Aerial Mono-Flyer of the Future

By H. WINFIELD SECOR

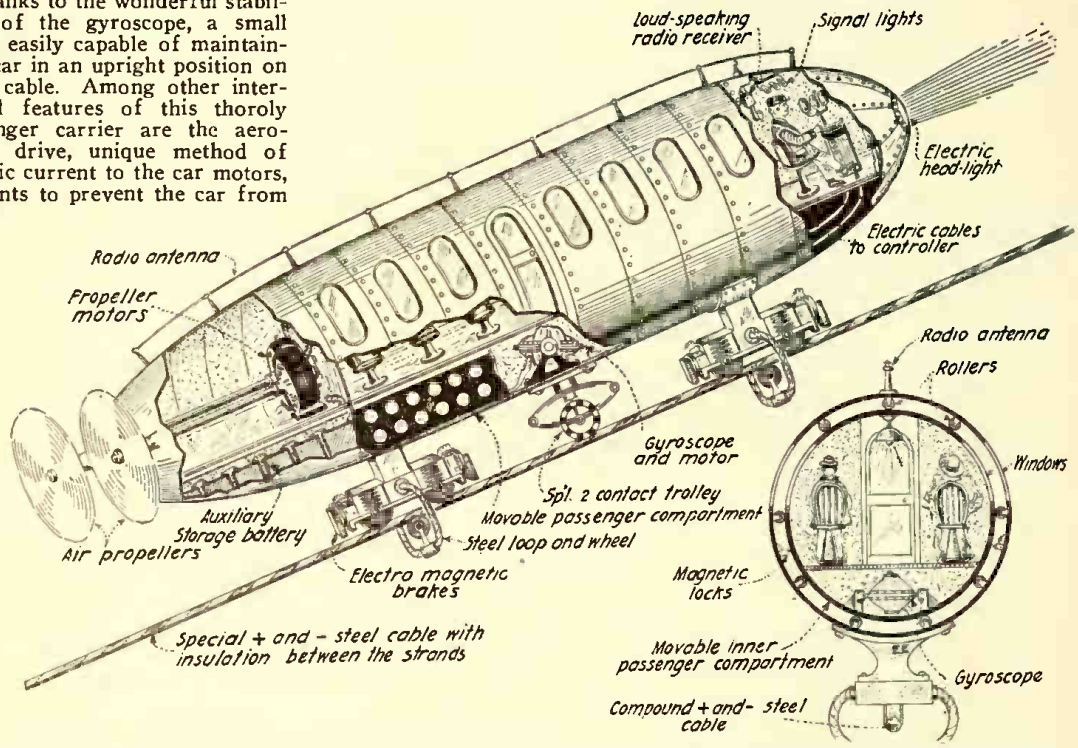
THE high-speed electric train of the future will undoubtedly be radically different in design from the railroad cars of the present day. For many locations, especially in mountainous regions the electrically operated mono-rail car, illustrated on our front cover as well as on this page, will prove of particular value. To begin with this aerial mono-flyer is enabled to run along at speeds of 200 miles per hour or faster on a single rail or cable, thanks to the wonderful stabilizing qualities of the gyroscope, a small sized one being easily capable of maintaining a 100-foot car in an upright position on a mono-rail or cable. Among other interesting technical features of this thoroly practical passenger carrier are the aeroplane propeller drive, unique method of supplying electric current to the car motors, safety attachments to prevent the car from dropping should the gyroscope fail, and a number of other interesting departures, based on sound engineering principles which our technical experts are quite familiar with, but which have not as yet found practical application.

