Vol. 18. Toronto—NOVEMBER 6, 1907—Montreal No. 36

CANADIAN CONTRACT RECORD

A Weekly Journal of Engineering, Public Works, Tenders, Advance Information and Municipal Progress

"TENDERS" AND "FOR SALE" ADVERTISEMENTS PAGE 3

TENDERS AND FOR SALE DEPARTMENT

FOR SALE

Merriman Screw Gang Stone Saw 5 ft. x 5½ ft. 10 ft., nearly new.

"MYLES" Concrete Block Machine nearly new with 250 Wooden Pallettes.

M. BEATTY & SONS, Limited,
Welland, Ontario.

Sealed Tenders addressed to the undersigned, and endorsed "Tender for Astronomical Observatory, Toronto, Ont.," will be received at this office until THURSDAY, NOVEMBER 21, 1907, inclusively, for the construction of an Astronomical Observatory at Toronto, Ont.

Plans and specifications can be seen and forms of tender obtained at this Department and at the office of Burke & Horwood, Architects, Toronto, Ont.

Persons tendering are notified that tenders will not be considered unless made on the printed form supplied, and signed with their actual signatures.

Each tender must be accompanied by an accepted cheque on a chartered bank, made payable to the order of the Honourable the Minister of Public Works, equal to ten per cent (10 p.c) of the amount of the tender, which will be forfeited if the person tendering decline to enter into a contract when called upon to do so, or if he fail to complete the work contracted for. If the tender be not accepted the cheque will be returned.

The Department does not bind itself to accept the lowest or any tender.

By Order,
FRED. GELINAS,
Secretary.

Department of Public Works,
Ottawa, October 29, 1907.

Debentures for Sale

Village of Elmira

Sealed tenders will be received by the undersigned up to 8 o'clock P.M. on FRIDAY, THE 8TH DAY OF NOVEMBER, 1907, for the purchase of $7,500.00 4½ per cent Debentures, payable in twelve years, re loan to the "Elmira Interior Woodwork Company, Limited"

Particulars from undersigned.

No tender necessarily accepted.

J. H RUPPEL, Clerk.

NOTICE TO CONTRACTORS

Tender for Alteration to Public Lavatory, Adelaide and Toronto Streets.

Tenders will be received by registered post only addressed to the Chairman of the Board of Control, City Hall, Toronto, up to noon on TUESDAY, NOVEMBER 12, 1907, for the work contemplated in this alteration.

Envelopes containing tenders must be plainly marked on the outside as to contents.

Drawings and specifications may be seen and forms of tender obtained at the office of the City Engineer, Toronto.

The usual conditions relating to tendering as prescribed by city by-law must be strictly complied with or the tenders will not be entertained.

The lowest or any tender not necessarily accepted.

E. COATSWORTH (Mayor),
Chairman Board of Control.

City Hall, Toronto,
October 25th, 1907.

DRAUGHTSMAN WISHES POSITION

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For Sale

One No.0 Rear Dump Smith Mixer, Steam Power.
One No.1 Ideal Brantford Mixer.

Both in first class condition, suitable for sidewalks or any concrete work. Apply to Box 117, CONTRACT RECORD Office, Toronto.

Department of Railways and Canals, Canada.

TRENT CANAL.

Rosedale Section.

NOTICE TO CONTRACTORS

Sealed Tenders addressed to Alex. J. Grant, Superintending Engineer, Trent Canal, Peterboro, and endorsed "Tender for Trent Canal," will be received until 16 O'CLOCK ON WEDNESDAY, THE 20TH NOVEMBER, 1907, for the works connected with the construction of the Rosedale Section of the Canal.

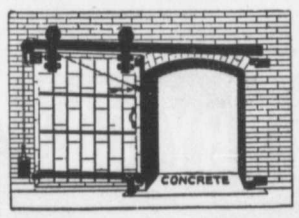
Plans and specifications of the work can be seen on and after the 31st October, at the office of the Chief Engineer of the Department of Railways and Canals, Ottawa, and at the office of the Superintending Engineer, Trent Canal, Peterboro, Ont., at which places forms of tender may be obtained.

The lowest or any tender not necessarily accepted.

By order,
L. K. JONES,
Secretary.

Department of Railways and Canals,
Ottawa, 26th October, 1907.

Newspapers inserting this advertisement without authority from the Department will not be paid for it.



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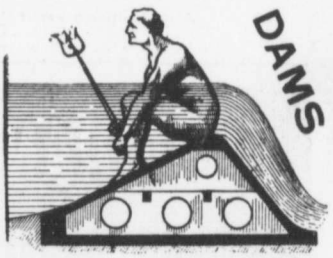

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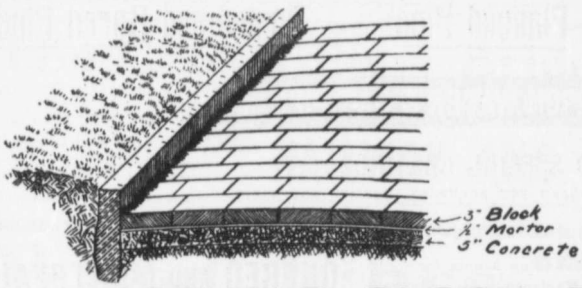

