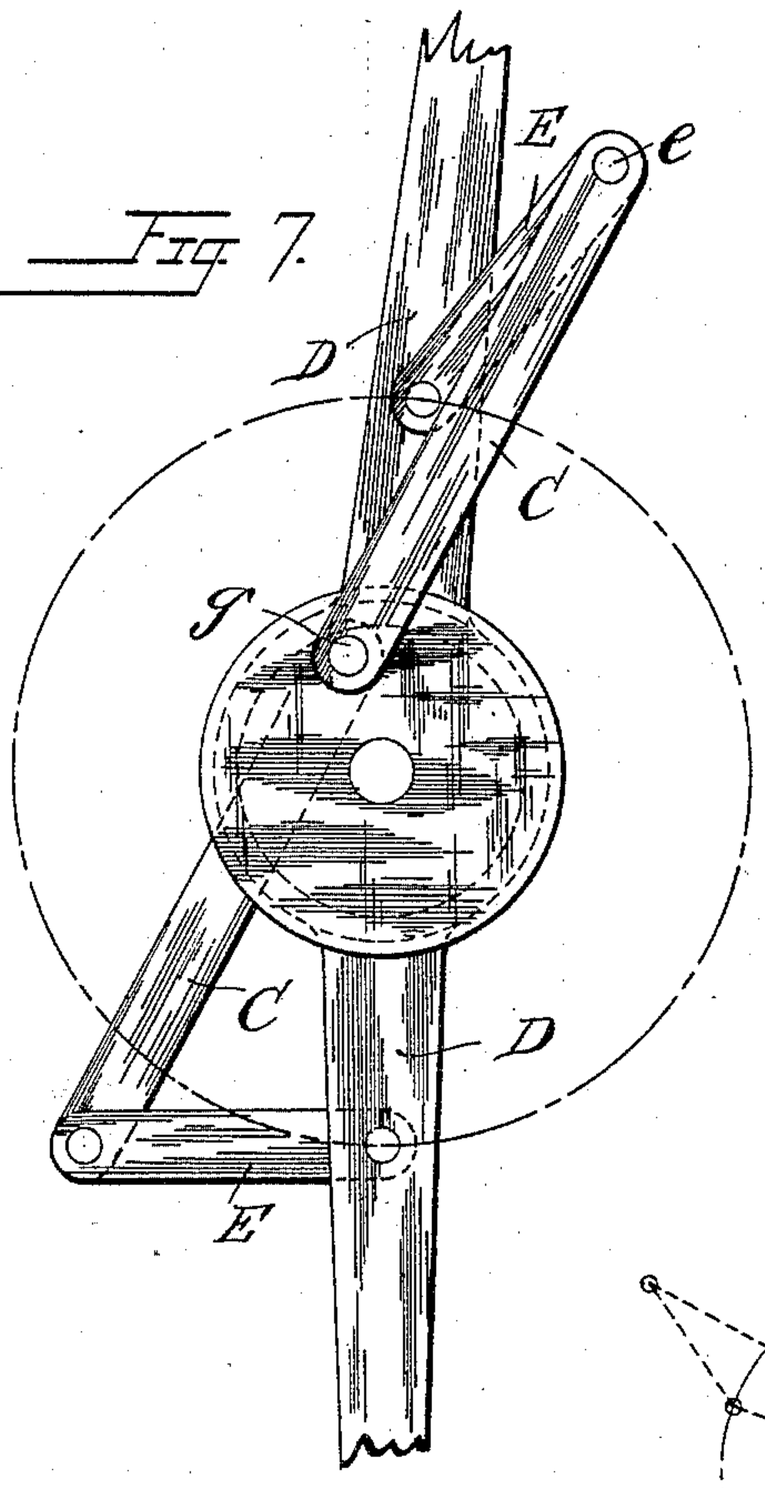


Fig. 8.

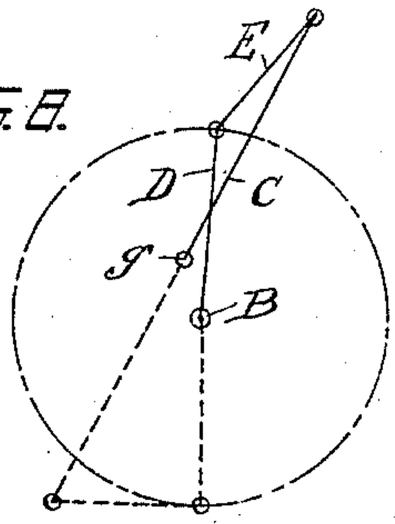


Fig. 9.

