PRESIDENTIAL ADDRESS.

By Wm. H. Ledger, B.E. (Syd.), M.C.E. (Cornell, U.S.A.).

(Read before the Sydney University Engineering Society, 28th April, 1915.)

I have had some difficulty in deciding upon a subject for my address this evening. The old type of address, consisting of a review of the year's progress in engineering science, presupposes a general and fairly intimate knowledge of the various branches of engineering, such as few in this age of specialising can claim to possess. Yet brief reference should be made to two of the most important undertakings of modern times which will render the year 1914 famous in the annals of engineering. I refer to the completion of the Panama Canal and the commencement of the construction of the Federal Capital.

In the Panama Canal we have witnessed the successful carrying out of the greatest engineering work ever undertaken in ancient or modern times. Not that it has involved any engineering problems that are new in themselves, but it has been a triumph in engineering methods and organisation since the commencement of the work in June, 1904; from the destruction of the malaria-carrying mosquito, that alone made possible the employment of white labour, to the final placing in position of the four million cubic yards of concrete employed in the construction of the locks and dams, and the fifty-eight thousand tons of steel in the lock gates. The problems of the canal have been responsible for the improvement and development of nearly every class of machinery used in the excavation and handling of material, and they have also revolutionised our ideas of time and cost in connection with the carrying out of this class of work. As example, we may take the handling of the material in the construction of the Gatun locks and dam, which contained two million cubic yards of concrete. This was removed from the barges and laid in position by means of wire rope cableways, operating at the rate of 3,200 feet per minute, whereas the maximum speed previously obtained was less than 1,000 feet per minute. At this speed eight cableways were operated for four and a half years, handling on an average 3,000 cubic yards of material in a day, each car carrying a load of six tons across a span of 800 feet, at the rate of 40 trips per hour. To attain this speed of transmission required special design in the mechanical appliances used to operate the cableways.

Another record has been established in the removal of 80 million cubic yards of material from the Culebra cut in seven years. Steam shovels were used for this work, but experience soon led to improvements in design, especially in the use of the wire rope operated shovel as against that operated by chains. The records established in the rate of excavation can be attributed partly to the development of new types of machines, partly to organisation, and partly to the encouragement of a healthy rivalry between the various working gangs. Whilst this material took seven years to remove, it must be remembered that the work was frequently delayed by tremendous earthslides, which sometimes completely blocked the canal and stopped all work, and which buried altogether 200 miles of railway track. These slides are stated to have delayed the opening of the canal for nearly two years.

Perhaps the most noteworthy of the machines evolved during the construction of the canal is the Lidgerwood unloader, The material taken from the Culebra cut was conveyed to the dumps at Tabernilla and elsewhere on Lidgerwood cars, which differ from ordinary railways cars in having steel flaps at one end which overlap the space between two cars, thus enabling the whole train to be transformed into one continuous platform. Such a train of 16 cars could be unloaded in 3½ minutes by means of a weighted steel plough in the form of a wedge. This was called the unloader, and was drawn from the rear to the front of the train by a steel rope operated from the locomotive, and in its progress ploughed the material off the cars on to the side of the track. The car next the engine was fitted with a side plough, which levelled the recently unloaded material as the train was backed off the dump. A track shifter, consisting of a specially constructed locomotive crane, then picked up the track in sections and moved it to one side ready for the next train load of material. The track-shifter was capable of removing a mile of track twelve feet to one side in an hour and a half, and this often without breaking joints.

The above is sufficient to indicate the nature of the improvements in engineering methods evolved during the construction of the canal. The canal is not yet completed as dredging operations are still proceeding, and the dry docks and naval stores at Christobal and Balboa have yet to be completed.

In referring to the Federal Capital, I must first express my personal admiration for the magnificent plan submitted by Mr. Griffin in the competition for the new city at Canberra. I think all will agree with me when I say that no other design submitted was comparable with it. A certain amount of symmetry has been maintained without monotony, and curved or winding streets have been wisely avoided, and reasonably direct communications exists between the various parts of the city. These advantages have been combined with an admirable arrangement of the different centres, both in themselves and in relation to one another. The more the plan is studied the more strongly does its beauty, as well as its utility, appeal to the mind. It is to be deplored that the present administration appears to be contemplating the mutilation of the design by making alterations to suit the ideas of certain departmental officers. I have referred to the planning of the Federal Capital city in an address before an Engineering Society, not only because of its national importance, but because it is as much an engineering as an architectural proposition. Mr. Griffin claims to be an architect, but his plan shows that he is also a man of considerable engineering ability. In the carrying out of the work the co-operation of the architect and the engineer is imperative.

