

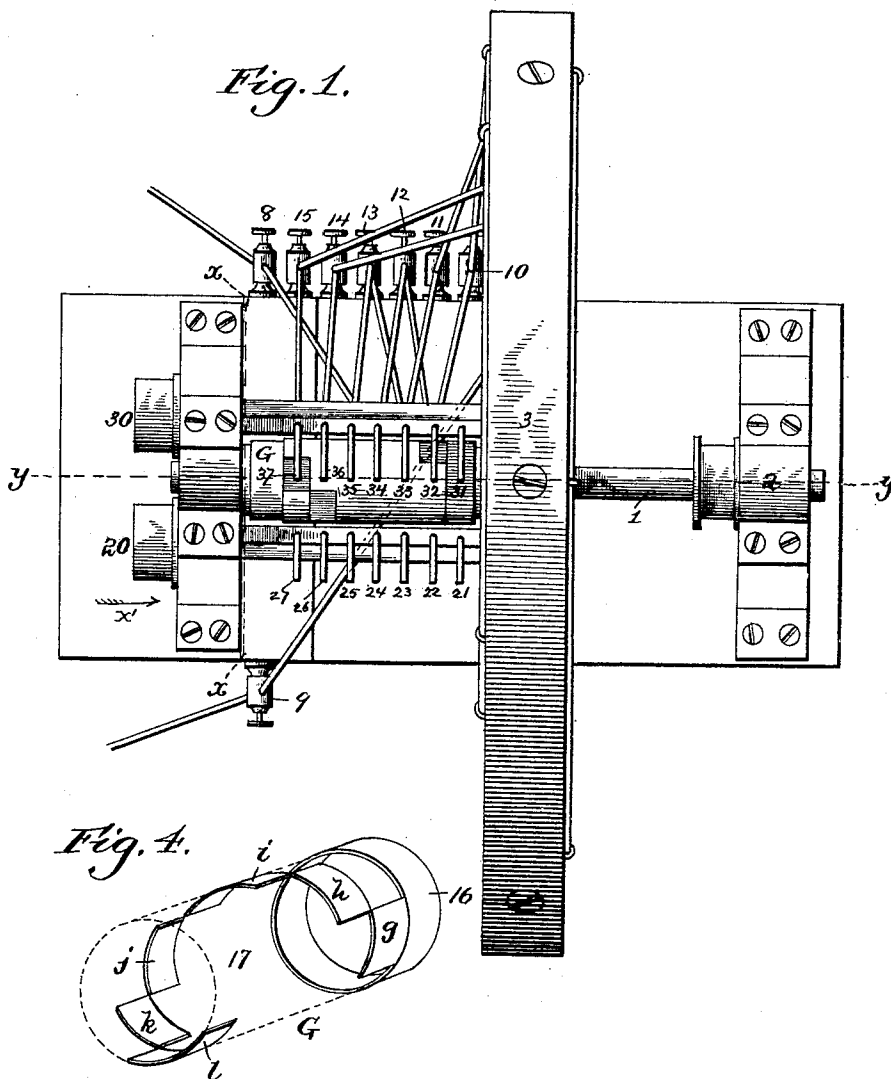
(No Model.)

4 Sheets—Sheet 1.

F. YEISER.
ELECTRIC MOTOR.

No. 477,483.

Patented June 21, 1892.



