The Steco Aerohydroplane, Gnome Omega and Denny Eggert

By Denny Eggert

Over the years, times and people have endured in our ever changing world. From what we were taught, to what we know now has drastically meant a new meaning of life especially with our families. From what was a close knit relationship, time took its toll only to see our family find our own ways. Gratifying experiences gave us a new avenue to follow. Some have had hard times, others not. It is this learning tool that we utilize to our benefit. Such is the case I'm about to relay to you. Most of Minnesota Air & Space Museum (MASM) members, volunteers and friends have an idea of what I've been pursuing over the past several decades, but do not realize the impact it has had on my life and what I really pursued. What follows are the highlights of the dedication, desire and need to preserve a piece of aviation history that I assumed when I was confronted with this remarkable task.

The 1911 Steco aerohydroplane displayed on its floats at the American Wings Air Museum prior to its closing. (Photo from the author)

HOW IT BEGAN

For years the opportunity to share with the public community locally, nationally and internationally the efforts of saving our aviation heritage. It began early in high school and continued through my military service for over 13 years. It consumed me to exercise my talents to show, display and relay to individuals what a valuable resource of aeronautical history we have via the Aviation Art Museum's exhibits. For numerous decades I was involved in hundreds of shows in a vast variety of locations such as air shows, shopping malls, military bases, airline offices, conventions, hospitals, charity events, schools, government buildings and a host of other facilities. Through it all, I was astounded at the positive reaction of hundreds, if not thousands, of people who were unaware of what was out there. I enjoyed it immensely and appreciated a close attachment with these people. After a number of years on the road traveling throughout the United States at mostly military bases, I called it quits because of the amount of time I was away from home. I then settled on doing local shows in the five Midwestern states, Minnesota, Wisconsin, Iowa, North and South Dakota, but at times I did venture to go west to three shows in the mid 1990s. It was costly, but ends were met.

THE DISCOVERY

We were in Minneapolis for a two month MASM show at the Hennepin County Government Center. As we typically do, we posted our contact information in the display area. Shortly thereafter, while set up at a mall show, we were contacted by Mr. and Mrs. Joseph Shannon of Minneapolis who had seen our display and our contact information. They said they had an aircraft that has to go into a museum. Not knowing the details about the aircraft we told them we would investigate it. The collection was located in Maywood, Ill., a suburb of Chicago. I led the fact finding mission, to uncover, what this mysterious aircraft was. Upon returning, a full report was given the Shannon's. Shortly thereafter we were contacted by them in which they gave us the astounding news that they would donate the entire collection to the MASM. We were ecstatic.

Now it was up to MASM to recover this collection that was, according to recovered documents, packed and stored in 1914 in a garage. Gathering a crew was fairly easy with our membership at that time, as we set out on this unique mission of the unknown. Only later did we find out that what we had was a Steco aircraft**;** **Steco** is the acronym for **ST**ephens **E**ngineering **CO**mpany, and cars designed and built by James Shand Stephens,

Stephens was an immigrant from Wolfville, Nova Scotia, Canada. Born in 1865, he immigrated to the Twin Cities around the 1880s, where he worked for the Milwaukee Railroad, Hamm's Brewing Co., Red Wing Power & Light Co. and several other organizations, eventually becoming the chief electrical engineer for the Columbian Exposition near Chicago in 1892. He later settled in Chicago on Lake Shore Drive where be pursued his aeronautical patents with the assistance of his son Ralph who worked on the cars until the outbreak of WWI. Stephens was active in the aeronautical community, where he was an officer of the Illinois Aero Club, served as an editor of *Aerial Age* and had a hand in the planning of the International Aviation Meet in Grant Park (1911) and the Gordon Bennett Aeroplane Race (1912).

The collection was packed and stored around 1914. Test flights were made off Lake Michigan in July 1914. No official pictures of this aircraft in flight are known to exist as of today. But photos do exist of it with the engine running on the beach of Lake Michigan, believed to be Stephens's backyard, and another faint picture of someone taxing out on Lake Michigan about to takeoff.