Mr. Griffin has kindly loaned to me his lantern slides illustrating the Federal Capital territory and his plans for the Federal Capital City, which I am sure you will appreciate. although some of you may have seen them before.

Nor can we let this occasion pass without placing on record the loyal response of our graduates and undergraduates to the call for active service in the present momentous war. We were proud to see our University men among the first to rally to the support of the mother country when her leaders, knowing that the people of England would prefer death to dishonour, called the country to arms in the defence of a weaker nation and in the cause of righteousness and liberty. Our engineering men were not behind in answering the call. At present 31 graduates and 11 undergraduates are recorded as having joined the Australian or the Imperial Forces for service abroad. That is 42 engineers, or 14½ per cent. out of a total of 289 recorded for the whole University.

The following list gives the names, graduating year, rank, and force with which each man is serving. As is to be expected, they are mostly recent graduates, but Captain Colyer, Professor of Engineering at Changsha University, North China, graduated 19 years ago:—

MEMBERS OF THE ENGINEERING SCHOOL ON ACTIVE SERVICE WITH AUSTRALIAN AND IMPERIAL FORCES.

A.M.E.—Australian Military Expedition.

A.I.F.—Australian Imperial Forces.

H. de V. Alexander, B.E., 1913, Light Horse Force, West Australia.

C. Alison, Eng. II., Motor Transport Corps, A.I.F.

R. C. Anderson, B.Sc., Eng. III., Lieut., A.I.F.

G. B. Asher, Eng. I., Lieutenant, Field Artillery, A.I.F.

S. L. Beeston, B.E., 1911, Eng.-Lieut., R.A.N.

G. Best, B.E., 1912, Trooper, Kind Edward's Horse.

C. A. Bourne, B.Sc., B.E., 1914, Lieut., Royal Field Artillery.

C. W. Bridge, B.E., 1912, Eng.-Lieut., R.A.N.

E. M. Carter, B.E., 1909, Sapper, A.I.F.

H. G. Carter, B.E., 1908, Captain, 1st Infantry Brigade, A.I.F.

M. J. G. Colyer, B.E. (Prof. of Eng. Changsha University), 1896, Captain, British Forces, North China.

J. M. C. Corlette, B.E., 1902, Major, A.I.F.

C. R. Cran, B.E., 1913, Trooper, King Edward's Horse.

C. G. Crane, B.Sc., Eng. III., Sapper.

W. A. F. Cunningham, B.E., 1915, Sapper, A.I.F.

F. H. Day, Eng. II., Wireless Operator, H.M.A.T. "Suffolk."

C. Dennis, B.E., 1912, Eng.-Lieut., H.M.A.S. "Sydney."

B. S. Dowling, B.E., 1914, Sapper, 3rd Aust.-Eng., Q'land.

A. B. Doyle, B.E., 1911, Eng.-Lieut., R.A.N., H.M.A.S. "Sydney."

V. T. England, Eng. II., Trooper, Signal Corps. 12th Light Horse.

H. W. Fry, B.E., 1910, 5th Reinforcement, A.I.F.

R. H. Fry, Eng. II., Sergeant, 2nd Wireless Troop, 2nd Lieut. Horse Artillery.

E. J. Gregson, B.A. (Syd.), Eng. (Cornell, U.S.A.), Canadian Contingent.

J. Hamilton, B.E., 1914, Captain, Div. Amm. Col., A.A.M.C.

G. B. Harden, B.E., 1914, Eng.-Lieut., Imperial Forces, Engineers.

W. Hay, Eng. III., Sapper, A.I.F.

F. S. Hebblewhite, Eng., Lieut., Queen's Royal, West Surrey.

D. P. Herbert, B.E., 1911, Eng.-Lieut., R.A.N.

O. A. Ireland, B.E., 1910, Eng.-Lieut., R.A.N., H.M.A.S. "Encounter."

L. R. H. Irvine, Eng. IV., A.I.F.

D. A. MacKay, Eng. III., Corporal, Engineers, A.I.F.

J. Y. Mackinnon, B.E. and Dem., 1914, Lieut., 3rd Reinforcement, A.I.F.

G. H. Mann, Eng. III., Trooper, Signal Troop, 12th Light Horse.

A. M. Martyn, B.E., 1905, Major, O.C., 2nd Company, Field Engineers, Egypt, A.I.F.

R. J. A. Massie, B.E., 1914, Lieut., 4th Batt., 1st Inf. Brigade, A.I.F.
M. Maxwell, B.E., 1913, Lieut., Royal Engineers.
J. McBryde, B.E., 1909, Sapper, A.I.F.
K. McIntyre, Eng., Sergeant-Major, R.A.M.C., Edinburgh.
E. A. Meldrum, Eng. I., Private, A.I.F.
J. S. Millner, Eng. III., Corporal, A.M.E.
F. H. Mullens, Eng. III., Private, 2nd A.I.F.
E. P. Norman, B.E., B.Sc., 1911, Sapper, A.I.F.
H. D. Pulling, Eng. I., 2nd Lieut., A.I.F.
