

Aircraft for Pleasure

By Bertram W. Williams

IF the history of the automobile is to be repeated, the airplane must first prove itself to be a reliable and efficient instrument of pleasure before it can hope to be a commercial success. The business man by the very nature of things must be cautious in experimenting with new and practically unproven methods. It has taken years to impress upon the public that the air is as safe a route of travel as any other provided proper machines and precautions are used, apart from it being infinitely more swift and comfortable. It now remains to convince commercial interests that the airplane is an economical means of transportation.

The success of aircraft in the war, far from advancing the cause of civilian aviation, has really made the average business man to be somewhat suspicious of its use as a substitute or even auxiliary of the proven automobile and truck. This idea has not been corrected by the daily press, which still persists in regarding all kinds of flying machines as dangerous and expensive toys. To combat this theory it is essential that the public be educated to look upon flying as nothing out of the ordinary—neither a hazardous nor very costly occupation. When that is accomplished, the vast field of its uses in the future will soon be realized.

In the past, manufacturers have given little attention to the general public as a possible customer; they have rather concentrated on Government and War Office orders, where excessive power has been the dominating need, and cost of construction and economy of upkeep negligible factors. Once the aircraft industry devotes its time to making these two latter details their chief consideration, flying will soon become as common as motoring.

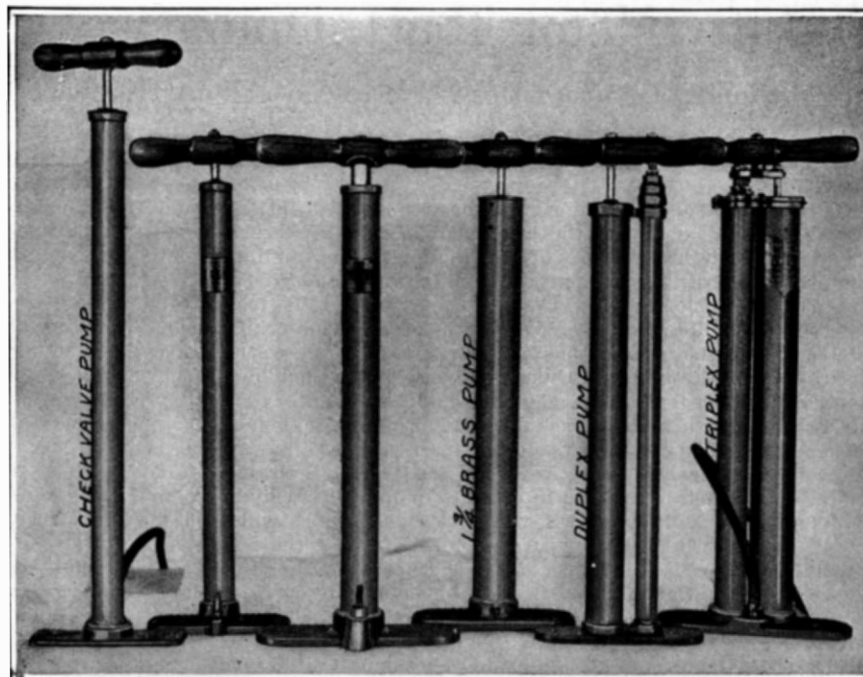
The automobile was for a long time dependent on good roads before it became popular with the general public, but if present-day machines were only capable of traveling on paved highways, they would still be a comparative rarity in this country, where four-fifths of the roads are far from ideal. Just so must the airplane be made more or less independent of large and specially prepared landing fields.

