

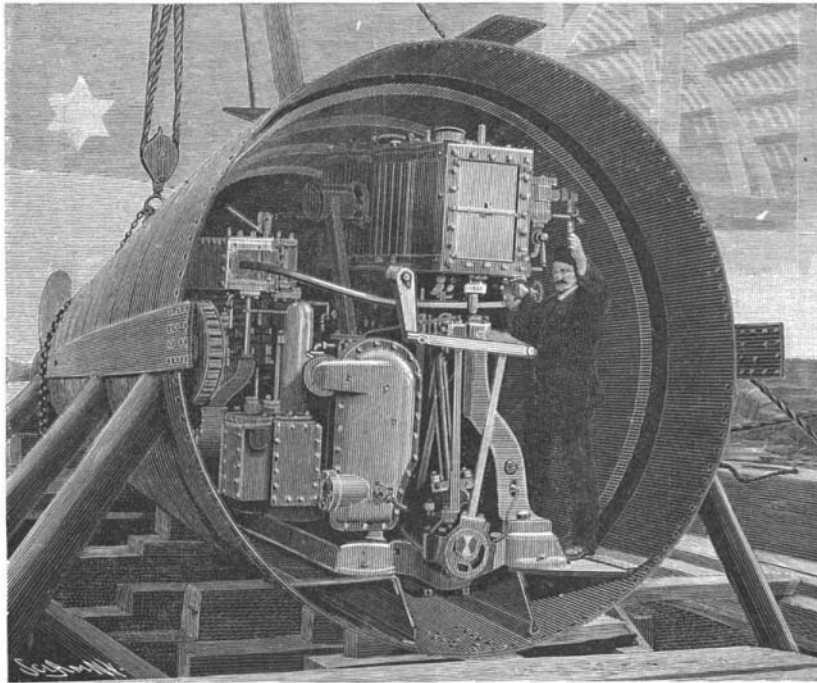
### TURKISH SUBMARINE BOAT OF THE NORDENFELDT TYPE.

At the present time, when so much attention is being paid to the submarine boat, and several of this type are being constructed for our own navy, it is of interest to turn to an early series of experiments, carried out by the British Admiralty, which, in the opinion of our contemporary, *The Engineer*, to whom we are indebted for our illustrations, "has left them in such a position that there is practically nothing more to be learned on the subject from such experiments as France, going over very old ground, is now conducting."

Referring to the French experimental work now being carried on, the same authority says that between the year 1886 and September, 1888, a series of experiments in the construction and use of submarine boats was carried on in this country and abroad, beside which the French experiments now going on are mere child's play. Mr. Garrett, a gentleman in holy orders, and extremely ingenious, devoted the greater part of his life and fortune to the development of the submarine boat; and with him was associated Mr. Nordenfeldt, the inventor of the well-known Nordenfeldt gun. The vessel was designed to run near to the vessel to be attacked, then sink 20 feet below the surface, and proceed submerged to within striking distance, when she would discharge her torpedoes and return. For the purpose of propulsion steam was used in the ordinary way on the surface. When going to sink, the chimney was removed, and air-tight stopper fitted on the opening to the up-take. The furnace mouths were similarly closed by doors like those of a gas retort, and the boat sank. Power was then supplied on Lamm's system by the hot water in the boiler. The experimental boat quite realized all Mr. Garrett expected. A second boat was constructed, and after elaborate and prolonged experiments full of incident, the little vessel was bought by the Turkish government.

