proper time it is necessary for her to actually plunge into the water and dive for the entrance to the bell. Her attendant quickly draws her into breathing space. Each mermaid is provided with a separate diving chamber and with a separate attendant. The fishermen who dive into the water share with the mermaids their air chambers provided for them, and they come to the surface after they have given the idea that they had actually been to the bottom of the sea. When the hero yields to Sirene's pleadings and dives into the water, he knows exactly where to find his air chamber. A good deal of fun is caused by the clown Marceline, who pretends to fish from the tank and suddenly pulls out a live dog. This is accomplished in a simple manner by providing an air chamber and an attendant for the dog. Marceline's fishing line is attached to the muzzle worn by the dog.

More complicated is the entrance of Neptune, who rises to the surface in a barge 12 feet long. At the proper time Neptune and his fellow passengers leave the large air chamber and seat themselves in the barge, which has the rear part cut out. The barge is then quickly drawn up through the water, and the emergence of this weird craft always produces a great sense of wonder. Our engraving shows the method of raising the barge or chariot, as it might be called in theatrical parlance. The boat rests on parallel bars which resemble a parallel ruler. They are operated by a cable which runs out of the tank in Marceline's hut, where five stage hands wind the cable upon the drum of a winch, thus raising the parallel bars which carry the boat.

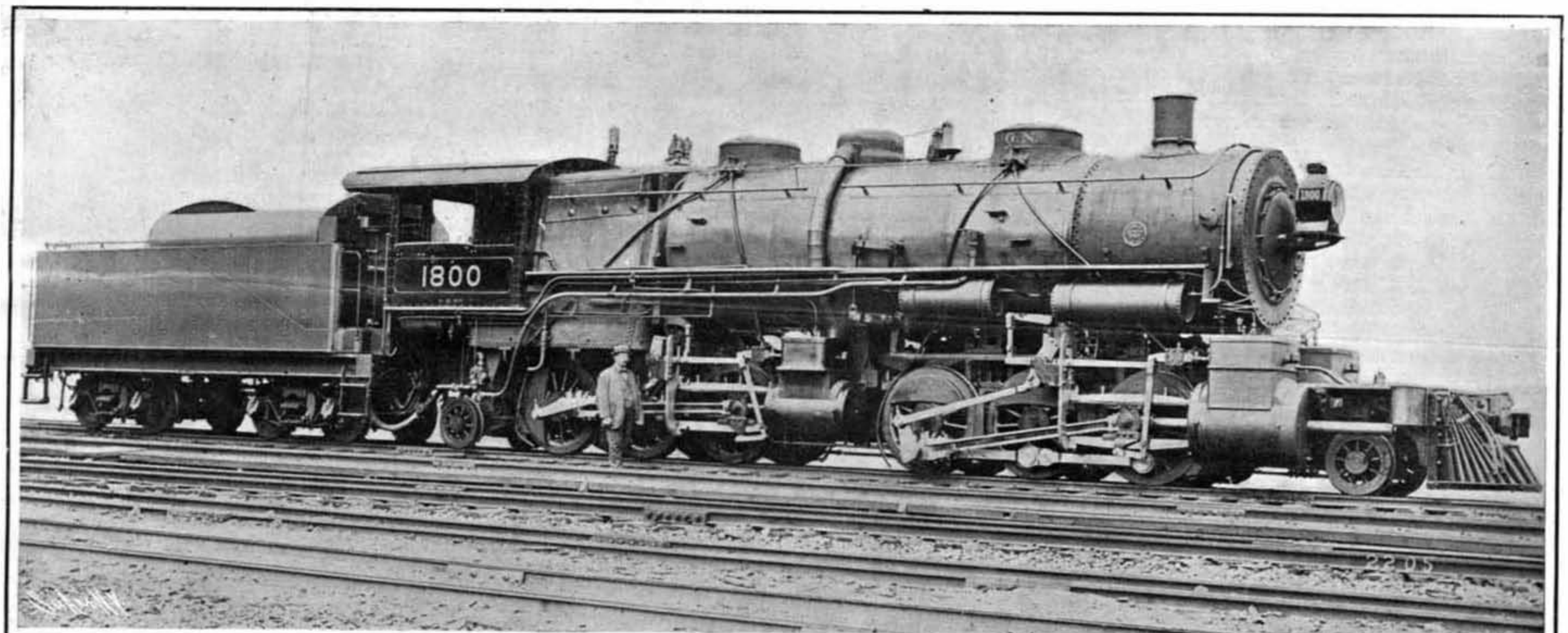
The mermaids are protected from cold by rubber undergarments. Their grease paints are waterproof. Notwithstanding the apparent reality of the effect, many people consider that the whole scene is some sort of a mirage effected with the aid of mirrors. This apparent marvel of modern science is merely an adaptation of an old principle.