Witnesses:
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H. J. Bernhard

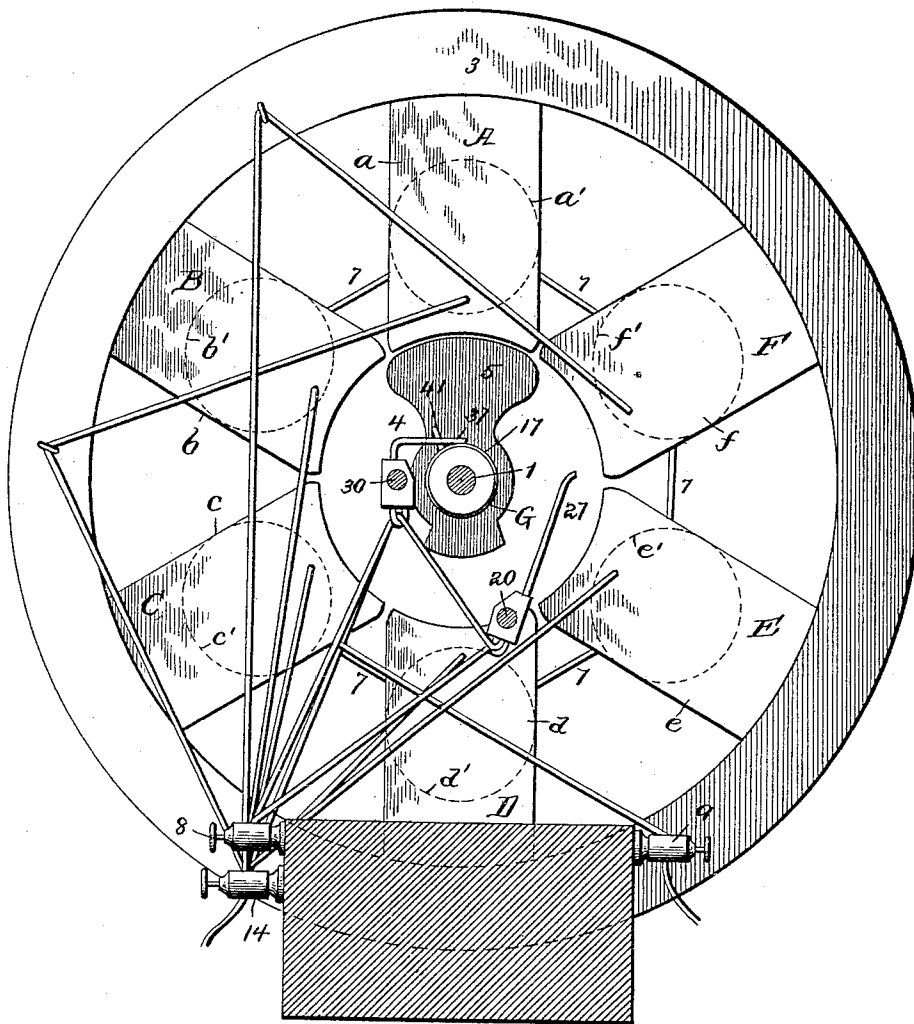
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Fig. 2.



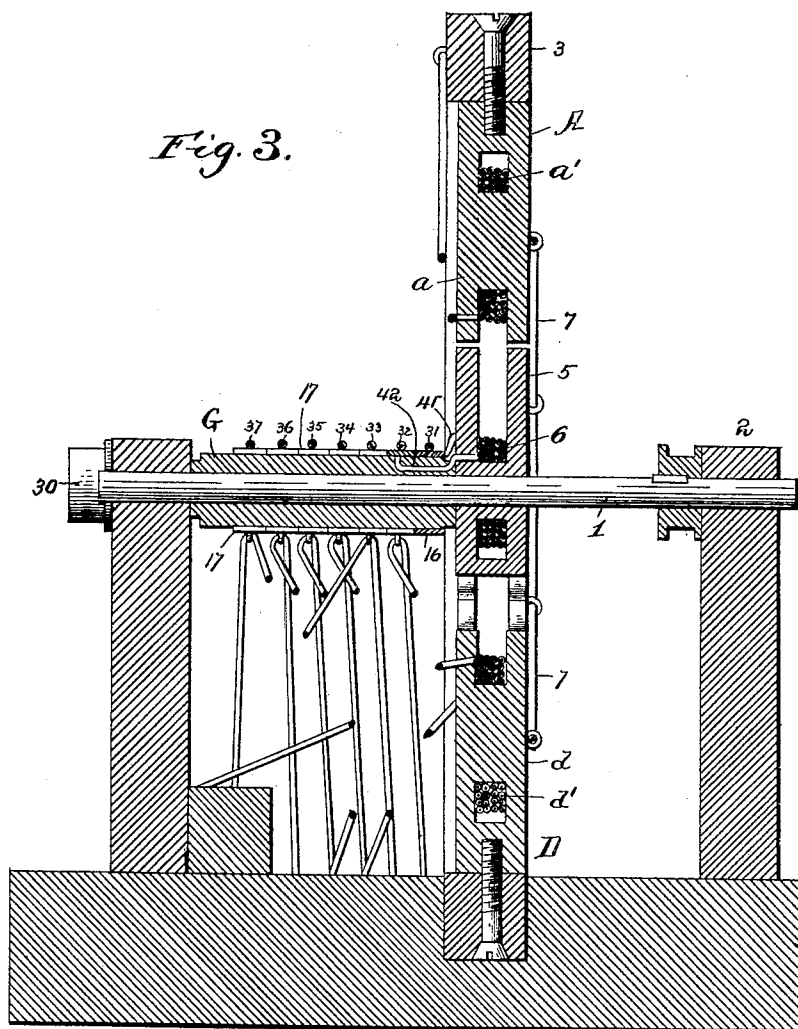
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Fig. 5.