RECOVERY

The recovery team consisted of five individuals -- one video cameraman and four workers to inventory the donated material and load it into four trucks in three days. Recovery went very well due to our pre-planning and schedule. It included three primary pieces with a host of related items. These were:

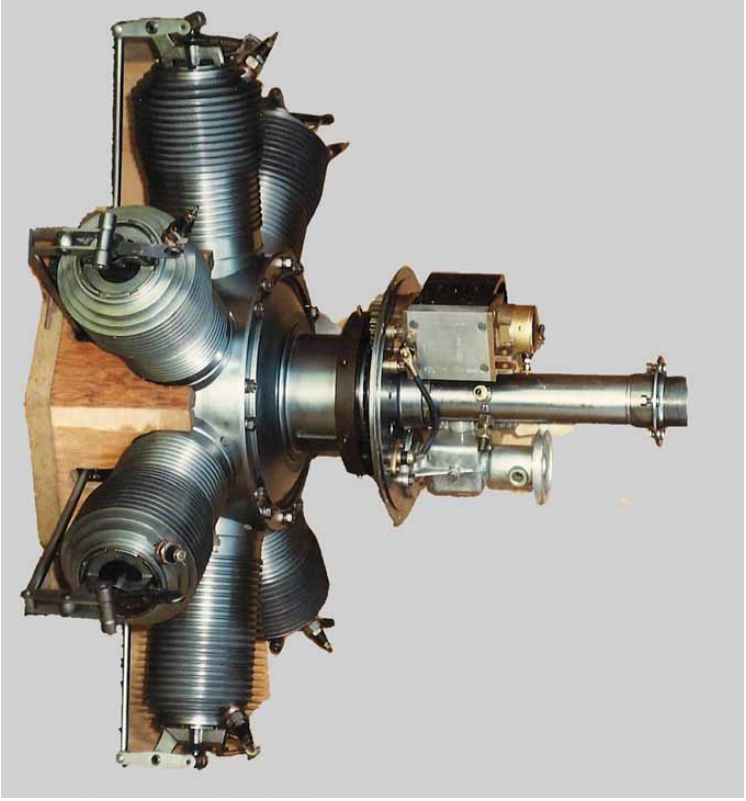
- A 1911 Steco Aerohydroplane, a one-of-a-kind.
- A 1909 French Gnome Omega 7-cylinder, ~ 50-hp rotary engine.
- A 1909-12 Steco Cyclecar, with a Mack motorcycle engine and parts for four more cars.

Numerous crates, documents, photos, tools, parts and related components were safely returned to the Twin Cities only to be restored again due to the lack of a facility in 1990. It was not until 1998 that an agreement was struck with Heritage Halls in Owatonna, Minn., in which the collection was assigned on a lease/loan. The manager after only six months faltered on their agreed payments. This situation continued for almost two years with MASM losing a great deal of income. The agreement also stated that when the collection was to be removed that the leaseholder would ship the collection back to the Twin Cities. Again, Heritage Halls faltered and MASM had to, at our expenses, disassemble and transport this rare aircraft and car back to Minneapolis, Minnesota. We were finally able to secure a small space at the American Wings Air Museum at the Anoka County Airport for several years that gave us the opportunity to re-assemble it for public display that took more of our available spare time.

1909 GNOME OMEGA

This engine was designed and built by Louis and Laurent Seguin around 1907-08 at their factory called, Societa des Moteurs Gnome et Rhone, 3 Rue la Boetie, Paris, France. A distributor for these engines was located in St. Louis, Mo., where we believe this engine was purchased. Innovative in design, it was a light-weight engine that rotated with the propeller. The crankshaft remains stationary being bolted to a mounting plate on the engine motor mount. It was put up for public sale in 1909 with good power to weight ratio. With no internal way to balance the engine, it was produced by weighting each of the cylinders to exact specifications thus eliminating any internal adjustments, thus no internal counter balancing was needed -- in other words it was essentially a fly wheel that could make controlling the aircraft difficult, but with the right training the pilot could compensate for this characteristic.