A 250-TON MALLET LOCOMOTIVE.

During the late exposition at St. Louis there was exhibited, in the Transportation Building, a Mallet articulated locomotive built for the Baltimore & Ohio Railroad, which was the most powerful built in any country up to that date. During the past two years this locomotive has been doing excellent work on the mountain division of the Baltimore & Ohio, where it has not only proved equal to heavy duty for which it was designed, but has been hauling exceptionally heavy trains on a moderate cost for fuel and repairs. The weight of the engine alone is 334,500 pounds, and its tractive effort, working as a compound, is 71,000 pounds, and working as a simple engine, 86,000 pounds.

The Baltimore & Ohio locomotive has now been exceeded somewhat in weight and power by another design of Mallet freight locomotive, which has been built and delivered by the Baldwin Locomotive Works to the Great Northern Railway. This engine, which is one of five now in course of delivery, weighs 20,500 pounds more than the Baltimore & Ohio engine. It differs from its prototype mainly in the fact that, instead of the whole of the weight being on the twelve drivers, it is provided with a pony truck at the front and a trailer at the rear below the cab. Consequently, although the engine is heavier, the weight on the drivers is less by 18,500 pounds. The steam pressure also is less, being 200 pounds to the square inch as against 230 pounds in the earlier engine; but the total heating surface also is slightly greater, as is also the cylinder capacity.

The Mallet type has for its distinguishing feature two separate engines, each operating its own set of drivers. In the present case the high-pressure cylinders, which are 21.5 inches in diameter by 32 inches stroke, are carried upon the main frame of the engine at about midlength of the boiler, with which the frame is rigidly connected through the saddle and at other bearing points. The six coupled driving wheels are 55 inches in diameter. Steam is admitted to the cylinders through outside steam pipes leading down on the outside of the boiler from the steam dome. The exhaust passes through a flexible joint placed at the vertical axis of the saddle, and passes to a pair of low-pressure cylinders, 33 inches in diameter by 32-inch stroke, which are located at the front end of the radial truck which carries the weight of the forward half of the boiler. From the low-pressure cylinders the steam exhausts to the smokestack through a jointed flexible exhaust pipe. It will be seen that this method of construction provides an engine which, in spite of its great length of 54 feet 7¾ inches, is very flexible, a quality that is rendered necessary by the fact that 10-degree curves are not uncommon on the division where these locomotives will operate. To supply sufficient steam for such powerful engines calls for an exceptionally large boiler. It is of the Belpaire type and is 7 feet in diameter. A tall man could walk through it with a foot of clearance. There are 225 square feet of heating surface in the firebox and 78 square feet of grate area. The total heating surface is 5,658 square feet. Working as a compound engine, this locomotive can exert a pull at the drawbar of 71,600 pounds, and working as a simple engine, by the admission of live steam to the low-pressure cylinders, it can exert the enormous pull of 87,200 pounds.



Tractive effort, working compound, 71,000 pounds; working as simple engine, 86,000 pounds; steam pressure, 200 pounds; high-pressure cylinders, 21.5 inches by 32 inches; low-pressure, 33 inches by 32 inches.

THE NEW 250-TON MALLET COMPOUND LOCOMOTIVE.

Another Test of Alcohol as an Automobile Fuel.