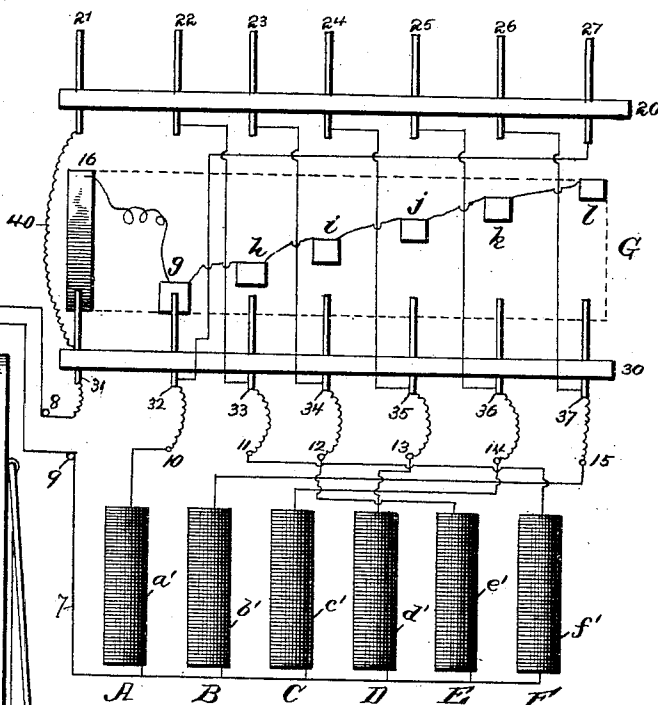
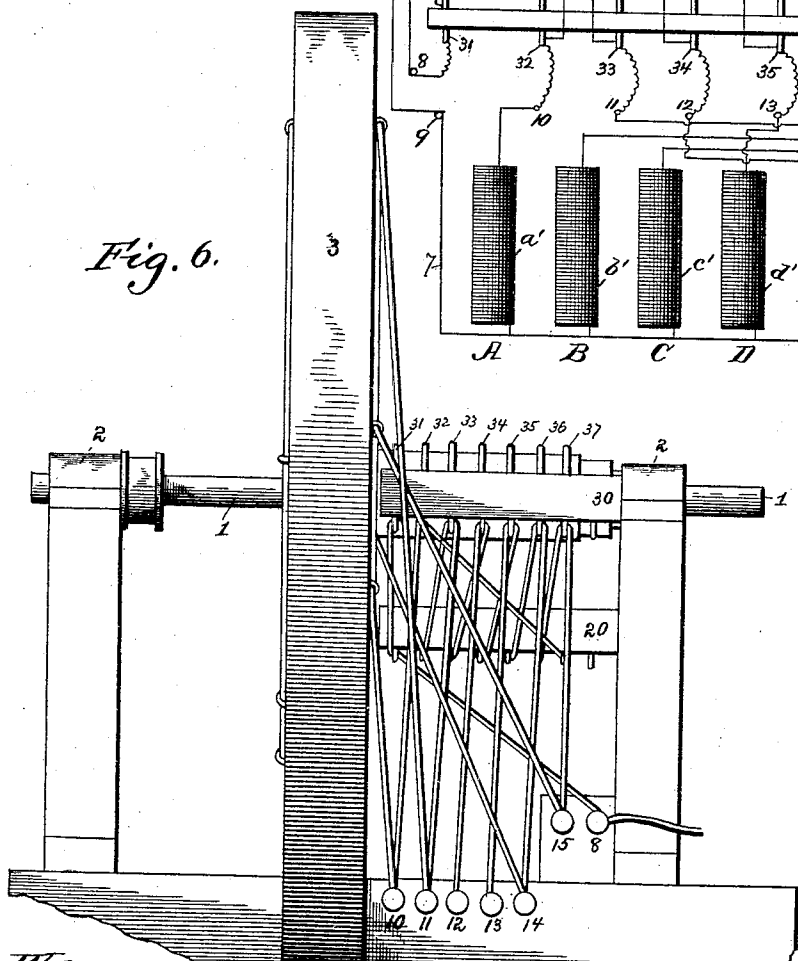


