## PERSONAL.

Ross & Macdonald, architects, have moved their offices from 908 Royal Bank Building to 61 Front Street West, Toronto.

G. Jacques & Co., architects and engineers, of Windsor, Ontario, have moved their offices in that city from 5 Sandwich street west, to the Peninsular Security Building, Chatham street west, and would be pleased to receive manufacturers' samples and catalogues.

Mr. Frank A. Spangenberg, who has been associate of Mr. C. S. Cobb for the past three and a half years, is leaving for Buffalo, N.Y., where he will be located with Messrs. Lansing, Bley, & Lyman. Mr. Spangenberg's architectural experience has been gained through association with some of America's foremost firms, covering a period of thirteen years. In the year of 1909 to 1913 he studied architectural design in Atelier Prevot, New York City, and Columbia University. In 1913 Mr. Spangenberg was chief designer and chief draughtsman for Austin W. Lord, architect, Isthmian Canal Commission (of Lord & Hewlett, architects, New York City). His work in Toronto has been particularly devoted to the National Sanitarium Office Building, the new Registry of Deeds and Land Titles, the W. J. Gage residence, and the C. S. Blackwell residence.

## CHANGE IN MANAGEMENT.

Changes in the management of MacKinnon, Holmes & Co., Limited, of Sherbrooke, Que., have recently taken place, caused by the retirement from the company of Mr. A. R. Holmes, who in the past has occupied the position of director and secretary-treasurer.

It is understood that Mr. J. W. Bowman, president, and Mr. G. D. MacKinnon, vice-president and general manager, have purchased the holdings of Mr. A. R. Holmes and his friends, and new directors, in the persons of Dr. A. W. Klein, of Greenwich, Conn., M. L. MacKinnon, and J. Nicol, of Sherbrooke, Que., have been elected with Mr. F. C. Johnston, secretary-treasurer.

The business will be conducted as in the past under the management of Mr. G. D. MacKinnon, and it is understood the company is making extensive plans for future development.

This company has been particularly successful in its general business of structural steel and steel plate work, having one of the most complete plants in the country for these special lines. It has also been successful in the forging of shells for the Imperial Munitions Board, having a very complete and up-to-date plant for this special work.

## INVESTIGATIONS OF GRAVITY AND ISOSTASY.

Recent investigations of gravity and isostasy are discussed and summarized in Special Publication No. 40 of the United States Coast and Geodetic Survey, a quarto volume of one hundred and ninety-six pages illustrated by numerous plates and charts.

The survey for a number of years has been carrying on geodetic investigations of isostasy with special reference to the effect of isostatic compensation upon the deflection of the vertical and the intensity of gravity. Four previous reports on these investigations have appeared, the first one in 1909 and the last in 1912. The present volume gives the results of further study of the relation between gravity and isostasy. In it are embodied the gravity data resulting from the previous work.

The conclusions which may be drawn from the investigation reported in this volume substantiate to a great extent the conclusions arrived at from previous investigations. This is considered important because seventy per cent. more gravity stations in the United States were used at this time than in the preceding gravity investigation, and many stations in Canada, India, and Europe for which data were available were also used. Copies of the volume may be obtained at sixty cents each from the Superintendent of Documents, Government Printing Office, Washington, D.C.

## CONTRACT AWARDED.

The British Cordite Co., Ltd., have recently executed a contract for ten 400 h.p. Murphy furnaces to be installed in their new plant at Nobel, Ont.

## INSTRUCTIONS TO STEEL INSPECTORS IN THE FIELD.

By Elwyn E. Seelye.

The purpose of this article is to bring out the essential points to look for when inspecting a steel frame.

It is assumed that the structure has been properly designed and that the shop work has been properly executed. It should be emphasized at this point that shop inspection and mill inspection are very important. The reasons for that are numerous. Some of the most important of them are as follows: Where steel is being rolled and some orders are being inspected the rejected material is apt to be unloaded on the purchaser who does not have inspection. In fabricating, if there is no inspection, the plans may not be followed accurately, causing delay and expensive field changes at the site, also, as will be noted later in the article, certain errors of fabrication are not apparent after the fabrication is complete.

Now presupposing the steel has been shipped in perfect order and is arriving on the site, the inspector should first look it over for damages, due to shipment. These will generally appear as bent plates or members. All these damages should be rectified by straightening, and, if necessary, by reinforcing, before the erection is allowed to proceed. If damage is serious an expert should be called in to pass on it. Where no shop inspection has been made, the field inspector should go over the riveting and see that surfaces in direct bearing are milled and in contact.

The important thing in the erection of bases, either grillages, steel plates or cast iron, is to see that they are properly grouted. This can best be done by pouring the grout into a funnel raised high enough to produce a hydraulic pressure. The space between the concrete foundation and the iron should also be rodded to eliminate voids. It is very important that the bases be set level, faced on the top and that the column be faced to provide a full and even bearing between the bottom of the column and the base. In unimportant columns a discrepancy may be wedged with thin steel wedges, but in important work the full bearing without wedging should be insisted upon. This facing or milling can be done with great accuracy and its omission on bearing surfaces is cause for rejection of the member.

