GASOLINE-PROPELLED GUNBOATS FOR RIVER SERVICE.

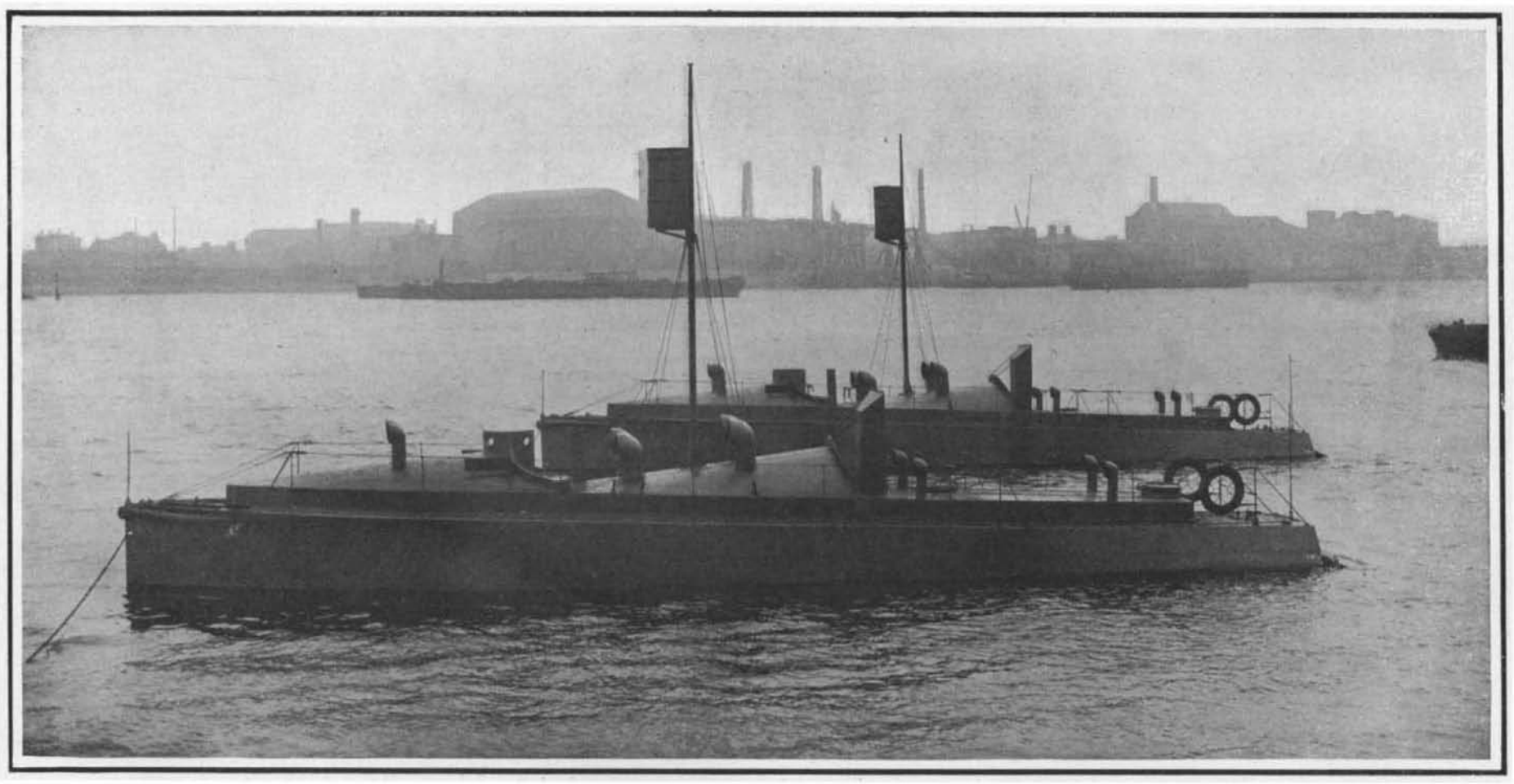
BY THE ENGLISH CORRESPONDENT OF THE SCIENTIFIC AMERICAN.

