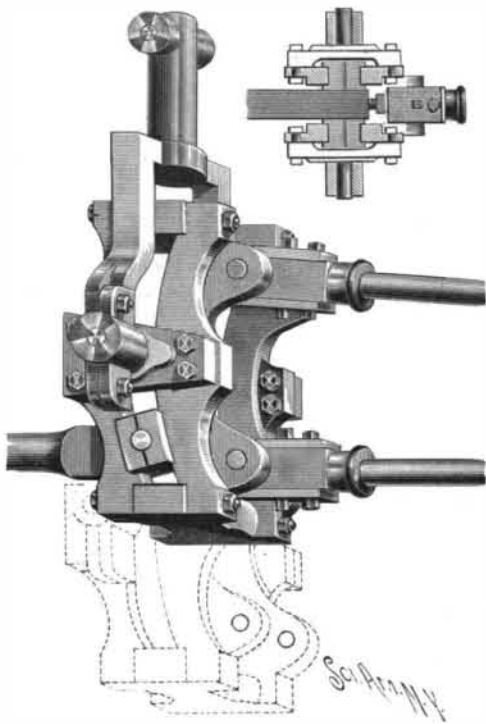


A NEW LINK VALVE-GEAR.

In the accompanying engraving we present a link valve-gear for steam-engines and other machines, which is designed to produce a complete center action by placing the eccentric and valve in a true line at all times, thereby preventing undue friction and pinching of the parts under heavy pressure. Fig. 1 of the annexed illustrations represents the valve-gear in perspective. Fig. 2 is a sectional plan view. The link valve-gear is provided with a yoke formed at its upper end with a pin. This pin is adapted to be engaged by a shifting-lever to move the link either into an uppermost or a lowermost position, according to the desired position of the valve. On the side-arms of the yoke are arranged aligned bearings engaged by trunnions. These trunnions have their plates secured to the outer faces of link-arms, arranged in pairs and fastened together at their lower and upper ends by cross-pieces. The link-arms of each pair are spaced to form the usual segmental slots engaged by sectional boxes. These boxes slide on the link-arms and are engaged by a pin carried by the valve-stem and secured in place by a set-screw. On the forward sides of the link-arms, lugs are formed, which receive pivot-pins for the heads of the two eccentric-rods, thus giving the usual rocking motion to the links in order to actuate the stem and hence the valve. It will be observed that the yoke,

**ROST'S LINK VALVE-GEAR.**

besides being capable of turning, can be raised or lowered into the position shown in dotted lines in Fig. 1, in order to change the position of the valve as the boxes slide in the link-arms to shift the valve upon rocking the link-arms further. The valve-gear is the invention of John A. Rost, Axtell, Neb.

Coal for Our War Vessels.

The Navy Department has now decided to keep at all times a stock of about one-half million of tons of the best steaming coal procurable. The war with Spain demonstrated the enormous importance of coal, and the distribution of this vast stock will be done with the advice of the best naval strategists. About 300,000 tons will be kept on the Atlantic and probably 120,000 tons will be used on the Pacific. The expense of purchasing and transporting this vast quantity of coal will be large and the apparatus which will be installed for the expeditious coaling of war vessels will be most elaborate. It has been decided that 25,000 tons of coal will be kept at Manila, 10,000 tons at Guam, 25,000 tons at Honolulu, 10,000 at Pago Pago, 25,000 tons at San Francisco, 25,000 tons at Brewerton, Puget Sound. On the Atlantic coast the coal supply will be approximately as follows: Havana, 25,000 tons; Santiago, 10,000 tons; San Juan, Porto Rico, 25,000 tons; Key West and the Dry Tortugas, 50,000 tons; Port Royal, S. C., 25,000 tons; Norfolk, Va., 5,000 tons; Washington, 1,000 tons; League Island Navy Yard, 5,000 tons; New York Navy Yard, 5,000 tons; New London, Conn., 25,000 tons; Boston, 15,000 tons; Portsmouth, N. H., 10,000 tons; Frenchman's Bay, Me., 15,000 tons. In addition to this vast and judiciously stored supply it is believed that the naval authorities can at any time command 50,000 tons of coal at either New York or Hampton Roads. With this splendid stock of coal the Atlantic coast will be efficiently protected compared with its position before the war.

The government now has seventeen colliers, which will be capable of coaling a fleet which would pass around the South American continent in case neutrality were enforced on countries contiguous to the coast. The entire coaling capacity of the colliers is estimated at about 50,000 tons. As some of the coaling stations are a couple of thousand miles apart, it is little wonder that longing eyes are often cast at comparatively unim-

portant islands which would furnish excellent coaling stations.

Moosic Mountain to be Tunnled.

Residents along the Delaware and Hudson Canal, who have been greatly depressed over the proposed abandonment of this waterway, are encouraged by the news of the great railway project of the Scranton, Honesdale and Eastern Railway to tunnel the Moosic Mountain a distance of one and three-quarter miles, a coal road to be constructed from the Lackawanna River to the Hudson. The road will start near the station of Frank Hollenbeck and run through the proposed tunnel to Honesdale, Pa., whence it will continue to a point on the Delaware River at or near the aqueduct at Lackawaxen. From there it will follow the line of the canal, with the exception of straightening out the crooked places, to Port Jervis and from there will run to Rondout. The road will be 138 miles long and the grades will be such that they will permit of hauling a long train of coal cars from the coal regions to tidewater or to the New England States without breaking bulk. The road will be down grade all the way.

It is thought that the new enterprise will greatly reduce the selling price of coal to dealers along the Hudson River. A contract for the construction of the Moosic Tunnel has been given to a Chicago firm. The tunnel will be 8,642 feet long and 14 feet high and its width will be 14 feet. It is proposed to complete the tunnel within one year from January 1, 1899, and the cost will be \$421,730. The work will be commenced simultaneously at both ends and four hundred workmen will be employed.