When the erection starts the inspector should keep in mind the functions of the connections and the way the stress is carried from one member into another. This will put him in a position to check the work up in a practical manner. For instance, he will notice that some steel beams rest upon seats which were riveted up in the shop. The additional rivets are really for the purpose of holding the beam in place and not to take a load. Other connections will be directly from the beam through the connecting angles to the column or girder by means of rivets. It will readily be seen that the rivets in this last connection are very much more important and should be more carefully inspected than the field rivets in a seat connection.

The inspector should bear in mind that a rivet is supposed to hold by its shearing and bearing values, but that it also performs a very important function if tight, by holding the two surfaces together and producing a large frictional resistance between the plates. He should also remember that the process of riveting induces a certain amount of internal tension in the shank of the rivet and thereby renders the rivet unreliable for additional tensile strains, and, therefore, bolts with lock nuts should always be substituted for any rivets that are supposed to act in tension.

Having pointed out the essentials of having a tight rivet, the question is how to get it. It is absolutely necessary to inspect steel work before riveting and see that the holes in the plates are concentric, for if a rivet be driven with one-eighth inch eccentricity, it may be a very poor rivet, but it may be tight, and therefore impossible to detect after the riveting is complete. I would say that all differences of eccentricity of over one-sixty-fourth of an inch should be reamed, although this practice might be made less rigorous on unimportant rivets. The use of a drift pin to make the holes concentric by forcing action is to be condemned. In the same way the cutting of extra holes by means of an electric or other torch is to be severely condemned. Having inspected the joint and found the holes concentric, the riveting may proceed. If the rivet is tight and the head full, it should be passed, but if it is loose it should be cut out. Here again, the riveting should be closely watched, as a rivet may be inadequately tightened up by what is known as calking, which consists of the use of a hammer and chisel, wedging the rivet head. The rivet may have the fault of too short a stock and the heads will be flat. This should not be confused with heads which are purposely flattened or countersunk for clearance. Another method of ineffectually tightening the rivet head consists of raising the plate surface under the rivet by driving the rivet snap sideways against the plate. Hence where the plate has been injured or shows a ridge around the rivet the rivet should be cut out.

Cold-hammering of heads should never be allowed. It is easy to detect this because a smaller snap is used on a head when cold-hammered.

The testing of a loose rivet can best be done with a small hammer. Place the finger on the opposite head while striking. Also strike the rivet head up and then down and note if there is any vibration.

A small tile hammer with a personal die cut in the head by annealing it soft and hard again will serve the purpose of surely marking defective rivets.

Another duty of an inspector is to see that the size and weights of beams called for on the plans are furnished. Owing to the Bethlehem and standard shapes having a number of different weights, the flanges should be carefully scaled to detect any substitutes. Where a beam or girder rests upon a wall, care should be taken to see that it is amply supported by the masonry and anchored thereto.

Painting is a very important matter in the preservation of steel work, and all portions where paint has been removed by shipment should be repainted before erection. The field coat should be of different color than the shop coat.

Cast iron members should be carefully inspected for visible defects.

All cast iron columns should have at least two holes drilled in the column for the purpose of checking the thickness of the column. Often the core is displaced in pouring, rendering the column thinner on one side than the other. A discrepancy of more than twenty-five per cent. should be cause for rejection.

All bearing surfaces in cast iron should be milled. Columns which are crooked should be rejected.

The cast iron beam seats should slope down outwards to make the beam bear as close as possible to the column and eliminate flexure in the seat.

A double lug generally engages the web of a beam through which a single bolt is passed. On one job these bolts held the beams up off the seat and necessitated field changes.

All steel should be marked for identification in the field and the shop inspector's mark should also appear. The most intelligent field inspection can be made by a representative from the designer's office, as he will be able to follow the designer's intent.

The inspector should co-operate with the erector in safeguarding the structure from accidents during erection. He should see that the derrick base is secured from the horizontal kick of the boom in any direction. The steel carrying the derrick should be strong enough and have sufficient connections for the erection stresses involved. He should exert a check on dangerous practices, such as lifting too heavy a load for the strength or counter-ties of the derrick, booming out too far or the splicing of booms.

Guying and bracing of steel in the process of erection against wind-bracing is important. In this case it is well to remember that serious accidents have occurred through the shrinkage of guy ropes when wet. To sum up:

1. See that your steel is inspected by a competent bureau in the mill and shop.
2. See that your bases have a proper masonry contact.
3. See that columns bear directly on bases with full bearing; that columns bear directly on columns with full bearing and that all stiffeners are milled to bear.
4. See that the steel is repaired and straightened where injured during shipment.
5. See that no rivets are in tension.
6. See that all rivets are tight and driven in concentric holes.
7. Look out for a good two-coat paint job.
8. Be sure that beams have proper wall bearing.
9. Inspect cast iron for workmanship and flaws.
10. Safeguard the erection against accidents.