H. O. EIANE.

FLYING MACHINE.

APPLICATION FILED JUNE 1, 1909.

964,957.

Patented July 19, 1910.

3 SHEETS—SHEET 1.

Fig. 1.

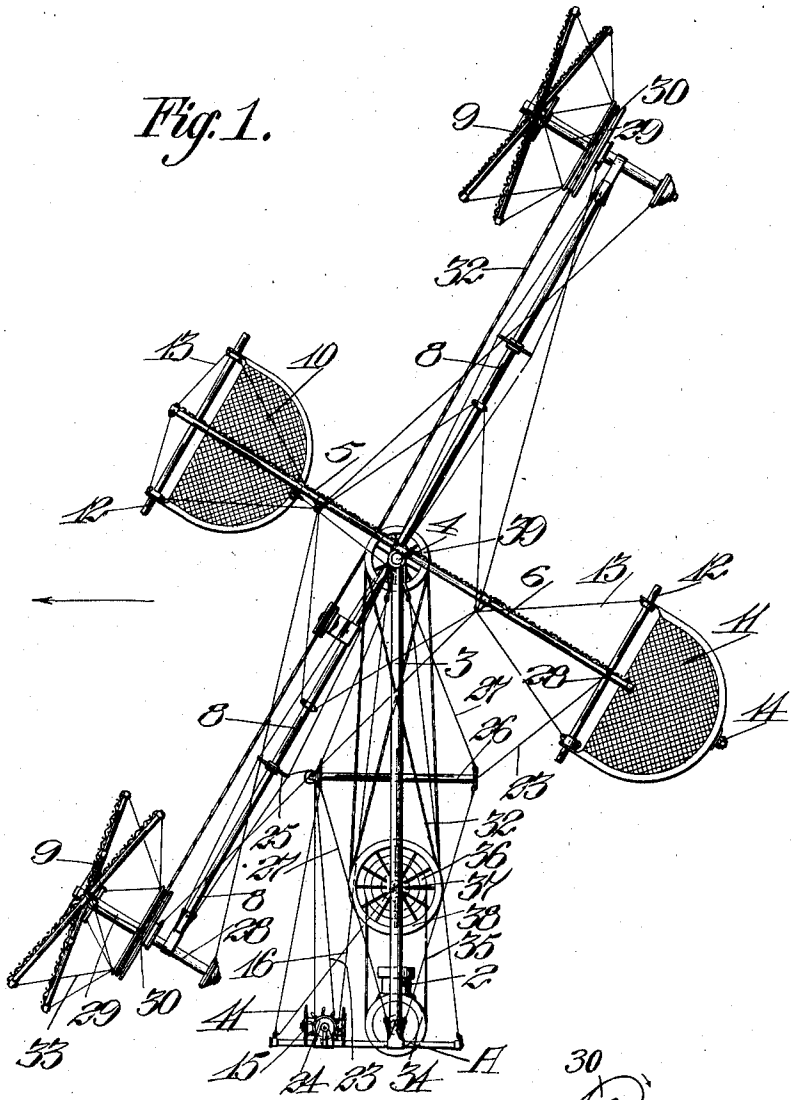
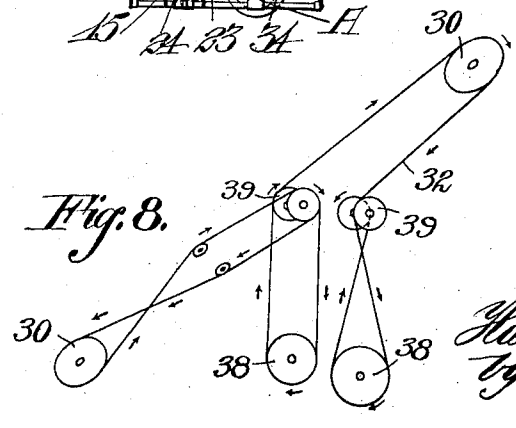


Fig. 8.



Witnesses.

R. Eastberg.

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his Atty.

