jury as far as known in the recent fighting. Of less important battleships on the European station, there are the "Navarin," of 10,000 tons and 16 knots speed, and the "Apostoloff," 8,500 tons and 16½ knots speed, whose main armament consists of four 12-inch guns in turrets and, in the case of the "Navarin," eight 6-inch guns in broadside, and in the case of the sister ship four 6-inch guns mounted in broadside. These vessels have partial belts of compound armor. Of course, they are now relegated purely to duties of coast defense. Then there are the three vessels of the "Sinop" class, of 10,500 tons displacement and 16½ knots speed. They have 16-inch belts, and a 12-inch central redoubt, within which are six 12-inch guns, protected by the redoubts and by hoods of 2-inch armor. These vessels also carry seven 6-inch guns on the main-deck. The "Nikolai I." and "Alexander II." are old battleships of 9,800 tons and 15½ knots speed, protected with 14-inch compound armor belts and carrying two 12-inch guns in a turret forward and four 9-inch and eight 6-inch in a battery on the gun-deck.

The Russian navy also includes three fairly modern coast defense vessels built in 1895, of 4,126 tons and 14 knots speed. They carry some of them three and some of them four 9-inch guns in turrets, and four 6-inch guns in the central battery. They have a partial 10-inch belt, and a 3-inch armored deck.

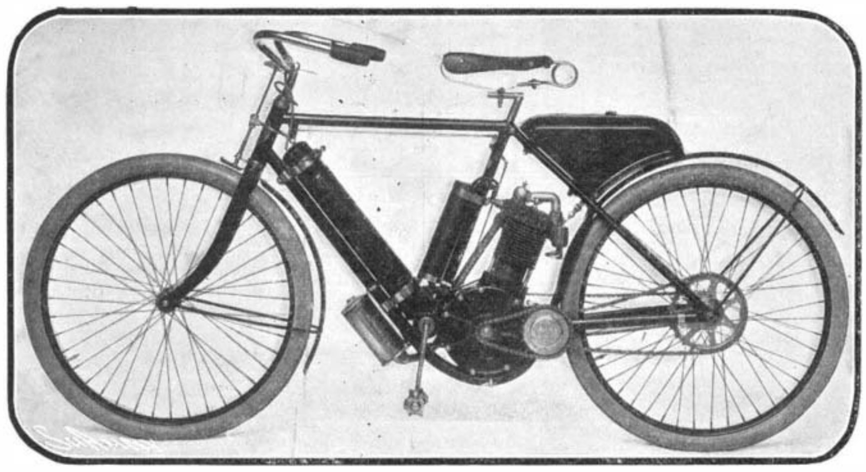
The Russian navy includes four large modern armored cruisers. The "Gromoboi," built in 1899, is of 12,367 tons and 20 knots speed, with a bunker capacity of 2,500 tons of coal, and provision for liquid fuel. The vessel has a partial 6-inch belt, a 2-inch deck, and 6 inches of armor on the casemates. She carries four 8.4-inch guns, sixteen 6-inch, twenty 3-inch, and twenty-four smaller guns, besides two submerged and two above-water torpedo tubes. She is practically an improved "Rossia," and the description of the "Gromoboi" will apply to the "Rossia," with the difference that the armor belt is 10 to 5 inches in thickness, and that she carries six above-water torpedo tubes. The "Rurik," of 10,950 tons and 18.8 knots speed, has a partial 10 to 5-inch belt and carries four 8-inch, sixteen 5.5-inch, six 4.7-inch, twenty-two smaller guns, and six above-water torpedo tubes. Although much smaller than the other vessels, the "Bayan," built at La Seyne in 1900, is the best designed of the armored cruisers. She is of 7,800 tons and 21 knots speed, has an 8 to 4-inch belt, 2-inch deck, and carries two 8-inch guns in 7-inch armored turrets, eight 6-inch guns in 6½-inch armor casemates, twenty 3-inch and seven smaller guns, besides two submerged torpedo tubes. There is also the "Nakhimoff," built in 1885, and rebuilt in 1899, which carries a 10-inch partial compound armor belt and mounts eight 6-inch, ten 4.7-inch, and several smaller guns.