One of the chief exhibits at the San Francisco aircraft exposition, held some time ago, was a small machine built solely for pleasure purposes by the Longhead organization of Santa Barbara, and there are so many novel and interesting features about this miniature airplane that it is worth describing in detail. The "S-1," as it is called, is a single-seater biplane with a wing span of 20 feet, and a total weight empty of only 400 pounds. Everything about this little airplane denotes a refinement and finish worthy of the best French and English machines, and lacking, it must be confessed, in most of our domestic craft. The fuselage is of the monocoque type, consisting of a thin shell of plywood reinforced by transverse bulkheads. This form of fuselage has long been acknowledged to be the most successful on account of its ideal streamline form, and its strength in proportion to its weight. Heretofore, it has, however, been little used on account of the laborious methods necessary which made it exceedingly expensive. The shell in the Longhead model

is produced by applying three complete layers of plywood to a mold the shape of the body; binding cloth and casein glue being applied between the layers, which are then subjected to a uniform air pressure of 20 pounds to the square inch, which is maintained over the entire surface until the glue has set. This process produces a wooden shell one-eighth of an inch thick which is said to be stronger for its weight than any other fuselage yet developed. The upper and lower wings are supported by a V-shaped strut near the wing tips which is solidly bolted to the upper wing spars and fastened to the lower wing by a simple but rigid pin connection. The most novel and original features of this machine are the air brake and the position of the radiator. In the former, the lower wing spar is made to pivot at the body, allowing the whole wing to rotate, not only forming a very efficient lateral control, but allowing the lower plane to be thrown into a vertical position which provides an extremely effective brake, making it possible to stop the plane within about 70 feet of the point where the wheels first touch the ground, thus solving one of the chief problems of aircraft construction since the first flight of a heavier-than-air machine. This simple and ingenious brake is operated by a separate lever beside the pilot's seat.

The designers claim that the machine will land at the exceedingly low speed of 25 miles per hour, while its maximum speed is said to be 75 miles per hour—a greater range than any other present-day type. There is no reason to doubt these figures, as the almost ideal shape of the fuselage and the general distribution of weight have made it possible to operate the machine with an engine of only 25 horse-power. In these days of gigantic horse-power one would be apt to scoff at such a puny power plant till it is remembered that Bleriot crossed the English Channel in a far clumsier and heavier machine with an engine of similar power and decidedly inferior cooling qualities.

(Continued on page 35)



Successive stages in the development of the tire pump, starting with the simple check valve type and ending with the triplex type

The Efficient Tire Pump

By Ralph Howard

SINCE the time when pneumatic tires proved their superiority over hard and cushion construction for bicycle equipment, the pump has been a tool for serious consideration. Forgotten and often abused in long periods of idleness, to be hauled out in times of stress and hurry, it has never enjoyed much popularity.

Idleness often destroys its usefulness more than operation. Satisfactory performance depends on flexibility of the leather cups. This is retained by oil. Tubes are often dented or leaks caused by carelessness. If the love of the fisherman for his rod or the hunter for his favorite gun could be felt by the motorist for his tire pump, much of the difficulty would be overcome.

