sponson, with captain's house under, for the better handling while docking and taking piers. From both of these bridges the bow and stern rudders are controlled by means of wheels connected with independent steam-steering gear placed below on the engine starting platform. A hand-screw steering apparatus is also placed in reserve aft in case of emergency. Docking and engine telegraphs are provided on each of the bridges.

The vessel was engined by the builders and the machinery consists of compound diagonal surface-condensing engines, the diameters of the cylinders being one 68 inches and two 92 inches in diameter, with a piston stroke of 84 inches. They are the largest and most powerful paddle-wheel engines yet built. Their nominal and indicated horse powers are respectively 1,290 and 10,000. When the ship was on her trials they worked up to close upon 12,000 horse power.

The three steam cylinders are placed side by side, and working on three cranks, the high-pressure cylinder being placed between the two low-pressure cylinders. The high-pressure cylinder is fitted with a piston valve and each of the low-pressure cylinders with flat slide valves, all controlled by the usual double eccentrics and link motion valve gear. The crank shaft is a ponderous piece of machinery. It is built, and, together with the paddle shafts, is forged of mild steel and bored hollow. The starting and reversing is effected by a large steam and hydraulic engine on the direct-acting principle.

The condenser is cylindrical, and placed athwartships between the cylinders and the supports for the shafting, and the condensing water is supplied by a circulating pump worked by an independent steam engine.

The paddle wheels are made of steel, and constructed on the feathering principle, with curved floats. The floats are each 18 feet in length. Steam is supplied to the engine by four double-ended boilers arranged in two compartments, one forward and one aft of the engine room. They are adapted to work with Messrs Howden's system of forced draught.

The vessel has two funnels and two pole masts, and presents a very handsome and majestic appearance. On July 8, the "Empress Queen" made four trial runs between the Cloch and Cumbrae Lights, when she averaged over 22 knots per hour, and, considering the stormy weather which prevailed on that day, the result was gratifying. The following Monday a six hours' sea trial was carried out on the Clyde with equal success, the average speed over the whole course out to sea being 22 knots. While on her trials on the Clyde the highest speed attained was fractionally less than 23 knots an hour.

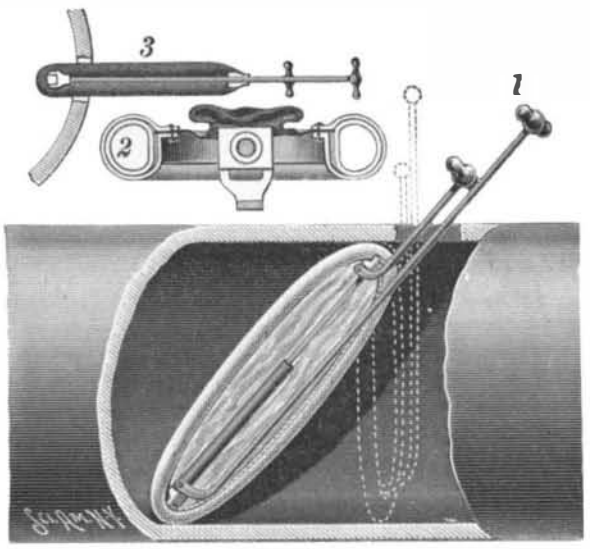
The "Empress Queen," which is licensed to carry 1,994 first and second class passengers by the Board of Trade, is now running to and from Liverpool and Douglas, which will be her regular station.

The Railroad in Alaska.