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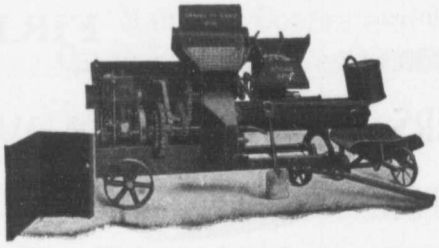

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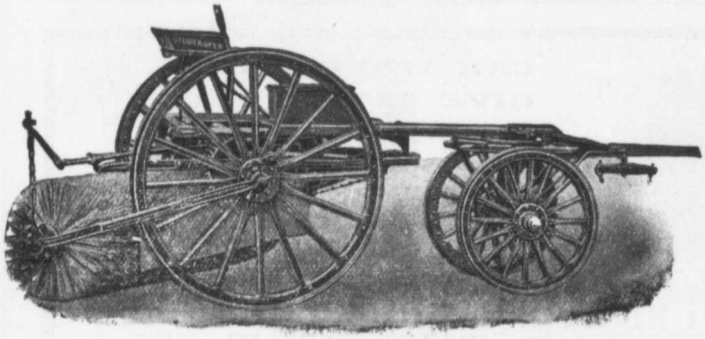

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Does not clog or get out of order. Greatest width of spray. Can be graded from driver's seat to any volume.

We also make an . .

IMPROVED VERTICAL SPRAY

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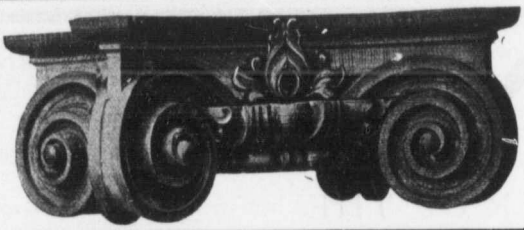

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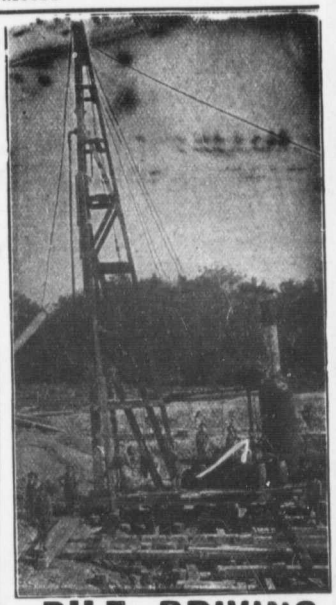

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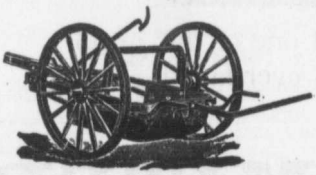

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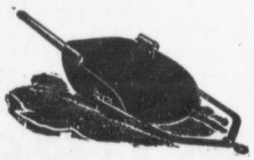

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at higher prices than competitors has again this year been awarded the most important contracts of the World because practical tests by leading Engineers proved its merit and relative economy. Note the following:

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CEMENT 45 BROADWAY, NEW YORK CITY **CEMENT**

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CONTRACT RECORD
PUBLISHED EVERY WEDNESDAY
BY
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TORONTO

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Subscribers who may change their address should give prompt notice of same. In doing so give both old and new address. Notify the publishers of any irregularity in delivery of papers.

CHANGE OF OWNERSHIP.

With this issue of THE CANADIAN CONTRACT RECORD it devolves upon the publishers to announce a change of ownership. Since its inception this journal has been owned by the C. H. Mortimer Publishing Company. The entire interests and good-will of this company were recently purchased by Mr. Hugh C. MacLean, under whose direction the publication of THE CONTRACT RECORD will hereafter be continued.

For almost eighteen years THE RECORD has chronicled the many more or less important contracts which are now building history, and has aimed at all times to present this news in as complete and up-to-date manner as possible. That it has satisfactorily discharged its mission is indicated by the clientele of advertisers and subscribers, whose numbers are steadily increasing.

What has been acomplished in the past is but an inspiration for future effort. The determined policy of improvement, designed to produce the best contract journal in America, will be pursued by the new management. These changes cannot be undertaken in a day or a month; they must necessarily be brought about as a process of evolution. Every issue, we hope, will be a plainly reflected improvement in the reading matter, the advertisements, the illustrations and general typographical appearance.

One change which has already been decided upon, and which we believe will be appreciated by our readers, is the publication of THE RECORD in an enlarged and more attractive form. Hereafter it will aim to supply, as well as a history of current contracts, articles descriptive of the latest building methods and appliances, the arrangement of this number indicating in a measure the proposed new form of the paper.

From advertisers and subscribers we solicit and anticipate the continuance of the support and co-operation which have been so generously extended by our patrons in the past, and to them we promise our best services.

HUGH C. MacLEAN, LIMITED.

INEFFICIENT LABOR.

