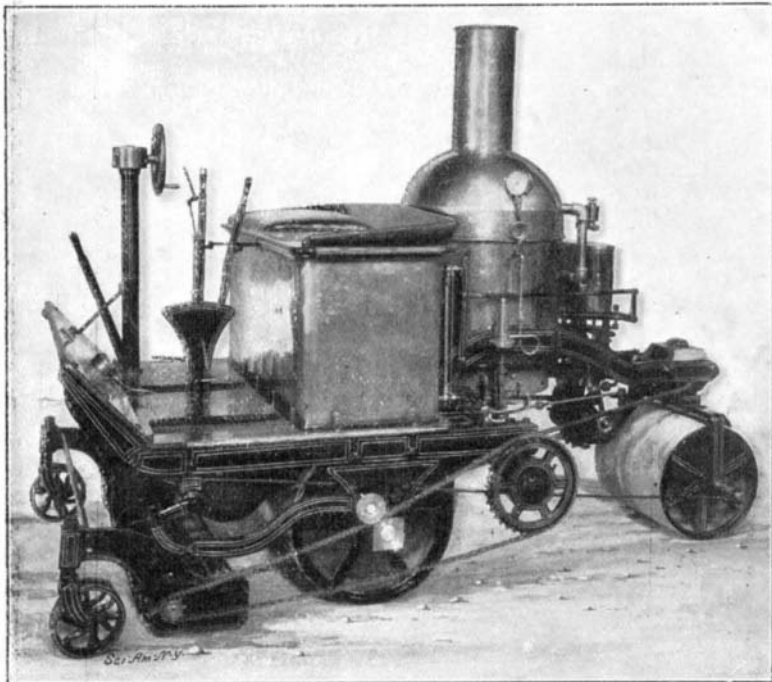


at constant load throughout, and the fuel consumption noted. The general result was that the motor took about twice as much alcohol as benzine—by weight—the alcohol being 90 per cent pure and the benzine having a density between 0.69 and 0.78 according to the sample used. There was a difficulty in starting the motor with pure alcohol, and a tabulated statement of results refers only to mixtures of alcohol with from 5 to 20 per cent of benzine. Calculations of cost are made on the basis of benzine at 25 marks per 100 kilos, and alcohol 90 per cent at 15 marks per 100 liters. The most favorable condition using alcohol appeared to be a high compression (7.5 atmospheres), and in this case the cost per horse power hour was 8.47 pf. for benzine of specific gravity 0.740 and 15.82 pf. for alcohol with 5 per cent benzine. The waste gases from the alcohol were found to contain acetic acid, and the motor did not appear to be cleaner after running on alcohol than after running on benzine.

**THE COLDWELL STEAM LAWN MOWER.**

The vehicle shown in the accompanying illustration is a self-propelled lawn mower, which has been on the market for the past two years. A number of these machines are now in use. The steam is supplied from a 20-inch boiler of the fire-tube type, which has 24 feet of feed-water heating coils in the dome, and contains 688 fire tubes in its main portion. Directly behind the boiler is a two-cylinder Mason engine of 3 1/8 x 4 inch bore and stroke. The engine is connected with a sprocket on the countershaft by means of a heavy chain, and this sprocket can be unlocked from the shaft by throwing out a positive clutch, if it is desired to run the engine alone in order to limber it up, or for any other purpose. The countershaft drives the main roller by a sprocket and chain, and also the lawn mower by means of chains on each side. The roller is



**THE COLDWELL STEAM LAWN MOWER.**

fitted with two hand brakes, one on each side, which are applied by a heel pedal. The machine shown in the illustration is steered by a vertical wheel, but lever steering is also applied to this machine. At the base of the steering post is a wheel, around which is wound a wire rope that extends to the rear roller. The machine is steered by turning this roller. The vertical lever shown in the front is the reversing lever, and the one which is tilted back against the seat is the throttle lever. The machine carries sixty gallons of water and ten gallons of gasoline, the tanks being respectively beneath the seat and the floor board. The water is sufficient to last for an eight-hour run on good ground, while the gasoline consumption for that length of time is about 15 gallons.

The boiler is fitted with a regular tube burner and fuel regulator, and an automatic air pump for maintaining the pressure in the gasoline tank is geared to the engine. The working pressure employed is 150 pounds per square inch, and the speed of which the machine is capable is four miles per hour. The machine may be used as a roller simply by raising the grass cutter by means of the lever shown at one side. It can be run backward or forward with equal facility. To show what it is capable of doing, it may be mentioned that a 900 x 450-foot polo field can be cut and rolled in eight hours.

The machine may be used for other purposes where power is required, by removing the sprocket from one end of the countershaft and attaching a pulley. Some of the uses to which it has been put are threshing grain, sawing wood, and spraying trees. The boiler can furnish steam to operate a steam water pump, or the machine can drive an ordinary pump with a belt.

**A NEW STEAM RUNABOUT.**

Grout Brothers, of Orange, Mass., the well-known manufacturers of steam vehicles, have brought out this year a new, low-priced, steam runabout like that shown in our illustration. The engine of this machine is placed horizontally under the rear platform, and can be readily reached for inspection or adjustment by taking up the removable boards of this platform. In this position the engine is directly over the rear axle, which it drives by means of a short chain. The boiler is placed under the seat, and the water tank within the square front bonnet. These are of sufficient capacity to properly supply the 6 1/2-horsepower engine for a reasonable length of time. The chassis of this car is of the reachless type, mounted on 38-inch half-elliptic springs and wood artillery wheels. Wheel steering is fitted if preferred.

The machine is capable of a speed of 15 or 20 miles an hour over ordinary roads, and of climbing 25 to 35 per cent grades. The platform behind makes it useful for touring or for other purposes where the carrying of luggage is required. The Grout Brothers also make a novel touring car with wheel steer and wheel throttle.



