and other coaches were on the other line. This led to further improvement, and the detector bar lock, devised by Saxby & Farmer, was introduced. This important safety appliance not only effectually prevented the possibility of the points being moved during the passage of a train over them, but also by means of the bolt lock connected to and worked with the detector bar, effectually insured the points being completely closed before a signal to pass over them could be given. The facing point lock, consisting of a detector bar and a locking bolt, was worked by a separate and independent lever from the points, which lever was properly interlocked, so that before any signal could be given, the lever working the facing point lock had to be pulled over, and by that means the points became bolted. Of course, if the points were not quite closed the bolt could not be shot, the facing point lock lever could not be moved, and therefore the signal could not be lowered. The points having been firmly closed, the facing point lock lever could then be pulled over and the points bolted. In bolting the points the detector bar, mounted alongside the rail, was moved. This detector bar attached to the rail was made longer than the wheel base of any coach, and as the lever working the facing point lock was pulled over, the bar had to rise above the rail and descend again, consequently as long as any wheel of a coach of the train was running over the detector bar it was impossible to lift the bar, and consequently impossible to move the facing point lock lever so as to unlock the points, which were, therefore, maintained firmly locked until the last wheel of the last coach had passed from over the detector bar, which could then be moved for the purpose of releasing the points to allow them to be shifted to another position.

In very many instances it became necessary to work facing points at a very considerable distance from the signal cabin, and if the rod to the points became broken accidentally it was possible to bolt the points in the opposite position to that intended; for example, suppose the points are right for running straight along a main line, and the signalman intends to reverse them for the purpose of sending a train to the branch line, to do this he pulls over the point lever in the signal cabin. Now, if the rods to the points are broken, the points remain in the position right for running on the main line, but the signalman thinks he has reversed them and set them right for the branch line. In consequence of this breakage of the rod connection, a conflicting signal is displayed because the points are not set to correspond with the position of the lever which works them. It therefore became necessary to devise something to enable the signalman to detect this breakage or disconnection of the point rod. This led to the invention of what is called "facing point detectors." Various types are in existence, the most generally adopted system is the following: every signal lever which works a semaphore or other signal directing trains or engines to pass over a pair of facing points is made to work a detector slide, that is a sliding rod which crosses the path of the plunger bolt lock rod, locking the points in the proper position corresponding to the signal lowered by the signal lever working the detector slide. With this arrangement, unless the points have been set and also bolted in the position intended, the signal for that position of the points cannot possibly be lowered because the wire from the signal lever passes through the detector, and consequently unless the points are completely closed and locked, the detector slide cannot move, and the wire remains stationary and the semaphore arm at danger.

As already noted the great improvement made in interlocking lever frames in 1867 continues to be used at the present day. The levers are made all alike so as to be used either for points or signals indiscriminately; the locking is of a compact form, moved not only by the spring catch of the lever, as before described, but also by the lever itself. By this system in the event of any catch rod becoming disconnected or broken, the locking is not rendered inoperative, but remains working by the lever itself, so that in point of fact there is a double locking. In modern signalling installations many very complicated problems of interlocking have to be solved, and it is therefore of great importance that the construction of the apparatus, while as simple as possible, should lend itself readily to the solution of these intricate problems in locking. This has been done in the most modern type of lever locking, called "duplex plunger locking."

In the interlocking system described the points are worked by means of rods, as already mentioned, and the signals by means of wires. More modern and improved systems in some respects consist in working the points and signals by means of hydraulic or pneumatic pressure, the object being to render the points and signals easier to work irrespective of their distance from the cabin, and the use of these systems also results in a smaller cabin and locking frame being necessary. The systems consist of a pressure pump and reservoir, or accumulator, and a series of handles all interlocked one with the other as previously described in connection with the earlier system. The pump retains the pressure in the accumulator, which is connected to the cylinders operating the switches and signals by means of pipes under ground; the pressure is turned on by the movement of the interlocked handles; this pressure being conveyed through the pipes moves the piston in the cylinder at the switch or signal which in turn operates the switch or signal.

Hydraulic power for working points and signals has been tried for some time, but hitherto a difficulty has been experienced in ensuring the proper setting of the points before a signal to pass over them can be given. This difficulty is got over by providing a return control; the pressure returning through a small pipe to a valve near the interlocked levers admits pressure to a piston which moves the interlocked handle, completing the mechanical interlocking, which not only indicates to the signalman that the work of moving the points which he intended to perform has been properly performed, but prevents the possibility of the signal being lowered unless and until the points are completely closed and locked. By mixing glycerine with the water used in the hydraulic apparatus all risk of derangement from frost is overcome.