The building of a railroad through Chilkoot Pass will be undertaken by the Chilkoot Railroad and Transportation Company, of Tacoma. It will be 8 miles long and will connect Dyea at tidewater with the mouth of the Dyea Cañon. Transportation through this cañon and across the pass to Crater Lake will be effected by a system of tramways, the contract for which has been awarded to the Trenton, N. J., Iron Company, which agrees to have them in operation by June 15, 1898. The tramway will be of the Bleichert system. The first one will be 4 miles in length, reaching from the cañon to Sheep Camp, with a rise of 1,000 feet. A second tramway will extend from Sheep Camp to Summit, 3½ miles, with a rise of 2,500 feet, and thence to Crater Lake, with a fall of 500 feet. Iron supports will be put in every 100 feet. The tramway will have a capacity of 120 tons daily—sufficient for the outfits of 200 miners. It is to be hoped that the promoters of this much needed means of transportation will not encounter any serious legal difficulties. It was believed that the Interior Department had the power to grant permission to run over the public lands, but no provision was made in the act of March 3, 1875, for Alaska, as no one then thought that railroads would be run in the Territory. The same state of affairs applies to the tramways, the cable roads, the telegraph and telephone lines and other enterprises which demand passage over the public domains. The originators of the enterprises will be forced to apply to Congress for charters or for legislation that may enable the Interior Department to take charge of the matter. It is probable that Congress will act at once upon these applications, so that the railroads can be built before the spring season opens. The Interior Department has many applications for such franchises, but it can do nothing but refer them to Congress for action, and so notifies all those who applied. Out of the five passes over which routes could be constructed from the coast to the interior, three have been surveyed for this purpose.

A GAS MAIN STOPPER.

To temporarily stop a gas main and prevent the flow of gas therein, as is frequently necessary in making changes or repairs, the device shown in the accompanying illustration has been invented and patented by Patrick Goodman, 115th Street, East River (address in care of the Standard Gas Company), New York City. Fig. 1 shows the manner of using the device, a portion of the gas main being broken out, Fig. 2 represents a cross section and Fig. 3 illustrates the manner of inserting the device in a pipe. Two flat steel springs are made with eyes at their ends by which they are pivoted to two rods, one telescoping with the other, the springs being slightly curved outwardly, but being capable of compression. Outside of the springs is an elastic packing, which may be of rubber tubing, and outside of such packing, and inclosing it with the springs, is a casing to which is attached a flexible diaphragm of cloth, leather or other suitable material, practically impervious to gas. Pivotally attached to the outer ends of the telescoping rods are outwardly extending handle bars, slightly curved near their pivotal points, and one handle bar being slightly longer than the other. The device, when first inserted in a hole in the side of a pipe or main, occupies an inclined position, as shown in full lines in Fig. 1, but, upon drawing upon the longer handle, the device assumes a vertical position, as indicated by the dotted lines, the springs being forced outward to form a ring which presses closely against the interior surface of the pipe, and, with the diaphragm, entirely shuts off the flow of gas.

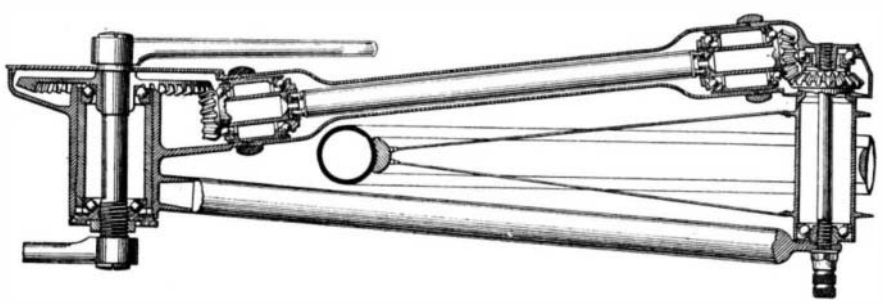


GOODMAN'S GAS MAIN STOPPER.

THE CHAINLESS BICYCLE.

The most conspicuous bicycle exhibit at the American Institute Fair is that of the Bayvelgere machine—one of the new type of chainless wheels which is likely to compete strongly with the chain-driven type during the coming season. The exhibit is somewhat historical, as it contains one of the earliest bevel-geared wheels put upon the market and one or two of the experimental machines made by the Bayvelgere Company, among which is one that has several thousand miles travel to its credit and shows surprisingly little wear as the result of it.

The aim of the designer of this wheel has been to provide a construction which will maintain each pair of gears at all times in proper alignment and yet allow of considerable deflection in the connecting shaft. This has been accomplished by inclosing and supporting each pair of gears, both at the crank hanger and at the rear wheel, in a rigid casing, which is incapable of being sprung out of shape by any rough usage that may be put upon the bicycle. The power is transmitted from one set of gears to the other by means of a shaft formed with a knuckle joint at each end.