The accompanying illustrations show two sectional views and a view from the quarters of one of the Turkish boats, whose description and principal dimensions, as given in *The Engineer*, are as follows: Length 100 feet, beam 12 feet, and displacement 160 tons. The engines are of the ordinary surface-condensing compound type, with two cylinders, and are estimated to indicate, at a pressure of 100 pounds of steam, 250 horse power. There is nothing particularly to remark about these engines, except that the circulating and air pumps are worked by a separate cylinder. The main engine is thus left free to work or not, while vacuum is always maintained to assist the various other engines with which the boat is fitted. The boiler, marked *G* in the longitudinal section, is of the ordinary marine return-tube type. It has two furnaces, and the heating surface is about 750 square feet. A novel feature about it is, however, that after the products of combustion have passed through the tubes, they again pass through a large pipe, marked *H*, in the steam space of the boiler before they reach the funnel. The object of this is threefold: First, the economy of heat and fuel; secondly, to enable the funnel to be as near the center of the boat as possible, and thirdly, that the inboard portion of the same might be kept the cooler by thus lengthening the passage to it of the heated air. The hot-water cistern is seen at *P*, and the power to operate all the separate engines during a submarine voyage is the heat, as previously mentioned, which is stored up in its contents, as also in those of the boiler. In all there are some 30 tons of water, the vapor of which has a maximum tension of 150 pounds per square inch when the boat is first submerged; and this, with the assistance of the vacuum, is sufficient to drive her from thirty to forty miles without lighting any fire on board or using any air for the generation of heat. The pressure is raised in the hot-water cistern as follows: Live steam from the boiler enters a series of tubes which have a superficial area, in all, of some 500 square feet, and after parting with its latent heat to the contents of the cistern, being then in the aqueous form, is taken off by a small double-acting pump and carried back

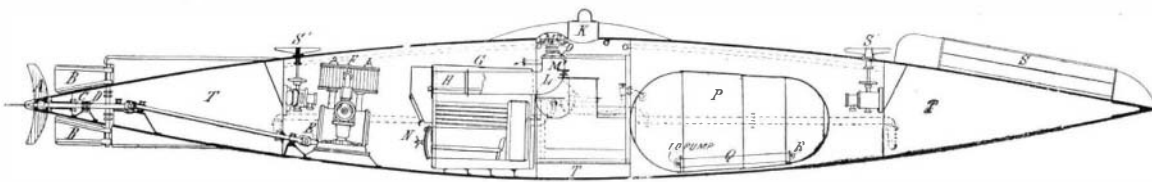
to the boiler. The propeller, *A*, is placed abaft the rudder, *B*, and it will be noticed that although the shaft is central, working on the thrust-block, *D*, the coupling connecting the crankshaft of the engine, *E*, is placed low down in the boat. It is this feature in the arrangement which admits of the use of a marine engine of ordinary type. The engines which operate the vertically-acting screws are of the three-cylinder type. This is in order that there may



CROSS-SECTION OF TURKISH SUBMARINE BOAT.

be no dead center, as it is highly important that they should start the moment steam is turned on. By the use of a special valve the captain is enabled to vary the speed of the propellers and to stop them both together or separately, at will, and thus to arrange the depth at which his craft is to operate. As seen in the engraving, these propellers in the Turkish boats are placed in the fore-and-aft line.

The maintaining of the vessel in a horizontal posi-



VERTICAL LONGITUDINAL SECTION.

tion is controlled by two bow-fins. By a very ingenious arrangement of a plumb-weight, with other mechanism extending to the conning-tower, the action of these fins is rendered both automatic and controllable, and perfect command is thus insured over the movements of the boats, as far as the vertical plane is concerned. To touch now upon the manner in which the "Nordenfeldt" is operated, it should be understood that the boat has two distinct conditions of existence

inner and outer portions of the funnel, *M* and *M'*, is not seen, it should be mentioned, in the engraving. In this position, with more or less of her bulk immersed, as may be thought necessary, according to the nature of the service upon which she is engaged, the boat can proceed upon voyages only limited in extent by her coal-carrying capacity. This in the Turkish boat is estimated to suffice for the fuel to drive her 900 knots at a moderate speed. The immersion of the

boat in her surface condition is regulated by the admission or otherwise of water into the ballast tanks. Of these there are three, one at each end and a third under the center compartment, *T T T*, in the engraving. The two first mentioned contain about fifteen tons of water each, and the central one seven, when the boat is at her proper draught for descending. At this draught there is very little of the craft visible beyond the conning tower, and knowing even in which direction to look, it is not an easy matter to make her out at any great distance, the eye being unassisted by the ear on account of the noiselessness of the engines. All those who have witnessed the running of the boat here have been particularly struck with this feature of her performance, as also the little disturbance at the surface occasioned by the screw.