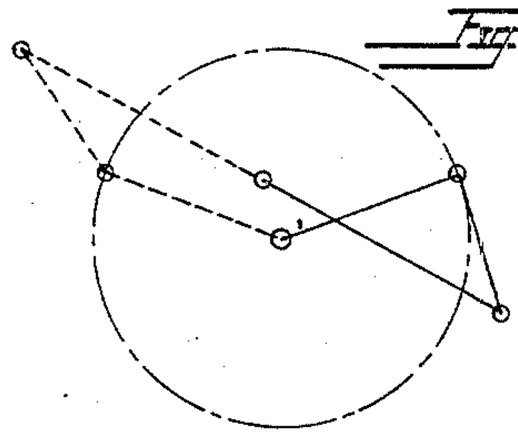


Fig. 10.

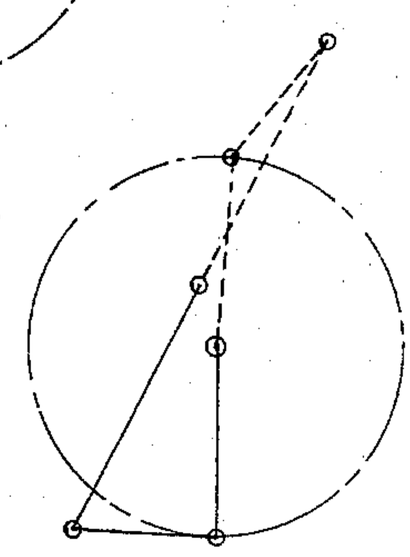
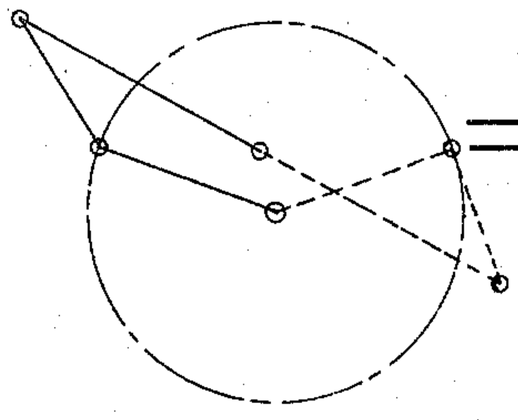


Fig. 11.



Witnesses

E. D. A. Telly

Adam L. Otterbein

Geo. W. Meigs
Edward Leyden
} Inventors

By their Attorney W. H. Blackstock

UNITED STATES PATENT OFFICE.

GEORGE W. MEIGS AND EDWARD LEYDEN, OF READING, PENNSYLVANIA.

CRANK MECHANISM.

SPECIFICATION forming part of Letters Patent No. 473,942, dated May 3, 1892.

Application filed July 31, 1891. Serial No. 401,296. (No model.)

To all whom it may concern:

Be it known that we, GEORGE W. MEIGS and EDWARD LEYDEN, citizens of the United States, residing at Reading, in the county of Berks, State of Pennsylvania, have invented certain Improvements in Crank Mechanisms, of which the following is a specification.

This invention relates particularly to crank mechanisms in which the crank-shaft is rotated by power strokes applied in one direction only and alternately on two cranks—as, for instance, in bicycles or other velocipedes. In crank mechanisms of this class the length of the crank is necessarily limited, so as to provide a convenient swing for the operator, and the leverage at which the power is applied is correspondingly limited.

The object of our invention is to provide a simple and practical mechanism by means of which an increased leverage will be secured during the power stroke of the operator without increasing the total movement of the swing, and at the same time to give a "lead" to the beginning of each power stroke which will avoid any "dead-centers." Heretofore eccentrically-pivoted levers have been used to operate upon the cranks for the purpose of increasing the leverage during the power stroke; but they have not been so arranged as to dispense with the use of slotted connections, as in the improved construction hereinafter described, the novel features of which are pointed out in the subjoined claims.

Figure 1 is a side elevation, and Fig. 2 a partial cross-section, of a portion of a bicycle having our improvements applied thereto. Figs. 3, 4, 5, and 6 are diagrams showing the relative positions of the cranks and their operating-levers at four different points in the stroke. Fig. 7 shows a modified construction, and Figs. 8, 9, 10, and 11 show the relative positions of the operating-levers and the fixed cranks at different points with this arrangement.

