

less because of the close association of masses of metal. Further, when the course of a vessel is changed, the compass will not indicate with absolute accuracy the turning movement, and to all other disturbing factors we must add the friction offered to the indicator or rose in liquid compasses. It is under such circumstances that the gyroscope has proven itself an effectual means for checking compass readings, and in some cases even as a substitute for that instrument, for it is absolutely unaffected by influences derogatory to the other.

The greatest difficulty experienced by the inventor was in attempting to rectify that characteristic of the gyroscope which varied the movements of the rotating element in accordance with the longitudinal position of the ship. This was finally accomplished by the introduction of a pair of electro-magnets, mentioned above, into the holder, thus in a measure converting the instrument into a magnetic compass, or rather into a combination of gyroscope and compass. With this improvement the rose can be set to a certain course, and the vessel then steered as by an ordinary compass.

Exhaustive tests were made by the German navy with the warship "Un-
dine," which was fitted with the instrument for this purpose. Some of the evolutions, which consisted in sailing the ship under forced draft and then suddenly reversing the engines, changing the position of the turrets and other heavy mechanism, and in firing the guns, were severe enough to completely disqualify the magnetic compass. However, when the trials were concluded the gyroscope was found to be in as good order as it was in the beginning. The opinion has been strongly expressed by observers that these tests thoroughly demonstrated the efficiency of the gyroscope as an aid to navigation.

AN UNSINKABLE MOTOR LIFEBOAT.

BY L. RAMAKERS.

A series of experiments of great interest alike to engineers, to sportsmen, and to life-saving societies took place recently on the Thames, near London.

For the past two or three years the Royal National Lifeboat Institution has been endeavoring to stimulate the activity of English inventors and boat builders by calling for improved types of lifeboats, for the reason that the boats now in use do not always meet the demands made upon them by the bravery and devotion of the life-savers.

After the seaworthiness of motor boats had been proved in various contests in French and English waters, the Institution published a precise statement of its "desiderata." It demanded a lifeboat propelled by a motor that would not be affected by the waves or entirely disabled even if the boat were capsized.

This interesting problem has now been solved by the well-known constructors of sea-going torpedo boats and steam yachts, Messrs.

John I. Thornycroft & Co., of Chiswick, England. The completion of their new lifeboat, the "Michael Henry," which is shown in the accompanying illustrations, marks an era in the annals of naval construction. In appearance it differs little from an ordinary lifeboat, propelled by oars, for which it would be taken at a little distance. As a matter of fact it is propelled both by oars and by a 24-horse-power, four-cylinder gasoline motor, which is placed amidships and near the keel so that it does not interfere with the movements of the rowers.

The boat was subjected to various tests in the presence of the officers of the Institution and a representa-

tive of the Admiralty. In the trials of speed and stability the "Michael Henry," carrying all its accessories in addition to sandbags equal in weight to a crew of seven men, attained the calculated speed, 7.3 knots, when driven by its motor and propeller.

The speed trial was followed by more interesting experiments, the object of which was to show that the casing surrounding the gasoline motor was perfectly watertight and, especially, to prove that the motor would stop automatically, as required by the Royal National Lifeboat Institution, if the boat should turn completely over and float with its keel in the air. It is scarcely necessary to insist upon the impor-



A PERIPATETIC LECTURE ROOM; WESTERN FARMERS ATTENDING AN AGRICULTURAL LECTURE IN A RAILROAD CAR.

tance of this point, as it will be readily understood that a propeller that should continue to revolve after such an accident would be likely to wound or even kill some of the passengers and crew. Besides, the propeller would be liable to damage by fouling with cordage.

The results of these experiments were completely satisfactory. With the aid of tackle attached to the yard of a ship the "Michael Henry" was first thrown on her beam ends and then completely capsized, as illustrated by the photographs. At the beginning of the operation, that is to say, when the boat began to heel over, the motor, which had just been started at full speed, stopped automatically. It also started automatically when the boat returned to its normal position. The experiment was repeated several times with the same result.

