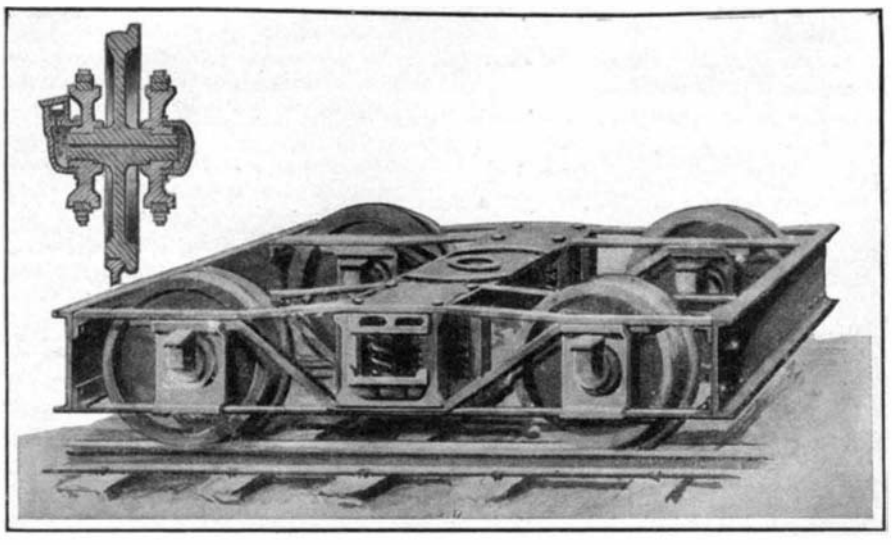
lated by the experts to be blowing at the rate of 12 miles an hour, yet it maintained a speed of nearly 18 miles an hour. During one flight it remained in the air an hour and twenty minutes, although the steering gear was caught in the skeleton framework and became partly unmanageable. The attempts proved also that the airship was dirigible in spite of its great size, as several complete circles were made while in the air. The expense of designing and building a craft of such proportions and the outlay for the balloon house and necessary machinery exhausted Count Von Zeppelin's resources and further development of his design was given up until November, 1905, when again accidents occurred which prevented the trial from being a practical success. The demonstrations showed, however, that the air ship could carry five men and sustain them aloft in addition to the double equipment of motors. The accident in 1905 was again caused by trouble with the steering apparatus located on the forward portion of the craft, partly submerging it in the water of the lake, although the after part of the car was sustained in the air by the gas and one motor.

During the trials which were held in the latter part of 1906 the airship at one time was aloft for a period of over two hours and reached a height of 1,000 feet above the lake. It was under perfect control during the entire period, being steered readily in various directions, describing circles, and performing other maneuvers. These demonstrations were witnessed by a number of experts in aerial navigation.

The immense proportions of the Zeppelin design form its most notable feature. The craft utilized in 1900 was about 420 feet in length. The one which made the last ascent is but ten feet shorter, while its diameter has been somewhat increased, giving it a capacity of about 370,000 cubic feet of gas. This is 32,000 feet more than the former type. The total weight of the present air ship, however, is 2,200 pounds less than the original design, being 19,800 pounds with ballast and equipment. The theory of the designer in favor of liquid ballast is still adhered to, the water being held in bags which can be opened by means of valves operated by wires leading from the controlling station. The gas bag is divided into six compartments supplied with suitable valves under the control of the engineer.

The engines form an excellent illustration of the wonderful progress which has been made in motor invention. The experiments in 1900 were made with an engine of but 30 horse-power. At the present time the two motors employed represent a maximum horse-power of 170 more than five times the capacity of the original motor—yet their total weight of 880 pounds is but 11 pounds more than the 1900 type. One engine is placed forward and the other aft beneath the bag in order to distribute the weight as equally as possible. The steering apparatus is also in duplicate, but so arranged that one man can control both the forward and rear rudders. A high grade of gasoline is used as fuel, and the reservoirs attached to the air ship contain a sufficient supply to permit it to remain aloft a period of several hours.