Another interesting design aspect is the engine has no intake or exhaust manifolds. The intake for fuel and oil into the



The restored Gnome Omega engine. (Photo from the author)

cylinders is accomplished through a spring loaded atmospheric valve on top of the piston. The exhaust valve is directly on top of the cylinder that is operated by an internal cam lobe inside the engine connects to a push rod that opens the top of the cylinder during the exhaust phase.

Fuel System

Fuel used is 87 octane, car gas that is gravity fed into the crankshaft with a scupper (funnel) drain below the carburetor for over flow of fuel. To start, the engine is primed with about four shots (squirts) of fuel in every other odd cylinder until all seven are primed via the open exhaust valve as the engine is rotated.. You have to hand prop the engine as no starter was used. The engine creates a vacuum in the crankshaft, thus atomizing the fuel to be mixed with the oil. It used a 2-cycle induction and 4-cycle operation system and mixed in the crankshaft to lubricate all internal bearings, pistons and other mechanical components and provide the fuel mixture to the seven cylinders.

Oil System

The oil/fuel tank was a two-chamber unit. One side house the oil (50 W non-detergent aircraft oil mixed with 15% STP blend. Originally the oil was castor oil, but this has a tendency to dry with the engine stood for some time. The castor oil would congeal and harden, which could cause the engine to seize. If the castor oil did harden, the only way to loosen it up was with heat and denatured alcohol (a nice combination to work with!).

The other side of the tank contains the fuel. Oil was pumped from the tank down to two pulseometer glass tubes

The author, and chief mechanic for the project, during a test run of the restored Gnome Omega engine. The engine has been test run a total of more than 36 hours. (Photo from the author)

on the control panel to show oil flow. There was really no oil pressure. From the pulseometers, the oil flows up to two intake ports in the upper crankshaft and is injected into along with the fuel to create a mixture providing for both lubrication and combustion.

Ignition System

A magneto driven from the main planetary gear supplied an electrical current to carbon brush blocks that are aligned to meet each of the seven contacts on the distributor ring that rotates with the engine. A 0.016 copper gauge, twisted wire fed through a hole on the rotating distributor ring down to each of the seven spark plugs. Originally the wire was attached to the top of the spark plug and secured with a nut. As our new Champion plugs did not have that attachment screw, we drilled six holes, 0.050 each, one for each phase of the hex design into the spark plug nipple. The copper wire was fed through and twisted for security completing the ignition to the spark plugs that had double electrodes.

Ignition Switch

An early ignition switch also served as a throttle. It had a rotating dial that would cut out three or four of the seven cylinders to control power. Normal operation is full on or off. By rotating this switch it would pulsate the engines power. It could be set at ¼, ½, ¾ or full on. Our modern test uses a fully controllable throttle unit, thus eliminating the old ignition switch and a basic ON and OFF master magneto switch.

Propeller

The original propeller was a French Chauviere Integrale propeller, hand crafted to exact specifications. The original propeller had some minor damage, but it was otherwise air worthy. Not to take any chances, we decided not to mount it on the engine; instead we found a company making wooden propellers in Plant City, Fla., that could make one to our specifications. The original propeller was shipped to them in a double-tier crate. After a period of time, we received the replica propeller land it was a most beautiful piece of workmanship. The new propeller has the names of individuals who sponsored/ funded its cost stenciled on both the upper and lower blades. This blade has a pitch close to the hub to force air across the cylinders for cooling, which is referred to as induction pitch. The test stand has a cowling; again, to aide in cooling and to collect strewn oil from the engine as it is an expendable oil system with no normal crankcase.

Test Propeller

This is a handmade unit with a flat paddle at each of the two ends of the prop shaft that were bolted to it. It was used to put a load on the engine for a few minutes of operation. Since the test propeller did not have induction pitch for cooling, engine operation was limited to very short runs to prevent overheating. There is a "Key" reference marks on the propeller, shaft plate and retaining nut, marked buy an "O". They all MUST be aligned for proper operation and it also prevents any vibration as these units are balanced. After installation the retaining nut is installed and secured with a cotter pin in the designated holes on the prop shaft.