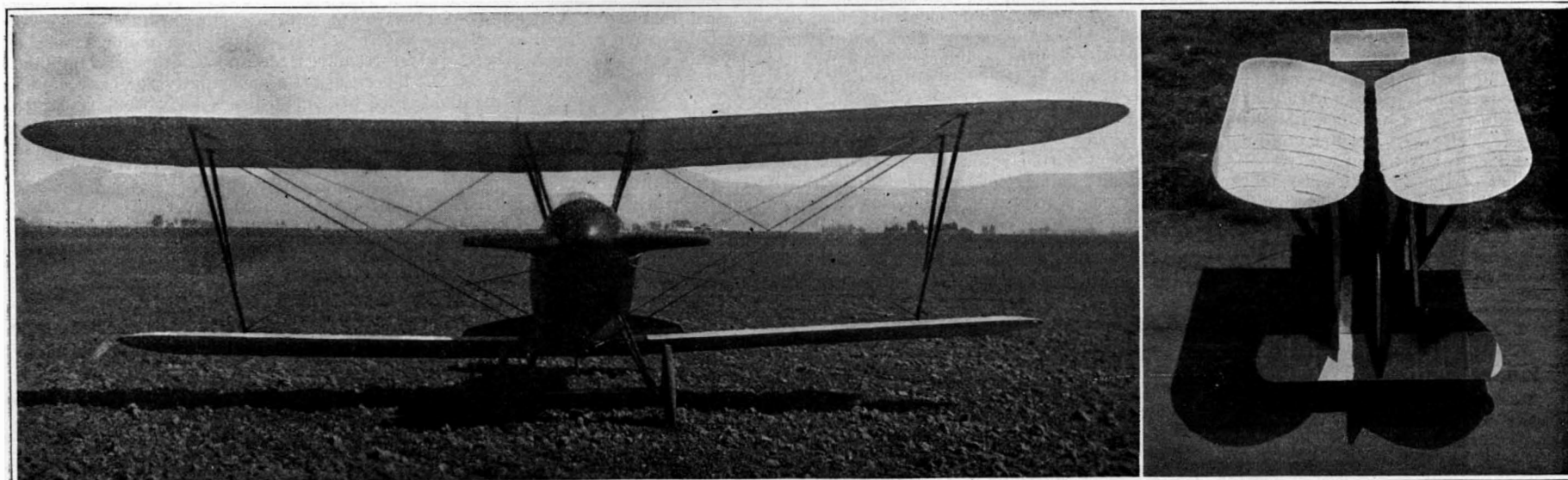
The great increase in volume of the automobile tire complicated the problem. Single action pumps of small diameters had been used. Makers at once turned to larger diameters, but found this plan had its limits, as it was humanly impossible to push down the large plunger against the higher back pressure. It was found that a 1¼-inch cylinder was about as large as could be used to get the specified pressures. The pumps already being

longer than the average user would utilize in making a stroke, the capacity was thus fixed. To overcome this the two-cylinder pump was developed.

Since the energy necessary to push down a plunger against a given pressure varies directly in proportion with the area of the plunger, the idea was conceived of starting with a 1½-inch cylinder and compressing the air on the down stroke through a cross-over in the base into a ⅞-inch tube parallel to it. The ⅞-inch cup acted as a check until the up stroke when it forced the charge into the tire, combating the back pressure with its limited area. It was found that this pump could handle more than twice the amount of air per stroke of the single-action 1¼-inch, while it met with less resistance in getting it through the tire nipple.

One pump maker has recently realized the advantage of carrying the compounding principle even one stage further, and has designed the triplex pump. This takes the air into the top of a 1¾-inch tube, delivers it on the down stroke into a 1¼-inch cylinder in exactly the same way as the double compound pump did. On the up stroke this air passes over at the top and is trapped in a ¾-inch tube from which it is expelled into the tire by that very small plunger.

The advantages gained were that the three-stage pump had *five times the capacity per stroke* of a 1¼-inch single and about *twice that* of the double. It combated back pressure on the down stroke when the weight of the body could be utilized. And yet the maximum operating effort was found by actual test to be almost equal. The greatest gain of all, perhaps, was in getting air through the tire valve, as the flow of air became almost continuous, while with the other pumps, the singles especially, air was expelled in short, jerky gusts which permitted the tire valve to close after each stroke, and, of course, necessitated its re-opening, thus greatly increasing the friction and the total amount of energy necessary to getting the tire up to pressure in a given time.



Two views of the Longhead biplane, which represents a serious American effort toward producing an airplane for general sport purposes

Doing Away with the Loading Charge

(Continued from page 24)

the truck body and raise it to whatever story is desired.

The loading and unloading of bulky and yet not extremely heavy packages is greatly facilitated by using drop sides or removable sides. If the body is used for regular routine delivery work, it is apparent that the drop side will save time as it can be handled more easily than the completely removable side assembly. For example, a bale of cotton weighs approximately 500 pounds. Hoisting this over the side of a motor truck can be easily accomplished by a couple of reasonably strong men provided the lift is not too high.

Cranes of various kinds are also of considerable value on trucks handling heavy materials. For example, in a truck delivering materials in barrels, it is possible to make the work easy for the driver so that it will not be necessary to carry a helper. This is done by fitting a simple, hand-operated crane to one side of the truck body at the rear end, provided with a swinging arm, which has a winch so that it can swing to any central point on the truck body and after the barrel is gripped by the hooks, the arm may be swung around and the barrel swung clear of the truck platform.