Coming now to the protected cruisers, we have a class of six splendid vessels of about 6,500 tons displacement and speeds that vary from 20 to 24 knots. They have about the same armor and armament; and a description of the "Variag," which was built at Philadelphia and destroyed in the recent sea fight off Chemulpo, will answer for the class.

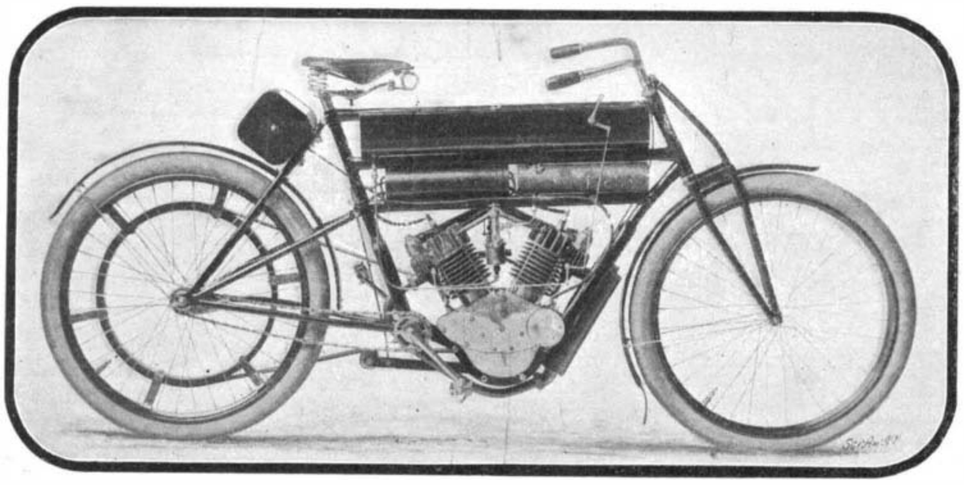
The "Variag" is, or rather was, of 6,500 tons displacement, 24.6 knots speed, and was protected by a 3-inch deck and by gun shields 6 inches or less in thickness. She carried twelve 6-inch, twelve 3-inch, and six smaller guns, besides two submerged and two above-water torpedo tubes. The other vessels of this class are the "Bogatyr," built at Stettin; the "Askold," a five-funneled boat built by Krupp; the "Pallada" and "Diana," both crippled at Port Arthur; and the "Aurora." Of the four other large protected cruisers, it is sufficient to say that, because of their age, they are in no way comparable to the foregoing ships. The "Pamiat-Azova," of 6,700 tons and 18.8 knots, is the best. She carries fourteen 6-inch guns, and has a partial belt of the old compound armor, which is not comparable in protective qualities to the modern steel protective decks. The "Dimitri Donskoi," of 5,800 tons, now on her way to the Pacific, and two other vessels, the "Monomakh" and "Korniloff," are protected by easily-penetrated compound-armor belts, and are armed with a numerous battery of 6-inch and 4.7-inch guns. They are of slow speed and doubtful utility against modern ships. The "Svietlana," built at Havre in 1896, is a serviceable 3,900-ton ship of 20 knots speed, with a 2-inch deck, mounting six 6-inch, twelve 3-pounders, and four above-water torpedo tubes. The "Novik," the fastest protected cruiser in the world, now disabled at Port Arthur, and the "Almaz" are 3,000-ton protected cruisers of 26 knots speed, carrying six 4.7-inch guns and eleven smaller guns. They have a 2-inch deck, and are provided with five torpedo-tubes, all located above the water line. Lastly, we have the three vessels of the "Boyarin" class, of 3,200 tons displacement and 22½ knots speed, protected by a 2-inch deck and carrying six 4.7-inch guns, eight smaller guns, and five above-water torpedo tubes. The "Boyarin" is another of the ships that was disabled at Port Arthur.

In addition Russia also possesses thirteen small cruisers and gunboats that range from 1,500 to 534 tons in displacement, two of the best of which have already been accounted for by the Japanese in the early days of the war. The torpedo-boat fleet consists of fifty destroyers, fifty-four first-class and twelve second-class torpedo boats, all of modern and first-class construction.