The possibilities of applying the small explosion motor to certain light craft for naval duties, such as river patrol work, have been recently advanced by the construction of two gasoline-propelled shallow-draft gunboats for service on the river Danube. These craft were built by the British naval shipbuilding firm of Yarrow & Co. for the Austro-Hungarian government. Each vessel has a length of 60 feet with a beam of 9 feet and a draft of 32 inches. They are built on the Yarrow shallow-draft system, having three screws revolving in tunnels and fitted with twin rudders. The hulls are built of galvanized steel.

The propelling machinery aggregates 350 horse-power distributed in five sets. Each wing screw has two sets of four-cylinder vertical Yarrow-Napier motors having a bore of 6½ inches by a 6-inch stroke, mounted in tandem and each developing 70-brake-horse-power. Thus each wing has eight cylinders representing 140 horse-power. The central screw has only one four-cylinder set and the reversing gear is coupled only to this middle set.

A small conning tower is fitted forward, while right aft is a revolving gun platform. A light gun will be mounted on the platform in Austria. The machinery space as well as fuel reservoirs, conning tower, and gun mounting are protected by 3/16-inch chrome steel armor plates affording complete protection to point-blank rifle fire at short range. Amidships is a short detachable mast fitted with a crow's nest for look-out purposes and to provide an elevated rifle firing position. Special attention has been devoted to the ventilation of the machinery space so as to avoid the accumulation of any noxious gases.

In the official speed trials carried out on the Thames measured mile by the Hungarian naval officers the vessels attained a mean speed of 22.25 knots with a load of three tons during a run of one hour's duration. A consumption trial was then carried out to ascertain the radius of action at an average speed of about 11 knots per hour and it was found that the vessels carried sufficient fuel for a continuous run of some 500 nautical miles. This represented a radius of action three times in excess of what would be possible with craft of the same size propelled by steam. A distinguishing feature during the high-speed trials was the absence of any vibration. Accommodation is provided for a crew of six men, the sleeping appointments for which are placed fore and aft respectively.



TWO 350-HORSE-POWER GASOLINE-PROPELLED GUNBOATS FOR PATROL DUTY ON THE DANUBE.

Note the conning tower, the crow's nest, and the revolving gun platform aft.

The evil repute of the bedbug has acquired fresh justification. It is well known that most contagious diseases are disseminated by blood-sucking insects—malaria and yellow fever by mosquitoes, plague by fleas, the African sleeping sickness by *Glossina palpalis* (a near relative of the tsetse fly), anthrax, tuberculosis, smallpox, scarlet fever, typhoid fever, etc., by the common house fly. Now Jordansky and Klodentzky have proved by very delicate experiments, that bedbugs are the worst of all, at least in the dissemination of plague. Not only do they draw contagion from the bodies of men and animals stricken with plague but the germs live and multiply within the bodies of the insects, retaining their full virulence for many days. The bedbugs do not appear to suffer any inconvenience, for they live and remain active for months after they have absorbed the germs. Hence a few bedbugs might easily infect a regiment with plague and it is to be feared that they possess equal power to spread other diseases.

THE WRIGHT BROTHERS' AEROPLANE IN FRANCE AND THE UNITED STATES.

In view of the fine performances of Wilbur Wright with his aeroplane in France, and also of the flights about to be made by Orville Wright near Washington, at Fort Meyer, we are glad to be able to present to our readers, in this issue, the first actual detail photographs of this world-renowned aeroplane which the Wright brothers have heretofore kept closely veiled from public view. These photographs show that, as had been supposed from the descriptions of eye witnesses and also from the minute photographs taken at long range of the machine in flight at Kitty Hawk, their motor-driven aeroplane is of the greatest simplicity and is, in fact, merely their gliding machine with a motor and propellers added. In the photographs which we reproduce the reader can see that the machine is fitted with a double-surface horizontal rudder mounted in front and having a small vertical rudder at its center point, while twin vertical rudders are used at the rear for side steering. The two propellers are located at the rear of the main planes, and are driven in opposite directions by chains from the motor located on the lower plane a short distance to one side of the center line of the machine. A vertical surface seen at the front end of the motor is the radiator, which consists of a number of small tubes closely assembled. The machine is carried on wood skids placed a short distance below the lower plane and which project forward and upward to form a support for the front horizontal rudder. Suitable stays extend downward from the front edge of the upper plane to these skids and also upward from the front edge of the lower plane to their vertical uprights. Practically all of these features could be made out in the small photographs taken at Kitty Hawk and published and described by us several months ago.