H. A. Roberts, B.E., 1909, Lieut., 2nd Reinforcement, A.I.F.
T. L. F. Rutledge, Eng., Major, 2nd Light Horse, A.I.F.
C. C. Sands, Eng. II., Private and Despatch Carrier, A.I.F.
W. R. Sinclair, B.E., 1914, Eng.-Lieut., R.A.N., H.M.A.S. "Australia."
R. V. Spier, B.E. and Med., III., 1902, Lieut., A.I.F.
F. D. Stafford, B.E., 1914, Eng.-Lieut., R.A.N., H.M.A.S. "Australia."
K. C. Waugh, B.E., 1908, Corporal, 13th Infantry Battalion.
A. H. Wright, Eng., III., Lieutenant, Machine-Gun Section, 20th Battalion, A.I.F.
J. L. Wright, Eng. III., Lieutenant, A.I.F.

Feeling that it would be appropriate, I have asked Mr. Vicars to move, and Mr. Bradfield to second, a motion expressing our appreciation of the efforts and sacrifices that these men are making to uphold the honour of our Empire and of our University; and I would suggest that this motion be published as an addendum to the present address, and that a copy of the same be forwarded to each of our men whose name appears above. The list was obtained from the official records of the University and is believed to be complete, but should any of our members notice the omission of the name of any graduate or undergraduate who has gone to the front they are asked to communicate the same to the Secretary so that it may be included with the others.

In my address to you this evening I propose to speak upon the subject of "SHOP-COSTING AND ESTIMATING FOR STRUCTURAL STEELWORK," and I am limiting myself to architectural steelwork under Australian conditions.

I shall deal with the subject in a descriptive rather than an analytical way. I do not believe that a scientific method of costing, such as would be requisite to provide the necessary records for an analytical study of the subject, has yet been introduced into any Australian shop.

I have chosen the above subject in the hope that there will be found in it something of interest to the younger members of the Society, and especially to the students who have not yet come into contact with the commercial side of their profession; and I have limited myself to this one section of commercial engineering because it is impossible to discuss the broader subject of the commercial organisation of an engineering business in a single address; moreover, there are some good publications available to those who desire to pursue the subject further.

Here I would like to call attention to what I believe to be a need in the Australian Universities, namely, the establishment of a special engineering course that shall prepare students to eventually take control of engineering establishments, either of workshops or commercial businesses. Such a course could be readily introduced by substituting for some of the purely professional subjects courses in such subjects as business management and commercial economy. In America the men who ultimately gain control of the large engineering businesses are frequently those who have been connected with the engineering staff, and have also origally been trained in one of the engineering schools of the Universities. I have lately received the class returns for the engineering schools of Cornell University for the year 1895, which show that within twenty years over thirty per cent. of the graduates are holding positions as presidents, managers, superintendents, or secretaries of engineering concerns; and these men have had no special training for commercial work except a general course in political economy. This seems to indicate that there is something in an engineering training that fits men for such positions; yet I consider that a special training such as I have mentioned would enable men to undertake this class of work with more confidence, and would save them from making mistakes that are now inseparable from the present method of gaining all their commercial knowledge from experience.