Besides these there are over 100 small torpedo boats of such early construction as to be practically obsolete. Before the opening of the war the personnel of the Russian fleet was something of an unknown quantity. It was supposed, however, to be very good; but until some reasonable explanations are forthcoming of the early reverses of the war, the public will conclude that the excellent Russian ships and general war material are vastly superior to the men who handle them.



2¼ H. P. COLUMBIA MOTOR BICYCLE.



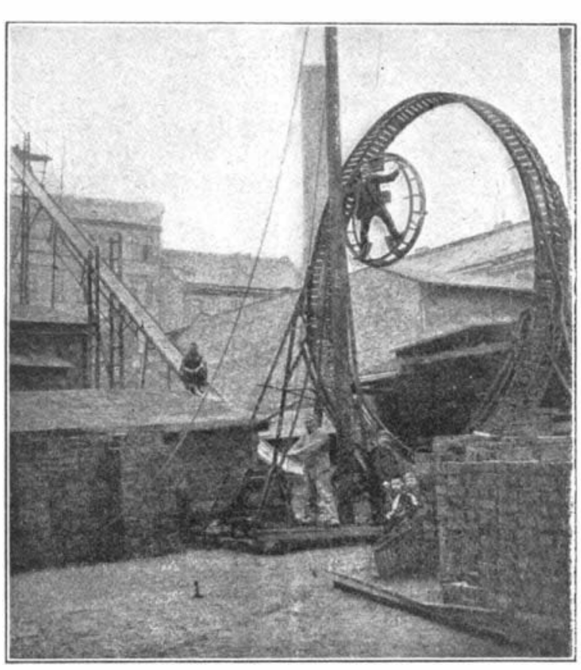
5 H. P. TWIN-CYLINDER CURTIS ROADSTER.

### TWO NEW MOTOR BICYCLES.

One of our cuts shows a motor bicycle with an air-cooled V-shaped motor of 5 horse power, which made the fastest time at the recent Florida Race Meet. The machine is made by the G. H. Curtis Manufacturing Company, Hammondsport, N. Y., and it is intended for use as a powerful roadster for use on all kinds of American roads. Its weight complete is but 165 pounds, and it has gasoline and oil tanks of sufficient capacity for traveling 150 miles. The double-cylinder, V-shaped motor is placed in a 23-inch frame, and transmits its power directly to the rear wheel by means of a 2-inch flat belt made of two-ply Russian rawhide. A wooden pulley is used on the rear wheel, and a leather-covered pulley on the motor. The motor itself weighs but 60 pounds, has a 3-inch bore and stroke and develops 5 horse power at 2,000 R. P. M., thus making the bicycle one of the most powerful motor cycles ever built for use as a regular road machine. The crank shaft runs on roller bearings in hardened and ground steel bushings. The two cylinders add greatly to the flexibility of the motor, and make it possible to obtain a wide variation in speed. With the regular gear of 4 to 1, the machine will climb any hill where the road is of fairly good surface, and will travel at the rate of 45 miles per hour on the level. With the racing gear of 2½ to 1, it made a mile in 59 1-5 seconds and 10 miles in 8:45 2-5 on the Ormond-Daytona Beach.

The switch and spark advance are controlled by turning the left grip, while the exhaust valves can be raised by a small lever on the frame. The batteries and spark coils are placed across the upper part of the frame, the gasoline tank behind the seat. The carbureter is seen between the two cylinders of the motor. The company also builds a single-cylinder, 120-pound, 2½-horsepower machine. The two sizes of machines are respectively fitted with 2½ and 2-inch detachable tires, and have a 62 and 58-inch wheel base.

The new Columbia motor bicycle, built by the Pope Manufacturing Company, of Hartford, Conn., has a chain drive through a speed-reducing countershaft to the rear wheel. The sprocket of the former, on which runs the chain from the motor, is fitted with two coiled springs, which transmit the power, yet absorb the shocks of the explosions. The motor has a 2¾-inch bore and a 3¼-inch stroke. High compression is used in it, and, at a speed of 2,500 R. P. M., it will drive the bicycle 35 miles an hour. All the Columbia machines are run up a hill of 25 per cent grade, which they must climb at a 15-mile-an-hour rate as a final test. The arrangement of parts is readily seen in the cut. The batteries are in a case above the lower tube of the frame; the muffler is just below this tube; the spark coil is on the upright post; and the tank is over the rear wheel. The machine is controlled entirely by the lever of the plunger brake. Pushing this down speeds up the motor, and pulling it up slows it down and applies the brake. The inlet valve stem and spring is exposed. Both inlet and exhaust valves can be readily removed.