The new type, therefore, represents a real improvement and appears destined to render very great service in navigation and especially in the saving of life.

A LECTURE ROOM ON A RAILROAD TRAIN.

BY KATHERINE LOUISE SMITH.

For the past two years certain Western railroads

among the most interesting of the efforts made by the large railroads to help the farmers along their lines. Usually, the lecturer is a professor from some agricultural college. He stands in one end of the car beside a large chart illustrative of the work, and lectures on such subjects as rotation of crops, seed germination, condition of crops along the line, remedies for defects, the yield to the acre, etc. The cars are always filled with farmers who are appreciative of a chance to get a ride and lecture free. Great interest is taken in the theories advanced by the speaker, and often questions are asked and experiences exchanged. The varieties of wheat or coarse grains raised in the vicinity of a

town, the peculiarities of the soil, and the good or bad crops of farmers in the vicinity are topics always discussed. The lecturer, besides covering the general subject of good seed, dwells upon adverse influences that may have been shown in the crops of a county or township, so that farmers desiring information as to the peculiarities of the land may obtain it. The bulletins of the various agricultural stations are distributed generously.

The lectures, whether in hall, station, or car, are well attended. Often a car is so crowded that men sit in the aisle, and some roads plan a stop of forty-five minutes to one hour at a station, so the lecture can be delivered while the car is sidetracked. When a train is

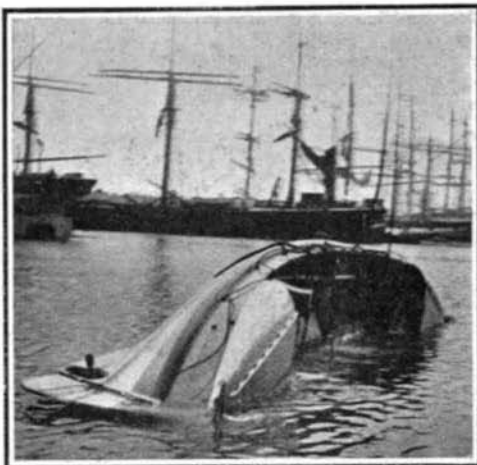
scheduled to be at a certain place at a certain hour, the farmers sometimes engage a hall and try to make arrangements for the lecturer to talk there and use his charts or stereopticon. The latest move among the most progressive western roads, like the Chicago, Milwaukee & St. Paul, the Chicago & Northwestern, and "The Soo," which traverse the vast farm lands of Wisconsin, Minnesota, and the Dakotas, is to start this train in winter. The farmers in this way gain the needed information before the time of seeding and when they are not so driven with work. While the attendance is large in the spring months, more farmers can attend in winter, and they have more leisure to discuss the important matters presented and to make their plans for ultimate scientific results.

The general superintendents of the roads are much interested in the "Good Seed" proposition, and further the movement in every way, co-operating with the lecturers and scheduling the towns for the stops. This movement is an entirely different one from the various seed trains which have been sent out by farmers' associations to show the crops that can be raised in their district. While seeds are carried, and specimens of the fruit and vegetable family, this is by no means an exhibit car.

The "Grassland," which is one of the most novel exhibit cars going through the country, is switched from one road to another, and reminds one of a harvest field. Shocks of wheat, oats, and buckwheat are arranged in the center of the car, and apples and other fruits, potatoes, pumpkins, corn, turnips, carrots, in

fact everything known to the root family, are exhibited. The sides of the car are also decorated with photographs. There are hunting scenes, camp scenes showing the once-timbered lands, fishing scenes, and views of sheep ranches, stock farms, and comfortable farm buildings.