DRIVING GEAR OF THE BAYVELGERE CHAINLESS BICYCLE.

Every wheelman is well aware that, under the strain of hill climbing, when the maximum pressure is put upon the pedals, the rear forks are liable to spring somewhat out of line. This is due to the pull of the chain being applied only on one side of the wheel. In the chain-driven wheel this flexibility is of comparatively little consequence; but any such distortion on a bevel-geared wheel, provided with a rigid intermediate shaft, would cause the gears to bind and set up a considerable amount of friction. The flexible shaft shown in the accompanying engraving adjusts itself to this distortion or to any bending that may be produced by collision or other accident, and permits each pair of gears to work without binding, even though they be considerably out of line with each other.

The flexible shaft is provided with a four point knuckle joint at each end, the points consisting of steel balls which engage corresponding holes in the ends of the axles of the gears at the crank hanger and the rear hub. Each of the two gear wheels adjoining the intermediate shaft is formed in one with a short hollow axle, whose bearings are carried in a short threaded cylinder which is firmly screwed into the crank hanger or the housing of the rear gears, as the case may be. The two casings are connected by means of a tube with enlarged and threaded ends which just fills the space between the casings, and is held in place by means of threaded couplings. Wear of the intermediate gears is taken up by screwing the cylinders containing the ball races into the casings, and the ball bearings are adjusted by screwing up the cones on the outer ends of the short hollow shafts or axles.

The mechanism is entirely inclosed by the casings and connecting tube, and when it is filled with oil or other lubricant, it will run for months without attention. Taken altogether, it is a highly creditable piece of work, both in design and construction.

The Patagonian Expedition from Princeton University.

The Princeton Patagonian expedition which left in February, 1896, returned in August. It was under the auspices of Prof. W. B. Scott, of the department of geology. The object of the expedition was to collect vertebrate fossils from the tertiary deposits and the skins and skeletons of recent birds and mammals. The objective points, says Science, was the port of Gallegos, on the east coast of Southern Patagonia. From this point investigations were conducted along the coast from Sandy Point, in the Straits of Magellan, to Port Desire, on the north. In this region many interesting fossil forms were secured, and a nearly complete series of living birds, mammals and plants. After spending several months in the coast region, the expedition went into the interior, where many new glaciers and watercourses were discovered. Being an unexplored country, not only were new facts relating to the geography of the region discovered, but many plants and animals new to science were also collected, while the information obtained relating to geological phenomena was of the greatest value. Numerous volcanic cones hitherto unreported were discovered.

Owing to the difficulty of traveling in the interior, it was impossible to take any great supply of provisions. So it was found necessary to limit the expedition to Messrs. Hatcher and Peterson. They were absent five months on this trip, during which time it was impossible for them to receive or dispatch any mail and they did not meet with a single human being. After spending a little more than a year on the mainland, the expedition proceeded to Tierra del Fuego and the adjoining islands, where important collections were made and observations were taken of the geology and paleontology of the islands.

Throughout their work the Argentine government was very generous and courteous to the expedition, giving to its members transportation on its war vessels from Buenos Ayres to Gallegos and return, offering to place at its disposal a smaller vessel for use in researches among the islands. The collection is the most valuable of any formed from that region, including as it does a nearly complete series of mosses and flowering plants, 800 skins and skeletons of recent birds, eight tons of fossils, including more than 1,000 skulls and many nearly complete skeletons.

Further Experiments on the Liquefaction of Fluorine.

At the meeting of the Academy of Sciences at Paris, October 12, M. Moissan read a paper on the liquefaction of fluorine with Prof. Dewar's instruments in London. He said it retained its liquid form at minus 120 degrees Centigrade, whereas almost every chemical affinity of the most active of known gases disappears in such great cold. The exceptions are hydrogen and turpentine oil, which even in a temperature of minus 210 degrees Centigrade combine with fluorine and are incandescent.

SCIENCE announces the establishment in Switzerland of a weather bureau. It says: "A dispatch is sent each evening from Zurich giving the weather probabilities for the next twenty-four hours. The predictions are based on data received from the principal meteorological stations of Europe combined with experience of local conditions. The dispatch is further distributed by telephone to those communes prepared to subscribe ten francs [$2] per month for the service."