ECLAIR'S SOMERSAULT MONOCYCLE COURSE.

MR. ECLAIR IN HIS WHEEL.

### SOMERSAULT MONOCYCLE COURSE.

In the present era of "weak nerves," the performance of "looping the loop," in which a cyclist traverses a vertically placed loop, has quickly staled, and has now been relegated to the rear and supplanted by a still more sensational piece of daring, a modification of the former, but requiring even greater courage and fearlessness.

The inventor or originator of this new kind of "looping the loop," Mr. Eclair, also whirls through a looped course beginning 14 meters above the ground, forming a loop about 8 meters high and broad, and ending on the ground. The construction used by Mr. Eclair for training is shown in our illustration. The intrepid performer will shortly exhibit his marvelous feat at one of the Berlin circuses. The somersault monocycle course, as it is called by the originator, is not traversed by Mr. Eclair with a bicycle, but with a large iron ring, in which he stands upright, as shown in our picture. The iron wheel has a diameter of 2 meters, a width of 40 centimeters, and weighs 5 hundredweight. Mr. Eclair starts with this wheel from the point of departure, 14 meters high, and is thus whirled through the course. When the heavy wheel has spun down the incline, it strikes with terrific force a door closing the loop below, which flies open, and is thus impelled on through the door by the powerful force or momentum it has attained in its downward course. Upon its second arrival below, the iron wheel pushes open another door at the other extremity of the ring or loop, and then rolls out, the daring ride ending in a net.

As the course, which has a total length of 60 meters, is covered by the wheel in 8 seconds, and the performer has to turn in it 14 times like the spokes of a wagon wheel, we may be sure that the blood of the reckless rider is well shaken up. As a matter of fact Mr. Eclair began training by having himself shut up in a drum, which he had turned around, first slowly, then faster and faster. Notwithstanding this precaution, many little veins in Mr. Eclair's eyes have burst.—Translated from Für Alle Welt.

### Details of the Allan Turbine-propelled Atlantic Liner.

BY THE ENGLISH CORRESPONDENT OF THE SCIENTIFIC AMERICAN.

The construction of the turbine-propelled Atlantic liner the "Victorian," is now well advanced, in the shipbuilding yard of Messrs. Workman, Clark & Co., Limited, of Belfast, Ireland, and she will be launched in the course of the next two or three months.

The vessel will have three propellers. The turbine engines have been designed with a special regard to the important question of reversing. They are to be constructed at the Belfast works of Messrs. Workman, Clark & Co., Limited, instead of at the Parsons works. Special care is being taken that the workmanship shall be of the highest class, the boiler power ample, and the pumps, valves, condensers, and other allied parts specially adapted to their work.

The "Victorian" will have accommodation for 1,500 passengers. She will be divided by bulkheads into eleven compartments, and these, together with the subdivisions of the double bottom, allow her to have twenty distinct water-tight spaces. She is built to the highest class of the British Corporation Registry of Shipping, and the strength of the hull has been greatly augmented over their requirements in order to meet the heavy weather of the North Atlantic.

Owing to the smaller size of the turbines, as compared with the ordinary reciprocating machinery, and consequently the less space occupied by the same, the freight space available is, notwithstanding the large complement of passengers, ample for the stowage of upward of 8,000 tons of deadweight cargo, and the facilities for its rapid handling and discharge are of the most up-to-date and efficient nature. Four large derricks are arranged on each mast, the lifting capacity of each being up to seven tons. These, together with two crane-post derricks, make ten in all, for the working of which ten double cylinder steam winches are supplied. Special attention has been given to the arrangement of the cargo holds, and the ordinary round pillar supports for the decks have been largely discarded in favor of special girders and supports, which leaves the holds freer for the reception, stowage, and discharge of freight. Insulated chambers for the carriage of fruit and dairy produce from Canada are provided in conjunction with refrigerating plant. The vessel has also sufficient coal bunker accommodations for the double journey, with an extra allowance for several days in the event of any unforeseen delay, thus obviating all fear of a shortage of fuel.