Before the boat can assume her condition as a submarine craft, it is necessary to hermetically close the furnaces, which is done by the doors marked *N*, upon which combustion is soon brought to an end. The piece of funnel connecting the boiler with the out-board portion is then removed, and the doors, *O* and *O'*, placed in position, as shown in the engraving. While these changes are being effected, water is allowed to run into the ballast tanks, to reduce the buoyancy to its proper limit, and this arrived at, nothing remains but to close up the conning tower. The vertically-acting screws may then be set in motion to place the boat quite out of sight, or she may proceed with nothing but the glass cupola of the conning tower showing above the surface.

### SIBERIA IN THE GLACIAL AGE.

Prof. G. Frederick Wright, of Oberlin College, recently returned from a trip around the world made in the interests of the science of geology. The main object of the trip was to settle, if possible, what has long been a disputed question among geologists—that is, whether Siberia has ever been covered with ice as North America and parts of Europe were during the glacial period. The view which is generally accepted is that Siberia was covered with ice, and a great many geologists still hold this view.

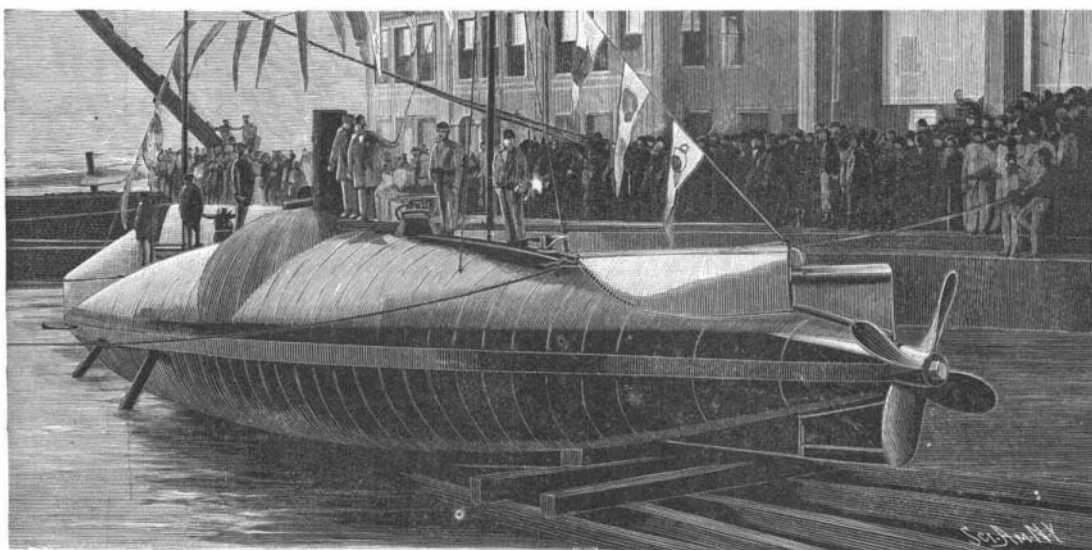
As a result of his trip Prof. Wright believes that at the time when North America was covered with ice, Siberia was covered with water. He found no signs of glacial phenomena south of the fifty-sixth degree. North of that he did not go, but he is convinced that the land was never covered by ice as was our own.

According to *The New York Sun*, Prof. Wright says:

"We did find indications of an extensive subsidence of all that region, which puts a new light on everything here. At Trebizond, on the south shore of the Black Sea, there was evidence of a depression of 700 feet. This was shown by gravel deposits on the hills. In the center of Turkestan the waters reached their greatest height, for there we found these deposits over 2,000 feet above sea-level. Southern Russia is covered with the same black earth deposit that we found in Turkestan. There were still other evidences of the waters having covered this portion of the globe. One of these is the presence yet of seals in Lake Baikal, in Siberia, 1,600 feet above sea-level. The seals which we found are of the Arctic

species, and are the same species as found in the Caspian Sea.

"The only theory, therefore, is that they were caught there when the waters receded. Perhaps the most wonderful discovery of all was at the town of Kief, on the Nippur River, where stone implements were found fifty-three feet below the black earth deposit, showing that the water came there after the age of man. This enabled us, therefore, to determine the



SUBMARINE BOAT IN DOCK AT CONSTANTINOPLE.

as a torpedo craft—that of a surface boat, and a submarine one. When performing the functions of a surface boat, the air which is sucked into the boat through the conning tower, *K*, by the fan, *L*, is forced by the said fan into the engine-room. From here, having no other outlet, it passes into the furnaces, and after supporting combustion reaches the atmosphere by way of the tube, *H*, as previously described, and the funnel. The connecting link between the

age of this depression. It shows that since man came there there has been a depression of 750 feet at Trebizond, and in southern Turkestan the waters were over 2,000 feet deep. The implements found were such as those made in North America before the glacial period, which gives good ground for believing that the depression was made there when the glacial avalanche occurred here. In short, it was practically the Flood."