Fig. 6.



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UNITED STATES PATENT OFFICE.

FREDERICK YEISER, OF TAMPA, FLORIDA.

ELECTRIC MOTOR.

SPECIFICATION forming part of Letters Patent No. 477,483, dated June 21, 1892.

Application filed September 22, 1891. Serial No. 406,458. (No model.)

To all whom it may concern:

Be it known that I, FREDERICK YEISER, a citizen of the United States, and a resident of Tampa, in the county of Hillsborough and State of Florida, have invented certain new and useful Improvements in Electric Motors; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to an improved electric motor constructed and designed to utilize a current from a battery or other source of electric energy to rotate an armature-shaft for power purposes and which can be manipulated to reverse the direction of rotation of said shaft by the simple adjustment of the commutator-brushes.

With these ends in view the invention consists in the combination, construction, and arrangement of parts, which will be hereinafter described and claimed.

In the accompanying drawings, Figure 1 is a plan view of my improved electric motor. Fig. 2 is a side elevation, partly in section, on the plane indicated by the dotted line xx of Fig. 1, looking in the direction indicated by the arrow x' . Fig. 3 is a vertical longitudinal sectional view through the machine on the line yy of Fig. 1. Fig. 4 is a detail detached view of the commutator. Fig. 5 is a diagrammatic view illustrating the circuits, and Fig. 6 is a front elevation.

Like numerals and letters of reference denote corresponding parts in the several figures of the drawings.

1 designates the rotary shaft or arbor of the motor, which is arranged horizontally and is journaled at or near its ends in suitable bearings on standards or pillow-blocks 2 2, which are fixed to a base, as is usual. This horizontal rotary shaft passes or extends through the center of a ring-like frame 3, arranged in a plane at right angles to the length of the shaft and suitably fixed or supported on the base, said ring-like frame being made of metal or a non-conducting substance, as wood, or of any other material suitable for the purposes of this invention. Within the ring-like frame are the field-magnets A B C D E F, any suitable number of which may be

employed, although I will only show and describe six of them for the purposes of this specification, the U-shaped pole-piece of each field-magnet being fixed or secured at its yoke end to the ring-like frame in any suitable manner. The field-magnets are spaced equidistant around the inside of the ring-like frame, with the inner pole ends of the U-shaped pole-pieces $a b c d e f$ terminating a suitable distance from the arbor or shaft, so as to form a central opening of such size as to permit the armature 4 to rotate freely in said opening and allow the pole ends of its U-shaped pole-piece 5 to pass very close to the pole ends of the pole-pieces of the field-magnets, but without touching the same.

The field-magnet coils $a' b' c' d' e' f'$ are coiled around the cores of the magnets, which are secured to the sides or bars of the pole-pieces of the respective field-magnets within the pole ends of said pole-pieces, and one end of each helix or coil is connected by a conductor 7, which connects the field-magnet coils in multiple, while the other ends of said field-magnet coils are conducted and fastened to a series of binding-posts 10 11 12 13 14 15, as shown in Figs. 1, 2, and 5.

The pole-piece 5 of the armature is suitably fixed on the shaft 1 in the vertical plane of the field-magnets, and between the sides or bars of said pole-piece 5 is the core around which is wrapped the coil or helix 6 of the armature, the ends or terminals of the coil or helix 6 being extended through the U-shaped pole-piece 5 and connected to the commutator in the manner presently described.