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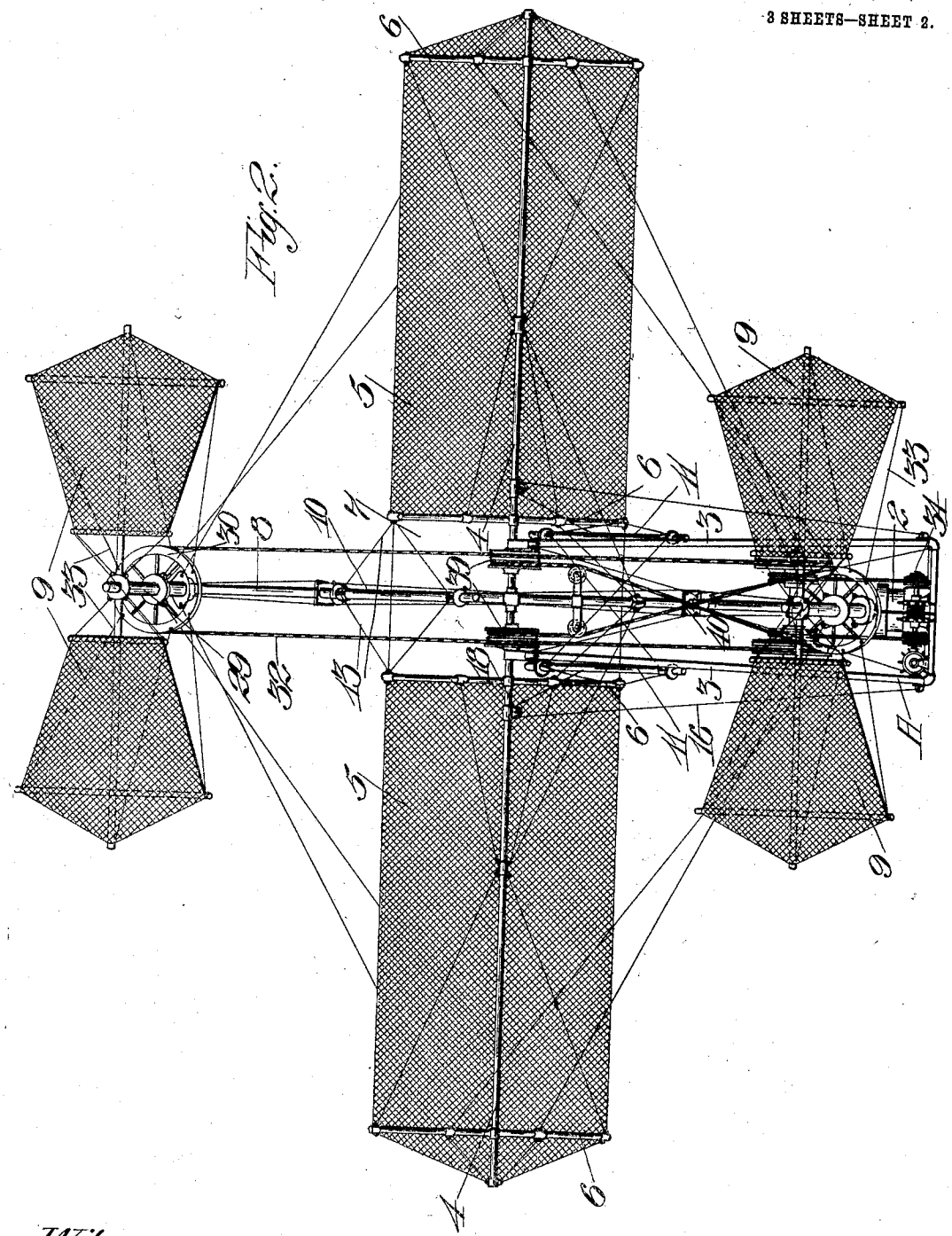
3 SHEETS—SHEET 2.

Fig. 2.



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3 SHEETS—SHEET 3.

Fig. 3.