Prof. Wright made some interesting investigations on the Red Sea. He states that it has hitherto been supposed that the Children of Israel crossed the Red Sea at Suez, but it has been found difficult to reconcile this supposition with the fact that a million persons crossed the sea in a single night, which would necessitate a very wide division of the waters. His explorations north of Suez have convinced him and those to whom he talked that the point of crossing was twenty miles north of Suez, because at that point the conditions are all fulfilled. The waters at that time were about four feet in depth there, and the mountains are in the west, just as related, and an east wind would have swept bare a place at least five miles wide.

#### HOFMAN'S FLYING MACHINE.

Following hard upon the heels of the Viennese engineer, Wilhelm Kress, whose aeroplane has been illustrated and described in the SCIENTIFIC AMERICAN, comes a Berlin inventor, Regierungsrath J. Hofman, who has constructed what is claimed to be a working model of a flying-machine. Kress, for lack of funds, was severely hampered in building his device. Unable to purchase a motor—an obstacle which, we are glad to note, has been overcome with the assistance of the Emperor of Austria—Kress could test his contrivance only on water. Hofman, on the other hand, did not immediately proceed with the building of a full-sized machine, but has first constructed a model on a scale of 1 to 10.

To start and to land are the most difficult feats in operating a flying-machine. For this reason ingenious inventors, among them Prof. Langley, have erected special frames from which they start their machines in order to secure sufficient living force, the machines themselves being merely of sufficient strength to meet the requirements of the speed to be attained. Hofman's machine differs materially from the contrivances of these inventors, in so far as he uses no particular launching-frame or other construction. He employs legs which are provided with wheels at their lower ends, and which are normally in the position shown in Fig. 2, but which are suddenly drawn from the ground close to the body when the propellers are set in motion. Robbed of its support, the machine falls, driven forward by its propellers. But the machine drops barely a second; beneath the wings, projecting far out from each side, sufficient air has collected to sustain the entire apparatus. New masses of air continually collect beneath the wings, so that, it is claimed, the buoyant force of the air becomes so great that the machine is not only supported in its flight, but is even driven further upward, there to be maintained at the desired height by the action of its propellers.

The little steam-engine used to drive the propellers is supplied with steam at a pressure of 165 pounds by a boiler composed of 72 water-tubes. The engine itself is made of steel. For a full-sized flying-machine, Hofman intends to use coal as fuel, although the firing of the boiler with petroleum has also been contemplated.

The wing or sail surfaces have an area of over 21 feet, and project laterally to a distance of 4.66 feet. The entire weight of the little model is 7.7 pounds.

The Scientific Alliance of New York city is now actively engaged in raising funds for a building to be devoted to the scientific societies of New York. It is desired to obtain \$500,000.

#### The White Rhinoceros.

A few individuals of the white rhinoceros, *Rhinoceros simus*, are to be found in Natal and Zululand, but their number is very small; it is supposed that not more than twenty of these animals exist in the world. Not long ago a band of five individuals was seen by a