On the shaft or arbor 1 is secured a cylinder G, arranged at one side of the armature and in a different vertical plane from the armature and field-coils, and on this cylinder is the commutator, consisting of the single continuous annulus or band 16 and the spiral-shaped plate 17. The annulus or band is arranged at the inner end of the cylinder in close juxtaposition to the armature, but out of electrical contact with the same, and the spiral-shaped plate extends entirely around the cylinder, with its terminals in different vertical planes and out of line with each other. The spiral plate 17 is made up of a series of square or polygonal flat pieces or sections $g h i j k l$, arranged in different vertical planes

and with their corners in electrical connection, the sections of the commutator-plate 17 corresponding in number to the field-magnets. The inner end of the spiral plate 17 does not
 5 contact with the single band or annulus 16, and it is insulated therefrom by suitable insulating material. It will be seen that the connected sections of the spiral commutator-plate extend entirely around the cylinder and
 10 that the end pieces *g l* of said spiral plate 17 are at opposite ends of the cylinder, although this is not essential; but it is essential that the different pieces of the commutator-plate 17 shall lie in different vertical planes and out
 15 of line with each other longitudinally of the cylinder.

On opposite sides of the commutator I arrange the rock-shafts 20 30, each of which carries a series of brushes, which correspond
 20 in number to the field-magnets, the commutator-brushes on the rock-shaft 20 being designated by the numerals 21 22 23 24 25 26 27 and those on the rock-shaft 30 by the numerals 31 32 33 34 35 36 37.

25 The brushes on the shafts are connected with the field-magnet coils in the following manner: The coil *a'* of the magnet A is connected by the conductor to the binding-post 10, thence to the brush 32 of the rock-shaft
 30 30, thence to the brush 27 of the rock-shaft 20. The magnet B has its coil connected with the post 15 and the brushes 37 and 26 of the shafts 30 20, the coil *c'* of the magnet C with the post 14 and the brushes 36 and 25 of the
 35 shaft 30 20, the coil *d'* of the magnet D with the post 13 and the brushes 35 and 24 of the shafts 30 20, the coil *e'* of the magnet E with the post 12 and the brushes 34 23 of the shafts 30 20, and the coil *f'* of the magnet F with
 40 the post 11 and the brushes 33 and 22.

The brushes 22, 23, 24, 25, 26, and 27 of the rock-shaft 20 are adapted to contact successively with the sections *g, h, i, j, k, and l* of the spiral plate 17 of the commutator, and likewise the brushes 32, 33, 34, 35, 36, and 37 of the rock-shaft 30; but the brushes 21 and 31
 45 of the shafts 20 30 are designed to have electrical contact with the single annulus or band 16 of the commutator F. These brushes 21 31
 50 of the rock-shafts are connected by a conductor 40 to the binding-post 8 and to one of the poles of a battery or other source of electric energy, while the conductor 7 of the field-magnet coils is connected to the post 9 and to
 55 the other pole of the battery or other source of energy.

One end of the helix 6 of the armature is connected by a bare-metal conductor 41 with the single annulus or band 16 of the commutator, while the other end of said helix 6 is
 60 connected by a conductor 42 with the spiral-shaped plate 17 of said conductor.

It is evident that when one rock-shaft is adjusted to throw its brushes away from the commutator and the other shaft is adjusted
 65 to bring one brush in contact with the band or annulus 16 and its other brushes success-

ively in contact with the sections of the spiral plate the current of electric energy from a suitable source will flow through the conductor 7, one of the coils or helices of the field-
 70 magnets, through said field-magnet coil to the brush-bearing on the section of the spiral commutator-plate 17, thence through the conductor 41 to the coil or helix of the armature, 75
 through the latter to the single band or plate 16 of the commutator, and finally through the brush-bearing on said commutator band or annulus back to the battery, thus completing the circuit and energizing the pole-piece of
 80 the field-magnet through which the current flows. As the commutator rotates with the shaft and the sections of the spiral plate make contact with the successive brushes on the rock-shaft the field-magnets are in turn en-
 85 ergized and then demagnetized to insure rotation of the armature, from the shaft of which power can be taken for running machinery.

