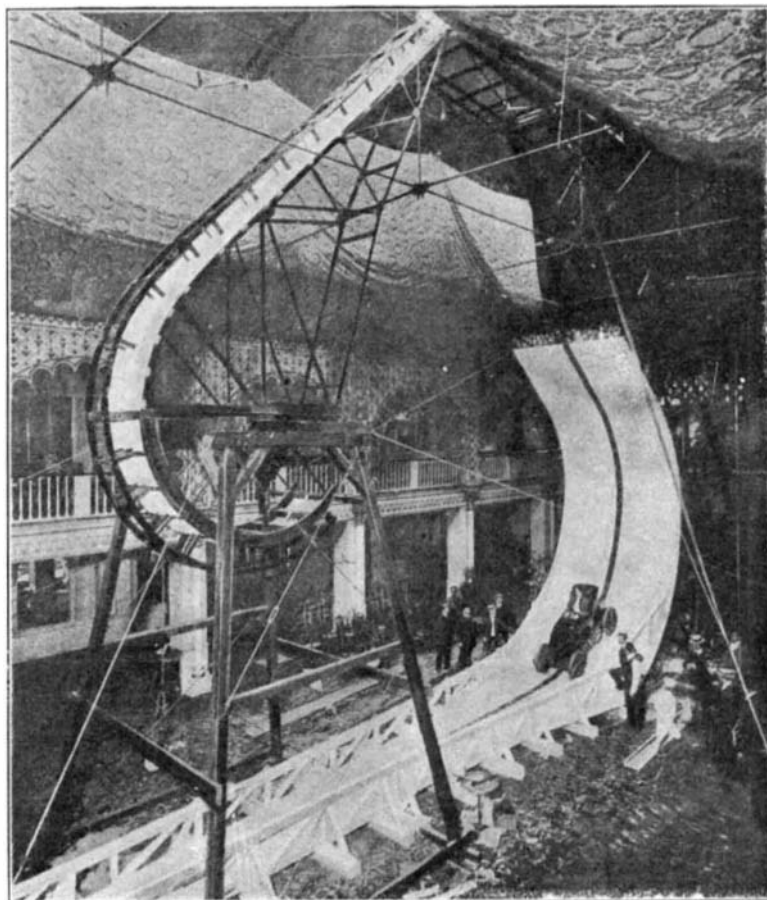


which the water escapes in the bag. The windows are covered on the inside with linen scrim, which prevents the lobsters from being caught in the copper screen. The rotating propellers create an upward current through the bottom windows, which flows out through those on the side. The paddle blades are four feet long and operated by a gasoline engine, which turns the main shaft, revolving the whole series. The largest number of "lobsterlings" raised to the fourth stage at one time was 12,750, being over fifty per cent. In a series of experiments in which the fry were counted at the beginning and at the end, from sixteen to fifty per cent of the fry in the first stage were carried through to the required final fourth. In the experiment which yielded fifty per cent 1,000 specimens were used, with 2,500 forty per cent were carried through, and over twenty per cent in an experiment with 5,000, kept together in a small inclosure. A percentage of fifty-four was obtained in one case. Hitherto the best percentage under the old method and with most favorable conditions at Wood's Holl yielded only a quarter of one per cent. The Norwegian investigator Appellöf, who has recently conducted experiments, reports that by the use of the greatest precautions he succeeded in carrying over, out of 1,500 larvæ of the second stage, only one hundred individuals into the fourth, less than ten per cent. The first step in the artificial propagation is obtaining eggs from the female lobsters. These are bought from the Creek Newport fishermen in July and August. The eggs are carried through the winter and spring under the tail of the female, attached to the swimmerets, and the hatching begins in May and ends about the middle of July. The number of eggs produced varies with the size of the lobster, and ranges all the way from three thousand to ninety thousand. The maternal care which the female lobsters display for the young is small. The newly-hatched fry are entirely free, have no means of attachment, and are readily scattered by the tide and waves and become easy prey for the other marine animals. The eggs are combed from the female into a bag occupying the space between the two cabins on the house-boat, and after being hatched are transferred into the regular canvas bags with propellers. Here they are carried through the interval of two to three weeks. The chief difficulty in rearing fry through this period in any considerable numbers consists in so confining them that they will not die from the effects of suffocation, mechanical shock, starvation, cannibalism, or parasites. This is remedied effectively by keeping the water constantly stirred, and the lobsters and their food suspended in the water. The attack from parasites constitutes one of the most serious difficulties to contend with. Frequently the young lobsters are so completely covered with a growth of parasites, which hinders their movements, that it interferes with feeding and with moulting, so much so as to finally cause death. Of unusual interest is Dr. Mead's observations on the early life habits and appearance of the young lobsters, hitherto not generally known, during the four stages of their infancy. The huge white bag, swarming with millions of the tiny creatures, furnishes at all times a fascinating and kaleidoscopic picture of marine life. The best food so far discovered for the young fry is the soft part of clams, the bodies of which were cut out and chopped into fine pieces and then thrown into the bag. Their habit of cannibalism made the question of ample food supply an important one. The only way found to prevent them from destroying one another was to give them an abundance of food. In the process of hatching, the first stage lasts about three days, the second about four or five, and the third five or six, though the length of each period varies greatly, depending upon the water temperature, the food supply, and the general health of the young fry. From nine to sixteen days are required for the larvæ to pass from the first to the fourth stage. The young, immediately after hatching, are designated as belonging to the "first stage"; after they have moulted once, as belonging to the "second stage," and so on. The surest and quickest means of distinguishing the different stages is by the appendages along the underside of the abdomen (tail). In the first stage there are none; in the second stage several pairs of swimmerets are present; in the third stage appendages appear upon the end segment of the tail. The fourth stage is so different from the preceding ones that no difficulty is ever experienced in distinguishing it.