Referring to Figs. 1 and 2, A A represent the front forks, *a a* the fork ends, B the axle, and *b* the hub, of a bicycle. Crank C, formed with supplemental arms *c'*, are secured to the end of the axle in the usual manner; but instead of being provided with pedals by means of which to apply rotating power thereto each is operated by means of an eccentrically-pivoted lever D, to which the power is applied. To each operating-lever D is pivoted at *d* a rocking arm D', one end of which is connected at *e'* by a link E with the main crank-arm C, while its opposite end is connected at *f'* to another link F, pivoted also at *f* to the supplemental crank-arm *c'*. The lever D is formed with a circular yoke portion *d'*, which rides upon the periphery of the projecting portion *a* of each forked end, and is retained in place thereon by a plate *g'* and a central screw *g*. As illustrated, this center *g* is forward of the axle-center and below it. The operation as thus arranged is clearly indicated in Figs. 3, 4, 5, and 6. In these figures the cranks C and operating-levers D are indicated by mere lines, those on the opposite side of the wheel being dotted. The circle made by the pin *d* around the center *g* may represent the path of the operating-force.

In Fig. 3 the positions of the parts correspond with those in Fig. 1. It will be noticed that the "near" lever D is sufficiently ahead of the vertical line of the far lever on the opposite end of the axle to permit a lead and overcome the dead-center. It will be noticed, also, that the center of the axle B lies between the pin *d* of the lever D and the center *g* of the latter, around which the pin *d* rotates at a fixed distance, and that it is therefore acting upon the axle at less than the average leverage, though not at the minimum.

In Fig. 4 the axle is represented as having made a quarter-turn, and it will be seen that the pin *d* has moved over considerably less than one-quarter of its circular path and that it is now operating at about its average leverage, being nearly equally distant from the axle-crank B and center *g*. The rock-arm D, turning upon the center *d*, has increased the distance between said center and the end *e* of the crank C, the crank-arm *c'* serving as a fulcrum through the medium of the link F.

In Fig. 5 the near lever D is in the vertical dependent position in which the far lever is shown to be in Figs. 1 and 3, while the far lever has in its turn assumed the position of lead. It will be noticed that this has been accomplished by reversing the angle of the levers with relation to each other, the far le-

ver turning sufficiently faster to gain the position of lead while the near lever has been acting at greatly-increased leverage.

In Fig. 6 the near lever is on its idle return movement, the rotary power being applied to the opposite crank and its leverage is quickly reduced to the minimum. In the last quarter-turn, which brings it back to the position of lead shown in Figs. 1 and 3, the point of minimum leverage is passed and the power stroke begins again with an increasing leverage, as already described.

The advantage of operating the crank through the medium of eccentrically-pivoted levers consists in increasing the average leverage during the power-stroke at the expense of the idle return stroke. It is comparatively unimportant whether the maximum leverage be exerted during the earlier or later portion of the power-stroke, and though we have shown the greater leverage in the later portion of the stroke, this may be readily changed, if desired, by placing the center *g* above instead of below the crank-center.

In the modified construction shown in Fig. 7 the arrangement has been changed so as to secure the greater leverage during the earlier portion of the stroke. The rocking arm D′ has also been dispensed with and substantially the same effect produced as with the former construction, as will be seen upon inspection of the diagram, Figs. 8, 9, 10, and 11, corresponding with Figs. 3, 4, 5, and 6 of the previous construction.

In either of the constructions shown it will be noticed that at the end of a power-stroke upon one lever the opposite lever has been given an amount of lead, which throws it somewhat past the dead-center and into position to be at once operated upon in the same direction, thus permitting a continuous exercise of effective rotating-power upon one lever or the other. There being no sliding connections between the parts, the bad effect of dirt which would otherwise tend to make the mechanism practically unsatisfactory is not felt.

Having thus fully described our invention, we do not limit ourselves to the particular constructions specifically set forth; but

What we claim is—

1. In a crank mechanism for velocipedes or equivalent purposes, the combination, with cranks fixed to the rotary shaft, of eccentrically-pivoted rotary operating-levers and links pivotally connected at opposite ends to said levers and cranks, respectively, substantially as and for the purpose set forth.

2. In a crank mechanism for velocipedes or equivalent purposes, the combination, with cranks fixed to the rotary shaft, of eccentrically-pivoted rotary operating-levers, rocking arms pivoted to said operating-levers, and links F and F, connecting the opposite ends of said rocking-arms to the fixed cranks, substantially as and for the purpose set forth.

In testimony whereof we affix our signatures in presence of two witnesses.

GEORGE W. MEIGS.
EDWARD LEYDEN.

Witnesses:
JAMES A. O'REILLY,
H. A. ZIEBER.