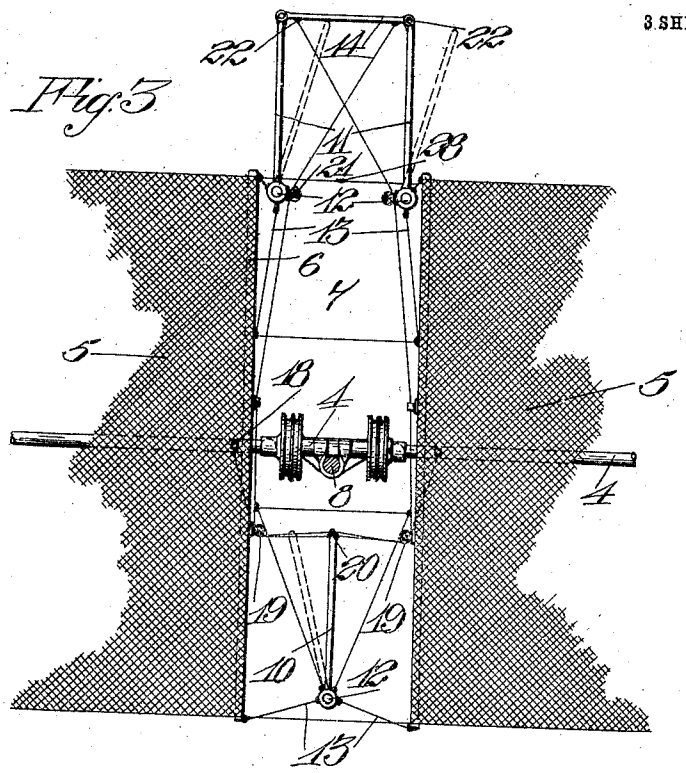

Fig. 4.

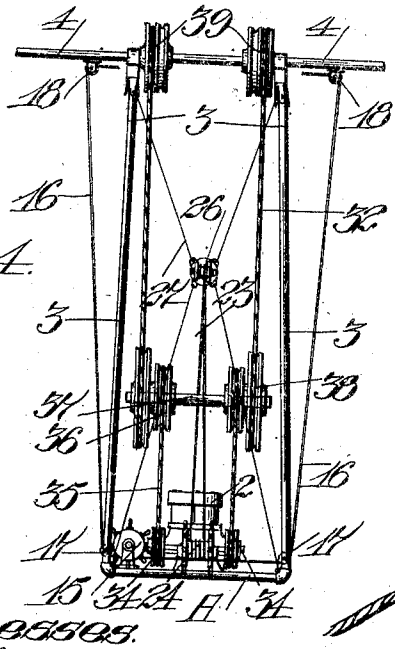

Fig. 5.

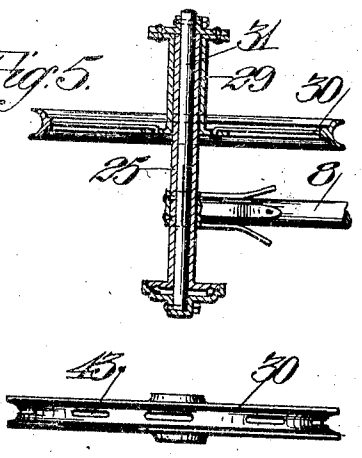

Fig. 7.

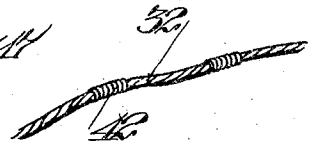

Fig. 6.

Witnesses.

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UNITED STATES PATENT OFFICE.

HALVOR OLSEN EIANE, OF THE UNITED STATES NAVY.

FLYING-MACHINE.

964,957. Specification of Letters Patent. Patented July 19, 1910.

Application filed June 1, 1909. Serial No. 499,391.

To all whom it may concern:

Be it known that I, HALVOR OLSEN EIANE, United States Navy, citizen of the United States, residing in the city and county of San Francisco and State of California, have invented new and useful Improvements in Flying-Machines, of which the following is a specification.

My invention relates to aerial machines, and pertains especially to flying-machines of the heavier-than-air class.