During the first three stages the lobsters swim near the surface in an aimless, jerky way. They are entirely unfitted for a bottom life. The thorax bears five pairs of forked limbs, which ultimately become the walking limbs of the lobster. One branch of each leg—the lower—extends forward and downward, and is

used solely for feeding; the other, which is fringed with long hairs, bends upward to the side of the thorax, and by vigorous downward strokes helps to keep the larva afloat. The abdomen (tail) of these lobsters is bent downward at right angles to the body and is the chief swimming organ, and by means of rapid, irregular, downward strokes sends the animal tumbling over and over. When the lobster has nearly reached the surface, it often rests for a little, and sinks gradually toward the bottom.

The most marvelous and astonishing change of form and habits occurs at the third moult. The emerging fourth-stage lobster has the general form of the adult. The abdomen is no longer bent down, at right angles with the body, but now extends straight behind. The downward stroke of the abdomen, which was the chief means of motion during larval life, is now used, as in the adult, only for rapid retreat. All five pairs of walking legs have lost their upper branches, and the first pair, which are now the large, characteristic nippers, are extended straight in front of the head while the lobster is swimming. The other walking legs are relatively shorter than in the larvæ, and are fitted for walking. These structural changes are accompanied by more radical differences in habits and instincts. He is no longer helpless upon the bottom, but burrows under shells or stones for a home, crawls over the bottom or swims about in search of food, avoids enemies, and instantly retreats from danger when attacked. A new style of locomotion is adopted, and he swims forward in a straight and perfectly definite course by the strokes of the swimmerets. In the



The Auto-bolide, on which an Automobile and Its Occupant Travel at the Rate of 130 Miles an Hour and Incidentally Turn a Complete Somersault in the Air.

fourth stage the lobster has passed the most crucial period of its entire life, and is vastly better fitted for the struggle for existence than in any earlier stage. After lobsters have been carried through to the fourth stage, they are liberated in lots of one to five thousand at various points. One of the most suitable methods adopted was to set them free in the morning upon a stony shore, when the tide was out. Here they could find a satisfactory place to burrow and hide from their enemies, also a chance to obtain food. If thrown overboard in large quantities in deep water at one place, they would undoubtedly attract large numbers of fishes and other enemies, and consequently be devoured. The hiding and burrowing habits which are taken up when the fourth stage is reached, continue to be characteristic of the lobster during the earlier period, and doubtless throughout life. In the cars where they are confined, the lobsters show a ready appreciation of anything which will serve as a hiding place, such as shells, stones, seaweed, etc. Aside from rearing the young fry up to the last stage, many new and important problems are being worked out, such as the rate of growth, age of maturity, regeneration, migration of adult lobsters along the coast, to and from deep water. These are copper-tagged with a number and request to return, when caught, to the hatchery. The record one for traveling up to date covered a distance of ten statute miles in less than eight days. By experiment it has also been proved that the young lobster could withstand the cold of winter and the freshened water of early spring. They were submerged in cars in November, and were sunk