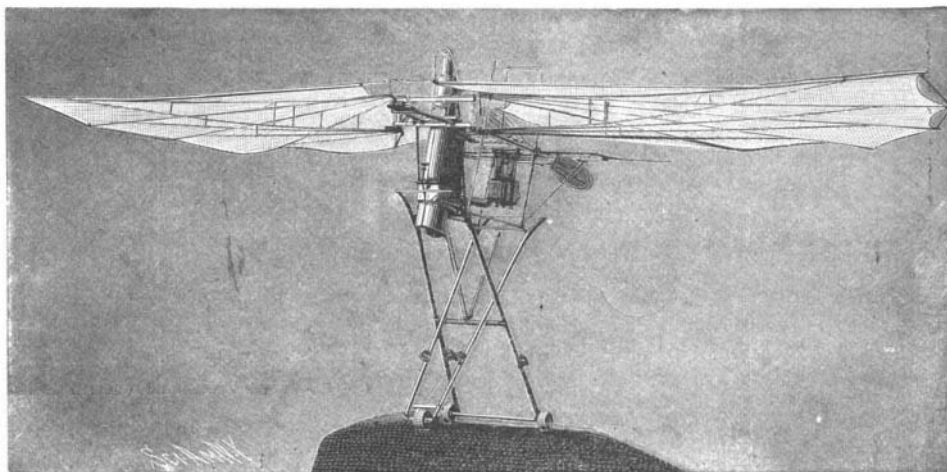


Fig. 2.—READY TO START.

party among whom was the Governor of Natal. This was in one of the regions set apart as a game preserve, near the junction of the White and Black Umfolzi. The governor and a local functionary were told that a band of these animals was to be seen; both proceeded in the direction indicated, on horseback, and soon came in sight of the band. The animals were moving slowly toward a clump of bushes and allowed themselves to be approached, not seeming at all shy; the horsemen came within 150 feet of the

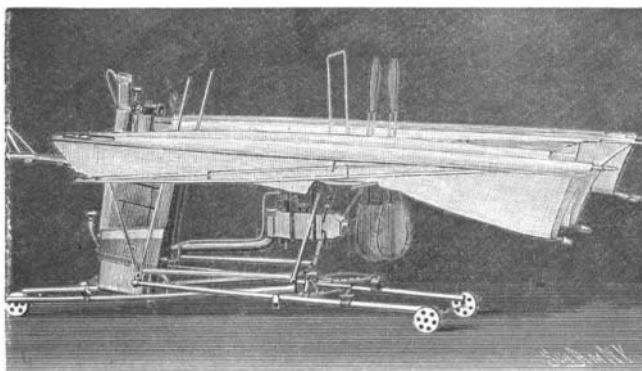


Fig. 1.—POSITION OF THE WINGS WHEN FOLDED.

enormous animals, who were occupied in feeding upon the grass of the plain, near some scattered trees. As they did not seem to be alarmed, the two men dismounted and approached on foot, stopping at a distance of only 60 feet from the group. They were thus enabled to observe the animals very closely for more than a minute; the latter did not seem to pay any attention to them, but kept on grazing. Soon, however, they commenced to sniff the air and became uneasy, but without apparently seeing their visitors,