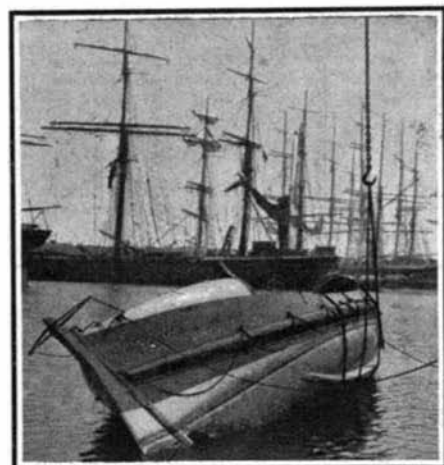
The "Good Seed Train" is far too practical for this. All available space is needed for the numerous audience. Naturally, the train runs over a wide stretch of territory, and the far-seeing road which furnishes it reaps returns in the prosperity of the farmers along its right of way. In some sections special attention is called to the new durum macaroni wheat. This



On Her Beam Ends.



Bottom Up.



Careened.

CAPSIZING THE UNSINKABLE MOTOR BOAT "MICHAEL HENRY."

have sent out so-called "Good Seed Trains" to assist the farmer in his vocation. Early in the year the trains are started, and through the spring months farmers have free rides and lectures galore until the spring break-up renders it necessary for them to devote their time to the land. These trains are fully equipped for the lecturer and his farmer audience. They pass slowly from village to village, can be flagged anywhere between stations if enough farmers are collected to warrant it, and often stop at some small place long enough for the lecturer to explain the object of the train and to give sometimes a talk on seeds and seed planting. In fact, these trains are

durum wheat proposition has been pushed in the Northwest for about three years. The large millers have fought it, but others have been convinced that if this wheat would grow in the so-called semi-arid sections the productivity of the Northwest would be increased, and the chances for new wealth would be larger every year and land values rendered more stable.

As a matter of fact, the macaroni wheat controversy has been a feature of the grain trade. Secretary Wilson and Mr. Carlton, of the Department of Agriculture, have encouraged the farmers to grow it, and gradually it is being more generally introduced, so that farmers who are seeding it have made money. The acreage each year is larger than the year before, and prices increase. This wheat contains more gluten than that ordinarily used for flour.

Another subject that is claiming the attention of Western railroads is that of good dirt roads. If the farmer has difficulty in hauling his grain to the cars, the roads may well be interested and try to rectify matters. A year ago the editor of a large farm magazine suggested to some of the principal roads that they run "Good Road Trains" similar to the "Good Seed Trains," and engage a man to lecture on good roads. The result was that trains of this description were run through Iowa and neighboring States for a month. Meetings were held in many cities, and prizes were offered to farmers who could make the best road with a split-log drag.

The success of this "Good Roads Car" has been so gratifying, that one road has issued complete directions how to make and use these split-log drags, which are simply an arrangement of two logs seven to nine feet long and ten to twelve inches in diameter. These are set on edge thirty inches apart, and fastened with three strong pins wedged firmly in. A chain runs through the center of the front log at the right end and over the left end of the same log. This is hitched to the horses, and the driver stands on a movable platform placed on the logs. The whole thing is remarkably simple, and is taken off the train at stations where roads are particularly bad and a demonstration is made. Telephone poles are remarkably good to make these drags, and they are so cheap that every farmer can make one at a minimum outlay of time and expense.

Few realize the interdependence of business and railroads. Country towns exist to supply the needs of

the farmer, and their prosperity is gaged by the crops of the latter. There is little profit to the merchant, the miller, the lumberman, the bank, if the farmer's crops fail or if he has to combat with poor roads to

get his produce to the shipping point. Railroads realize that traffic along their lines, both passenger and freight, depends on the prosperity of the farmer. When the crops are good, cars and crews are in demand, and the wide-awake roads which are preaching

parts, ammunition, and rations for the garrison. Designed on the three-rope continual-operation system, the ropeway is provided with two separate runways, one of which serves for the incoming filled cars, while the other for the return of the empty cars, and the third, used as a hauling rope, is situated beneath the two runways and operates the railway.

The runways are constituted by two carrying ropes, located at the same height, 7.7 feet distance from each other, and anchored in each of the stations. The runways are held taut by freely suspended weights which are connected to the carrying ropes by means of flexible ropes running over rollers. The uniform tension thus produced avoids the possibility of an overload and results in a safe compensation of any difference in tension, due to changes in temperature. The total length of the ropeway, which comprises three sections, is about 25 miles, the difference in level being 5,984 feet. Two intermediary tightening stations are provided for tension devices and anchorages for the carrying ropes.