The foregoing paper was read by Mr. Patton at a recent meeeting of the Engineers' Club of Toronto.

Railway or Railroad.—"Railway" is the original word for a highway operated by steam, and is part of the legal title of the great majority of rail transportation companies in English-speaking lands. In the index of the Official Guide for the U.S., Porto Rico, Canada, Mexico and Cuba, no less than 552 lines are legally designated by the word "railway."—Railway Age.

The Canadian Locomotive Co., Kingston, Ont., writes: "We duly received your journal for Jan., and congratulate you upon the same; we find its contents very interesting, and are very well pleased with our advertisement."

J. H. Sorley, City Freight Agent, C.P.R., Ottawa, Ont., writes: "I have pleasure in enclosing subscription for your valuable paper THE RAILWAY AND SHIPPING WORLD."

S. J. Montgomery, C.P.R. Station Agent, Bedford, Que., writes: "THE RAILWAY AND SHIPPING WORLD is indeed very interesting and instructive."

The Fraser River Bridge.

The plans for the construction of the railway, vehicle and foot bridge to be erected across the Fraser River at New Westminster, B.C., by the B.C. Government, provide for a double-deck bridge, the lower deck being for the railway and electric car tracks, and the upper deck for vehicles and pedestrians. The location of the bridge in New Westminster will be, so far as the highway approach is concerned, about where a continuation of Dufferin st. would strike the bank of the river, and the railway deck will be connected with the track by a T. The bridge can best be described by dividing it into three sections, the substructure, the approaches, and the bridge proper.

At the New Westminster end of the bridge there will be three abutments, two of them having long wing walls, built of concrete or second-class masonry. Adjacent to the C.P.R. track there will be for the railway tracks—the east and west arms of the T—eight pedestals, either resting on the soil or built on piles; and there will be four other pedestals to carry the highway deck. These pedestals are to be erected of concrete or second-class masonry. There will be 11 piers in the river part of the work, the first two being sunk by open dredging into the boulders; the next three by open dredging into the sand, and the remainder will be built on timber cribs filled with piles and concrete. All these 11 piers are to be built of concrete or first-class masonry. The approximate quantities of materials in the piers, pedestals, etc., are as follows:—Mass in cribs and caissons of piers 1 to 5, 9,750 cubic yards; mass in cribs of piers 6 to 11, 1,700 cubic yards; masonry, coping and backing (or all concrete) in piers 1 to 11, 3,300 cubic yards; piling below bottoms of cribs in piers 1 to 11, 9,400 cubic ft.; concrete or 2nd class masonry in pedestals, 240 cubic yards; concrete or 2nd class masonry in abutments and retaining walls, 1,450 cubic ft.; excavation for shore pedestals, abutments and retaining walls, 1,600 cubic ft. All the piers are to be provided with steel cutting edges. The work of putting in the foundations for the piers will not, in the opinion of the engineers, present any great difficulty. The pedestals for piers 1 and 2 are to be sunk through a mass of sand and boulders by excavating from a central well, and some difficulty may be experienced on account of their large ratio of frictional surface to weight, and because of the resistance of the mass of boulders. Piers 3, 4 and 5 will be built with caissons, and some difficulty may be experienced in keeping these in place, owing to the current, and the use of current breakers is suggested. For the other piers, piles 70 ft. in length have to be driven for the masonry foundation to rest on.

The main part of the superstructure of the bridge will consist of eight spans, 1 through, fixed span of 225 ft.; 1 through, fixed span of 380 ft.; 1 through, swing span of 380 ft.; and 5 through, fixed spans of 159 ft. each, a total of 1,780 ft. The width will be 19 ft. for the 380 ft. spans, and 16 ft. for the 159 ft. spans; while the 225 ft. span will be 19 ft. over pier 3, but over pier 2, owing to the dividing of the tracks east and west on 12°.30′ curves, it will be 136 ft. wide between pedestals. The highway deck will be carried above the top chords of the five shorter spans, and at about mid-height of trusses of the other spans. From the high land at Dufferin street, the highway will be carried to pier 2 by 1 deck, plate girder span of 96 ft., and two similar spans of 40 ft. each, and at pier 3 it will cover the railway track. The east arm of the T will consist of 2 deck, plate girder, skew spans of 75 ft. each, 1 half-through, plate girder, skew span 35 ft., and 1 deck plate girder, skew span of 68 ft.; and the west arm will consist of deck, plate girder, skew spans of 75, 48