That there is an increasing lack of efficiency in labor, marked by a lessoned output and by inferior quality, is asserted by a writer in "The Iron Age," New York. The great increase in the volume of business is declared to be at the bottom of the trouble since every man has felt that there was little danger of him losing his position however slipshod his work—because of the scarcity of men. The prospect of a business decline which the writer considers imminent will, he thinks, furnish the remedy. He says:

"The gravest evil from which this country is now suffering, graver by far than the exaggerated dangers from monopolies or from freight rebates, is the decline in the efficiency of labor. It finds expression in slouchy work on the part of those who know how to do better, and poor work on the part of those who have never been taught or are incapable of learning. To the more serious defect or lowered quality is added the troublesome feature of lessened quantity. It is a curious fact that the one question above all which is uppermost in the minds of manufacturers and other employers of labor, and which is privately discussed by them with helpless iteration, is so rarely touched upon in public utterances.

"The hope of developing some remedy is the only consolation to the employers of labor when they face the prospect of a decline in the volume of business.

"There has been an extraordinary demand for labor of all kinds. So far as that has raised wages and directly increased the cost of production employers have had no grievance, although it is a troublesome and difficult matter to carry them back to the normal level. Manufacturers know that prices for their products usually decline more rapidly than the labor cost, and must be willing to face that contingency. The laws of supply and demand never operate so promptly in the one case as they do in the other.

"As for the quantity of output of labor, that, too, responds fairly well, when the demand for labor declines. The process of weeding out the lazy and the inefficient begins promptly, and it may be accepted as a general fact that few managers have not thoroughly examined their rolls with a view toward making their selections. The percentage, usually, will be small, but the moral effect is quite out of proportion to the numbers. During the past two years the knowledge that a job was waiting for any man who was willing to take it has had a demoralizing effect upon all labor throughout the country.

"The fact will be firmly realized soon that steadiness, reasonable industry, and acquiescence in necessary measures of discipline are primary conditions for employment, and that simple application for work is not the only qualification.

"There is every reason to hope, too, that a lessened demand for labor will be reflected in better quality of work, although in that respect deeper causes have been operative than temporary high pressure of production. The effect of leveling down which has been the curse of the labor unions can not be so quickly eradicated. It is true that the concentration of in-

dustry into larger units tends to deprive an individual workman of the hope of starting on his own account, and the necessity for preliminary scientific and technical training is closing him out of the ranks, once open to him, of managers and superintendents. It is further true that in the days of extraordinary demand the manufacturers have often permitted or even encouraged some sacrifice of quality for the sake of quantity. But granting that all these factors have been at work, there remains a residuum of wretched work which must be directly charged to the spirit in which labor is facing its tasks. It almost seems as though the hard school of adversity can alone bring back a realization of the fact that the world owes a living only to those who deserve it."

WORKMEN'S COMPENSATION.

One of the first cases under the new Workmen's Compensation Act in Great Britain has recently been reported. The respondent was a widow who owned some house properly, and the applicant, a laborer, appears to have been casually employed by her. On the first day of his employment he was paid by time, but on the second day he was white-washing some houses, being paid by piecework and finding his own material, when he fell from a ladder and fractured a rib. The County Court judge, not without some hesitation, made an award in his favor. This decision involves two findings. In the first place, the man, being casually employed, to be within the Act had to be employed "for the purposes of the employer's trade or business," and owning houses appears to have been held "a trade or business." In the second place, the man was held to be a "workman" and not an "independent contractor." This is a question which will constantly arise under the new Act, and no satisfactory guiding principle as to the distinction between a "workman" and an "independent contractor" was ever laid down under the former Acts. Probably the test to be applied does not depend upon who supplies the materials, but upon the degree of control retained by the person putting out the work.

The man in question was not claiming under these Acts, but having some years ago become the possessor of a genuine bad knee, he had ever since turned it to account by tripping over brewers' ropes and other obstructions in public places, and then putting forward a claim in respect of his injured knee. Some fifty claims had been manufactured by him, and he had received some hundreds of pounds. The same procedure could be adopted by unscrupulous persons under the Workmen's Compensation Act, but with even greater ease, for whereas in accidents giving rise to claims against strangers contributory negligence would defeat such claims, under the Workmen's Compensation Act contributory negligence is no defence, and even wilful misconduct does not in all cases disqualify the claimant. Doctors have already foreseen this danger, for as workmen, servants, or employes in general are not subjected to medical examination on taking service, medical men have pointed out that such an injury as a rupture may well be made the ground of claim over and over again. Those who employ casual labor are especially liable to be victimized by this kind of fraud.

WORKMEN'S INSURANCE.

Social reform legislation in Germany calls for compulsory insurance against sickness for wage earners, the cost being borne in the proportion of two-thirds by the employe and one-third by the employer. In the case of the great majority of workmen of all classes, and of foremen or managers with salaries not exceeding £100 a year, insurance is made compulsory. Certain other classes of working people, those employed casually, people working independently on a small scale and agricultural laborers, may also be brought within the range of compulsory insurance. In addition, other classes, including all persons whose income is less than £100 a year, and domestic servants, have the right to insure themselves voluntarily.