The main planes are 40 feet long by 6½ feet wide, and spaced 6 feet apart. Their supporting surface is 500 square feet. The horizontal rudder planes are 16 feet long by about 2½ feet wide, their total surface being 75 square feet. The weight of the aeroplane without operator or supplies is about 800 pounds. With two men and a supply of fuel and water, it weighs about 1,150 pounds, which, if the area of the horizontal rudder is added to that of the main planes, gives a loading of the surfaces of but 2 pounds per square foot. As some of the recent French monoplanes carry from 3 to 3½ pounds per square foot of supporting surface, it can be seen that the Wright machine is not heavily loaded, the consequence being that it can rise in the air and fly at a speed of 26 miles an hour, although it is capable of traveling at the rate of 40. The machine in use in France has but two control levers, while the new one to be flown here has three. Two of these, which control the warping of the planes and the vertical rudders, can be worked in unison, while the third operates the horizontal rudder. The 4-cylinder, vertical, water-cooled gasoline motor (which is the Wright brothers' own design) is run at a constant speed of about 1,400 R. P. M. It drives the propellers in opposite directions at about 500 R. P. M. No carbureter is used, the gasoline being pumped into the cylinders above the inlet valves. According to Mr. Orville Wright, the speed of the aeroplane is varied by manipulating the surfaces and not by varying the speed of the motor. The method of operating the motor without a carbureter by feeding gasoline direct to the cylinders is that used by Farman with his 8-cylinder engine, and it is claimed that this method, although not economical of fuel, produces the best results when a motor is run at constant speed. The motor of the Wright aeroplane is placed in a fore-and-aft direction across the lower plane a short distance to one side of the center line, while the aviator and passenger sit beside the motor on the other side of this line and with their feet upon a cross brace below and in front of the plane. The frame and braces of the aeroplane are constructed of wood (spruce, ash, and pine), while unbleached muslin is used for the surfaces. No special pains have been taken to reduce the resistance of the various braces, with the exception of the uprights connecting the main planes, which are oval. The planes are braced in all directions with piano wire. They are flexibly connected so that they can be warped slightly by cords passing through pulleys and connected to the levers.

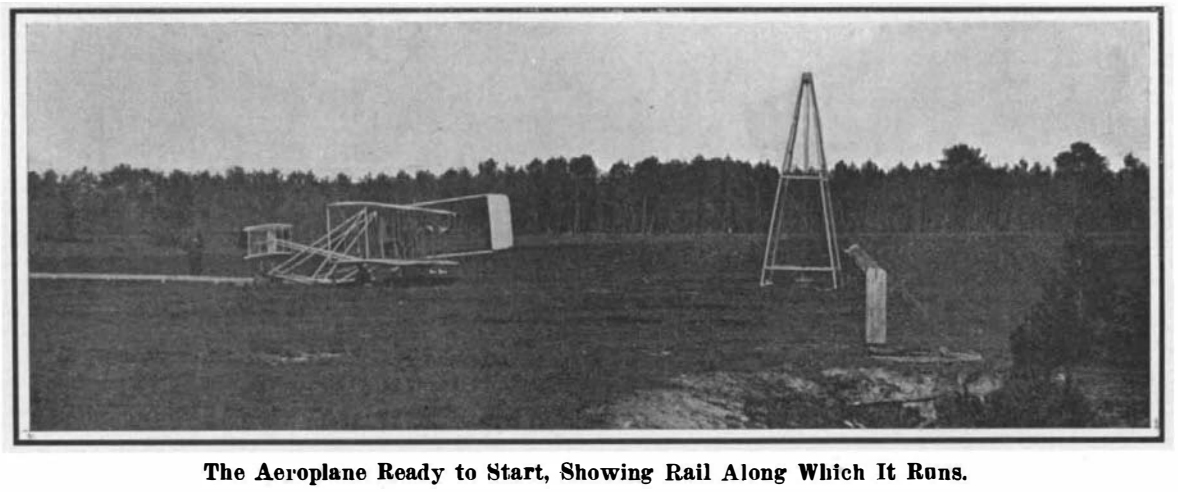
The main points about the Wright machine are its simplicity and efficiency. The former is apparent by a glance at the photographs, which also show some reasons for the latter, such as the lack of a tail and the almost flat surfaces set at a very slight angle of incidence. While there are apparently a good many braces to make head resistance, nevertheless these are chiefly concentrated at one point in the center part of the machine where the resistance of the motor, radiator and men are met with anyway. Besides the ease with which the machine glides through the air for the reasons above mentioned, the Messrs. Wright claim that their screw propellers (which are of wood and about 6 feet in diameter), give very great efficiency. This is another of the chief reasons why they can propel their machine at such high speeds with so little horse-power. The chain drive from the motor to the propeller shaft is also a fairly efficient form of power transmission. As a result of these various causes, they have succeeded in attaining a speed of 44 miles an hour with about 25 horse-power, which shows that their machine is practically 100 per cent more efficient than the best of those made abroad. When the question of stability and safety is considered, however, this machine does not appear to so great an advantage. It is true that the transverse and longitudinal stability can be maintained with great ease by the