The lowermost section starts at Cesana Station at 4,510 feet above the sea level (see A, Fig. 1) and leads as far as the first intermediary tension device (B, Fig. 1) at 6,097 feet altitude. Between these two sta-



Fig. 2.—Part of the First Section Passing Through the Forest.



Fig. 3.—View of the Second Span, Showing the Double Support in the Distance.

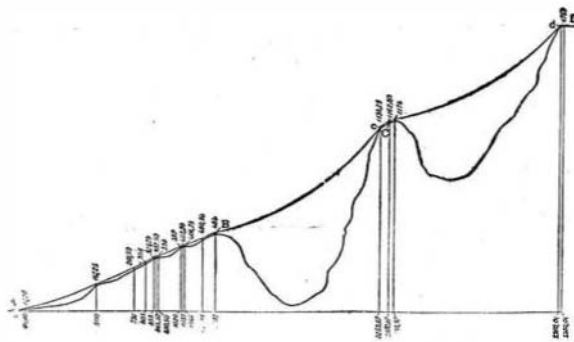


Fig. 1.—The Path of the Rope Tramway.

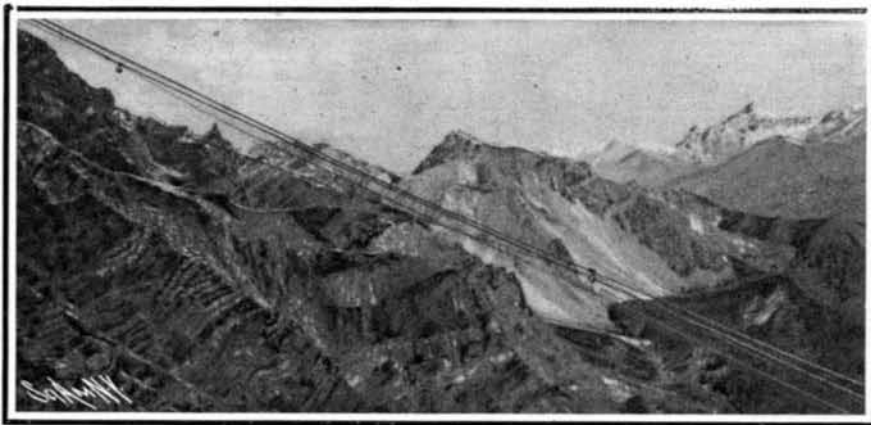


Fig. 4.—Part of the Second Span.

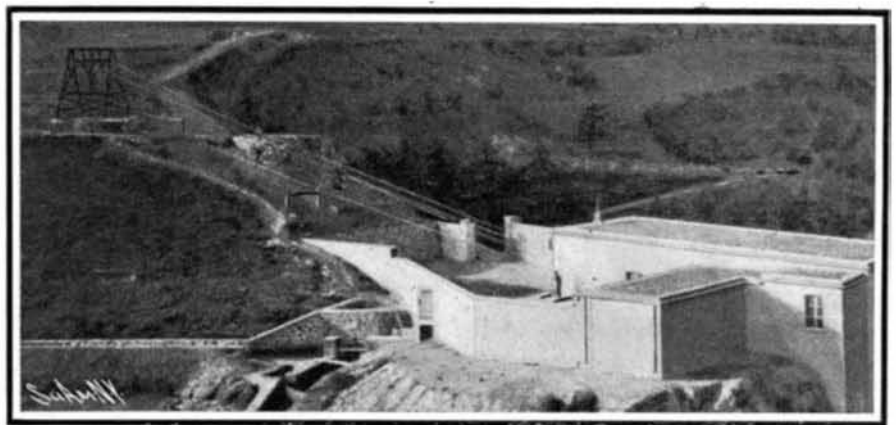


Fig. 6.—The Driving and Loading Station.