in the channel in from eight to ten feet of water and left undisturbed until spring. No food was given them, although they may have obtained some from the water or from the animals which grew in the car. In the spring they were raised, and seemed not to have suffered from their long fast and winter's exposure. They were all in a healthy condition, but so torpid with the cold that they could be picked up with the hand, becoming very lively, however, when warmed. It was found that the size of the lobsters of the same age varied greatly, though reared in exact conditions. The immediate cause of these differences is probably due to the amount of food taken, as some are more courageous than others in foraging.

The Wickford hatchery, through the painstaking and scholarly researches of Dr. Mead, has conclusively proven that artificial lobster culture upon a large scale is now practicable; while the establishment of numerous hatching plants, liberating millions of young fry annually, is destined ultimately to reclaim the valuable waning lobster industry of this country. The author acknowledges his indebtedness to Dr. A. D. Mead for data incorporated in the foregoing sketch, and to Mr. Hadley for drawings reproduced of the newly-hatched "lobsterlings."

#### THE AUTO-BOLIDE.

The latest of those daring contrivances which seem to defy all dynamic laws, and for which Parisians in particular seem to have an overweening fondness, is the "Auto-Bolide"—compared with which "looping-the-loop," "the circle of death," and other felicitously-named "amusement" apparatus seem tamely commonplace. The accompanying illustration, which is reproduced from L'illustration, shows the apparatus clearly enough, but the account which that paper gives of the principle upon which Mlle. de Tiers whirls around this structure, in a specially-constructed automobile, is anything but clear. We are simply vouchsafed the information that a platform is situated a considerable distance from the ground, from which platform two rails descend at an angle of 45 degrees, terminating in a sharp though graceful upward curve. Separated from the end of this curve by an air gap of some 30 feet is an ordinary loop-the-loop track. The entire contrivance resembles more the letter S than anything else. Indeed, at the Folies-Bergère this piece of acrobatic foolishness is called "*la boucle en S*."

From the very obscure description of Mlle. de Tiers' automobile, it would seem that the vehicle is provided with rollers which grip the track on the downward plunge, leaving it at the air gap, and allowing the automobile to finish the last stretch of this hazardous course on its own wheels. Since the occupant of the vehicle must turn a complete somersault in the air, a heavy counterweight is secured to the front part of the machine, to assist it in its revolution. The leap across the gap is said to be "impressive." Startling, would be a more fitting description. The tires receive a violent shock, but seem to stand it well enough. The entire distance of 50 meters (164 feet) is covered in four seconds, or at a speed of about 130 miles an hour. It may be a matter of rejoicing to engineers to know that not a member of their profession is the inventor of this absurdity, but a painter, M. Alonzo Perez by name.

#### Fiala Rescue Expedition Fails.

W. S. Champ, leader of the expedition that started to relieve Ziegler's North Pole expedition under Anthony Fiala, telegraphs as follows:

"I regret to report my failure to reach Franz Joseph Land. The ice is insurmountable. The approaching winter and heavy frost have compelled me to abandon further effort."

Fiala left New York in May, 1903, for Norway, where his ship, the "America," was waiting. His plan was to go to Camp Ziegler, Alger Island, for winter quarters, and in the spring of this year to make the dash for the pole.

A notable locomotive engineer, Mr. William Adams, M.I.C.E., has recently passed away in his eighty-first year at Putney, England. He was one of those most closely associated with the development of the present type of locomotive, and was the first to produce an engine especially adapted for short-distance traffic. This engine, which was designed in 1868 for stopping and starting with great acceleration, has served as a model for this class of work ever since. During the course of his brilliant career Mr. Adams was the locomotive engineer for three of the most prominent trunk railroads in Great Britain.