One of the chief objects of the invention is to provide a simple, practical flying-machine which can be made to lift itself directly from the deck of a ship or other limited area.

In most flying-machines it is necessary for the machine to get a flying start for a considerable distance, the ascent from the ground being gradual, and the height to which the machine can rise being limited. I have devised a machine which can ascend almost directly from the spot where it rests.

The invention consists of the parts and the construction and combination of parts as hereinafter more fully described and claimed, having reference to the accompanying drawings, in which—

Figure 1 is a side elevation of my flying machine. Fig. 2 is a front view of same. Fig. 3 is a plan view, broken away, showing the steering rudders and connections. Fig. 4 is a detail of the lower frame and mechanism. Fig. 5 is a section of the propeller shaft. Fig. 6 shows one of the pulleys. Fig. 7 shows how the flexible driving belt may be wound to prevent slippage. Fig. 8 is a perspective view showing in diagram the arrangement of the endless driving cable.

A represents a suitable framework forming a platform and support for the engines 2 which supply motive power to the machine. This framework has suitably trussed or braced standards or uprights 3 supporting the horizontal rock-shaft 4, the ends of this shaft extending to any desired length to each side of the frame and forming a main support and axis for the aeroplanes 5. The planes 5 are of suitable material like heavy fabric stretched over suitably braced frames 6 carried by and turnable with the shaft 4. An open space 7 is left between the adjacent ends of the planes, and centrally of the machine, and a transverse bar 8 at approximately right angles to the planes is fixed to the shaft 4 in this middle space and is rigidly braced and secured to the shaft and plane frames 6 so as to be in effect an integral part of the planes, frames 6 and shaft 4. Propellers 9 are carried at the ends of this bar 8 and they are driven from the engine constantly when the engine is running, irrespective of the angle assumed by the planes 5 or bar 8; all as will be shortly described. The purpose of the planes 5 is to enable the ascension and elevation of the machine, and the forward end of the planes is always slightly elevated.

The steering of the device is done by a double set of rudders 10—11, there being one rudder 10 in front, while there will be two rudders 11 at the rear mounted at opposite ends in the space 7 between the planes. These rudders are all connected so that they turn simultaneously, but in opposite directions, each rudder having a rigidly supported shaft 12 connected to the frames 6 by brace wires 13. The rudder frames turn on these shafts 12 as pivots, and the rear set of rudders is connected by a link 14 so as to maintain them always at a uniform distance apart and insuring their unified action. The rudders are controlled from the platform A by a steering-wheel 15 which has a drum around which a flexible cord or cable 16 is wound a sufficient number of times to prevent slipping on the drum. The ends of this cable extend from the drum in opposite directions through the guide pulleys 17 on frame A, and thence up to guide sheaves 18 on the shaft 4, thence through sheaves 19 near the front end of the aeroplane frames 6. There they connect at 20 to the rear free end of the front rudder 10, thence are rove back through the sheaves 19 to a guide sheave 21 on each rear rudder. The ends of the cord 16 are then crossed and connected to the link 14, as shown at 22. Thus by turning the steering-wheel 15 in one direction, both the front and rear rudders are shifted so as to steer the machine to the right, and when the wheel is turned in the opposite direction the rudders are turned to steer the machine to the left.

In order to turn the shaft 4, and so vary the inclination of the aeroplanes 5, the following means are provided: A flexible cord or cable 23 has its middle portion wrapped a number of times around the drum of a wheel 24 mounted on the platform or car portion A of the machine. One end of the cable extends forward and connects with the lower

arm of a tubular cross-head 25 on the lower front end of the bar 8. The other end of the cable or cord 23 extends up and passes through a horizontal tubular guide 26 carried by the brace and truss rods 27 which also serve to support and strengthen the uprights 3; this end of the cord connecting to some suitable part of the aeroplane structure on that side of the machine, as, for instance, the brace rods 28 for the rudders. Thus by turning the wheel 24 in one direction the front end of the cable is wound up and the other end paid out, so that the aeroplanes will be tilted more or less into a horizontal position; while if the wheel 24 is turned in the other direction the aeroplanes will assume a more nearly perpendicular position, according to the nature of the flight to be made.