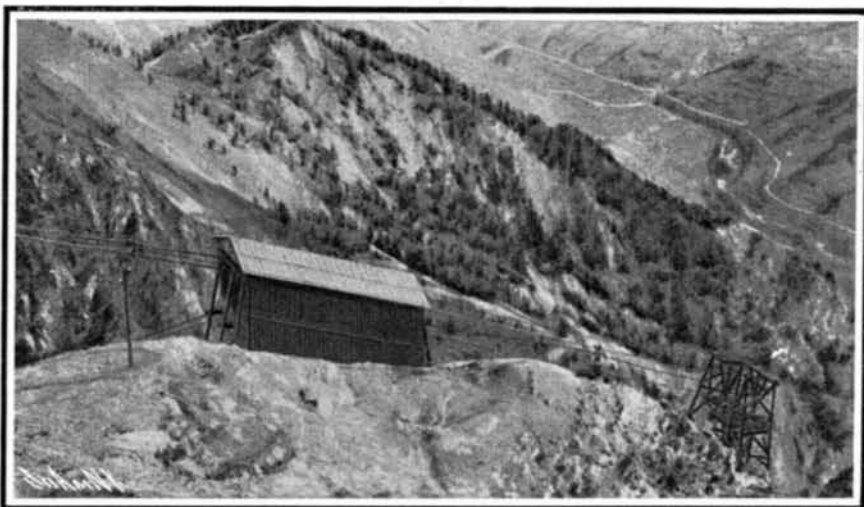


Fig. 5.—The Second Intermediary Tension Device and the Double Support in Front of It.

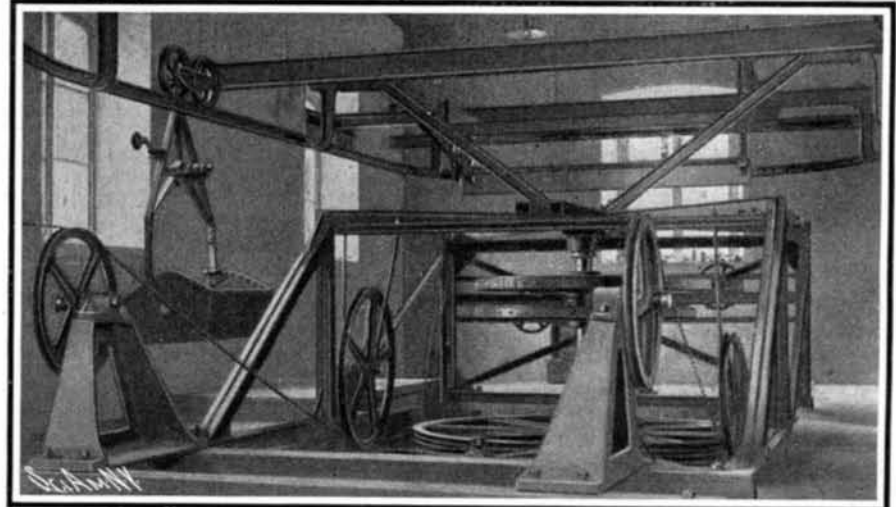


Fig. 7.—The Driving Gear.

the "Good Seed Gospel" and "Good Roads Movement" are profiting in more ways than one. All through the Mississippi Valley the farmers in the corn and grain countries are eagerly availing themselves of these opportunities to improve the character of the land, and the chances are that the educational trains already in vogue will be supplemented by others as occasion demands.

A WIRE ROPE RAILWAY USED IN THE CONSTRUCTION OF AN ITALIAN FORTRESS.

BY DR. ALFRED GRADENWITZ.

The ropeway described in this article was constructed by Messrs. Ceretti & Tanfani, of Milan, Italy, for use in the construction of a fortress. It is remarkable for its enormous spans and for the extraordinary altitude it reaches. The plant belongs to the Cesana Community, in the Cottian Alps, and passes between Briançon and Oulx at the foot of Mont Genève. The construction of this ropeway, which at present serves for the transport of all sorts of building materials required in the construction of one of the largest Italian Alpine fortresses, was supervised by the Italian engineering corps. When the fortress is completed the plant will be used for the transport of gun