Instrumentation

There is only one instrument to operate this engine, a tachometer or as the French call it, *Tour's per Minute*. It is hooked up to a magnet belt driven to leads to the tach. The tachometer had to be overhauled to make it operational.

1911 STECO AEROHYDROPLANE

The aircraft featured several unheard of innovations a few years after the Wright Brothers first flight in 1903.

1911 Steco aircraft unique features:

- A tricycle landing gear and Burgess Floats
- It has controllable nose wheel steering from inside the aircraft
- Large brass pneumatic shock absorbers
- Independent caliper wheel brakes
- A patented empennage flight control system, no conventional controls
- Powered by a 1909 Gnome Omega 7-cylinder rotary engine using a Chevalier propeller
- A bi-plane with an overall wing span of 42 feet, 39 feet long and 10 feet high.

J. S. STEPHENS.

AEROPLANE FLYING MACHINE.

APPLICATION FILED JULY 5, 1910.

1,127,105.

Patented Feb. 2, 1915.

7 SHEETS—SHEET 1.

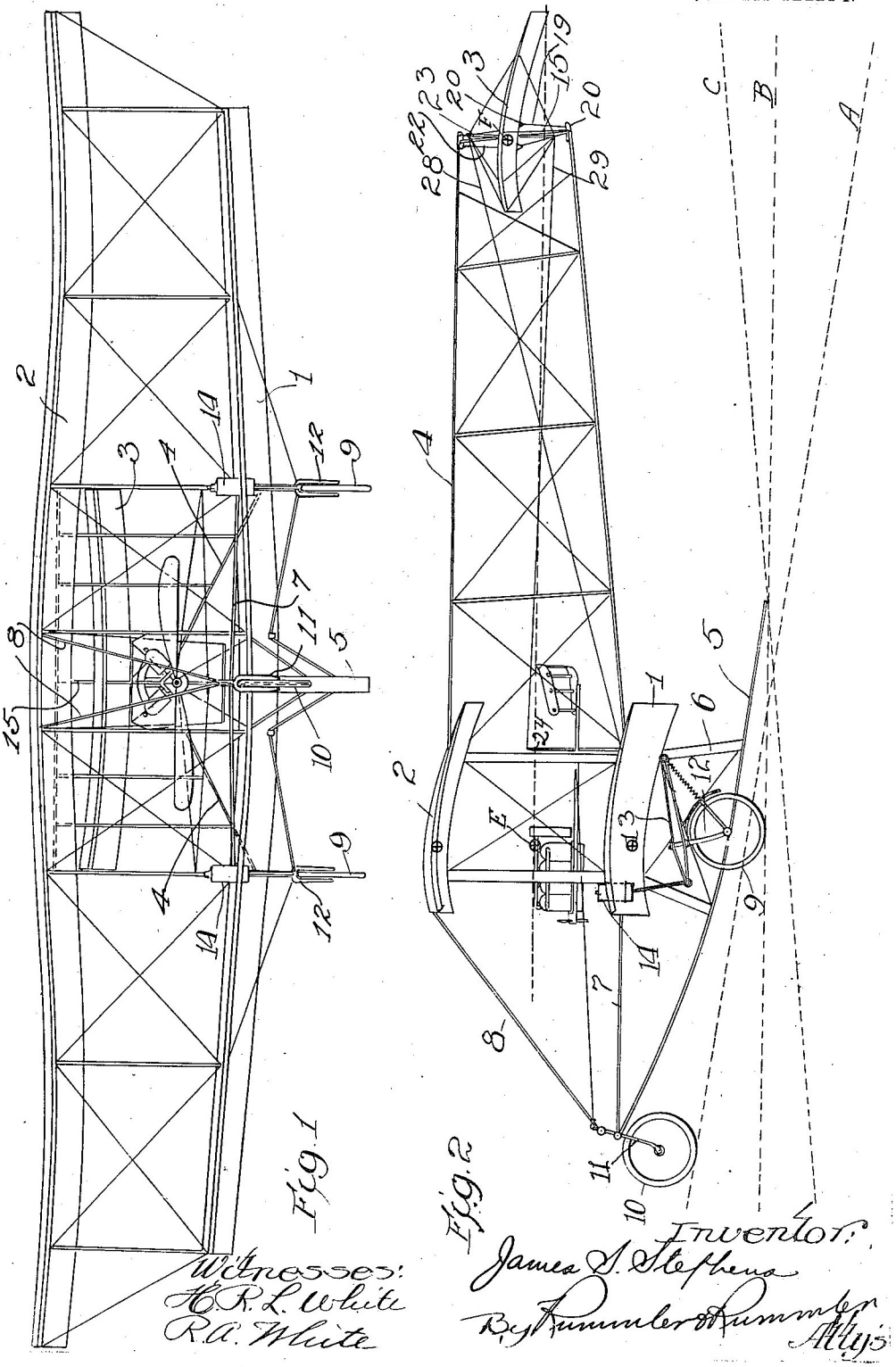
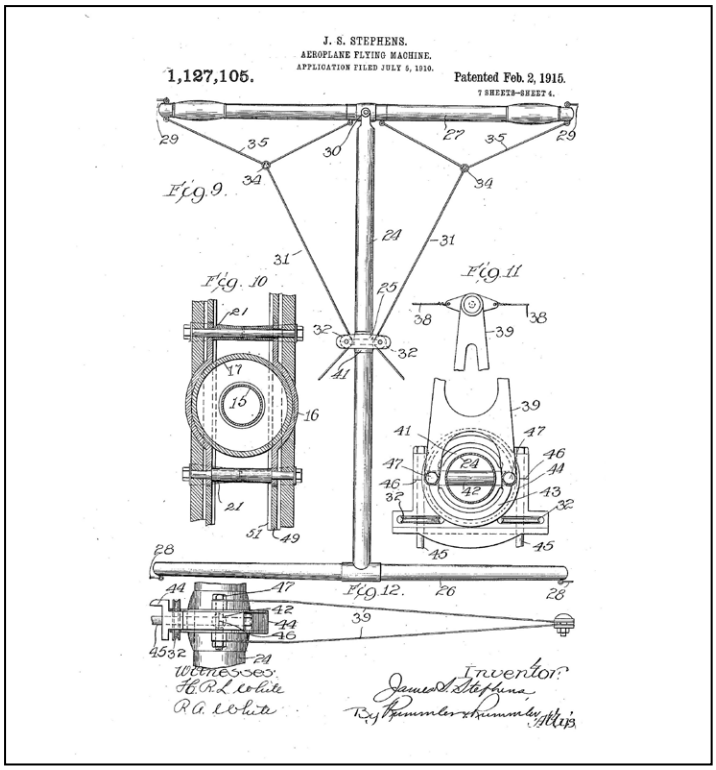


Fig. 1

Fig. 2

Witnesses:
H. R. L. White
R. A. White

Inventor:
James S. Stephens
By Rummler & Rummler
Attys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7 SHEETS—SHEET 4.
Fig. 9.
Fig. 10
Fig. 11
Fig. 12.
Witnesses
H. R. L. White
R. A. White
Inventor
James S. Stephens
By Pennie & Edmonds Attys.

Details of the unique control tiller from Stephen's patent that is installed in the 1911 Steco aerohydroplane. (U.S. Patent 1,127,105)

Stephens and his son, Ralph, founded Steco Engineering Co. to build prototypes of both the airplane and cycle cars. The 1911 aircraft won a U.S. patent for a radically new empennage flight control system which was a major advancement over the warp-able airfoils used by the Wright Brothers at Kitty Hawk, N.C., eight years earlier. There were no ailerons, elevators, rudders, or wing warpage to control directional flight. For easy flying, the plane was made with only one movable surface: the tail. It was connected to a straight handlebar, similar to one on a mountain bike. The pilot could turn the plane by turning the handlebar left or right or could make it dive or climb by moving the handlebar backward or forward. Two vertical stabilizers mounted between the upper and lower wings kept the plane from slipping or skidding while it turned. Total weight

1911 Steco on its tricycle landing gear. (Photo from the author)

empty was 1,320 pounds.

