Norman, which Mackenzie had reported burning in 1789.

The track is laid continuously from Fort William on Lake Superior via Winnipeg and Edmonton to Prairie Creek, Alberta, 1,412 miles, and a daily passenger train service between Winnipeg and Edmonton, 792 miles, was inaugurated July 3rd, 1910. Train service has also been established between Fort William and Winnipeg and between Edmonton and the end of the track at Prairie Creek.

Thriving towns are springing up where a few months ago there was nothing but the bare prairie; grain elevators, warehouses, dwellings, stores and other evidences of remarkable activity are presented immediately following the laying of the track. The growth is especially astonishing at the division points or terminals of Rivers, Man., Melville, Watrous and Biggar, Sask., and Wainwright and Edson, Alta., and there are many other towns which give promise of notable development.

OPTICAL DETERMINATION OF STRESS.

In his second lecture at the Royal Institution, London, Eng., on "Optical Determination of Stress and Some Applications to Engineering Problems," Professor E. G. Coker first discussed the determination of the lines of principal stress by optical means, taking as an illustration a particular case in which the central lines of a series of dark bands of inclination were shown on a tension member having two fine saw-cuts in it, which diminished its effective cross section by one-half. Great use might be made of the lines of equal inclination, as the positions of the dark bands appeared to be independent of the physical properties of the material. Professor Filon had, in this way, verified experimentally some of the results of his mathematical researches in elasticity, by observations of bands of this type. For many purposes, however, a method which made use of both isoclinic and isochromatic lines was convenient, but it was important to be able to distinguish between black bands which denoted no stress at all and those which showed the positions for which the planes of principal stress coincided with the principal planes of the polarizing and analyzing apparatus. In a general way it was possible to distinguish between each kind, if the stressed plate of material were turned round in its own plane, and was viewed in a beam of plane polarized light between crossed Nicols. Some bands moved while others remained stationary, and the former could be identified as isoclinic lines and the latter as belonging to the isochromatic group. It was often convenient to show this latter system in their true relation to one another, without disturbance by the dark bands due to the optical system. This might be accomplished by using circularly polarized light. Any stressed specimen, viewed under such conditions, showed at every point a color proportional to the difference of the principal stresses, and, since the shear was proportional to this difference, a picture of the shear stress throughout the plate was obtained.

Sudden Changes of Section.—Proceeding to consider a few cases which arose in practical applications of engineering work due to sudden changes of section, the lecturer said one of the simplest examples was afforded by a rivet hole. The effect of a simple pull was to cause a complicated stress distribution in the neighborhood of the hole, due to the crowding together of the lines of stress. It was easy to show experimentally that, if the hole was small compared with the breadth of the plate, the maximum stress rose to about three times its normal value, and theoretical calculation verified the experimental values. In a line of rivet holes the maximum stress at the minimum section could be readily determined. In a riveted joint the distribution was still more complicated, because the stress was carried from plate to plate by the direct pressure of the shanks of the rivets, and some idea of the intricate nature of these practical problems might be gained by comparing similar members under the same loads, in which the rivet holes were first without rivets; secondly, had rivets inserted; and, finally, had rivets in them by means of which the load was applied to the member.

Another type of discontinuity was afforded by semi-circular holes and rectangular slots in plates and beams. For example, in a tension member with two semi-circular notches in it, away from the discontinuity the lines of principal stress formed a rectangular system, but as they approached the notch they came closer and closer together, and at the waist the nearness together of the lines at the periphery indicated that the greatest stress was reached there. If the notches were small compared with the breadth, the stress rose to twice its normal value. If the notch was rectangular the stress at the re-entrant corners became very great. A similar notch in the form of a square hole in a plate forced the lines of stress to pass through the narrow spaces on each side of the hole, and here, again, the corners of the square showed by the close spacing of these lines, and the color effects on the specimen, how great was the influence of this kind of discontinuity.

Another subject of interest and of great importance in practical work related to the behavior of members like springs, hooks, links of chains, and the like, in which the curvature of the member was an important factor in the distribution of stress due to an applied load. A case which had some resemblance to that of a circular hook section was found in some forms of boiler, in which the flues containing the fire grate and for the circulation of the hot gases of combustion were corrugated in order to increase their strength. The determination of the stress distributions in members like these and in the parts of machines and the like, which it was the special province of the mechanical engineer to construct, was one of the greatest complexity, and long experience of the behavior of materials obtained by first-hand acquaintance in some particular branch of this profession as in, for example, the design and construction of tools or locomotives, could not be replaced by any experiments on models. They could help, however, and indeed mechanical engineers did not require to be convinced on this matter, as the use of models of machines for all kinds of practical purposes was the rule and not the exception.

THE MOTOR SHIP "SALENDIA."

The East Atlantic Company have recently purchased a new vessel designed for ocean traffic and propelled by oil engines.

The "Salendia" is 350 feet long with a beam of 53 feet, and a gross tonnage of 4,964 tons, and is fitted with two sets of four cycle Dissel motors, each with eight cylinders 20.8 in. by 28.7 in., giving together 2,500 i.h.p. at 140 r.p.m. built like the vessel herself, by Messrs. Barmeister & Wain, of Copenhagen. With a dead-weight cargo of 7,400 tons the displacement of the vessel is 9,800 tons, with a speed of 11 knots, on a consumption of 500 lbs. of oil an hour. The storage capacity of the double batten being for 900 tons or sufficient for a round voyage of 20,000 miles at full power. The vessel left her berth in the West India docks recently and the manœuvring necessary in order to bring her into the lock afforded a great demonstration of the ease with which the engines were started and reversed.