The total number of persons from these classes insured against sickness in Germany in 1905 stood at nearly 12,000,000, one in every five of the population at all ages, and more than three-fourths of all wage earners in industry and agriculture. Over nine million of the insured were men, and nearly three million women. The cases of sickness dealt with yearly number about 5,000,000. The annual expenditure is now over £13,000,000, and is increasing.

For the workman when he falls ill the central Government has prescribed a minimum scale of benefits to result from this compulsory insurance. He obtains for at least twenty-six weeks free medical treatment, including drugs, and if required spectacles and surgical appliances, together with an allowance of at least half the wages of a day laborer in his district. Or he may receive treatment in a hospital, with payment of half his allowance. These benefits are the lowest given, more than three-quarters of those insured belonging to funds, to which a higher minimum scale is applicable. It should be added that for the first thirteen weeks an industrial accident is treated as sickness. Insurance against accidents, which is a second branch of compulsory insurance in Germany, is only in the case of accidents the effects of which continue longer than thirteen weeks.

Germany compulsory insurance for wage earners has had its difficulties. Some years ago there was a strike in the medical profession as to the right of insured persons to choose their own medical attendants. Criticisms have been directed against the costliness of administration. It is not absolutely complete in its scope, nor is it intended to be. Recourse has still to be had to the poor law. But compulsory insurance does not put an end to self-help. The great number of people which it affects, and the length of time that it has been in operation, are two strong reasons why the German method should receive serious consideration at the hands of Canadian legislators.

A transaction has been completed by which Mr. Hugh C. MacLean, of Winnipeg, publisher of "The Commercial" of Winnipeg and "The British Columbia Lumberman" of Winnipeg, has bought out the Mortimer Publishing Company of Toronto and Montreal. This company publishes "The Architect and Builder," "Electrical News," "The Canada Lumberman," "The Contract Record" and "The Western Canada Contractor" of Winnipeg. Mr. MacLean will conduct the Mortimer Company as a distinct business.—*Globe.*

The Cause of the Money Stringency

THE DUTY OF THE BANKS

It is reported from the West that the crops cannot be moved, not on account of a shortage of cars, a lack of elevator accommodation, or a scarcity of lake vessel capacity, but because the banks are unable to advance the usual and necessary funds to the grain dealers. It is as yet too soon to discuss a situation which may be but transient and momentary, but if it lasts even for a few days it will entail a serious loss on the farmers of the West, a loss from an entirely unexpected quarter. It was thought the good prices of the present year would largely atone for the crop shortage, but if the grain must be held over or shipped later by train at winter rates the loss will be heavy. It will certainly comes as a surprise to our complacent and heretofore well-grounded faith in the elasticity of the Canadian banking system. The real test of any system is a time of stress, not a time of easy confidence, when any system would work satisfactorily. We have always felt that our banks and our banking system were capable of furnishing all the accommodation for which legitimate business enterprises could furnish unimpeachable security. If a crop of grain needed for consumption within the next few months and furnishing perfectly safe security cannot be marketed for want of the necessary accommodation there will be a tendency to question a system that has heretofore stood every test.

That our system is stable and our banks are safe are facts that should occasion general satisfaction. But the present trouble seems to have arisen through an abnormal determination to more than meet the demands of safety. It is as if a man were so eager to build his house strong and safe that he thickened the walls till he had insufficient room. Our banks have been so eager to build up their reserves and increase their holdings of gold that they have been denying needed accommodation to the general business community. It is known that bankers of late have not been trying to do business, but to avoid doing business, and that loans have been refused which would have been made eagerly a year ago. All this, so far as absolute safety is concerned, may be satisfactory from the standpoint of the banker, but the public will not regard it as properly serving the purposes for which the banks have been chartered.

There are grounds for believing that our banks in an abnormal regard for safety have helped to bring on the stringency they feared. They have taken pride in piling up reserves. The effect of that was not felt till the demand for circulating notes began to crowd the limit fixed by their paid-up capital. Under such circumstances our leading banks might, without in the least impairing their safety, have increased their capital, and consequently their legal note issue, by giving stock dividends. This could have been arranged under the existing law. It might easily be accomplished by concerted action, but will be difficult so long as our leading banks stand aloof and regard one another with feelings akin to jealousy. The bank statement for September last compared with that for the same month last year shows that the reserves have been stiffened from $65,221,000 to $69,798,000, and specie and Dominion notes on hand have risen from $60,360,000 to $72,811,000. The paid-up capital has increased from $93,656,000 to $95,737,000, and the note circulation from $77,209,000 to $79,455,000. A good regard for the claims of Canadian business is shown in the reduction of current loans abroad from $35,776,000 to $25,794,000. Call loans abroad showed a slight shrinkage from $63,771,000 to $63,158,000. Caution is shown in the reduction of call loans in Canada from $59,495,000 to $47,298,000. Current loans in Canada, the most important business of our banks, increased from $515,213,000 to $578,207,000 a growth which shows capacity for meeting the country's needs. Since September closed there has been an air of panic abroad, and our banks, with needless timidity, have been contracting loans and stiffening reserves. The situation is perfectly safe, and now that excessive caution has put the system on its trial our leading bankers should come together and adopt a policy that will afford the needed relief. On occasions like the present the claims of the public are entitled to consideration, and our leading bankers, though naturally aloof and somewhat antagonistic, should unbend sufficiently to insure a more liberal and less cautious policy. This can be done without approaching the lines of perfect safety, which must be kept sacredly inviolate.—The Globe.

