NAVIGATING THE AIR.

BY

AUGUSTUS POST,

Secretary, Aero Club of America.

RÉSUMÉ OF THE POPULAR SCIENCE LECTURE DELIVERED AT WITHERSPOON HALL, FRIDAY EVENING, OCTOBER 15, 1909.

The lecture was prefaced with a brief introductory address by President Clark. The speaker pointed out that aerial navigation had been developed by the evolution of the three distinct classes of apparatus—balloons, dirigibles, and aeroplanes; and presented the subject in the following order:

Balloons.—Successful navigation of the air may be fairly said to have its first impetus with the experiments of the Montgolfier brothers. Their crude experiments on the ascensional power of "smoke" and "steam" finally led to the use of heated air as a means of securing buoyancy. Shortly after this, through the investigations of the brilliant physicist Charles, hydrogen was found more suitable and balloons, even at that early date, barring advances in construction and other technical details, differed little from those used at present.

At that time there existed many technical difficulties in the manufacture of the gas which have been overcome in modern generators. Among the improvements in modern gas plants may be mentioned a steel cylinder for convenient transportation of gas at high pressure to the field of operation.

The principal requirements in balloon construction are—envelope must be gas tight and water-proof, the netting must properly fit the envelope, and the car must be suspended in a certain position fixed by the shape and dimensions of the gas bag.

Among the methods of control may be named the gas valve at the top of the envelope for controlling the escape of gas from the car, the ballast, the drag rope and the anchor, all of these seemingly crude methods of control permit navigating a balloon, by taking advantage of air currents at different elevations, with a degree of precision surprising to the uninitiated.

An equipment of instruments to aid navigation is provided, such as the compass, the recording barometer, and the anemometer. Among these there is one peculiar to ballooning known as the "stotoscope" which utilizes the change of barometric pressure, due to a change of elevation, to indicate by the motion of a delicate diaphragm whether the movement is one of descent or ascent.

Dirigibles.—Although attempts to construct balloons propelled by mechanical means were made over fifty years ago, it is only within comparatively recent years—since the advent of the liquid-fuel internal-combustion motor—that such efforts have met with practical success. The envelopes are invariably elongated in a horizontal direction, to present as small a cross-sectional area as possible in the direction of motion. The best known and most successful of these are those built by Lebaudy Parseval, de la Vaulx, and Zeppelin. With the exception of the last these all have a flexible envelope like a balloon. Zeppelin differs from the others in having a rigid envelope and is a most interesting achievement in extremely light construction.

Dirigibles are without exception, exceedingly susceptible to injury on account of their large volume and extreme lightness when anchored, by any sudden gust, or, other inclemencies of weather, and in order to protect them they are stored, when not in use, in air-ship houses. These are large

frame structures capable of swinging about a pivot in order that the opening may be made to face various points of the compass according to the direction of the wind.

Aeroplanes.—Ascentional power in aeroplane apparatus is secured entirely by the application of mechanical power; the vehicle itself, though light, being quite devoid of buoyancy in air. The principle utilized is that when a plane, or a slightly curved surface, is driven through the air in a direction having small inclination to the direction of motion, the component of air pressure perpendicular to its direction of motion is far greater than that required to drive it. Much theoretical investigation and many experiments have been made to determine the more effective size, shape, and arrangement of an aeroplane to obtain a maximum lift. Notable among the modern experimenters in this field may be particularly named Maxim, Langley, and Lilienthal. The methods of the latter are said to have been followed by the Wrights, the early trials of which culminated in their undisputed preëminence. Their successful efforts have been quickly followed by equally remarkable flights by Farnum, Curtis, Bleriot and others. Aeroplane production is now an established industry in Europe and equipment and motive power peculiar to this type of vehicle may now be purchased, which, in refinement and adaptability, is a delight to the mechanical instinct.

[Mr. Post elaborated extensively upon all the topics mentioned in this résumé and illustrated the subject by a large number of lantern slides and moving pictures depicting in a most striking manner the appearance of dirigibles and aeroplanes in operation.]

TITANIUM.

USES OF A RARE METAL.

The use for titanium which gives promise of greatest expansion is in steel and cast iron. In steel it is ordinarily added in the form of ferrotitanium (containing preferably from 10 to 20 per cent. of titanium) in quantity sufficient to form about 0.1 per cent. of the steel. Rails treated with titanium and laid in places on railroads where the wear was especially hard are said to have shown much less wear than untreated rails. Gray cast iron also is said to have shown beneficial effects from such treatment. Cuprotitanium is also manufactured for use in bronze and other castings containing copper. The titanium acts as a deoxidizer, much like phosphor-tin, and makes very tough castings. Another use of titanium which promises to assume considerable proportions is the manufacture of electrodes for arc lights.

Titanium ore in the form of rutile, which is titanium dioxide, has been mined in Nelson County, Virginia, where a plant has been erected to extract the metal from the ore. Titaniferous iron ores are mined in New York, Minnesota, and Wyoming.

A report on the production of titanium and other rare metals in 1908, prepared by Frank L. Hess, has just been issued by the United States Geological Survey.