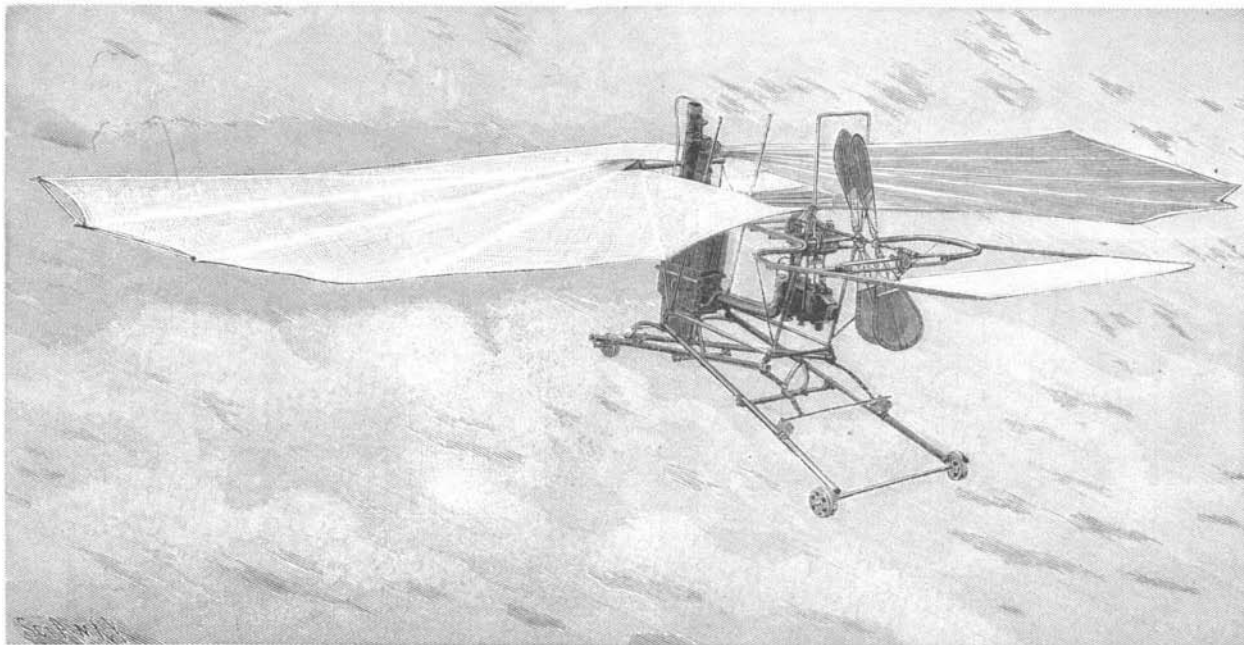


Fig. 3.—THE HOFMAN FLYING-MACHINE IN FLIGHT.

who were not at all concealed, and then commenced to move off slowly, first walking, then at a trot. It is a rare circumstance to see and to observe these animals for any length of time at such close quarters. The group was composed of four adults, among whom was a powerful male, and an individual of three-quarters growth. On the same day were seen a group of three others of the same species, and these include

nearly all the animals of this species remaining in the region, within one or two; it is supposed that the number is not more than ten in all. It is thought that a few specimens exist also in the chain of Ubombo, but this appears doubtful, these being rather the *R. bicornis*. The white rhinoceros is protected as strictly as possible, and it is forbidden to hunt them under a penalty of \$250 to \$500, or imprisonment; the governor himself cannot give permission to kill them. It seems likely that the species will before long become extinct.

#### The Quagga.

The Zoologist contains an interesting account of the quagga and its disappearance, by Mr. Graham Renshaw. The quagga is now entirely exterminated, owing to its wholesale destruction by the hunters and colonists in South Africa. The blaubok has long since disappeared, and the blesbok nearly so; among other animals which are fast disappearing are the gnu, the white rhinoceros, the southern giraffe and the quagga. The latter was in former times very abundant at the Cape and in Orange Free State, and it

wandered in these regions in herds of considerable size; at present, however, not a single one is found. This animal had almost the form of a horse, as regards the mane, tail, hoofs and general proportions. Its color was red-brown, passing to a tan color at the rear, then to white on the legs, tail and abdomen. The head was striped like that of a zebra, and the neck had large stripes of dark brown and white. The quagga when captured young was easily domesticated, and it could be crossed with the horse. It could be

hitched to a vehicle, and in the first half of the century some of these animals have been seen drawing carriages in Hyde Park. The species has disappeared in the course of the present century; a hundred years ago it was still very abundant, although in 1820 it had already abandoned the district of Albany at the Cape. W. C. Harris, in 1836, explored the South African region and found the quagga in abundance in the plains to the south of the Vaal; to the north it was replaced by the zebra. The different quadrupeds were quite numerous, including, besides the quagga, the gnu, the blesbok, and others. It is especially after 1850 that the quagga began to diminish in number. The Boer hunters commenced to make their appearance and killed the quagga for its hide; there was no restriction laid upon the hunting of this animal, and after a number of years it began to be killed off; in 1865 it had disappeared from the Cape, and a few years later from Orange Free State. At the present time it has entirely disappeared and it is only in a few museums that stuffed specimens are to be seen.

Among the museums possessing skins or skeletons may be mentioned those of London, Edinburgh, Philadelphia, Paris, Amsterdam, Berne, Vienna, etc., the total being twelve or fifteen skeletons and skins. This is all that remains to represent a species which was once counted by thousands.

#### Compromise of an Important Patent Suit.

Suits for infringement of patents instituted more than five years ago by the American Nickel Steel Company, of Philadelphia, against the Carnegie Steel Company and the United States government were compromised at Washington on April 23. The amount paid by the defendants is not known. It is said that the sum paid amounted to about 5 cents a pound for armor plate in which nickel steel was used. It is also said that suits will now be brought against other manufacturers who use nickel steel in any form. The

American Nickel Steel Company grants to the government and the Carnegie Steel Company a license to use the patents of that company in all nickel armor plate manufactured by them.

There are about forty steamers whose sole work is the laying and maintenance of the telegraph cables of the world.