warping of the ends of the surfaces and the use of the horizontal rudder, but there is nothing in the least automatic in the way this is done, the aviator being depended upon entirely to control the equilibrium of the machine by moving levers. If anything happened to the man directing the machine, or should he make a false movement of a lever, the aeroplane would either plunge suddenly to the ground, or turn a backward somersault. Should anything happen to the horizontal rudder (as has been known to do with other aeroplanes), the machine would be completely out of control of the aviator and it would probably be dashed to the ground; whereas with the Farman type of machine, which employs a steadying tail, an accident happening to the rudder might be counteracted by the tail, or *vice versa*. Thus, for the sake of simplicity and efficiency, the element of safety has been sacrificed to a considerable extent. In a machine for war purposes, however, speed and efficiency are most desirable and the aviator is willing to sacrifice a large factor of safety in order to be able to fly at high speed.

One of the photographs which we reproduce shows the aeroplane at the beginning of the track along which it runs in making its start. It is mounted on a small two-wheeled carriage, which is jerked forward by a falling weight arranged in the tower at the rear of the machine. This accelerates the speed of the aeroplane more rapidly than the propellers alone can do, and causes it to rise in the air after traveling a distance of barely 100 feet. The carriage is left behind, and the aeroplane, when alighting, lands on its skids. How it seems to start off and make a flight in this machine can best be told by the Wright brothers themselves, from whose article in the current Century Magazine we quote the following:

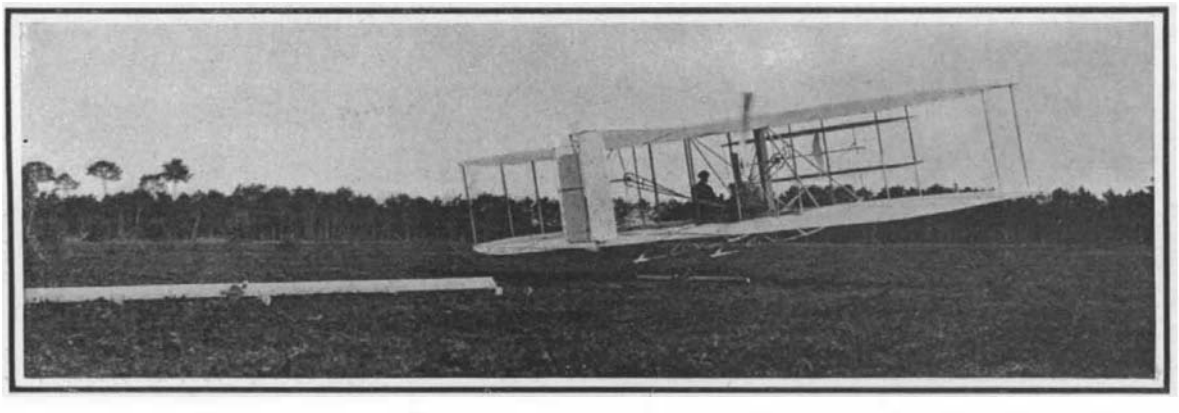
"In order to show the general reader the way in which the machine operates, let us fancy ourselves ready for the start. The machine is placed upon a single rail track facing the wind, and is securely fastened with a cable. The engine is put in motion, and the propellers in the rear whirr. You take your seat at the center of the machine beside the operator. He slips the cable, and you shoot forward. An assistant who has been holding the machine in balance on the rail, starts forward with you, but before you have gone fifty feet the speed is too great for him, and he lets go. Before reaching the end of the track the operator moves the front rudder, and the machine lifts from the rail like a kite supported by the pressure of the air underneath it. The ground under you is at first a perfect blur, but as you rise the objects become clearer. At a height of one hundred feet you feel hardly any motion at all, except for the wind which strikes your face. If you did not take the precaution to fasten your hat before starting, you have probably lost it by this time. The operator moves a lever; the right wing rises, and the machine swings about to the left. You make a very short turn, yet you do not feel the sensation of being thrown from your seat, so often experienced in automobile and railway travel. You find yourself facing toward the point from which you started.