**THE GROUT STEAM RUNABOUT.**

Spengler, has remedied this defect very simply by hanging from a sleeve which turns with the vane, a metal plate whose inclination to the vertical indicates the force of the wind. The plate travels over a graduated quadrant of which the part above, or to leeward, of the plate is closed by overlapping sectors pivoted at the center of the arc, while the lower or windward part is kept open by the lifting of the sectors by the wind plate itself. The contrast of light and shade so produced facilitates the reading of the instrument from a distance. The quadrant is graduated on the international scale, velocities of 5, 10, 15, 20, and 25 meters per second being indicated by projecting points, and, presumably, it is graduated empirically by comparison with a standard anemometer. The instrument is intended, of course, only for rough measurements.

**A Test of the Lake Submarine.**

A board of army officers, consisting of Major A. Murray, Capt. Parker, and Capt. Bailey, from Fort Totten, New York, were in Newport on January 19 to make an inspection and test of the Lake submarine torpedo boat "Protector," with a view to finding out her usefulness, as an adjunct to military coast and harbor defense and also in mine defense.

The "Protector" was taken out into the bay and sunk to the bottom near the telephone cable which crosses the bay. With Major Murray in the diving room the cable was picked up and the motions of cutting it gone through. The boat was then run submerged thirty feet below the surface, during which the signal mast was carried away by ice.

Dinner was cooked and served to the members of the board while the vessel rested on the bottom. The temperature was about zero, yet it was not uncomfortable on board the "Protector."

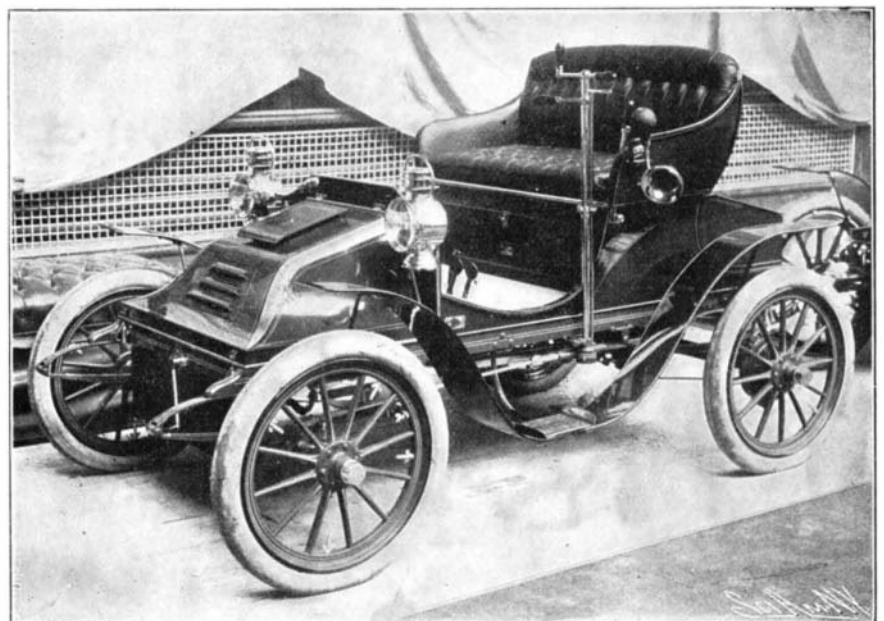
**Airship Competition.**

United States Consul J. C. McNally writes from Liege, Belgium, under date of November 27, 1903, to say that the authorities of the universal exposition, to be held in Liege in 1905, have decided to offer a prize of \$19,300 for an airship competition to be held in connection therewith. The details of the contest are now under consideration.

**THE NEW AUTOCAR RUNABOUT.**

Our illustration shows a new runabout which has just been brought out by the Autocar Company. The motor is the same as that which has been used in their well-known touring car for the past year, and is a 3 1/4 x 4 double-cylinder opposed type of engine, geared so that at 1,600 revolutions a minute, it drives the car thirty-five miles an hour. The engine develops ten brake horsepower at 1,000 revolutions a minute. It is fitted with an oiler which is entirely automatic, starting and stopping with the engine. The transmission is of the individual clutch type, giving two speeds forward and a reverse. All of the gears run in oil. The transmission is fitted with ball bearings. The rear axle is driven by a universally-jointed shaft, which transmits power through bevel gears to a short, incased spur-pinion which drives the large gear on the rear axle. The axle is fitted with both ball and Hyatt roller bearings. The steering lever is on the side post, which also carries the spark and reverse handles. A lever beside the seat changes the gears and controls the throttle by twisting the handle. The car is fitted with pressed-steel artillery wheels, and shod with 28 x 3-inch tires. The gasoline capacity is eight gallons, which is sufficient for a 200-mile run. The weight of the car complete is about 1,175 pounds. It has a 70-inch wheel base and a 52-inch tread.

The regular autocar is being built this year with several improvements. A small wheel steering device is used in place of the lever arrangement employed on the runabout, and ball bearings of special design find a place in the transmission. All controlling handles are arranged on the steering-post, and the change-gear-lever is disposed directly under the steering-wheel rim, so that it may be operated by the right hand. The clutch-shifting lever is operated by the left hand, and is also arranged below the steering wheel, while the turning of its handle controls the throttle. The ignition-lever is placed conveniently to the left hand. An arrangement is provided, so that when the clutch is thrown in, the speed of the engine is automatically accelerated. The engine may also be throttled by a simple twist of the wrist. When the emergency brake is applied, the clutch is thrown out. The 4 x 4 engine used in this car develops eleven brake horse power at 1,000 revolutions.



**THE AUTO-CAR DOUBLE OPPOSED-CYLINDER RUNABOUT.**