### Wages of Farm Labor in the United States.

Within the memory of living men the standards of wages at the time current have been unsettled throughout the country on at least three memorable occasions. The discovery of gold in California in 1849, as a sequel to the war with Mexico, brought a revolution in prices. The civil war, 1861-65, withdrew millions of men from ordinary pursuits and left labor systems to be replaced under rates inflated by a disturbed currency. The war with Spain, 1898, with its temporary diversion of labor and its territorial expansion, has been too recent for its effect to be fully measured. Besides these influences, the coincident developments of steam and electricity, as applied to manufactures and transportation, have so diversified and intensified and specialized all forms of labor that farm labor is no longer a distinctive term. Agricultural labor can no longer be discussed intelligently without special treatment of the peculiar forms into which it has become separated by conditions of soil, climate, and distance from dense bodies of population. All this emphasizes the imperative need of education and training for the work of the modern farm, whether in the field with grain, stock, cotton, fruit, dairy and garden product, or in the house.

## Correspondence.

### A Laboratory Blowpipe.

To the Editor of the SCIENTIFIC AMERICAN:

In your issue of last week you describe a "laboratory blowpipe" for gasoline, which I think, from my experience with gasoline, would be a highly dangerous apparatus. In it the air is pumped into a gasoline tank, which it enters at the bottom and bubbles up through the gasoline, thereby becoming charged with gas (vapor) which is then led through a pipe from the top of the tank, and ignited at the open end, after a further admixture of air near the exit (which air may not be required) in order to produce the blue flame. Now, this apparatus will work all right as long as the resulting vapor from the tank, or in the tank, is sufficiently overcharged; but if the vapor falls to the point where air is present to form the explosive mixture, what will prevent its firing back to the tank, and exploding the same? I have handled numerous gasoline pressure lamps, stoves, blowpipes, and run a gasoline engine, but could not be induced to work with the rig described in your paper last week. Perhaps your readers would be interested with a little experiment I tried on my 1½-horsepower gasoline engine. I removed the carbonating valve, and built a tank similar to your generator described, running the inlet pipe from my engine to top of tank, and plugging top of tank with a seated valve, through which a ¼-inch gas pipe extended nearly to the bottom of gasoline, and putting a small air cock on engine inlet pipe to supply air for forming the proper mixture. Now I find in practice that while air is usually needed to form the explosive mixture, sometimes the mixture is of the right quality as it comes from the tank; and the air cock must be kept closed, which means that there is an explosive mixture in the tank. Now, in addition to the engine inlet valve, I have an additional check valve midway between engine and tank, so that if engine inlet failed to seat, the other valve would prevent firing back to tank, and in addition, my tank is made of 7-inch iron pipe, strong enough to withstand the pressure if a back fire happened. I might add that I have used the rig about six months, and it gives better results than the carbonating valve.

In conclusion, would state that I might lay a claim to being the youngest old subscriber of your excellent paper. I am thirty-five, and have read your paper about twenty-eight years. My father subscribed when I was a child, and when he finally gave it up, I continued to buy your paper up to the present, and would as soon do without my dinner on Saturday as miss it.

Toronto, January 18, 1904. A. C. L.

### Protection Against Fire in Theaters.

To the Editor of the SCIENTIFIC AMERICAN:

I read with interest the articles on "The Theater Fire and Its Prevention in Germany," by Carl Lautenschlaeger, in your issue of January 23, 1904. In two respects, I think the apparatus therein mentioned has been very decidedly improved upon:

1. The recommendation of a sprinkling apparatus operated or controlled by valves, which in turn are worked by hand, is utterly out of date. If there was a scenery fire on the stage, it might easily be that no fireman could reach the valves. The automatic sprinkler, which will release and spray water whenever and wherever the temperature rises above a fixed limit (usually 155 deg. F.) is incomparably better.

2. The writer remarks: "It is essential that when a fire does occur, the gases be allowed to float upward in a strong draft. At the Prinz Regent Theater, previously referred to, this end is attained by huge ventilators, located at the very top of the stage, over the gridiron. They are controlled by manila ropes operated by the firemen from the stage floor. Even if they should not be lowered by the firemen, they would drop of their own accord upon the burning of the ropes."