In preparing an estimate for the purpose of submitting a tender for the manufacture and supply of the steel work for any particular structure the first item of cost to be considered is that of *direct material.* By direct material is meant the material supplied to form a component part of the finished structure in contradistinction to material used indirectly, such as timber for template making, tool steel, etc.

In the case of architectural steel work the enquiry will seldom come from the architect direct, but from a general contractor who has contracted, through the architect, for the erection of the complete building. The tender however will be made up from the architect's plans and specifications, which will generally show only the sections to be used for the stanchions and girders.

The first part of the estimate consists in making a record of the various sections, with their lengths and weights per foot of the material as included in the plans and specifications. But as the different rolled steel sections vary in cost they must be recorded in such a manner as to permit of them being separately priced. To do this some knowledge of the cost of material is essential. The cost of each section delivered at the works is made up in the general office, usually by a trusted official such as the secretary, and is treated as private information to be entrusted to as few of the employees as possible. It is of great assistance to the estimator if a copy of these costs be supplied to him, but this practice may become dangerous where a large estimating staff is employed. In many shops these costs are kept secret, being known only to the manager and secretary, under which circumstances the estimator becomes little more than a quantity surveyor.

Material costs vary continually with market fluctuations, but to arrive at them the following considerations will need to be taken into account.

In the older countries, where the rolling mills are easily accessible, the material can be ordered cut to the length required after the contract is secured, and if thought necessary a price for its supply can be obtained from the rolling mills before quoting. In a country like Australia, remote from the source of supply, a large stock of rolled steel joists, channels, angles, tees, plates, and bars has to be carried in order to be prepared to meet the demand, as, in general, the time allowed for the completion of the work does not permit of an order for the importation of the material being placed with the British mills. Annual or semi-annual contracts are usually made, either with British iron and steel merchants or with a British mill direct, for the supply of material at specified rates. The prices will either be F.O.B. at a British port, or C.I.F. and E. at an Australian port. The latter method is preferable as the British merchants are in a position to make better terms with the shipping companies. On C.I.F. and E. quotations the material is usually paid for upon arrival in Sydney, the shipping documents being handed to the purchasing firm with a sight draft to the value of the invoice. If the firm is of good standing the sight draft may be replaced by one payable at a certain number of days after sight, during which time bank interest will have to be paid upon the face value of the draft. This interest, however, will not usually be added to the material cost, but will be included later as part of the "on-costs" or "establishment charges."

If the purchasing price is F.O.B. the port of shipment, as is almost universally the case when the goods are purchased in America, a bank letter of credit is forwarded to enable the selling firm to obtain the money from the bank at the port of shipment in exchange for the shipping documents. This is equivalent to tying up the purchaser's money during the period in which the order is being filled and thus adds indirectly to the purchase price. Freight, insurance, exchange, wharfage, and harbour dues, if any, need to be added to the F.O.B. price, to obtain the corresponding price, C.I.F. and E., Sydney.

The F.O.B. or C.I.F. and E. price will be a basis price at per ton, and there will be a different basis price for rolled steel joists, channels, angles, tees, plates, and bars. The basis price is the lowest price for which a particular length of a certain section will be supplied; all other sections carry extras, according to their size and length. There are no fixed relative values between the various classes of material, as the following quotations for supply C.I.F. and E., Sydney, will show:—

PRICE PER TON.

SECTION.	JANY., 1913.	AUG., 1913.	FEB., 1915.	MAR. 1915.
R.S.J.'s	£8 2 6	£7 8 9	£9 0 0	£10 3 0
Channels . ..	8 11 0	7 15 0	—	—
Plates	8 19 0	8 12 6	9 5 0	10 3 0
Tees	8 14 6	7 17 6	—	—
Angles	8 2 6	7 7 6	8 19 10	10 3 0
Flats	8 11 0	7 15 0	—	10 12 0
Bars	9 0 0	—	—	10 12 0

The figures quoted for March include war risk. To-day's figures are higher still, for which questions of freight are largely responsible. It is generally anticipated that prices will continue to rise for some time.