The objects on the ground now seem to be moving at much higher speed, though you perceive no change in the pressure of the wind on your face. You know then that you are traveling with the wind. When you near the starting point, the operator stops the motor while still high in the air. The machine coasts down at an oblique angle to the ground, and after sliding fifty or a hundred feet comes to rest. Although the machine often lands when traveling at a speed of a mile a minute, you feel no shock whatever, and cannot, in fact, tell the exact moment at which it first touched the ground. The motor close beside you kept up an almost deafening roar during the whole flight, yet in your excitement you did not notice it till it stopped."

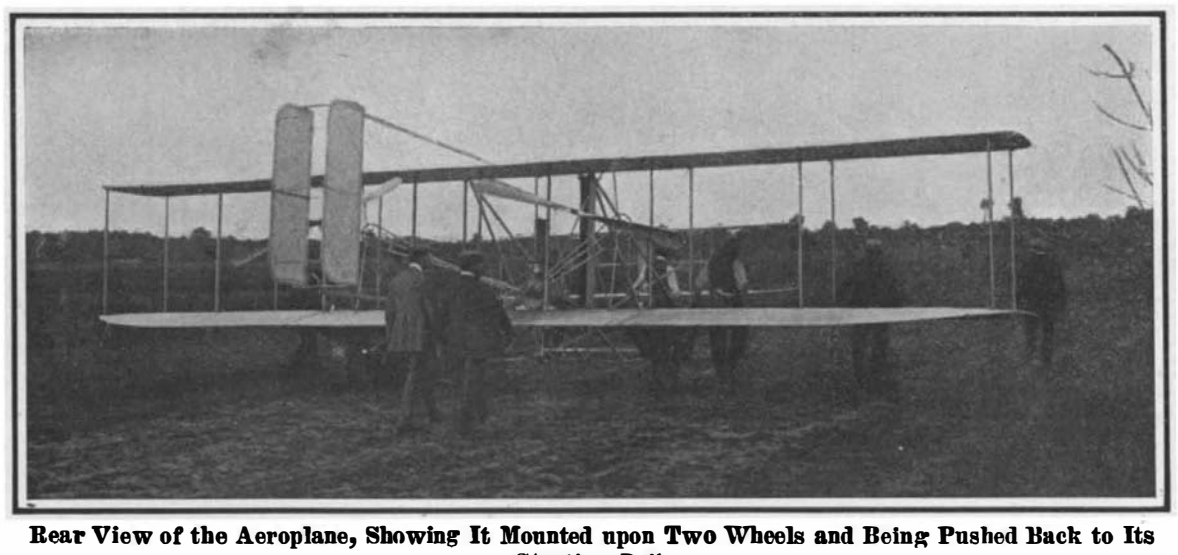


The Aeroplane Ready to Start, Showing Rail Along Which It Runs.

The tower at the right supports a heavy weight which is connected to the small car that carries the aeroplane. At the moment of starting, the weight drops and jerks the machine suddenly forward, thus accelerating quicker than is possible with the propellers alone.