In operation, if the pole ends of the armature pole-piece 5 are brought opposite to the
 90 pole-piece of the field-magnet A and the rock-shaft 20 is turned so as to bring its brush 21 into contact with the band 16 and its brush 26 in contact with the piece *k* of the commutator-plate 17, the brush 26 of the shaft 20 will
 95 be connected with the field-coil *b'* of the field-magnet B, as heretofore described. Now as a current of electric energy passes from the battery through the conductor 7 it will energize the coil of the field-magnet B, and the
 100 magnetic force of the pole-piece of said magnet B attracts the armature and causes it to turn, and thus partially turn the shaft, and when the armature is opposite, or nearly so, to the pole-piece of the field-magnet B the
 105 rotation of the commutator will bring the section *j* of the plate 17 opposite to the brush 25, which is connected with the field-coil *c'* of the field-magnet C, thus demagnetizing the field-magnet B and energizing the field-magnet C,
 110 which in turn attracts the armature and insures continued rotation of the shaft or arbor. The continued rotation of the commutator causes the sections of the spiral plate 17 to successively contact with the brushes in
 115 shaft 20 and cause the field-magnets to be energized successively to attract the armature, and thus the shaft is rotated in one direction. To reverse the motor, or, more properly speaking, the direction of rotation of the shaft,
 120 it is only necessary to turn the rock-shaft 20 to bring its brushes out of contact with the commutator and to adjust the other rock-shaft 30 to throw its brush 31 into contact with the band or annulus 16 and one of its
 125 other brushes in contact with one of the sections of the spiral plate 17 of the commutator. Assuming the pole-piece of the armature to be opposite to the pole-piece of the field-magnet A, the brush 31 of the rock-shaft 30 will
 130 contact with the band 16 and the brush 33 contacts with the section *h* of the spiral plate 17. The brush 33 being in circuit with the field-magnet F, the latter is energized by the

passage of the current through it and attracts the armature, and as the commutator rotates the sections of its spiral plate successively make contact with the brushes of the rock-shaft 30, which causes the successive field-magnets to be energized and then demagnetized, so that the armature is attracted by such successive magnetization and the shaft is turned in the reverse direction to that in which it was first turned.

I am aware that changes in the form and proportion of parts and details of construction and arrangement of parts herein shown and described as an embodiment of my invention may be made, and I therefore reserve the right to make such alterations and modifications as fairly fall within the scope of my invention.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In an electric motor, the combination, with the field-magnets and the armature, of the commutator having an annulus, and the spiral plate connected with the terminals of the helix or coil of the armature, and the commutator-brushes included in the circuit of the field-magnets, one brush adapted to have continuous contact with the commutator-band and the other brushes of the series adapted to have contact successively with different parts of the spiral plate during each rotation of the commutator, substantially as described.

2. In an electric motor, a commutator comprising an annulus or band connected with the armature-helix, a spiral plate insulated from the band and having its sections in different vertical planes and out of line longitudinally with each other along the armature-shaft, and two sets of commutator-brushes included in the circuit of the field-magnets and adapted to be independently brought into contact with the commutator, substantially as described.

3. In an electric motor, a commutator consisting of an annulus or band connected with one end of the armature-coils, a spiral plate connected with the other end of the armature-coils and having its connected sections arranged in different vertical planes and out of line longitudinally of the armature-shaft, and the brushes, one of which is connected with one pole of a generator and bears continuously on the annulus and the remaining brushes of the series being connected with the field-magnets and adapted to have contact successively with the different sections of the spiral plate, as and for the purpose specified.

4. In an electric motor, the combination, with the field-magnets and the armature, of the commutator having its band and spiral plate connected with the respective terminals of the armature-coils and two sets of brushes adapted to be independently brought into service, each set of brushes having one brush arranged to have contact continuously with the band and the other brushes of the series connected with the field-magnet coils, substantially as and for the purpose specified.

5. In an electric motor, the combination of the field-magnets having the coils connected by a common conductor leading from a primary generator, an armature arranged to rotate close to the pole-pieces of the field-magnets, the commutator having its band and spiral plate connected with the ends of the armature-helix, and two rock-shafts carrying two series of commutator-brushes arranged in circuit with the field-magnet coils and adapted for operation in the manner and for the purposes set forth.

In testimony whereof I affix my signature in presence of two witnesses.

FREDERICK YEISER.

Witnesses:

MORRIS YEISER,
G. S. PETTY.