

A NOVEL MOTOR ICE BOAT.

The motor ice boat shown in the accompanying illustration was built by Mr. Charles S. Ketcham, of Eastport, L. I. The boat consists of an ordinary scow having mounted within it a two-cycle gasoline motor of four or five horse-power, which is connected direct by a belt to a large spiked wheel mounted forward of the motor, and adapted to engage the ice through a slot in the floor of the scow. The motor scow is steered with a sharpened steel rudder blade on the end of a long sweep. This motor ice boat is a very simple affair that can be constructed by any amateur, and yet it is capable of attaining a considerable speed and giving much enjoyment to the owner.

THE HEATON AIRSHIP.

Since the publication of our article last week in which the failure of Heaton's airship, the "California Messenger," was chronicled, we have received the two pictures herewith published. They show admirably the construction of the craft, and indicate that it differs not very widely from most gasbag dirigible balloons. To recapitulate the information published last week, it may be stated that the Heaton airship consists first of a silk gas reservoir 76 feet long and 14 feet in diameter, with a capacity of 10,000 cubic feet of hydrogen gas, of a lifting power of 600 pounds. Directly beneath the bag is a sheet of canvas, denominated by the inventor an "aeroplane," designed to assist the movement of the airship in falling or ascending. The rudder is lightly constructed of bamboo covered with sacking, and is governed by ropes at the will of the engineer, the air current, generated by the rapid revolution of engine and propeller, assisting in the prompt control of the airship in the line of direction as the operator determines. The platform upon which the operator stands is built of bamboo rods trussed to the net above by linen lines.

The engine, though generating 20 horse-power, weighs, exclusive of propeller, but 55 pounds. It is described as a double-cylinder, 4 by 4, revolving around a stationary crankshaft, the propeller blades being attached to and a part of said cylinders. It is constructed of steel, and the motive power is furnished by gasoline. Power is increased by the elimination of flywheels, as well as lightness by dispensing with water coolers, the cylinders being kept cool by the strong air currents generated by the rapid motion in revolving. The two fans have each a surface of 8 square feet and are 5 feet from tip to tip.

In common with other affairs of life, some of the most simple and apparently obvious facts of steam engineering have only been learned after long experience and endeavor in a contrary direction to natural laws. Years ago, before the days of the distillers on board ship for supplying fresh water to the boilers, it was the practice in the United States Navy to use salt water for the "make-up," i. e., to supply the water lost by leakage and other wastes. The rule was never to allow the salinity of the boiler water to exceed $1\frac{1}{2}$ per cent of saturation. But, of course, it happened more than once that this rule had to be broken on account of leaky boilers, stress of weather or other reasons which make it impossible or unsafe to blow off and replace with sea water. Under such circumstances the surprising result was always noted that the scale deposits were more friable and easily broken loose from the sheets and tubes, so that cleaning the boilers was an easier task than when the salinity had been kept down to the prescribed percentage. The reason, of course, was that when the salinity was kept at a low percentage more sea water had to be pumped into the boilers, which introduced more lime and other scale-making properties. The lime being thrown down at once, formed a hard insoluble scale that could be removed only with difficulty. With less seawater introduced less lime was deposited, hence less scale.—Machinery.

There were six mines in the United States which produced over 1,000,000

tons of ore each in the year 1903. Five of these—the Fayal, the Mountain Iron, the Adams, the Stevenson, and the Mahoning—are on the Mesabi range, in Minnesota; the sixth is the Red Mountain group, in Alabama. Eleven other mines shipped

