In 1903 arrangements had almost been perfected for an excursion of the Institute through British Columbia and to the British Yukon, but unfortunately at the last moment, although two hundred members had expressed their intention to start from New York on a special train, the Canadian Pacific Railway Company found it impossible to take from their ordinary uses the number of Pullman cars requisite for the accommodation of this large party, which was made up of the leading mining engineers, metallurgists and mine operators of the world, consequently the excursion had to be abandoned. There is no reason to doubt that results similar to those which followed the excursion into Old Mexico in 1901, would have manifested themselves in this Province had the excursion in 1903 be found practicable.

During the current month the Institute will be holding its annual excursion and business meeting in the Lake Superior regions of Michigan, and the writer of this article has good reason to feel assured that if at that meeting the subject is properly approached there will be no difficulty in obtaining the promise of the Institute to make British Columbia and the British Yukon the objective points of the annual excursion during the summer or autumn of 1905.

In 1903 the Government of Old Mexico as well as the officials in the different Provinces of that country, fully recognizing the benefits which would be derived from the excursion, put forth every effort to entertain the members and afford each and every one ample opportunity to study the mineral resources and thoroughly investigate the mining industries. The example set by President Diez and those in authority under him, forms an object lesson for other Governments, and such an example may well be followed by our own or any other Government, because of the manifold benefits which must necessarily result therefrom.

A VISIT TO A GREAT ENGLISH STEEL FOUNDRY.

The *Times* (London) recently published a lengthy account of a visit paid by the Yorkshire section of the Institute of Civil Engineers and others interested in the production or use of steel to Hadfield's steel foundry at Sheffield (represented in this country by Messrs. Peacock Brothers, of Montreal, who kindly forward us the cutting in question.)

The visitors were first conducted to the large machine shop of the works, where a number of projectiles made by the company were exhibited. Many of these had been fired through armour plates; and the efficiency of the "cap" of mild steel, now so largely used, was well illustrated by the specimens. A large 12in. shell that had gone through a 7in. nickel-steel plate appeared none the worse for the tremendous ordeal it had gone through, being only very slightly scored or scratched on its sides. A 6in. shot which had penetrated a 9-in. steel plate also seemed to be in excellent condition Other capped projectiles which had been fired through plates were also no more than slightly marked whilst broken fragments of like projectiles that had been put to the test without the cap testified to the advantage of that addition.

Later on the visitors proceeded to inspect the foundries, machine shops, and other departments under the guidance of the chairman and directors and members of the staff. In the course of the inspection a number of tests were made, to exhibit the remarkable properties of some of the steel manufactured by this company. Trials were also made at the proof butts, a couple of rounds being fired against a Hadfield cemented plate. A capped projectile went right through the plate without damage, whilst the uncapped projectile was broken up on the face. The late Mr. Robert Hadfield, the father of the present chairman of the company, held opinions that cast steel could be used not only for common shell, but also for armour-piercing shell. This view was opposed to the convictions of the metallurgists and artillery experts of the day; but the Government officials, with an open-minded liberality of opinion—a characteristic for which Government officials do not always get credit—encouraged Mr. Hadfield to proceed, and ultimately the result of tests made showed that the Hadfield cast-steel projectiles were suitable for perforating wrought-iron and compound plates. This was about 15 or 16 years ago, and since that time great advances have been made in the manufacture of armour. The compound system—*i. e.*, a wrought-iron backing with a steel face—has given place, first to Harveyized plates, and, later, to the armour made by the process of chilling chromium steel on the process first introduced by Krupp, of Essen. The greatly superior resisting power of plates of this description naturally set the projectile makers a harder task, and for a time foreign manufacturers held an advantage, their lead being attributed to extensive research guided by superior knowledge in metallurgical science. This was notably the case in regard to the projectiles made by Holtzer. Fortunately for the credit of English industry, Mr. R. A. Hadfield, who succeeded to the control of the Hecla works on the death of his father, had developed the scientific and research side of the establishment to a high degree, and was therefore able to offer to our Government a projectile which was proved to be equal to the remarkable Holtzer projectiles. In the trials of armour plates resistance to a Hadfield projectile was officially allowed to be equivalent, as a test of merit, to resistance to a Holtzer projectile.

In the meantime, the increased area of ship's side that could be covered with the new armour—which naturally could be made thinner without sacrifice of efficiency—led to naval gunners demanding a projectile capable of piercing a certain thickness of armour and yet having an explosive charge sufficient to burst the projectile after penetration. The problem set to the steel makers, therefore, was to produce a shell strong enough not to break up on impact, and yet to have a cavity sufficiently large to take a bursting charge of from 4 per cent. to 6 per cent. of the total weight. A steel of remarkable and apparently antagonistic qualities was needed. If the metal were too soft it would fail to penetrate the hard cemented face of the armour; if it were too hard it would be brittle and would fly to pieces without piercing the plate. Naturally the chemists or explosive experts had a great deal to do in working out the whole problem, but that is a part of the subject upon which we do not now speak. It is sufficient to say that the Hadfield cast-steel projectiles combined the two features in a remarkable degree, giving a shell that was able to perforate both the Krupp cemented and non-cemented armour, and which, at the same time, carried a charge sufficient to burst the shell after penetration.

The success of the Hadfield Company was the more remarkable, as the suggestion to use cast steel in place of forged steel, was looked on as chimerical by the leading metallurgical and artillery experts of the day; and it must be said that this view was fully justified by what was known until Mr. Hadfield produced results which upset all previous notions on the subject. One of the most annoying defects of steel shells is their liability to spontaneous fracture. Projectiles are to all appearance perfectly sound, and which from the nature and thickness of the metal should have enormous strength, will break up with a loud report for no apparent reason. The cause for this self-destruction—which may take place when the shell has been made a considerable time—is traceable to internal strains set up in the metal by unequal contraction during cooling. Sometimes a shell will last, in apparently perfect condition, until it is fired, but will break up in the gun under the shock of discharge. It was held, and the conclusion was fully warranted by what was formerly known, that cast