to the pressure, and consequently it runs without any difficulty.

If the oils are so destructive, how is it possible to make such mileage as we do? Many run 30,000 and 35,000 miles before they are worn through lead $\frac{1}{8}$ of an inch thick. I have a bearing here which is said to be lined with lead. It has made 75,000 miles to my certain knowledge and the lead is not destroyed. If the acids in the oils destroy the lead, increase the friction, how is it that they run so well without getting hot?

Mr. WALDO: I spoke particularly of boxes for high speeds and high pressures, such as the boxes of engines.

Mr. ADAMS: I should like to inquire if the passenger cars do not go just as fast as the engines do?

Mr. WALDO: But the pressure is nothing like it.

Mr. ADAMS: That is true, but we have some that weigh 50 tons.

Prof. C. FRANK ALLEN: Mr. Lauder said that cheap lubricants might cost less, but that when the wear of the journals was considered the total result would not be a saving. That is all right as far as he went, only he didn't go far enough. If you are heating boxes, and if you are wearing down your journals in doing it, it will cost something to do that. In other words, you are spending money every day in the week, all through the year, in overcoming friction that you ought not to overcome.

Mr. JOHN COGHLAN: I was interested in lead lining and its effects on the journal. I had a car whose bearings had $\frac{1}{10}$ of an inch lead lining; when taken out, the lead lining was just barely worn through. The mileage of the car was 56,500 miles, and the weight of the car, wheels and all included, is 49,000 lbs. The journal had worn less than $\frac{1}{32}$ of an inch in diameter. If the effect of oil is so great upon the lead, it would be impossible to have that car run that time without some injury to something. It has proved the efficiency and the economy of using a good lead-lined bearing. I also made an experiment in reference to the increased length of the journal and the diameter of the axle which consisted of taking an ordinary sized M. C. B. bearing and reducing it 25 per cent, and putting it under a car that had always been running cool before; the consequence was we could not keep it cool. It would not run 10 miles without getting hot on account of that reduction of 25 per cent. Afterward I put back the original full sized journal, and we never had any trouble.

The discussion was then declared closed.

The subject for the next meeting will be an address by Mr. Twombly, of the Old Colony, on "Incidents in Mexico." A nominating committee was appointed to recommend candidates for officers of the Club for the ensuing year.

Gibbs' Interlocking for Electric Street Railroads.

The rapid increase in the use of electricity as a motive power for street railroads has emphasized the need of more efficient crossing protection than that afforded by the vigilance of a motorman or the bar of the ordinary crossing gate. The reasons for increased danger at crossings with electric street railroads over those with horse car lines lie in the greatly increased speed of the cars on the former, their great weight and consequent inertia, and the liability of failure of their source of power by blowing out of fuses, jumping off of trolley wheel by jolting over rough crossing frogs. The necessity for applying the same regulations for the crossing protection of such roads as are now required by state laws in cases of steam roads is apparent.

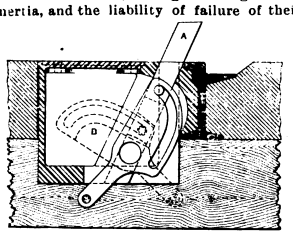

Fig. 2.

The devices shown in the accompanying illustrations are the invention of Mr. George Gibbs, Mechanical Engineer of the Chicago, Milwaukee & St. Paul Railway, and consist of a Saxby & Farmer or other mechanical interlocking machine, so combined with the electric line as to enable the towerman to cut off the current from the electric cars when necessary to block the line and thus make it impossible to move cars in disobedience of the signals. A derailing device is also provided to be operated in paved streets to prevent cars from coasting onto or over crossings. This is of such a nature that it offers no obstruction to street traffic, and is quite free from liability to clog up with mud, snow or ice. It is apparent that the ordinary form of derailer employed on steam roads would not fulfill these conditions.

In the general plan, fig. 1, is shown a double track crossing of a steam and an electric railroad. The tower is placed in a convenient location and contains the interlocking machine *M*. The pipe line and wire lead-outs for operating the switches and signals on the steam roads require no explanation. Similar lead-outs are run to the scotch-blocks on the electric lines. These blocks are the equivalent of the derailers on the steam lines and are placed at suitable distances from the crossing, usually about 50 ft. Their construction is such as to derail a car. The signal is placed a few feet in advance of the scotch-block. To effectually control the movement of the electric cars the supply current is placed under control of the tower man, through the interlocking machine.

At a suitable distance (500 to 1,000 ft.) before reaching the crossing, the trolley wires *H* are broken by the insertion of a circuit breaker or insulating block, *C*, and at a point about 30 ft. from the crossing another circuit breaker *S* is inserted. A feed wire from this insulated section *C S* is run to the switch *F* in the tower, and this switch is connected to a lever in the interlocking machine. The switch is supplied with current by means of the wire *E*, which is supplied from the main line feeder *T*. Thus, by opening or closing the switch *F*, the current may be cut off, or supplied to the insulated trolley wire section at will. It will be noticed that the insulated section is terminated a few feet from the crossing. This is an important provision, as it insures a "live" section over the crossing at all times, making it impossible for a careless towerman to cut the motive power from a car which may happen to be on the frogs when line-clear has been given the steam road.

The details of the scotch-block are shown in fig. 2. It consists of a strong cast iron box, which is set outside of the rail and bolted securely to the ties, so that its top is flush with the street paving. In the top of the box and close to the rail is a 2-in. × 4-in. opening. A wrought iron plug, *A*, is set in this to form the stop-block. It is raised and lowered by means of the slotted crank, connected by pipe line to the tower. It will be noticed that the line of motion of this plug is oblique to the axis of the rail, and the crank having a throw of 4 in., the plug will in its derailing position project some distance from the box and over the railhead. The slotted crank has a shoulder; so that in its upper position the square end of the plug will rest upon this shoulder in line with the axis of arm and crank pin. The plug will therefore be locked in its extreme position, and the downward thrust of a car wheel will be taken upon the strong pivot pin without bringing strain upon the pipe-line connection. The construction of the block is such that it clears itself of dirt and snow, and the moving parts are effectually protected from such obstructions, drainage being provided through the open bottom of the box.