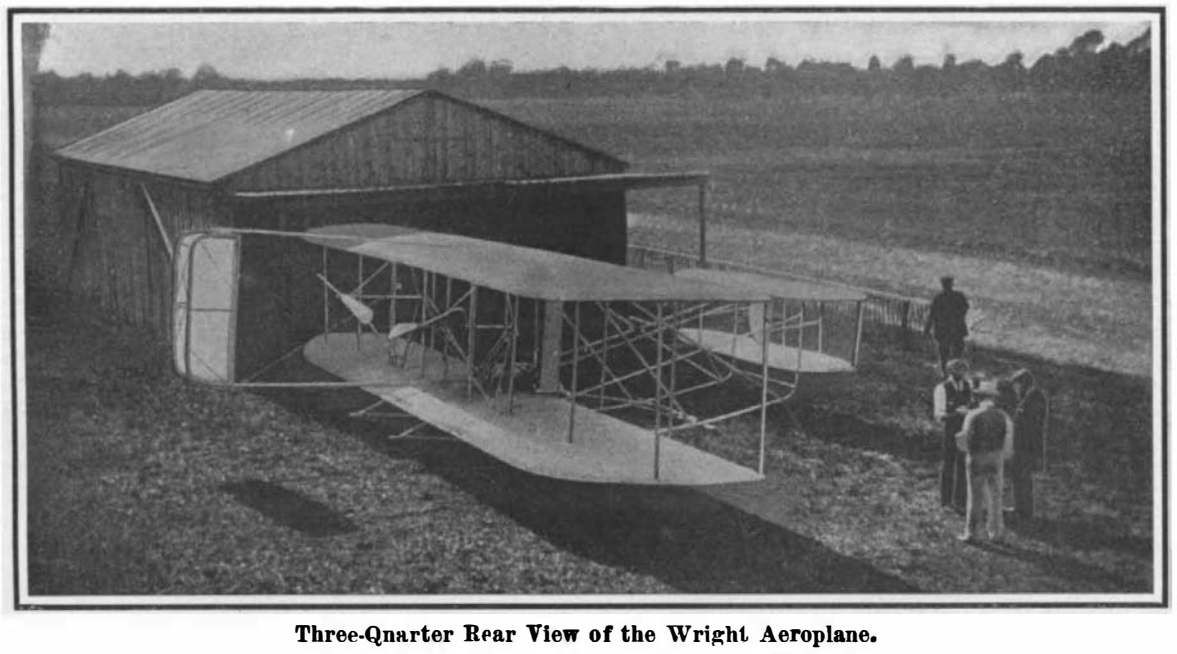


The Aeroplane Leaving the Rail, Showing the Angle of Ascent Produced by the Horizontal Rudder.



Rear View of the Aeroplane, Showing It Mounted upon Two Wheels and Being Pushed Back to Its Starting Rail.

The 25-30-horse-power, 4-cylinder motor and its twin radiators are distinctly visible, as are also the inclosed chains which drive the propellers in opposite directions.



Three-Qnarter Rear View of the Wright Aeroplane.

The aeroplane rests on skids which extend forward and support the horizontal rudder. Note the curved vertical rudder in the center of this, the vertical radiating tubes at front edge of main planes, the motor extending back from them, and the twin propellers and rudders at the rear.

SOME DETAILS OF THE WRIGHT BROTHERS' AEROPLANE.

Some of the difficulties met with by experimenters in constructing a machine which will have good stability are also described in the same article:

"The balancing of a flyer may seem, at first thought, to be a very simple matter, yet almost every experimenter had found in this the one point which he could not satisfactorily master. Many different methods were tried. Some experimenters placed the center of gravity far below the wings, in the belief that the weight would naturally seek to remain at the lowest point. It was true, that, like the pendulum, it tended to seek the lowest point; but also, like the pendulum, it tended to oscillate in a manner destructive of all stability. A more satisfactory system, especially for lateral balance, was that of arranging the wings in the shape of a broad V, to form a dihedral angle, with the center low and the wing-tips elevated. In theory this was an automatic system, but in practice it had two serious defects: first, it tended to keep the machine oscillating; and, second, its usefulness was restricted to calm air."

From the above it will be seen that an aeroplane is largely a matter of compromise and that its form and surface must be determined from the uses to which it is to be put, and from whether it is to fly in winds or in calm air alone. The Wright machine has demonstrated that it can fly in a wind as great as 20 miles an hour, while none of the other aeroplanes have ever flown in a wind of half this velocity. In this one point alone it is far superior to all other aeroplanes; and doubtless, in time, the brothers will perfect it so that it will have automatic equilibrium and thus be capable of use by almost any individual. There are great possibilities, too, in the way of reducing the supporting surfaces and all parts of the machine to their minimum size and weight; for one leading experimenter in this line asserts that a two-man motor-driven aeroplane can be built which, complete, will weigh only about 150 pounds. Such a machine could be readily carried to a suitable starting place by the two men using it, and as a means of transport in inaccessible country it would be unsurpassed.