The propellers 9 are peculiarly mounted so as to give them the strongest bearing possible, which is quite an essential feature in machines of this class. Therefore, each propeller has an outside hollow shaft 29 carrying a grooved pulley 30, and it also has an inner concentric shaft 31 which is longer than the outer hollow shaft 29; this inner shaft 31 being adapted to telescope with the hollow cross-head 25 carried at the ends of the bar 8. The upper arm of the cross-head also telescopes up into the space between the hollow propeller shaft 29 and its inner shaft 31. As a consequence a long bearing is provided for the propeller, and the pulley 30, around which passes the driving cord or cable 32, is supported practically at the middle of the shaft. The propellers which turn with the pulley may be braced to the pulley, as shown by the stay wires 33. This driving cable 32 is of the endless variety and is driven from the engine by the following means: The engine shaft carries two grooved pulleys 34, around which flexible cables 35 pass to larger grooved pulleys 36 mounted on the floating or suspended counter-shafts 37. Shaft 37 carries two grooved pulleys 38 around which the driving cable 32 passes. From these pulleys 38 two separate portions of the cable 32 pass upward around suitable direction pulleys 39 on shaft 4, certain portions of this cable 32 thence passing in opposite directions around the propeller pulleys 30; the portion of the cable which passes to one of the propeller pulleys being crossed, at 40, so that both the propellers will be driven in opposite directions, and therefore obtain the greatest ascensional force.

The base A or platform portion of the machine is of any suitable construction or type so as to give a substantial support for the machine when standing still.

In operation, when it is desired to ascend, the aeroplanes are tilted until they stand as nearly vertical as possible. As soon as the engine is set in motion the propellers are made to revolve rapidly, which lifts the entire machine from its point of rest, which may be, for instance, the deck of a ship, or any other limited inclosure. As soon as the proper or desired elevation has been reached, the aeroplanes are tilted, by suitably manipulating the wheel 24, to bring them more or less into a horizontal position, and at the same time pulling down the front propeller 9 and lifting the rear one, so that the machine will then sail forward, being buoyed up by the action of the air on the under side of the aeroplanes. The turning of the machine to right or left is effected by a simple manipulation of the tiller-wheel 15.

The machine may be of any desired size, proportion, or power, and adapted to carry one or more passengers.

By this construction my aeroplanes have a tilting movement from nearly a vertical to nearly a horizontal position sufficient for all ascensional and descensional purposes and purposes of flight, and the propellers tilt with the aeroplanes and are driven continuously and irrespective of the tilting movement of the aeroplanes; this continuous drive and adjustment being provided by the flexible driving connections above described. Preferably a floating or suspended counter-shaft, as 37, is employed, so as to maintain the proper flexibility in the driving connections. Also, by attaching a chain, as 41, to the counter-shaft and carrying it down to the front end of the frame A, a simple, practical means is provided for tightening the various driving connections.

In order to insure against slippage of any of the cables or cords by which power is transmitted, I prefer to wind these cables with short sections of wire, as shown at 42, or otherwise provide them with lugs which will catch in suitable pockets 43 in the various grooved pulleys 30, etc., around which the cables pass.

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

1. In a flying-machine, a main frame having uprights at the top of which is journaled a transversely extending rock-shaft, aeroplanes rigidly connected with the ends of the rock-shaft, propellers carried by the rock-shaft, means for tilting the rock-shaft, and means for operating the propellers.

2. A flying-machine comprising a suitable framework on which is mounted a transversely extending shaft, aeroplanes carried on the ends of this shaft and turnable from a nearly vertical to a nearly horizontal plane, a bar mounted centrally on said shaft and at right angles to the aeroplanes, with propellers at the ends of the bar, means for tilting the aeroplanes, and means for driving the propellers irrespective of the tilting movements of the aeroplanes.