The mono-rail flyer is not as impractical as would at first appear for such a single-rail car carrying a passenger had been operated by Brennan, the English engineer, several years ago. His car, fitted with a small stabilizing gyroscope, travelled along upright on a single rail very successfully. If you wish to demonstrate this remarkable power of the gyroscope go to the nearest toy-shop and purchase a 25 cent gyro. You will find that if you stretch a piece of string horizontally or at an angle that the upright gyro, spinning at high speed, of course, will travel along the string upright. Another important fact is that as the gyro's speed decreases it cants over *gradually* more and more, which action you can readily demonstrate for yourself; moreover, this shows that if the mono-flyer's gyroscope should fail at any time then the car would cant over easily, not rapidly, owing to the great momentum of the gyro wheel. Thus it is the decelerating gyro and car slowly reach a neutral or hanging position, which it will safely assume when provided with guard rings and cable wheels as our illustrations show. An ingenious arrangement of the inner passenger compartment of the mono-flyer has been worked out for such emergency conditions, and this involves the free suspension of this compartment on roller bearings as indicated in the end-wise sectional view of the car. The inner cab is not free to rotate on its axis normally, but as soon as the gage in front of the motorman indicates that the gyroscope is failing, due to lack of current, etc., he immediately pushes the emergency button which releases a set of *magnetic locks;* these locks set the inner compartment free and as the whole car of the mono-flyer slowly turns over about the cable, as already explained, the passengers are kept on an "even keel" as it were.

The method of propelling the car, either along cableways over mountain passes as here shown, or over regular mono-rail land systems, is by high speed air propellers. This idea may not seem feasible at first but the practicability of the scheme is attested by the gigantic Caproni triplanes, as well as large English bombing planes, some of which have as many as four propellers and a carrying capacity of fifteen to twenty passengers. The mono-flyer propellers are driven by electric motors controlled by the motorman at the front of the car.

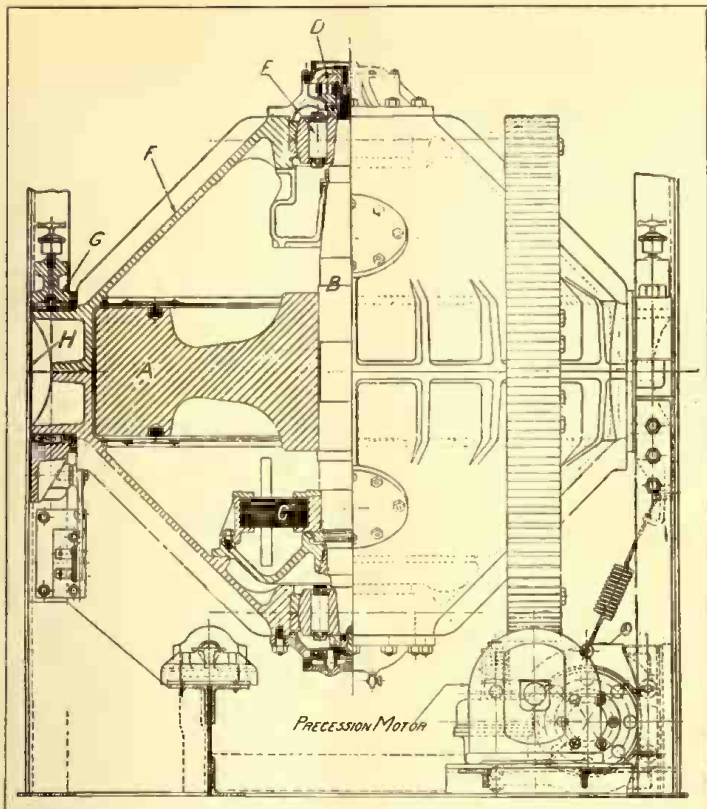
The next proposition is how to supply the car with current. There are three methods by which the car can be electrically operated. The first is to employ a gasoline-electric power plant; in this unit a petrol motor drives a dynamo and the current delivered by it is supplied to the propeller and gyroscope motors thru regulating rheostats in the usual manner. The second scheme is the one illustrated herewith in which the positive and negative currents are carried by a special duplex cable, so wound as to provide alternate + and — contact surfaces continuously along its surface. A specially contrived + and — contact trolley wheel rolls on this double polarity cable, gathering the positive and negative electric currents respectively. Owing to the peculiar construction of this contact wheel, with its spiral shoes and the spiral arrangement of the opposite conductors in the cable, the circuit is completed effectively. Either direct or alternating current can be utilized.