Fig. 1.

Gibbs' Interlocking for a Crossing of an Electric with a Steam Railroad.

Warning of the approach of an electric car is given to the towerman by a novel and simple annunciator; it consists of a local battery bell circuit, actuated by a relay placed in the loop of the trolley wire, which is brought into the tower. As soon as a car using current passes into the insulated trolley-wire section, the magnet of the relay is energized and closes the bell circuit, giving the alarm.

This interlocking apparatus has been installed and is in satisfactory working shape at the grade crossings of the Chicago & North Shore Electric road with the Evanston Division of the Chicago, Milwaukee & St. Paul at Calvary and at Sheridan Park, Ill., and it is believed constitutes the first application of the kind in the country.

The cost of the apparatus is less than that of an interlocking plant for a plain crossing between two steam roads, as fewer levers are used and the same pipe line is used to actuate both the stop block and the signal.

TECHNICAL.

Manufacturing and Business.

The shops of the Rogers Locomotive Works, which have been closed 10 weeks, were reopened this week.

The directors of the Barney & Smith Car Company have declared a regular quarterly dividend of 2 per cent. on a capital stock of $4,500,000.

The Lewis Tool Co., of New York, has been organized with a capital of $20,000 by Mortimer G. Lewis, Edwin H. Mulford, New York City, and John R. Mulford, of Havana, N. Y.

The Clayton Air Compressor Works have removed their offices and salesrooms to the Havemeyer Building, 26 Cortlandt street, New York, retaining their former store as a warehouse.

The Knapp Railroad Car Ventilator Co. has been organized by Charles Knapp, of St. Louis, C. S. Crane, C. W. Ford and others, who manufacture the patent car ventilator of Mr. Knapp.

A company called the Duplex Improved Air-Brake Co., of East St. Louis, has been incorporated in Illinois to manufacture air-brakes under the patents of J. A. Hoff and William Pickles.

The American Railway Supply Company, of Chicago, with a capital stock of $1,000,000, has been incorporated in Illinois. The incorporators are: George W. Haines, James J. Armstrong and Charles F. Haines.

The Hale & Kilburn Manufacturing Co., of Philadelphia, has received an order for 125 cars for its patent canvas lined rattan spring seats and backs. The above orders are in addition to the contract for 55 passenger cars of the Long Island Railroad.

The iron roof over the dye house for George C. Hetzel & Co., at Chester, Pa., and the roof for the new electric light station for the Citizens' Electric Light, Heat & Power Co., at Lancaster, Pa., are to be furnished by the Berlin Iron Bridge Co., of East Berlin, Conn.

The new car wheel works of the Detroit Foundry Equipment Co., which are being erected at Harvey, Ill., are expected to be under roof by April 1. All the structural iron for the foundry building has been delivered at Harvey, and material for the other buildings is arriving rapidly.

The Chicago Railway Terminal Elevator Co. has been incorporated in New York to operate grain elevators and warehouses. The directors are: Frederick W. Whitridge, Willard Brown, Edwin T. Rice, Jr., Charles H. Ludington, Jr., James M. Drake, William H. Witner and T. Ludlow Chrystie.

The Canadian Pacific has equipped a number of its through passenger trains with the commingler steam heating system of the Consolidated Car Heating Co. The change from heating by stoves has attracted the attention of the local newspapers which appreciate the improvement and are giving the Consolidated company an abundance of free advertising.

M. L. Andrews & Co., of Cincinnati, are receiving frequent and large orders for their patent drill chuck. They have received large numbers of spindles from Philadelphia and other Eastern cities which were sent to be fitted with the new chuck. Many foreign manufacturers, especially German, have shown a high appreciation of the merits of the device. The chuck can be fitted to any old or new spindle. It is designed to prevent the drill or boring bar from dropping out of the socket.

The Craig-Reynolds Foundry Co., of Dayton, O., has recently introduced the Dayton railroad crossing gate. It is direct acting and always under the control of the operator. It is operated by wire cable, and hence is free from the difficulties due to atmospheric changes which affect so seriously some other gates. The arms can be worked in unison; they may be locked in any position by an absolute lock, perfectly controlled, and the arms of either side may be raised or lowered independent of those of the other side. These gates have been ordered by the Cleveland, Cincinnati, Chicago & St. Louis, and the Chicago & Northwestern.

The Pond Machine Tool Co., of Plainfield, N. J., for whom Manning, Maxwell & Moore, 111 Liberty street, New York, are the sole salesagents, have just been awarded the contract by the Ordnance Department of the United States Army for the manufacture of gun lathes and other machine tools required in the construction of steel, breech-loading rifle cannon of 12 in. to 16 in. calibre. The other bidders for this contract were the Niles Tool Works, Bement, Miles & Co., of Philadelphia, Pa.; Robert Poole & Son Co., of Baltimore, Md.; and the Builders' Iron Foundry, of Providence, R. I. The order consists of three lathes for boring and turning guns, one lathe for turning and finishing these guns, one machine for threading and slotting the guns and the rifling machine. This company has previously furnished to the Ordnance Department 23 large gun lathes and two rifling machines for the manufacture of breech-loading rifled cannons of 8 in. to 12 in. calibre. In the previous large contract awarded the Pond Machine Tool Co. the time for completing the work was four years, and the firm finished it near.