THE WESTERN FINANCIAL SITUATION

By A. E. Watts, Wattsburg, B. C.

The troublesome disease called "Stringency in the Money Market" has been diagnosed and expiated upon by the great authorities on such subjects after the manner of quack doctors, causes are explained in a superficial way, either through ignorance or lack of ability to grasp the subject and probe to the bottom.

The popular explanation given by most of the quacks is that this country is developing too quickly and using up capital faster than it can be imported or created; that is to say, the farmer is plowing too much land and producing too much grain, the manufacturers and their workmen are turning out too much of their products, the busy bees produce too much honey.

Yet the great bugbear, stringency of the money market, spells ruin, disaster, and poverty, that is, if the panic mongers can have their way,

SAFE LIVE & DEAD LOADS IN LBS. PER. SQUARE FOOT, FOR FLOOR JOIST.

P = PINE, F = FIR

SIZE	CENTERS	SPAN IN FEET. 8' P	8' F	10' P	10' F	12' P	12' F	14' P	14' F	15' P	15' F	16' P	16' F	17' P	17' F	18' P	18' F	19' P	19' F	20' P	20' F	21' P	21' F	22' P	22' F	23' P	23' F	24' P	24' F
2"×4"	12	46	77	30	50	20	33	15	25	13	22	11	18	10	17	9	15												
	16	35	58	22	37	15	25	11	18	10	17	9	15	8	13	7	12												
	18	31	52	20	33	13	22	10	17	9	15	8	13	7	12	6	10												
2"×6"	12	109	180	69	115	48	80	35	58	31	52	27	45	24	40	21	35	19	32	17	28	16	27	14	23	13	22	12	20
	16	81	135	52	87	36	60	27	45	23	38	20	33	18	30	16	27	14	23	13	22	12	20	11	18	10	17	9	15
	18	73	124	46	77	32	53	24	40	20	33	18	30	16	27	14	23	13	22	11	18	10	17	9½	16	9	15	8	13
2"×8"	12	197	328	126	210	88	147	65	108	56	93	50	83	44	73	39	65	35	58	31	52	29	48	26	43	24	40	22	37
	16	148	246	95	158	66	110	48	80	42	70	37	62	33	55	29	48	26	43	24	40	21	35	20	33	18	30	16	27
	18	132	220	84	140	58	96	43	72	37	62	33	55	29	48	26	43	23	38	21	35	19	32	17	28	16	27	14	23
2"×10"	12	310	516	200	331	139	230	102	170	89	148	78	130	69	115	62	103	55	91	50	83	45	75	41	67	38	63	35	58
	16	234	390	150	225	104	174	76	127	66	110	59	98	52	87	46	77	42	70	38	63	34	57	31	52	28	47	26	43
	18	210	350	133	220	93	155	68	113	60	100	52	87	46	77	41	67	37	62	33	55	30	50	28	47	27	45	23	38
2"×12"	12	455	760	290	482	200	331	148	246	129	215	113	188	100	167	90	150	80	133	73	124	66	110	60	100	55	91	50	83
	16	340	567	217	361	151	250	110	183	97	162	85	142	75	125	67	111	60	100	54	90	49	82	45	75	41	67	38	63
	18	300	500	193	320	134	224	98	163	86	143	75	125	67	111	60	100	53	88	48	80	44	73	40	67	37	62	33	55
2"×14"	12	620	1030	398	662	276	460	201	334	176	294	155	258	137	238	123	205	110	183	100	167	90	150	82	137	75	125	69	115
	16	470	784	298	496	208	246	154	256	132	220	116	193	103	172	92	153	82	137	74	123	68	113	62	103	56	93	52	87
	18	415	690	264	440	184	306	135	222	118	197	103	173	92	153	82	137	73	124	66	110	60	100	55	91	50	83	46	77
2"×16"	12	815	1355	522	870	362	604	266	442	231	384	204	340	180	300	160	266	145	242	130	216	118	197	107	178	99	165	90	150
	16	610	1015	390	650	270	450	199	332	174	290	152	254	135	222	120	200	108	180	98	163	89	148	81	135	74	123	68	113
	18	540	900	346	567	240	400	177	295	154	257	135	222	120	200	107	178	96	160	87	145	79	132	72	120	66	110	60	100

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SAFE UNIT, LIVE AND DEAD LOADS IN LBS. PER. SQUARE F.T. ON FLOOR AREA.