After having shown the possibilities of alcohol as a fuel for automobiles in the long-distance run from New York to Boston last winter, the makers of the Maxwell automobile decided to see what can be done with this fuel under more favorable circumstances. In the first test extremely bad snow-covered roads were traversed, and the pulling power of the engine under these conditions was found to be very good when alcohol was used as a fuel. In the present test, which was conducted by the Automobile Editor of this journal, some of the best and smoothest roads to be found in America were traversed at high speed. The test consisted of a run from Trenton, N. J., to Atlantic City, a stop being made at Philadelphia, Pa.

The only change in the engine using alcohol as fuel was that the compression was increased about 33 1-3 per cent, it being raised from 60 to 80 pounds. It was supposed that this increase in compression would make a considerable increase in efficiency; but the result of the test does not show this to have been the case. In order to get any marked efficiency, a compression of at least 150 or 175 pounds would probably be required, as well as a longer stroke.

In place of the kerosene car used in the first test, Mr. Maxwell this time substituted a car the engine of which was fitted with two carbureters. In one of these kerosene was used, while the other was supplied with gasoline. A mixture of the two fuels was thus used in the engine, the idea being to do away with the excessive carbonization produced by the kerosene alone. The results obtained with this car were quite interesting.

The three cars—alcohol, kerosene-gasoline, and gasoline—weighed respectively 2,560, 2,470, and 2,280 pounds. The total distance registered by the odometer was 106.8 miles. The amount of fuel consumed and the market price of the same was—denatured alcohol, 14½ gallons at 37 cents = $5.36½; kerosene, 3 gallons at 11 cents = 33 cents, + gasoline, 5 gallons at 22 cents = $1.10; and gasoline, 7½ gallons at 22 cents = $1.65. The miles run per gallon of fuel for the three cars in the order named were 7.36, 13.35, and 14.24. This corresponds to a fuel cost per car-mile of $0.0502, $0.0133, and $0.0154, while the cost per ton-mile would be $0.0392, $0.01084, and $0.01354 for the alcohol, kerosene-gasoline, and gasoline cars respectively.

A comparison of these figures with those obtained on the former test shows that the alcohol car did slightly better than before, as this time it made 7.36 miles per gallon instead of 6.13 miles. The miles run per gallon by the gasoline car were raised from 10.1 to 14.24, which increase is due, evidently, to the good roads; so that the increase of a mile per gallon made by the alcohol car cannot be laid to the improvement in efficiency of the engine. The increased compression, however, was beneficial in the way of speed, as this car is capable of developing a speed of 35 miles an hour with ease. The most marked increase in distance traveled per gallon of fuel was that of the kerosene combination car. When run on kerosene alone, in the former test, this car made but 7.4 miles per gallon, while in the present test, using 3 gallons of kerosene and 5 gallons of gasoline, this car averaged 13.35 miles per gallon. A corresponding lowering of the cost of operation is noticeable in the figures. The idea of the inventor is to utilize the heavier oil for trucks and commercial vehicles. The combination kerosene car showed good speed and power, as well as economy, and it will doubtless be possible to work out this plan successfully on commercial vehicles, if the saving in operating cost is found to be worth the complication of having two fuels and two carbureters.

The present test showed that alcohol is fully as suitable for high speed as for slow speed and hard work. The alcohol engine ran perfectly when fed from the regular carbureter, and it could be started on alcohol after it had been standing over an hour. When some manufacturer designs and builds an automobile having a special engine adapted to the use of alcohol, tests such as have just been made will be found most valuable to bring out the difference in efficiency between the alcohol and the gasoline engine. Several years ago, at tests in Vienna upon stationary engines, it was found that alcohol will develop practically as much horse-power, gallon for gallon, as will gasoline (and this notwithstanding the fact that alcohol has only about half as many heat units as has gasoline), provided that the two fuels are used in suitable engines. This result will probably never be attained in an automobile engine, as it is impossible to use such high compression as can be had with a stationary engine.

Norwich has in use 18,000 gas cookers and 18,000 slot gas meters, and this total is not equaled by any other city of the same population—just over 100,000.