An arrangement of an automatic character very much superior to that above described is being installed in a local theater. It consists essentially in a large skylight, the top of which is closed by doors, which would swing open from the leverage of weights placed at right angles to their surface, unless held down by a rope. The rope is fastened on a ceiling joist below on a hook, and between this hook and skylight doors is a fusible link, which will part when the temperature exceeds 155 degrees, thus causing the doors of the skylight to swing open, allowing the flames and gases to escape without getting into the auditorium.

If the stage is so broad as to render it desirable, the rope can be swung from pulleys to both sides of the stage, and fusible links inserted at several points, so that if there is a fire anywhere on the stage, it will at once release the doors.

Although the scenery employed in a theater is necessarily combustible, it will not make a fire lasting any great length of time, and if the heat is sucked out of the building by a strong draft created in the manner described, it is confidently believed that an audience might sit still in their seats, and be in no more danger than when sitting before an open-grate fire, to which the stage and proscenium arch would bear a strong likeness.

Many of the theaters use ventilators over the stage, but in order to protect the house from the severe downward draft, these are usually kept closed with some kind of cloth, or even in a more substantial manner. The danger is therefore that these would be found unavailable in case of fire; and even under the most favorable circumstances, the draft which they afford would be much inferior to a great direct draft created by a space open to the sky.

The fusible link operates almost instantaneously, and can absolutely be depended upon, whereas the burning of the manila rope as described by Herr Lautenschlaeger necessarily occupies some considerable time, every second of which is of enormous value.

One of the minor advantages of this arrangement is that by detaching the rope from the hook, it can be ascertained with very little trouble whether the doors are working freely on the hinges, and are therefore in good condition for the purpose designed.

Too much importance cannot be given to making all these appliances automatic, instead of depending upon the class of help which must necessarily be employed for such purposes. C. S. ASHLEY.

Toledo, O., January 30, 1904.

[The automatic sprinkler which is set into operation by the melting of a fusible alloy, serves a useful purpose, and is in use in Germany as well as the United States for the protection of cellars, passageways, etc. The sprinkler described by Director Lautenschlaeger is intended to deluge the entire stage from the gridiron to the cellar, a distance which might easily be 125 feet. Now, supposing a fire started at the level of the stage, the heat would not be intense enough, for a few moments, to melt the plugs, and the result is that the fire gains great headway. Sprinklers of the type mentioned by our correspondent do not permit of as thorough inspection as the other type of sprinkler in use in Germany. To insure safety, *all* the cloths, whether let down to the stage, or supported above the proscenium arch, must be thoroughly wet. The sprinkler valves can be operated from the stage, the gridiron, and from the director's box in front of the curtain. The ventilators referred to by Director Lautenschlaeger can be operated from the stage and from in front of the curtain. The burning of the sustaining ropes is only an added precaution, comparable to our correspondent's fusible plugs. Automatic appliances in conjunction with regular inspections, and the presence of trained firemen who can operate the machinery instantaneously, would tend to make a serious theater fire a rarity. There is a vast field for invention in the theatrical line.—ED.]

### Iron and Steel Industry of Belgium.

To the Editor of the SCIENTIFIC AMERICAN:

Your valuable publication comes at regular intervals and forms a highly interesting part of the reading files of this consulate. Your issue on iron and steel has been much read by the shippers having invoices legalized at this office, inasmuch as Liege is a manufacturing city of much importance, and has within its environs many steel and iron works. They are shipping their products of steel and iron throughout the world, and have established a pretty fair market in the United States for steel rails and structural bridge iron. Their principal markets, however, are in Europe and Central and South America. Liege, as you know, is also noted for its manufacture of guns and gun barrels. It is a manufacturing city as important as any in Europe of its size.

Should you desire any information whatever concerning the manufactures here, or should any of your readers desire information from my consular district, it will afford me pleasure to be of service. My ambition is to open a market here for American goods of all kinds; and if I can in any measure compass that commercial union, I will be more than repaid for any service rendered in connection therewith. Requests for information are welcome at this office, and I comply with the same as speedily as possible and to the best of my ability. JAMES C. MCNALLY,
United States Consul.

Liege, Belgium, December 26, 1903.