P = PINE, F = FIR

DEPTH OF BEAM	SPAN OF BEAMS IN FEET. 8' P	8' F	10' P	10' F	12' P	12' F	14' P	14' F	15' P	15' F	16' P	16' F	17' P	17' F	18' P	18' F	19' P	19' F	20' P	20' F	21' P	21' F	22' P	22' F	23' P	23' F	24' P	24' F
4"	46	77	30	50	20	33	15	25	13	22	11	18	10	17	9	15												
6"	109	180	69	115	48	80	35	58	31	52	27	45	24	40	21	35	19	32	17	28	16	27	14	23	13	22	12	20
8"	197	328	126	210	88	147	65	108	56	93	50	83	44	73	39	65	35	58	31	52	29	48	26	43	24	40	22	37
10"	310	516	200	331	139	230	102	170	89	148	78	130	69	115	62	103	55	91	50	83	45	75	41	67	38	63	35	58
12"	455	760	290	482	200	331	148	246	129	215	113	188	100	167	90	150	80	133	73	124	66	110	60	100	55	91	50	83
14"	620	1030	398	662	276	460	201	334	176	294	155	258	137	238	123	205	110	183	100	167	90	150	82	137	75	125	69	115
16"	815	1355	522	870	362	604	266	442	231	384	204	340	180	300	160	266	145	242	130	216	118	197	107	178	99	165	90	150
18"	1040	1730	661	1100	460	766	338	562	284	473	259	432	230	384	220	366	184	307	165	275	150	250	137	229	125	208	115	192

COEFFICIENT TABLE

WIDTH OF BEAMS IN INCHES.

CTR. TO CTR OF BEAMS	4"	6"	8"	10"	12"	14"	16"	18"
2'	1.143	1.715	2.28	2.86	3.43	4.00	4.60	5.04
3'	.762	1.142	1.52	1.90	2.29	2.66	3.03	3.36
3½'	.655	.982	1.3	1.63	1.96	2.28	2.63	2.88
4'	.572	.857	1.14	1.43	1.72	2.0	2.3	2.52
4½'	.507	.765	1.01	1.27	1.52	1.78	2.04	2.24
5'	.457	.687	.914	1.14	1.37	1.60	1.84	2.02
5½'	.416	.625	.83	1.03	1.25	1.45	1.67	1.83
6'	.382	.574	.76	.956	1.14	1.33	1.53	1.68
6½'	.352	.527	.704	.856	1.06	1.23	1.43	1.55

CTR TO CTR OF BEAMS	4"	6"	8"	10"	12"	14"	16"	18"
7'	.327	.48	.65	.82	.982	1.14	1.31	1.44
8'	.286	.439	.572	.715	.858	1.04	1.15	1.26
9'	.254	.38	.51	.635	.762	.89	1.02	1.12
10'	.228	.343	.457	.571	.685	.80	.92	1.01
11'	.208	.312	.415	.52	.622	.727	.835	.915
12'	.19	.286	.38	.476	.57	.667	.767	.837
13'	.176	.264	.35	.44	.527	.615	.71	.775
14'	.163	.245	.326	.41	.49	.57	.657	.72
15'	.152	.228	.304	.38	.457	.532	.612	.672

CTR TO CTR OF BEAMS	4"	6"	8"	10"	12"	14"	16"	18"
16'	.143	.214	.285	.357	.427	.506	.574	.63
17'	.135	.202	.269	.336	.405	.47	.54	.59
18'	.127	.19	.254	.318	.38	.443	.51	.56
19'	.120	.18	.24	.30	.36	.42	.480	.53
20'	.114	.171	.228	.286	.342	.40	.46	.502
21'	.110	.163	.217	.27	.326	.38	.437	.48
22'	.104	.156	.21	.26	.31	.364	.42	.457
23'	.10	.149	.198	.249	.298	.348	.40	.44
24'	.095	.143	.19	.238	.285	.334	.38	.42

To find the safe live and dead load per square foot of floor area, take the safe unit load from depth and span, and multiply by coefficient from width and centre to centre.

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and the general public are as helpless as a flock of sheep in the clutches of a horde of financial wolves, consequently the panic always starts by the yelping of the wolves as they fully intend it should.

Panics of all kinds, in military actions or during fires in theatres are always assisted by, and disasters occur entirely through, the inherent cowardice of the human race. Just so is it in financial matters. The great financial string pullers who have the power to bull or bear the markets of the world, which they do whenever they can see the chance to rake in millions at the expense of the toiling masses, cry fire when there is no fire, cry money is scarce when there is just as much money in existence as ever there was, which can be proved by the rule of thumb and by statistics. Bankers assist in making the scare worse. They pay depositors no higher rates of interest, but they raise the interest on loans, they paralyze commerce and industries at one fell swoop by withdrawing credits they have encouraged merchants and manufacturers to accept for legitimate business enterprises.

The Government and the horde of howling politicians are guilty of criminal negligence for taking no action in these matters which are of more vital importance to the masses than any other questions of the day. Legislative measures should be enacted, making it impossible for financiers to paralyze industries.

Bankers, who encourage their clients to take funds for business enterprises and then demand immediate payment when they know it is impossible to comply, are guilty of worse than a moral crime. They are crushing and absolutely ruining merchants who could under considerate treatment pay two hundred cents on the dollar. I do not say all banks are guilty; there are some exceptions. I have no personal cause for complaint, therefore what I say cannot be construed as being prompted by any feeling of pique or animus. At the same time many flagrant cases have come to light, and banks adopting such methods should be tabooed and boycotted by the general public and by merchants and manufacturers. It is also the duty of the Government to take a hand in the game, which it could easily do, and thereby palliate the effects of a threatened panic.