A third way of supplying electric current to the mono-flyer is by the *one-wire,* high tension, high frequency system of Tesla. In his works on high frequency currents Dr. Tesla shows and describes a *one-wire* motor which he built and demonstrated successfully. This method of distributing electric energy is ideally applicable to the present railway. The steel cable upon which the car travels could be charged by a high frequency, unipolar current and the motors operated on the Tesla one-wire method. Also, to intensify the *corona* transmission a light feeder cable could be run along just above the car, the two cables being oppositely charged with a high tension, high frequency current. The corona leakage between such highly charged conductors is enormous, and not easily appreciated by anyone who has never seen such a discharge. This corona is like a silent effluve and will fill the air space between two oppositely charged conductors separated 6 to 8 feet apart, when charged by such potentials as 150,000 volts. A number of the long distance transmission lines of today utilize voltages of this order, and the reader may gasp when he thinks of what might happen if our mono-flyer was rolling along peacefully between two cables charged at 200,000 volts and a short-circuit should occur. Well he might hold his breath if the current were of 60 cycles frequency, for then there would be some fireworks. Sixty cycle current kills. But this same 200,000 volt alternating current if oscillating at half-a-million cycles per second would be harmless. Besides, the passengers in the steel car would be protected from any shock as the currents, in the event of a short-circuit, would pass thru the steel frame.

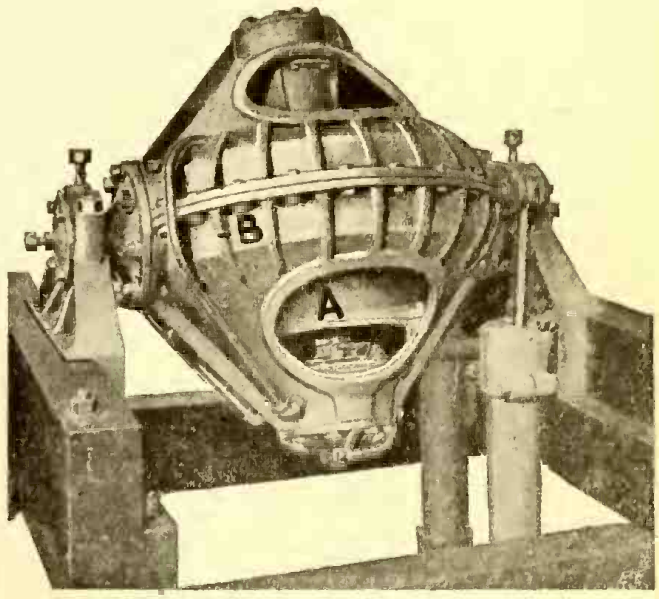


Semi-sectional Side View and Center of the "Aerial Mono-flyer of the Future," Which Can Run Along a Single Steel Cable Stretching Across Deep Ravines and Canyons. It Is Propelled by Powerful Air Propellers Driven by Electric Motors. The Motors, Lights and Signals Are Furnished with Current thru a Special Duplex Cable and a Double-contact Trolley Wheel.

Two views of a Sperry ship-stabilizing gyroscope of the electric motor-driven type are illustrated herewith as of interest to readers of this article. The sectional view shows the driving motor mounted inside the casing of the 24-inch diameter gyro rotor. The motor is an A. C. squirrel cage induction motor. The gyro is fitted with a motor-operated vacuum pump which keeps the gyro chamber exhausted of air, in this way eliminating considerable losses due to the windage of the massive high



Sectional View Thru Modern Electric Gyroscopic Stabilizer for Use on Ship-board. "A" Is the Heavy Steel Rotor Wheel Driven by the Electric Motor "C". The Gyro Usually Weighs Less Than One Per-cent of the Vessel's Gross Weight.