3. A flying-machine comprising a suitable framework on which is mounted a transversely extending shaft, aeroplanes carried on the ends of this shaft and turnable from a nearly vertical to a nearly horizontal plane, a bar mounted centrally on said shaft and at right angles to the aeroplanes, with propellers at the ends of the bar, means for tilting the aeroplanes, means for driving the propellers irrespective of the tilting movements of the aeroplanes, said aeroplanes having their adjacent ends spaced apart to provide a central space to accommodate said propeller bar, and rudders pivoted in said space.

4. A flying-machine comprising a suitable framework on which is mounted a transversely extending shaft, aeroplanes carried on the ends of this shaft and turnable from a nearly vertical to a nearly horizontal plane, a bar mounted centrally on said shaft and at right angles to the aeroplanes, with propellers at the ends of the bar, means for tilting the aeroplanes, means for driving the propellers irrespective of the tilting movements of the aeroplanes, said aeroplanes having their adjacent ends spaced apart to provide a central space to accommodate said propeller bar, front and rear rudders pivoted in said space, and flexible connections by which the several rudders are operated simultaneously.

5. In a flying-machine, a main frame having uprights at the top of which is journaled a transversely extending rock-shaft, an aeroplane rigidly connected with each end of the rock-shaft, propellers carried by the rock-shaft, means for tilting the rock-shaft, and means for operating the propellers, said means for operating the propellers including a flexible connection extending from pulleys on the propellers around suitable direction sheaves on the rock-shaft and to a motor on the frame.

6. In a flying-machine, a main frame having uprights at the top of which is journaled a transversely extending rock-shaft, an aeroplane rigidly connected with each end of the rock-shaft, propellers carried by the rock-shaft, means for tilting the rock-shaft, means for operating the propellers, said aeroplanes spaced apart, forming a central open space, with front and rear rudders pivoted in said open space, and means for operating said rudders from the main frame.

7. In a flying-machine, the combination of a main frame having uprights on which is journaled a transversely extending rock-shaft, aeroplanes at the ends of the rock-shaft rigidly connected and turnable therewith, propellers mounted on a support carried by the rock-shaft and at right angles to the aeroplanes, means for tilting the aeroplanes, and means for operating the propellers continuously irrespective of the tilting movement of the aeroplanes.

8. In a flying-machine, the combination of a main frame having uprights on which is journaled a transversely extending rock-shaft, aeroplanes at the ends of the rock-shaft rigidly connected and turnable therewith, propellers mounted on a support carried by the rock-shaft and at right angles to the aeroplanes, means for tilting the aeroplanes, and means for operating the propellers continuously irrespective of the tilting movement of the aeroplanes, said propellers each having an outer hollow shaft and an inner concentric shaft, and said support for the propellers having a hollow cross-head telescoping with said propeller shafts.

9. In a flying-machine, the combination of a suitable support having uprights on which is journaled a transversely extending rock-shaft, aeroplanes on the ends of the rock-shaft and rigid therewith, said aeroplanes having their adjacent ends spaced apart to provide an open space, with rudders mounted in said open space, front and back propellers mounted on a support carried by the rock-shaft, and which support is substantially at right angles to the aeroplanes, means for tilting the aeroplanes, means for operating the rudders, and means for operating the propellers irrespective of the tilting movements of the aeroplanes.

10. In a flying-machine, the combination of a suitable support having uprights on which is journaled a transversely extending rock-shaft, aeroplanes on the ends of the rock-shaft and rigid therewith, said aeroplanes having their adjacent ends spaced apart to provide an open space, with rudders mounted in said open space, front and back propellers mounted on a support carried by the rock-shaft, and which support is substantially at right angles to the aeroplanes, means for tilting the aeroplanes, means for operating the rudders, and means for operating the propellers irrespective of the tilting movements of the aeroplanes, said last-mentioned means including pulleys on the propeller shafts and also on the rock-shaft, a motor on the main frame, flexible connections passing around the aforesaid pulleys, and a counter-shaft having pulleys and suspended from said driving connections and connected with the motor.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

HALVOR OLSEN EIANE.

Witnesses:
W. D. FOLEY,
DENNIS MCNELIS.