It has been questioned why Lake Constance was selected by Count Von Zeppelin for the scene of what will be his life work. It is understood that he preferred this locality partly because of its suitability for the maneuvering of an air ship of such proportions, and also because of the favorable wind currents. As shown by the accompanying photographs the building for housing the airship is so arranged that when the craft is to be used, it can be drawn out by one of the small steam boats in service upon the lake. It usually rests upon floats built to support it until the engines are started and it gets under way. Despite the enormous size of the gas bag, the arrangements for filling it are such that it can be completely inflated in about six hours.



A NEW FORM OF RAILWAY ROLLING STOCK CONSTRUCTION.

A NEW HAND-PROPELLED AUTOMOBILE FOR CHILDREN.

The accompanying illustration shows a new kind of toy automobile recently invented and placed on the market. The machine is known as the Exer-ketch, and it differs from most toy autos in that it is hand-driven by levers instead of being propelled by the feet. It consists of a U-shaped iron frame carrying at its rear end a large spur gear that meshes with a pinion of

A NEW TYPE OF TOY AUTOMOBILE.

about half its size mounted upon the rear axle. The shaft of the gear carries a crank on one end and a sector having three holes on the other. The crank and sector are attached by connecting rods to the two levers pivoted near the front end of the frame. By placing the connecting rod in different holes in the sector, the levers can be made to work together or in opposition. The levers can be pivoted at three different points in the frame in order to adjust them to the length of reach of the operator, who sits as shown and steers with his feet by turning the pivoted front axle. A special form of clutch locks one of the rear wheels to the revolving rear axle for the purpose of driving the machine. The seat is of sufficient length to accommodate two children readily. Besides being a good chest and arm developer, this new form of auto will doubtless be found a favorite by all children on account of its method of propulsion being similar to that of a hand car and because of the comparatively fast speed they can attain with it.

A NEW FORM OF RAILWAY ROLLING STOCK CONSTRUCTION.

We had occasion recently to call attention to the evils of the present practice of rigidly attaching opposite car wheels to a common axle. When rounding curves the outer wheel should travel faster than the inner one; but this it cannot do owing to the rigid connection of the two wheels. Consequently, one or both of the wheels must slip, grinding and wearing away the tread surfaces of the wheel and rail. Aside from the fact that the load is thus increased at curves there is constantly the danger of breaking a flange or of a wheel climbing the rail and thus derailing the car. To overcome these evils, Mr. Emilio Mujica Canto, of 116 Broad Street, New York, N. Y., has invented the construction illustrated in the accompanying engraving. It will be observed that each wheel of the truck is formed with a separate short axle mounted independently in its own bearings. Thus each wheel can adapt itself to its own peculiar requirements irrespective of the movements of its fellow. The new construction is best shown in the section view of one of the wheels, and it will be evident that it is as strong as the usual construction. A journal box is provided at each end of the axle to supply oil to the two bearings. If desired, the inner box may be sealed as shown in the section view, and it may be filled by feeding the oil from the outer box through a central bore in the axle. Aside from overcoming the defects mentioned above, it is claimed for the new truck that the life of the wheels is materially increased, it will round curves of smaller radius, it is more flexible on uneven roadbeds, and allows of a more uniform distribution of the weight of the car. By using two journal boxes with a connecting oil passage the danger of a hot box is materially reduced, for, if the oil of one box is exhausted, it will renew its supply through this passage from the other journal box.

An Elastic Roadbed.