The upper wing had a span of nearly 42 ft., the lower, 36 ft. Overall length was 31 ft. and the plane rode on custom built twin Burgess floats set 11 ft. apart. The integral flotation system was composed of "sections of inflated pig gut, "as quoted in the 1910 patent application. The plane's power plant is a 1909 Gnome Omega rotary engine, made in France. It develops 50 hp, driving an 8-foot Chauviere propeller that gives the amphibian a maximum speed of 50 mph. The cockpit showed that the pilot apparently controlled the gasoline-castor oil mixtures by a system of valves and gauges varying the fuel's formula according to the demands of the flight.

One crate revealed that the plane had an alternate tricycle landing gear complete with curved nose skid and pneumatic shock absorbers. Another remarkable innovation for so early an airplane. The plane was first built with landing gear, then later outfitted with floats that were tested on the water in 1914. It was shortly after James Stephens successfully soloed the amphibian plane that it was packed away and stored. Some say this was possible due to WWI. It looked like the cycle cars and airplane were crated for shipment somewhere, rather than storage, but the details were never learned.

The only photographs of the aircraft show it on the Burgess floats and was known to have been test flown off Lake Michigan from Stephen's backyard. His patents are registered in the U. S. Patent Office, #1,127,105.

Three-quarter rear view of the 1911 Steco Aerohydroplane. (Photo from the author)

Working on his patents, Stephens also started to produce five Steco Cyclecars during the period of 1909 to 1912, aided by his son Ralph Stephens. With the outbreak of WWI, Stephens literally stopped working on his inventions. From documents found, the projects were was stored in a garage in 1914. They stayed there undisturbed until the MASM recovered the collection, donated by Mr. & Mrs. Joseph Shannon of Minneapolis, Minn., in April 1990. Joseph was the nephew of James Stephens. The plane remained in storage for several more years in St. Paul, Minn., until it was first assembled in 1998 at Heritage Halls in Owatonna, Minnesota. Short lived, it was moved back to St. Paul, Minn., and re-assembly began in the former American Wings Air Museum at Anoka County Airport until it closed in the early fall of 2009. Assembled, it is located in a new temporary hangar, now restored at the Anoka County Airport, Blaine, Minn., where it now resides until a permanent home can be found. American Wings Air Museum was forced to close in August 2009 due to inflated lease rates from $1,000 per month to over $4,000 per month, which the museum could not afford.

The collection is currently being held by the National Motorcycle Museum in Anamosa, Iowa. ✈

Acknowledgements

This project not only involved dedicated and devoted MASM members, but countless volunteers over the course of the last two decades. It was their willingness to be a part of a historical event. As for me, I can tell you that hundreds if not thousands of hours and uncountable amount of personal financial resources have been drained and expended to save this very rare and historic aeronautical collection for our future generations.

Consider making a tax deductible donation to the preservation of this collection. Send your contribution to or obtain more information:

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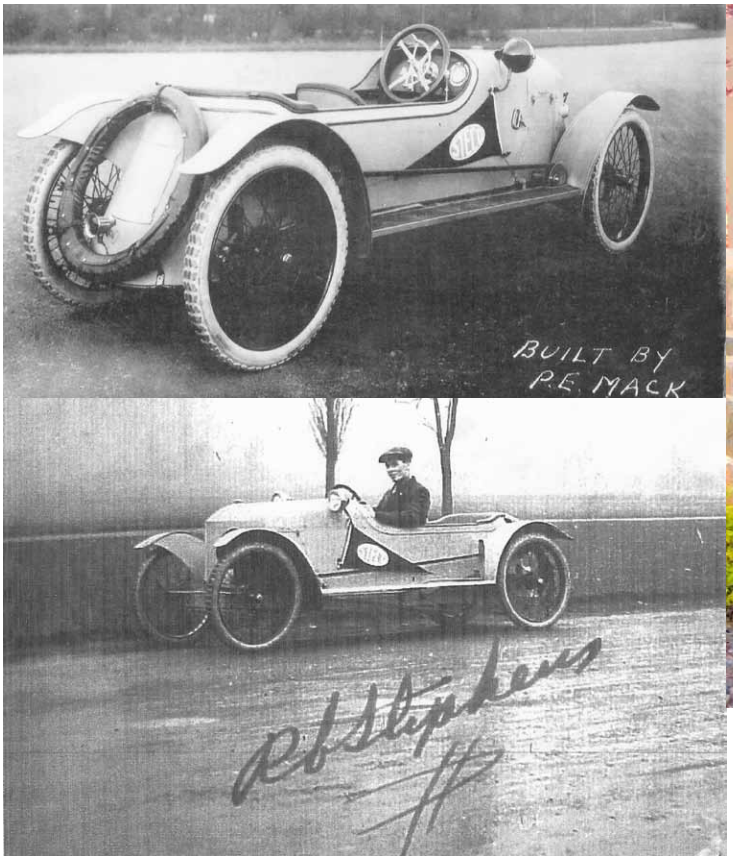
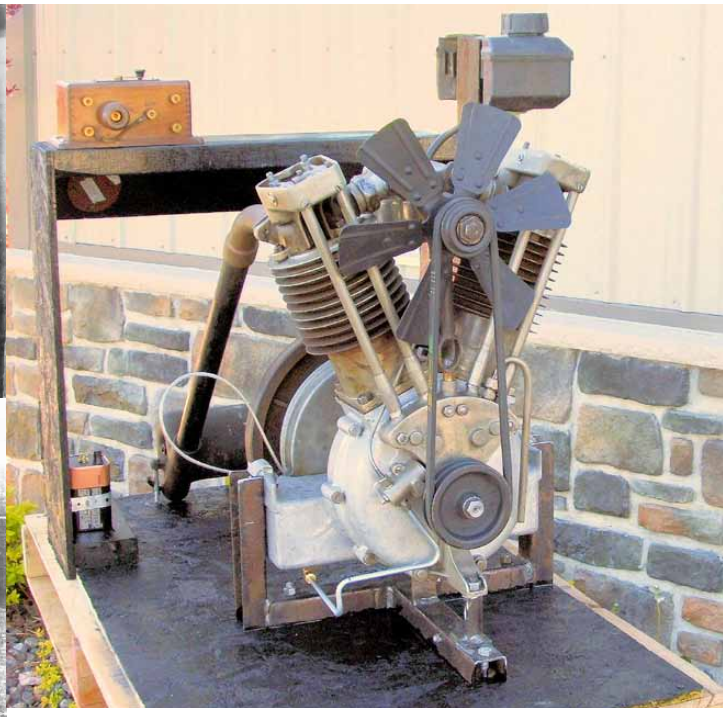
St. Paul, MN 55116
E-mail: steco1911@aol.com,
Phone: 651-291-7925

[Note: The 1911 Steco Aerohydroplane is the "Oldest Known Aircraft Ever Discovered in the United States." It's not the oldest aircraft in the U.S., but the oldest one ever found. Yes, we are still pursuing all avenues to find a permanent home for this rare historic collection.]

STECO CYCLECARS

This article has focused primarily on the Steco Aerohydroplane and its Gnome engine. Stephens and his son also developed a number of cyclecars - small automobiles that were powered by motorcycle engines and generally used motorcycle wheels and tires. The Stephens collection included at least one complete car and engine and components of at least four additional vehicles. These are illustrated in the following photographs.





Upper Left*: Mack cyclecar modified by Stephens.* Left: *Another photo of the vehicle with Ralph Stephens driving.* Above: *The restored Mack/Stephens motorcycle engine on its test stand. (All photos from the author)*