The extras to be added to the basis prices will vary slightly at the different rolling mills; but the following lists issued by the Cargo Fleet Iron Company, Ltd., Middlesboro, indicate the general practice at the leading British mills:—

JOISTS LIMITS AND EXTRAS.

The following Sections are subject to the undernoted extras—

SECTION.		LBS. PER FOOT.		EXTRA.
3in. × 3in.	....	8.50	....	20s. 0d. per ton.
4in. × 1¾in.	....	5.00	....	20s. 0d. per ton.
4in. × 3in.	....	9.50	....	7s. 6d. per ton
4¾in × 1¾in.	....	6.50	....	10s. 0d. per ton
5in. × 3in.	....	11.01	....	Basis Price.
5in. × 4½in.	....	17.99	....	"
6in. × 3in.	....	11.99	....	"
6in. × 4½in.	....	20.00	....	"
6in. × 5in.	....	25.00	....	"

SECTION.				LBS. PER FOOT.		EXTRA.
7in.	×	4in.	....	16.01	....	Basis Price.
8in.	×	4in.	....	18.01	....	„
8in.	×	5in.	....	28.02	....	„
8in.	×	6in.	....	35.00	....	„
9in.	×	4in.	....	21.00	....	„
9in.	×	7in.	....	58.02	....	5s. 0d. per ton
10in.	×	5in.	....	29.99	....	Basis Price.
10in.	×	6in.	....	42.02	....	„
10in.	×	8in.	....	69.98	....	10s. 0d. per ton
12in.	×	5in.	....	31.99	....	Basis Price
12in.	×	6in.	....	44.02	....	„
12in.	×	6in.	....	53.99	....	„
14in.	×	6in.	....	46.01	....	„
14in.	×	6in.	....	57.01	....	„
15in.	×	5in.	....	41.99	....	5s. 0d. per ton
15in.	×	6in.	....	58.98	....	„
16in.	×	6in.	....	61.97	....	„
18in.	×	6in.	....	54.64	....	10s. 0d. per ton
18in.	×	7in.	....	75.02	....	„
20in.	×	7½in.	....	88.96	....	„
24in.	×	7½in.	....	99.93	....	20s. 0d. per ton

Lengths over 40 feet: 1s. 0d. per ton each foot or part.
Lengths under 5 feet: By arrangement.
Cut to exact lengths within ⅛in. either way: 5s. 0d. per ton.
Oiling or Painting per coat: 2s. 6d. per ton.

LIMITS AND EXTRAS.

ANGLES.—BASIS.

LIMITS.—6 to 12 united inches, ¼in. thick and over.

EXTRAS.

	s.	d.	
Under 6 united inches	5	0	per ton per inch or part
Over 12 united inches	5	0	„ per inch or part
Under 1/4in. thick to 3/16in. inclusive ..	10	0	„
Under 3/16in. thick	15	0	„
Lengths 5ft. and upwards, at basis price—			
Lengths under 5ft. and down to 2ft. ..	5	0	„
Lengths under 2ft. by arrangement, minimum	10	0	per ton
Cold straightening, 6 united inches and upwards	3	6	„
Cold straightening, under 6 and down to 4 united inches	5	0	„
Cold straightening, under 4 united inches	10	0	„
Oiling or Painting one coat 6 united inches and upwards	3	6	„
Oiling or Painting one coat under 6 ins.	5	0	„
Ordinary Round Backed Angles equal sided	5	0	„

FLATS.

LIMITS—Over 5in. wide × ⅜in. and thicker.

EXTRAS.

	s.	d.	
5in. wide and under by arrangement—			
Under 3/8in. thick to 5/16in. all widths	5	0	per ton
Under 5/16 thick down to and including 1/4in. thick under 8in. wide ..	10	0	„
Under 5/16in. thick down to and including 1/4in. thick, 8in. wide and over ..	15	0	„
Lengths 5ft. to 40ft. without extra—			
Lengths over 40ft.	1	6	per ton per foot or part
Lengths under 5ft. and down to 2ft. ..	5	0	„
Lengths under 2ft. by arrangement, minimum	10	0	per ton
Cold Side Straightening over 5in. wide ..	3	6	„
Cold Flattening	10	0	„
Oiling or Painting one coat over 5in. wide	3	6	„
Oiling or Painting one coat 5in. wide and under	5	0	„

TEES.