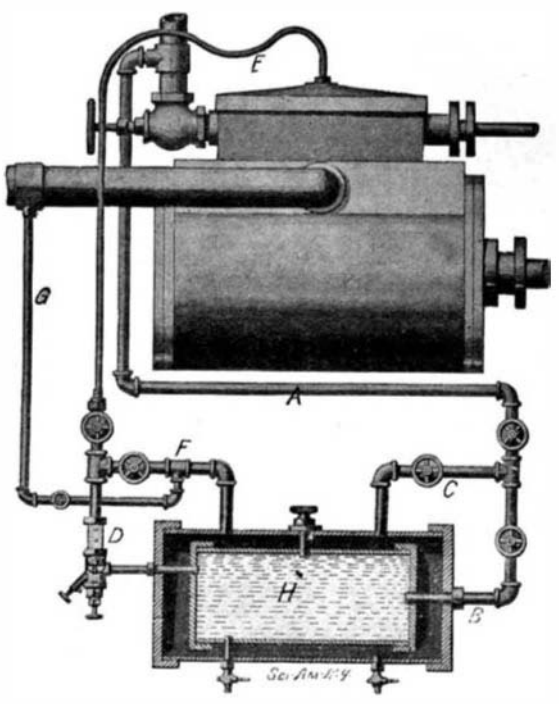
Consul-General Richard Guenther quotes the correspondence in a Frankfort paper from Zurich, Switzerland, stating that trials were recently made there with an elastic road covering invented by Street Superintendent Aeberli.

A section of Hohlstreet was covered with Aeberli material. Many persons witnessed the trial, among them representatives of the municipal and cantonal authorities, who showed great interest. Two steam rollers were employed to smooth the road covered with the new macadam. Trials with a six-horse wagon loaded with ten long tons gave a satisfactory result after the macadam had been sufficiently rolled. The macadam is prepared of gravel of a fineness of from 30 to 50 millimeters (1.181 to 1.968 of an inch) in diameter, and is freed of all earthy matter. This gravel is first heated in a specially constructed machine, and from a revolving drum is subjected to the action of liquid tar, so that each particle of gravel becomes covered with a coating of tar.

This tarred gravel is then put up in heaps, covered, and allowed to remain so from eight to ten weeks. It is asserted that during that period fermentation occurs which causes the tar to penetrate into the pores of the gravel and in this way lessens the formation of dust. In covering the road with this material the most painstaking cleanliness must be observed and dry weather must be awaited. No foreign matter must become mixed with the macadam. In rolling it no water must be used. The cost of preparing this macadam is small, 44 pounds of tar being sufficient for 1 cubic meter (35.3 cu. ft.) of dry gravel; or if limestone is used, 55 pounds. The machine is operated by four laborers and furnishes from 10 to 15 cubic meters (353 to 530 cubic feet) per day.

LUBRICATOR FOR STEAM ENGINE CYLINDERS.

Lubricators of steam engines intended for use in the open, such as traction engines, and the like, are liable to become clogged in cold weather. To obviate this difficulty a recent invention provides a steam jacketed oil chamber which prevents the oil from freezing; furthermore, the oil is forced from the oil chamber into the cylinder by means of live steam. The flow of oil is regulated by a needle valve through a sight feed which is constantly under the eye of the engineer. The apparatus is clearly illustrated in the accompanying engraving. From the main steam pipe a pipe *A* leads through the jacket *B* into the oil chamber *H*. A branch *C* from this pipe opens into the jacket *B*. From the oil chamber *H* a pipe leads to the regulating valve *D* which is formed with a glass tube section through which the engineer may watch the flow. Thence a tube *E* leads to the steam chest. The tube *E* is connected by pipe *F* with the jacket *B* and a bypass connects the pipe *F* with the exhaust pipe of the engine. In use if the oil is frozen, the valves of pipes *C* and *F* are open to permit a flow of steam through the jacket,



LUBRICATOR FOR STEAM ENGINE CYLINDERS.

thus melting the oil in the oil chamber. The steam discharges into the steam chest, unless the bypass is open, when it flows directly into the discharge pipe. The oil in the chamber *H* is forced, drop by drop, through the valve *D* by steam from the pipe *A*, and is injected with the steam through the pipe *E* into the steam chest. The inventors of this improved lubricator are Messrs. Charles L. Grayber, and Edward R. Kerrigan, of Deer Lodge, Mont.