The best loading mechanism, where it is practical to use it, is a portable wagon- or truck-loader which will eliminate a large amount of hand shoveling in handling materials such as coal, gravel, etc., that is usually stored in piles. For example, by the use of a portable wagon-loader, it is possible to unload gondola cars of the hopper or dump-bottom type very easily, inasmuch as the car is run along a section of track and the load dumped in a pile. The portable wagon-loader, which in its simplest form consists of an adjustable bucket-conveyor mechanism mounted on wheels, carries the coal to a chute at the top which transfers it into the truck body. In another form of scoop conveyor, the material is lifted from the car interior by a chain conveyor operated by any suitable crane rigging which lifts the coal into a large, hopper-bottom steel bin. This is supported on a trestle work of sufficient height so that a motor truck can be driven under it to be loaded.

Some forms have belts instead of metal bucket conveyors. In the belt form, two forms of cleats are provided depending upon the kind of material to be lifted. The usual speed of a conveyor belt is about 170 feet per minute. When the belt is fitted with low cleats it is suitable for carrying material such as bricks, coke, coal in large sizes, bags, boxes, paving blocks, tile and similar materials. When the belt is provided with high cleats it can be used for handling material such as fruits and vegetables, smaller sizes of coal, ashes, crushed stone and other substances of similar nature.

Perhaps the most common form of special body that has received general application and which is adapted for a wide range of industrial use is the rear-dumping body having hydraulic or mechanical hoisting mechanism. These dumping bodies are made in a wide variety of different patterns and differ in design according to the requirements of the people using them. Some of these bodies are centrally pivoted on the longitudinal axis and may be tilted so the load is discharged from one side. Others, which have been designed for use with trailers, are bottom dumped. Evidently the bottom discharge construction would not always be as practical on a motor truck chassis as it is on a trailer because of the parts of the truck mechanism that are carried on the frame underneath the body.

The usual form of dumping body is pivoted near the back end and lifts up so its load can be discharged through the

tail gate at the rear. It is possible to make a body of this type with a hopper-like back so that it is not necessary to use a tail gate. Automatic dumping bodies are designs in which the material is carried in a box having a sloping bottom so that it will discharge without tilting the body. This method of construction is not always advisable because there is considerable loss in the available cubical contents of the body. Some forms of bodies that are used in the coal industry which provide automatic dumping features are so mounted that they may be elevated so that the load will be raised six or eight feet higher than the ground.

Hoisting mechanism is of two general forms: those in which the body is lifted by arms actuated through gearing which may be turned by a hand crank by man power or through a power take-off by the engine, and that type in which the work is done by hydraulic means. The mechanism employing reduction gearing is merely an improvement on the old type that was formerly hand operated and provided as equipment on horse-drawn vehicles.

The present hydraulic type of hoist would not be practical except on motor trucks; they cannot be operated very well by hand, for they require motor power to turn the pump fast enough to lift the ram in a reasonable length of time.

An important consideration in the designing of all dumping bodies, whether these are to be of the automatic type, or that form in which the wagon body is raised, is the angle of slide. This means the minimum angle with the horizontal at which material will move by its own weight. Naturally this angle is altered by the nature of the material and the type of body construction. Authorities state that an angle of inclination of forty-five degrees will be ample for dumping any of the materials usually handled in dump bodies.

In certain classes of contracting work and around industrial plants, portable lifting cranes and derricks have been installed on standard motor truck chassis. Some of these derrick mechanisms have a capacity for lifting six or seven tons, the load being raised by block and tackle arrangement which is operated by a motor-driven winch or windlass carried behind the driver's seat and operated from the truck engine.

The reason a separate engine is used on some of these derricks rather than employing the truck power plant is that the amount of power required for operating the derrick is considerably less than that delivered by the motor truck power plant.