LIMITS—6 to 10 united inches × 5/16 thick and over.

EXTRAS.

	s.	d.	
Under 6 united inches	5	0	per ton per inch or part
Over 10 united inches	5	0	per ton per inch or part
Under 5/16in. thick to 1/4in. inclusive	5	0	„
Lengths 5ft. and upwards without extra—			
Lengths under 5ft. and down to 2ft. ..	2	6	per ton per foot or part
Lengths under 2ft by arrangement, minimum	10	0	per ton
Cold straightening 6 united inches and upwards	3	6	„
Cold straightening under 6 and down to 4 united inches	5	0	„
Cold straightening under 4 united inches	10	0	„
Oiling or Painting one coat 6 united inches and upwards	3	6	„
Oiling or Painting one coat under 6 united inches	5	0	„

CHANNELS.

LIMITS—6 to 12in. web.

EXTRAS.

	s.	d.	
Under 6in. web.	5	0	per ton per inch or part
Over 12in. up to and including 15in. web	5	0	„
Over 15in. web. up to and including 15¾ × 3in.	10	0	„
17in. × 4in.	20	0	per ton
Lengths under 5ft. and down to 2ft. ..	2	6	„ per foot or part
Lengths under 2ft. by arrangement, minimum	10	0	per ton
Cold straightening 6in. wide and upwards	2	6	„
Cold straightening under 6in. web. ..	5	0	„
Oiling or Painting one coat	2	6	„

There is usually a maximum width to which plates will be rolled without extra charge, the following table being recognised by most of the Scotch mills:—

Thickness of Plate.	Maximum width supplied without extra charge.
$\frac{3}{16}$-inch and under $\frac{1}{4}$-inch	54 inch
$\frac{1}{4}$,, ,, $\frac{5}{16}$,,	60 ,,
$\frac{5}{16}$,, ,, $\frac{3}{8}$,,	66 ,,
$\frac{3}{8}$,, ,, $\frac{7}{16}$,,	75 ,,
$\frac{7}{16}$,, ,, $\frac{1}{2}$,,	84 ,,
$\frac{1}{2}$,, ,, $\frac{9}{16}$,,	90 ,,
$\frac{9}{16}$,, ,, $\frac{5}{8}$,,	96 ,,
$\frac{5}{8}$,, and thicker	96 ,,

For every 3 inches or part over the width indicated, an extra 2/6 per ton is charged. There are also extras for large plates over, say 1½in. thick, which, however, are seldom used in structural work. These extras would be about 10/- per ton for each one-eighth inch increase in thickness over 1½in. Materials of special quality, of special chemical composition, and materials subject to special survey or inspection, carry recognised extras.

American rolled steel joists carry no extras, all sections being sold at the same price per ton. American extras include angles, tees, plates, and bars are indicated in the following tables:—

CHANNELS.

1½ × 3-16 inches and heavier, but under 3 inches	Base.
1 to 1¼ × 3-16 inches and heavier	2/4
⅞ × 3-16 inch	4/8
⅝ and ¾ × 3-16 inch	7/-
⅝ × ⅛ inch	14/-
½ × ⅛ inch and thicker	23/4
Channels ¾ inch and wider, but under 3 inches, ⅛ inch thick .. Extra over 3-16 inch	2/4

ANGLES.

1½ × 3-16 inches and heavier, but under 3 inches	Base.
1 to 1¼ × 3-16 inches and heavier	2/4
⅞ × 3-16 inch	4/8
¾ × 3-16 inch	7/-
⅝ × ⅛ inch	46/8
½ to ⅛ inch	70/-
3 × 3 inches × less than ¼ of an inch thick	11/8
Angles ¾ inch and larger, but smaller than 3 inches, ⅛ inch thick	2/4 extra over 3-16

TEES.

1½ × 3-16 inches and heavier, but under 3 inches	Base.
1¼ × 3-16 inches and heavier	2/4
1 to 1⅛ × 3-16 inches and heavier	4/8
⅞ × ⅛ inch and thicker	11/3
¾ × ⅛ inch and thicker	14/-
⅝ × ⅛ inch and thicker	46/8
Tees 1 inch and larger, but smaller than 3 inches, ⅛ inch thick	2/4 extra over 3-16.