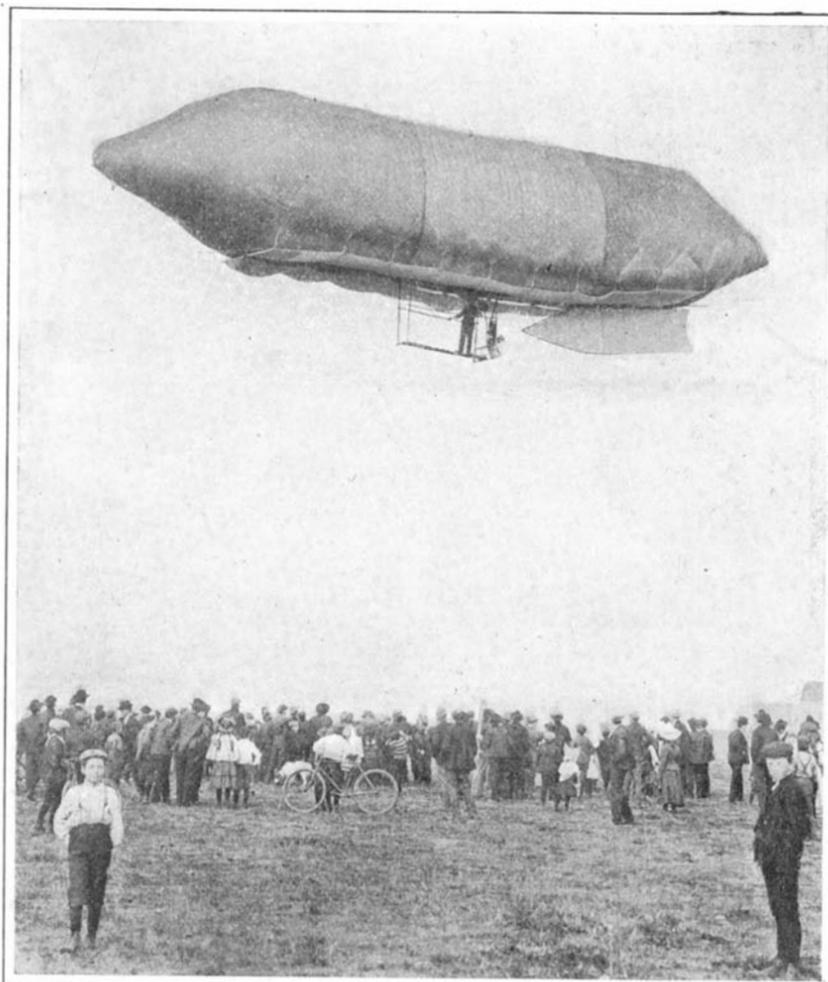


A HOME-MADE MOTOR ICE BOAT.

over 500,000 tons and less than 1,000,000 tons each. These were the Biwabik, the Spruce, and the Burt, on the Mesabi range; the Pioneer and the Chandler, on the Vermilion range, in Minnesota; the Chapin, the Cleveland Cliffs, and the Pewabic, on the Menominee range in Michigan; the Aragon and the Lake Superior, on the Marquette range; and the Norrie, on the Gogebic range.



Heaton Standing Next to the Frame of His Airship.



THE HEATON AIRSHIP IN FLIGHT.

MOTOR BOAT ENGINES AT THE SPORTSMEN'S SHOW.

At the eleventh annual Sportsmen's Show, now being held in Madison Square Garden, New York, the exhibit of motor boats and their engines, together with a large oval display tank in which the boats are shown in action, occupies the entire main floor. Although there is no great change in the construction of the boats themselves, there is a decided increase in the size of the gasoline engines used on some of the larger ones for the purpose of developing high speed, and the number of cylinders used is as high as six or eight.

The accompanying illustrations show several of the noteworthy engines on exhibition. The 250-horse-power, eight-cylinder Craig engine used in the "Onontio" when she made her record nautical mile in 2 minutes, 26 seconds (28.42 statute miles per hour)

last October is the largest engine at the show. The large inlet and exhaust pipes used on this engine are noticeable in the photograph. They are 3 and 4 inches in diameter respectively.

The cylinders have a $7\frac{1}{4}$ -inch bore and a 9-inch stroke, and their heads contain twin inlet and exhaust valves mechanically operated by bell cranks worked from a single cam shaft on one side. The compression used is 80 pounds, and the speed of the engine 850 R. P. M. A three-bladed, reversible propeller was used with it on the "Onontio." The cylinders are mounted on nickel-steel stanchions, the cranks being entirely exposed. The bearings and cranks are lubricated by wick oilers. The crankshafts, of which there are two coupled together at the center, are $2\frac{3}{8}$ inches in diameter. They are of nickel-steel, hollow-bored. The bedplate, bell cranks that operate the valves, and a number of other smaller parts are made of manganese bronze.

The total weight of the engine is 3,520 pounds. Variable make-and-break igniters are used on this engine, the current being supplied by two magnetos driven by bevel gears. The two four-cylinder engines of which it is composed are thus independent even to their ignition current supply. Separate carbureters supply each also.

Another engine built on somewhat the same lines as the Craig is the new 100-horse-power, six-cylinder Standard, which has 8 x 10 cylinders and develops its power at 300 R. P. M. This engine has its valves in a valve chamber beside the cylinder. The inlet valve is automatic, or suction-operated, and is provided with a small piston on its valve stem. This piston (which is fitted with one piston ring) works in a closed cylinder having but two or three small air holes, through which the air can escape. Thus it forms an air dash pot and keeps the valve from seating too heavily.

An extra set of cams permits of running backward. Three of the cylinders are fitted with auxiliary valves for letting in compressed air for starting and reversing purposes. A special cam opens the exhaust valve during every up-stroke of the pistons, and air is admitted during every down-stroke, so that the three cylinders form a single-acting compressed-air motor under those conditions. As soon as the other three cylinders begin to fire, the air is shut off and the whole engine is run on gasoline. Sufficient air is carried, at a pressure of 75 to 100 pounds per square inch, to run the engine two or three minutes this way alone. The air is compressed by an air pump driven by an eccentric on the crankshaft. The starting and reversing feature makes a clutch and reverse gear unnecessary, as the engine can be started and reversed under load.

The 150-horse-power Simplex engine of the "Challenger," which boat covered a mile recently in Florida at the rate of $29\frac{1}{2}$ miles an hour, consists of eight cylinders cast in pairs and bolted to a single aluminium crank case. The crankshaft is a steel forging of generous size. The bore and stroke of the cylinders are $6\frac{1}{2}$ and $6\frac{3}{4}$ inches respectively, and the compression used is 95 pounds. The motor develops its full power at 800 R. P. M. It is fitted with jump spark ignition from