Other trucks have been designed that use a traveling telfer which is provided instead of the usual form of derrick boom. These are suitable for lifting very heavy loads and are simpler in construction than the derrick is. Their use is limited, however, as they can only lift material from the truck body to the immediate rear of the truck or lift it from the ground back of the truck into the body. In order to permit mechanism of this kind to handle heavy goods, a pair of substantial screw jacks is carried by the rear of the chassis. These are dropped down to the ground and adjusted to support the rear end of the frame and relieve the truck springs and tires of the heavy load. When the jacks are down, a rigid platform is obtained.

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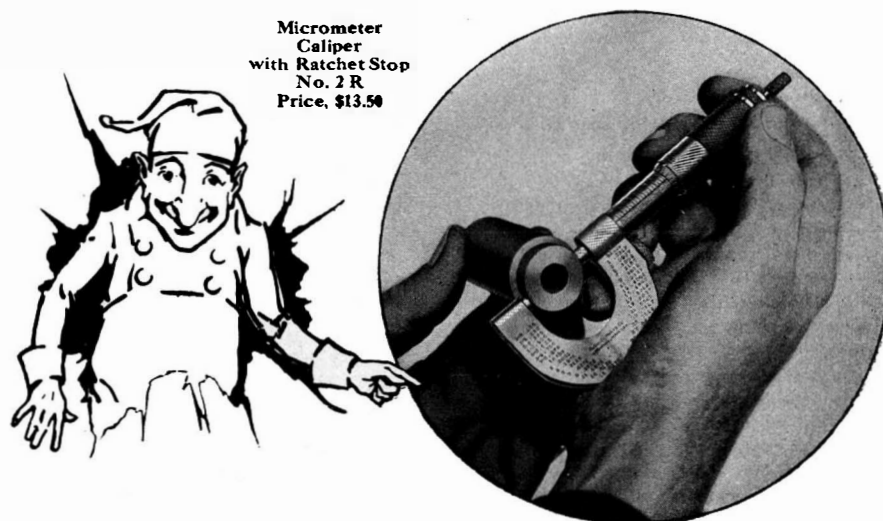
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The Longhead motor weighs approximately 90 pounds, is water cooled, and has two horizontally opposed cylinders with a bore of $3\frac{5}{8}$ inches and a stroke of $4\frac{1}{2}$ inches. There are two independent magnetos; and two high pressure gear-type oil pumps. The radiator, as noted above, is mounted in a novel position, immediately under the fuselage—the most logical

(Continued on page 37)

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Toolsmiths

Aircraft for Pleasure

(Continued from page 35)

ical place for it. Fuel consumption is one gallon, and oil one-half pint per hour. The landing gear is of the usual type with a factor of safety of over 10 to 1. There are only five wires on each side of the body—three flying, one landing and one drift, all being neatly faired to lessen head resistance. A special feature which will commend itself to all private owners is the patented wing-folding device reducing the housing space required to such an extent that any good garage is a suitable hangar.

Another small machine intended primarily for pleasure purposes is the "Butterfly" monoplane, built by the L. W. F. organization of College Point, N. Y. The body of this machine is monocoque, ending in the vertical knife-edge common to most European machines. A somewhat novel feature for a monoplane is that there is no cabane or structure above the fuselage to hold the wings in place by means of wire when the machine is on the ground. The latter are kept rigid by two diagonally placed wooden braces on each side, placed parallel, and running from either end of the chassis struts to about the center of pressure of the planes. There is also a small vertical strut in between to give additional strength. Wire cables prevent side sway.

In passenger machines there are several models on the market, but they are all naturally more expensive both in first cost and in upkeep than the single-seaters. Very powerful, and consequently, heavy motors are not really necessary in a pleasure craft where speed is not a first desideratum as in warfare, or lifting capacity would be in a commercial machine. If a properly designed body and camber of wing allows a small single-seater to be safely flown with a 25-horsepower engine, it follows that a two-seater requires but little more power, certainly less than double, if the passenger is properly seated as near the center of gravity as possible, a feature often overlooked. Weight distribution is a more important factor than is generally recognized.