BASIC OPEN HEARTH STEEL PLATES.

LIST OF NET EXTRAS.

Base Price applies to Rectangular Plates, "Tank," "Ship," or "Bridge" quality, 3-16in. thick and heavier, 100 inches wide and under.

Gauges under 3-16in. to Nos. 8 and 9 (B.W.G.) inclusive	5	0	Extra per ton
Gauges under 9 to 10, 11 and 12 (B.W.G.) inclusive	10	0	"
Plates over 100 inches to 110 inches wide, inclusive	5	0	"
Plates over 110 inches to 115 inches wide, inclusive	10	0	"
Plates over 115 inches to 120 inches wide, inclusive	14	0	"
Plates over 120 inches to 125 inches wide, inclusive	23	6	"
Plates over 125 inches to 132 inches wide, inclusive	37	6	"

As well as the following extras for rolling, the shipping companies also charge extra freight for excessive lengths. This charge is a variable one, but generally lengths over 30 feet are liable to an extra freight of about 2/6 per ton up to 35 feet, and a further 2/6 per ton up to 40 feet, with special rates for lengths over 40 feet. On account of these extras, both for rolling and shipping lengths of rolled steel sections exceeding 40 feet are not stocked in Australia.

In addition to the following charges, to obtain the cost of the materials delivered at the works, we have to add the following:—

Custom's Duty.—Before the revision of the tariff in 1914, the duty on R.S.J.'s, and channels imported from the United Kingdom was 12½ per cent. upon the price, increased by 10 per cent., at which similar material could be purchaser locally at the port of shipment. It can readily be seen that the true purchasing price at the port of shipment became a subject of endless controversy between the purchasers and the customs authorities in Australia. The method has now been superseded by a direct rate of 17s. 6d. per ton on all R.S.J.'s and channels imported from the United Kingdom, and 25s. per ton from elsewhere, which is equivalent to fixing the purchasing price in the United Kingdom at £6 7s. 3d. per ton.

Stacking charges of 8½d. per ton have to be paid to the wharf authorities in Sydney.

Cartage from the wharf to the works is at so much per ton, according to the location of the works. The cartage rates to the several districts around Sydney are now fixed by the Master Carriers' Association. Should the steel company do its own carting the cost will be deduced from the company's records.

MILD STEEL BARS AND SMALL SHAPES.

List of Net Extras per Ton.

Rounds and Squares.—Base Sizes: ½ in. to 4 in.

Rounds	¼	5/16	⅜	7/16	½ to 4	4¼ & 4½	4¾ & 5	5¼ & 5½	5¾ & 6	6¼ & 6½	6¾	Inches
Squares	¼	5/16	⅜	7/16	½ to 4	4¼ & 4½	4¾ & 5					,,
	16/4	14/-	11/8	9/4	Base	7/-	9/4	11/8	17/6	23/4	29/2	Extra per ton

Flat Bars and Bands.—Base Sizes: ¾ in. to 6 in. wide x ⅜ in. to 1 in. thick.

Widths.	Thicknesses.												
	Nos. 10, 11, 12 & ⅛ in.	Nos. 7, 8, 9, & 3/16 in.	¼ in. & 5/16 in.	⅜ in.	7/16 in.	½ in.	⅝ in.	¾ in.	⅞ in.	1 in.	1-1/16 in. to 1-3/16 in.	1¼ in. to 1½ in.	1⅝ in. to 2¾ in.
⅜ in....	56/-	44/4	35/-										
7/16 in.	49/-	42/-	28/-	23/4									
½ in....	35/-	30/4	25/8	21/-	21/-								
9/16 and ⅝ in. ...	30/4	28/-	16/4	11/8	11/8	11/8							
¾ in....	28/-	23/4	11/8	Base	Base	Base	Base						
⅞ in....	18/8	16/4	11/8	,,	,,	,,	,,	Base					
1 to 1⅜ in.	16/4	11/8	4/8	,,	,,	,,	,,	,,	Base				
1½ to 6 in.	14/-	9/4	4/8	,,	,,	,,	,,	,,	,,	Base			
3 to 6 in.	14/-	9/4	4/8	,,	,,	,,	,,	,,	,,	,,	2/4	4/8	7½c.