It is sheer nonsense to say money is scarce owing to over-development of a country. That is a superficial view that will not bear analysis. A country or a property in the course of development does not exhaust nor destroy money, money being simply the medium of exchange. The same amount is in existence all the time, it may be diverted into various channels, but it is always available in some place; if a person borrows a million to develop a business or a property, not one cent of the actual money remains in that property—it simply changes hands and quickly finds its way back to the bankers, but it is no way diminished in volume.

There might be some grounds for the argument that over-development exhausts money if the methods of the ancients were followed, and the money when earned by the masses was buried or hidden away. The cry of shortage of money is more imaginary than real, nevertheless, the effects will be just as disastrous if it culminates in a panic, but why should a panic occur in a country when in a high state of prosperity? Money like labor will be attracted wherever it can earn the highest wages or rates of inteest. Why cannot the bankers of Canada pay a higher rate of interest, and charge their clients in proportion, and if they must tighten the purse strings, let it be on speculative transactions, and not on legitimate industries, except in case of over-production. In the latter case it would have a very salutary effect, if made general.

A glance at the chartered banks' statements to the Dominion Government from time to time proves that the so-called stringency does not exist in fact, though it is made to do in theory, and that really there is no just cause for uneasiness and certainly no reason for a panic.

DRASTIC ACTION URGED.

President Roosevelt is being urged to call an extra session of Congress to deal with the financial situation. The request comes from and represents the judgment of conservative leaders in the financial world, who have represented the present situation as one that compels action of a character which will effectually eradicate all ground for suspicion of American industrial methods.

The President has been assured from most reliable sources that there will be no opposition on the part of the great industries of the country to the enactment of laws necessary to carry out his ideas of Federal control to the extent to which he has expounded them in his recent utterances. These assurances are given to avert what is represented as the most dangerous situation which has confronted the country during a long historical period—that is the seemingly growing lack of confidence based on known irregularities in business methods in some quarters, and no sure and speedy means of separating the good from the unsound.

SAFETY LOADS FOR PINE

The accompanying tables for pine and fir timbers were computed by W. P. Cowles, engineer for the Department of Buildings, Minneapolis, for his personal use, but as there have been a number of requests for copies by architects and contractors, permission to publish them was secured by "The Improvement Bulletin," to whom we are indebted for their reproduction. The tables are figured on stock sizes and on a factor of safety of six, and are not complete in detail in that the deflection co-efficients to be used in connection with the tables have not as yet been completed. These deflection co-efficients will be published later. However, the loads given in the tables will not produce a deflection enough to crack plaster.

Those who have had access to these tables have found them of great assistance in figuring out work along these lines, and there have been a number of suggestions that they be reproduced in print for the benefit of others.

CEMENT AND CONGRETE

[NOTE --Contributions suitable for publication in this Department are invited from subscribers and readers]

STANDARD SAND FOR CEMENT WORK

An investigation of sands for cement work has been made at the Iowa State College, Ames, Iowa, by Mr. M. J. Reinhart, to ascertain what the best sand should be like and how ordinary sands can be improved by screening or by adding the proper material to give the resulting mixture the least percentage of voids. From the account of the investigations presented by Mr. Reinhart before the convention of the Iowa Cement Users' Association these notes have been taken.

The sand used in the experiments was bank sand of exceptionally good quality, comparatively coarse and having about 30 per cent. of voids. All that failed to pass a No. 2 sieve was rejected. This was about 3 per cent. of the original sand and it was the grades from this size down that were used in making the mixtures.

The screens used in separating the sand into the various sizes were as follows: The No. 2, or two meshes per lineal inch, the No. 8, No. 16, No. 30 and the No. 50 creens. With the above screens a given amount of material was divided into the six graded sizes as follows: That which passed the No. 2 and was retained on the No. 4; passed the No. 4 and was retained on the No. 8; pased No. 8 and was retained on the No. 16; passed No. 16 and was retained on No. 30; passed No. 30 and was retained on No. 50; and finally that which passed the No. 50 sieve. In each case the per cent. of the whole was determined by weight and the voids in each separate part determined.

In determining the voids the following method was used: A cylindrical vessel holding about a pint was carefully filled with sand up to a horizontal line around the jar, and settled somewhat by shaking and tapping the sides of the vessel, but not tamped, and then weighed. The vessel was then emptied and a certain amount of water poured in, approximately equal in volume to the voids ÷ total weight of water × 100 per cent. carefully put back into the jar and water enough removed or added to cause it to stand just to the level of the line around the glass. The difference in weight between the vessel filled with sand and water, and the weight of the vessel and sand alone is the weight of the water required to fill the voids of the sand. Next the weight of the water required to fill the vessel up to the horizontal line was determined and by the following expression the percentage of voids was calculated: (Weight of water required to fill the voids ÷ Total weight of water) × 100 per cent. = percentage or voids. In all cases two determinations were made and the average taken.