Appearance of Electric Stabilizing Gyroscope of the Sperry Type, Intended for Installation on a Fast Submarine Chaser. A Is the Small Electric Motor Driving 24-Inch Diameter Rotor at 4,000 R.P.M. It Prevents the Ship Rolling On Heavy Seas.

speed wheel. The precession of such gyroscopes is taken care of automatically by a special motor gear as shown in the sectional view. Here A is the heavy steel rotor wheel, revolved on a vertical shaft B, by means of the squirrel cage induction motor C. A heavy roller bearing D, carries the thrust load while the radial bearings E transmit the gyroscopic loads thru the case F to the gudgeon G, secured to the ship's or car's structure. Great gyros of this type and measuring 20 to 25 feet have been successfully installed on large battle-ships to prevent their rolling in a heavy sea, and thus provide a steady platform from which the big guns could be accurately fired. The wonderful stabilizing power possest by even the smallest gyroscope can be gleaned from the fact that in computing the size of gyro for stabilizing a certain ship, the engineers figure on the complete gyro equipment to weigh about *one per cent* of the ship's total displacement. Thus for a 500-ton craft the gyro equipment would weigh but 5 tons while for a 10,000-ton battle-ship it would be only 80 tons or eight-tenths of one per cent.

The idea as here exprest is susceptible of many improvements to be sure. For one thing it is not conceivable that we have found the most efficient form of air propulsion mechanism at all. Possibly the air propelled craft of the future will have propellers shaped like huge augers and worm their way thru the air—who knows?

WILLIAM J. HAMMER NOW A MAJOR IN U. S. NATIONAL ARMY.

It is with extreme pleasure that we can announce that Mr. William J. Hammer, Consulting Electrical Engineer of New York City, and who has contributed numerous interesting electrical articles to the Electrical Experimenter in the past several years, has been appointed as a major in the U. S. National Army, and is at present located at Washington, D. C. The U. S. Government is to be congratulated upon obtaining the services of so distinguished and accomplished a scholar as a co-worker to aid in solving the many diversified problems now besetting it. Mr. Hammer, who was for a number of years an early associate of Thomas A. Edison in the development and application of the electric light, has traveled extensively in Europe, and is therefore thoroly conversant with electrical inventions and developments both in Great Britain and on the Continent. Major Hammer may be addrest in care of the Inventions Section, War Plans Division, General Staff, War College, Washington, D. C. He received his appointment on June 4th, 1918.

THE VALUE OF A KILOWATT AND HOW TO SAVE IT.

By John J. Dempsey

Vice-President Brooklyn Rapid Transit Lines.

WHAT is a kilowatt?

In terms of economy—of power saving—which is in a double sense a burning issue to every industry and the nation at large today, a kilowatt represents the consumption of *three pounds of coal.*

In the much-discust matter of heat, for instance: The operation of trains *without* heat requires *four kilowatts per car mile.* With three points of heat on, it requires between five and one-half and *six kilowatts per car mile.* Thus the heating of a car requires 30 *per cent* of the power required to operate it.

Obviously, then, it is the duty of every conductor to keep in mind the amount of energy wasted in the opening and closing of doors. With due care in this regard alone, a proper temperature could be maintained in the cars on from one-third to one-half less power.

During the cold weather conductors on surface cars should keep the rear doors closed as much as possible and, during non-rush hours, ask passengers to use the rear entrance entirely, thus keeping the front doors closed and contributing to the comfort of passengers. When conductors find it necessary to confer with motormen they should be careful not to stand with head and shoulders thrust out thru the open front door, but should rather step onto the front platfrom and close the door behind them.

Motormen, for their part, should remember that every time a brake is applied a certain amount of energy is taken out of the train, and that to restore it a further consumption of power is necessary. When a motorman, running thru a congested district, or where cars are blocked, keeps "nosing up" by throwing his power on and off to the jerky accompaniment of the brake, he might as well be shovelling coal out of the Company's bins, or money out of the Company's pockets into a ditch. The Company could really better afford to *pay such a man to stay at home and not work at all.*

Proper and economical operation requires a motorman to use his brake as seldom as possible consistently with safety and to coast as long and as frequently as possible consistently with his schedule.

So far as the public is concerned, it is perhaps not unnatural for persons who have no sense of the amount of coal necessary to operate a system like the Brooklyn Rapid Transit to think, because we have what seems a great quantity of coal in our bins that that is sufficient to operate almost indefinitely and furnish ample heat as well. But that is only because they view the situation from the standpoint of their own coal consumption. If they stopt to think that it takes *one and a half tons of coal* to run *one* five-car train from Union Square to Coney Island and back and that two such round trips consume more coal than the average family uses in a year, they would, if fair-minded, be disposed to withhold judgment.