In conclusion one may remark that there is no reason why the airplane should not become as universally popular in the near future as the automobile. Standardized types built on a quantity output scale should cost no more than the average motor car.

Fifty Motor Truck Opinions

(Continued from page 26)

Yet it is also true that there is opportunity for standardization, namely, in the chassis. One manufacturer suggests that truck builders should come to a standard dimension from dash board to back of seat box and for the width of two or three-men cabs, so that the body builders could make up cabs in quantities and bring down their costs, thus effecting a saving to motor truck builders which could be passed on to the buyer. This would certainly be a step forward in production.

Are motor truck bodies too high? Perhaps there is room for thought in that question, for a leading engineer states that in his belief motor truck bodies will have to be made narrower or wheel housings will have to be included in the bodies in order to allow the platform of the usual body to be nearer the ground.

Saving a Few Pounds Here and There

Pound by pound the motor truck builders are shaving down their truck weights in order to secure more economical operation, consistent with long wearing qualities and efficient service. As an instance, one builder has just put into production a tubular type propeller shaft which reduces the total weight of his truck just 32 pounds. In his quest for lighter weight this same manufacturer, some time ago, eliminated torque and radius rods as he found that the rear springs could be

made to do their work better and at the same time eliminate between 400 and 700 pounds of weight.

Another builder has reduced the unsprung weight of his car 200 pounds by using pressed steel axle housings instead of malleable iron or cast steel. On the one hand designers are simplifying and eliminating parts here and there to reduce weight, while on the other the engineers are turning to lighter alloys and metals. Aluminum, we find, is being used in moderation. It is employed by some for crank cases and underpans in order to reduce motor weight. Regarding structural parts, drop forgings and pressed steel parts are gradually replacing heavier castings. Heavy alloy steel is used in parts having to resist greater strains, but more from a standpoint of increased strength than a reduction of weight. Of course, there is a limit to how light a motor truck can be made, consistent with efficiency. A motor truck must have enough weight to get traction, that's certain.

The subject of weight introduces that of tires, which in the case of motor trucks looms up quite big in view of the keen rivalry between the solid and the pneumatic types. The consensus of opinion is that the use of the pneumatic tire on trucks has opened large new fields which could not be approached with the solid-tired vehicle. The pneumatic tire permits higher speed with heavy loads on good roads, and is also particularly adapted to soft roads since it does not cut into them as deeply as the solid type.

Pneumatic or Solid Tires?

Automotive authorities do not look forward to any radical changes in the tire situation, except that cushion tires are likely to become more common. As for the choice between pneumatic and solid tires, this is largely a question of circumstances. Some authorities recommend solid tires for use on the larger motor trucks employed for city service, and pneumatic tires on the smaller trucks and up to 2½-ton capacity. For country use, especially over roads that leave much to be desired in the way of smoothness, pneumatic tires are recommended.

Obviously, this all means, when boiled down to essentials, that the pneumatic tire has proved its worth in the past few years since its introduction. Motor truck builders appear to be quite enthusiastic over the pneumatic tire, which offers greater resiliency and therefore permits of greater speed on the one hand, and better protection to the vital parts of the truck. Furthermore, better traction can be obtained. All these factors mean much in the way of lowered transportation costs. Again, pneumatic tires prolong the life of any truck and save on repairs. However, as one authority points out, their maintenance cost—and they cost considerably more per mile—has caused some users to discard them. It seems as though the solid tire and the pneumatic tire each have their proper field, and sooner or later they will settle down in those fields with little or no conflicting opinions regarding their most efficient applications.

What of the Future?

The motor truck is no longer an experiment. Its field is pretty well defined. It has solved the problem of short hauls and is the best known means or radii for connecting railroad diameters, as one authority puts it. Up to 150 miles, the motor truck is held to be the most economical form of rapid transportation. Its place in our transportation scheme is between the horse and the railroad; but it will be some time before it displaces entirely the former.

As for novel applications, aside from the motor truck's regular use as a short-haul transport, there appears to be no limit. Today we find motor trucks equipped with flanged wheels doing duty on branch line railways and small rail-



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