A NOVEL CHAINLESS BICYCLE.

A chainless bicycle recently made its appearance in Princeton, N. J., which, on account of its novel construction and ingenious driving-mechanism, has attracted no little attention.

From the accompanying illustration it will be seen that the driving-mechanism consists essentially of a small spur pinion mounted on the axis of the rear wheel, and meshing with a large spur-gear pivoted upon the frame of the bicycle. This large spur-gear is connected by means of a driving-rod with one of the pedal-cranks.

The pedal-crank in question is bent and has a pivot-pin for the driving-rod located at a short distance from the pedal-shaft and in a direction from the pedal-shaft substantially at right angles to the direction of the pedal-pin from the shaft. To this pivot-pin is connected the driving-rod, which at its other end is secured to a crank upon the large spur-gear.

The driving-rod, in order to overcome dead centers, and to insure the rotation of the cranks in the proper direction, is provided near its middle with fulcrum rollers having shifting pivotal connection with sockets on the frame. By reason of this construction, the driving-rod acts as a lever when the cranks are on dead centers. When the bicycle is in motion, the pedals will rotate in a forward direction and will carry with them the front end of the driving-rod; the rollers will alternately engage their sockets on the frame; and the rear end of the driving-rod, and consequently the large spur-gear, will rotate backwardly, or in a direction opposite to that of the pedals.

The object of the peculiar construction of the pedal-shaft with which the driving-rod is connected is, that the pedal-cranks and the short cranks connected by the driving-rod shall all be simultaneously on dead centers, from which construction it also follows that the cranks will be in the most favorable position for the transmission of power at the same time.

The driving-rod is formed in two pieces adjustable longitudinally, so that the rod may be varied in its length and accommodated to different bicycles.

The inventor of this mechanism, Mr. William C. Duryea, informs us that the bicycle has been in use for more than a month, and runs with remarkable ease and freedom from noise.

ACCORDING to Lurmann, carborundum (silicium carbide) can be employed as a substitute for ferrous silicium in the production of steel, considerable quantities of carborundum being already used for that purpose.

AN IMPROVED RAIL-JOINT.

A useful improvement in rail-joints has been patented by William E. Smith and John H. Adams, of Telluride, Col., in which improvement fish-plates are employed, so joined that the contiguous ends of the rails are braced and fastened between the fish-plates.

Of the accompanying illustrations, Fig. 1 is a perspective view of rail-sections joined together by the improved means; Fig. 2 is a perspective view of a fish-

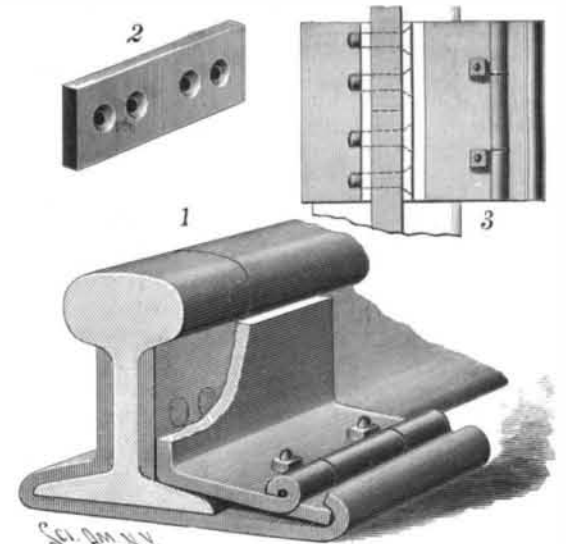
**NOVEL RAIL-JOINT.**

plate employed; and Fig. 3 is a plan view of the improvement with the rails in section.

Through the rail-sections pins pass, which serve the purpose of the usual bolts and which have their heads seated in openings of the fish-plate countersunk, shown in Fig. 2. The fish-plate lies against one side of the rail with the pins projecting through the rail and through another fish-plate formed by the upturned end of a chair. The chair in question extends beneath the rails, and has at its side edge an upwardly and inwardly turned flange, as shown in Fig. 1.

The pins passing through the rail are held in place by means of a long hinge-section formed with a presser-plate and joined by a pintle to a coacting hinge-section adapted to bear on the chair-flange. Bolts pass through the long hinge-section and the chair and by their means the long hinge-section can be drawn down. By the action of the hinge, which is essentially that of a toggle, the presser-plate is forced against the heads of the pins, to hold the pins from displacement. The presser-plate and the fish-plate on the other side of the rail are forcibly drawn toward each other and the sides firmly clamped, thus making a secure connection.

The improvement, it will be observed, does away with the bolts and nuts ordinarily used on fish-plates.

Fermentation Without Living Cells.

As a result of the investigations of Prof. Buchner, of Tübingen, another of the fetiches of old chemistry is destroyed, namely, that living cells are necessary to fermentation. Prof. Buchner, according to Science, grinds yeast with quartz sand in order to disrupt the cells, and submits the moist mass to a pressure of 500 atmospheres. The liquid contents of the cells are entirely removed and the cells totally disrupted. The

**A NOVEL BICYCLE DRIVING-GEAR.**

filtered liquid is of a clear or slightly opalescent, yellowish color, retains the odor of yeast, contains considerable carbon dioxide and some albumen. Most interesting is the behavior of the yeast juice toward sugars, fermentation being set up much more quickly than by yeast, and proceeding much faster. The gas evolved is almost pure carbon dioxide. When carefully dried at a low temperature, the fermenting principle is not destroyed, and it is possible that, when desiccated, the activity of the ferments may be preserved indefinitely.