PROPERLY GRADED SAND.

Kind		Percentage Voids.	Quantity in Mixture				P. C. of Total.
			Separate		Combined		
Passed.	Retained on.		lb.	oz.	lb.	oz.	
No. 2	No. 4	44.2	3	2.	..	..	22.9
No. 4	No. 8	42.4	1	6.1	..	..	10.2
No. 2	No. 8	38.0	..	..	4	8.1	..
No. 8	No. 16	43.4	1	11.4	..	..	12.6
No. 2	No. 16	33.5	..	..	6	3.5	..
No. 16	No. 30	38.7	2	1.4	..	..	15.5
No. 2	No. 30	28.9	..	..	8	5	..
No. 30	No. 50	38.1	2	6.4	..	..	17.6
No. 2	No. 50	26.9	..	..	10	11.4	..
No. 50	.....	35.5	2	14.1	..	..	21.2
No. 2	.....	24.4	..	..	13	9.5	..

Next, a properly graded sand was attempted by putting the right amount of each grade of sand into the mixture. The weight of a certain amount of the coarsest material was found, and to it was added just enough of the next size to fill the voids. This gave a material made up of particles or pebbles which passed the 1-2 inch mesh screen and were retained on the 1-8 inch sieve. The voids of the large size was 44.2 per cent. of the small size 42.4 per cent., and of the mixture 38.0 per cent. To the mixture was then added enough of the third size to fill the voids, and so on down to the finest material, which passed the No. 50 sieve. The table shows the weight and voids of each material and mixture. The final mixture contained 24.4 per cent. of voids, a reduction in voids of nearly 19 per cent. as compared with the 30 per cent. of voids in the natural sand. This was the second mixture tried, the other by adding an excess of fine material each time gave a slightly larger per cent. of voids.

Next a mixture that would be practicable for improving sand was tried, on which by one screening of the sand the voids could be materially reduced. It is a generally known fact that if to ordinary sand fine pebbles as an aggregate be added a stronger mortar can be made from the sand, if mixed in a given proportion. So it was decided to add to the ordinary sand a certain amount of aggregate which passed a No. 2 sieve and was retained on a No. 16 sieve. To determine the correct proportion to add, a determination was made to find the per cent. of aggregate larger than that which passed a No. 16 sieve as well as the voids of the aggregate.

It was found that 34 per cent. stopped on the No. 16 screen and that this material had 34.2 per cent. voids. Starting thus with a given amount of this coarse material (16 lbs.), the proper amount of natural sand to add in order to just fill the voids was calculated thus: Let x = the amount of coarse material or aggregate in the sand. Let y = the total weight of sand. Then $(16-x) \times 0.34 = y-x$, and $x = 0.342\ y$. Solving, $y = 10$ lb. In other words, to 10 lb. of sand was added 16 lb. of the coarser material, and this mixture contained 25

per cent. of voids, a reduction in voids of nearly 17 per cent. By the same method of determination the proper amount of aggregate to add to any sand or gravel might be determined.

In order to show the comparative strength of mortars made from the three sands, the natural, the properly graded mixture, and the mixture improved by one screen only, tests were made, both for tension and compression. The specimens tested were ordinary briquettes for tensile strength and 6 inch cubes for compressive strength.

The mortars used in the tension briquettes were all 1:5 mixtures and the compression blocks were all made of 1:4 mortars. Three briquettes of each class were tested after seven days and six others were reserved, three to be tested at three months and three at one year. One compression block of each mixture was broken when seven days old and two others made at the same time and from the same mortars will be crushed when three months and one year old, respectively. The mortar in which natural sand was used showed an average tensile strength of 367 lb. per square inch and a compressive strength of 1,889 lb. The mortar made with sand improved by one screening developed a strength per square inch in tension of 397 lb. (average) and in compression crushed under 2,611 lb. per square inch. The specimens made with properly proportioned sand showed an average tensile strength of 403 lb. and a compressive strength of 2,139 lb. The values developed in tension were quite consistent.

The results show the value of having the graded materials in a mixture of sand, and the fine material in the proper proportion to fill the voids the larger aggregate. This was not a concrete but a mortar of about the consistency for cement blocks, tile, posts, etc. In the natural sand there was a deficiency of both the coarse and fine material, while in the other mechanical mixtures this fault had been largely overcome. In the former, mixed in a proportion of 1 to 4 the cement was insufficient to fill the voids, while in the latter case it was just sufficient, and hence the results.

SOME COMMENTS ON CONCRETE FOUNDATIONS

In these days of progress and enterprise when the timber supply of the country is rapidly being depleted, substitutes for use in place of wood, especially in building work, are coming prominently to the front. Conspicuous among these is concrete, which in the last few years has been utilized for a great variety of purposes, not the least interesting of which is that for foundation work. Concrete piles are being used to replace timber piles in a large number of modern factories, and up to date construction, for the reason that it has the advantage of permanence and immunity from decay, while at the same time being comparatively cheap.

In wet or filled-in areas where the ground water level is more than 6 feet below the surface of the ground, and the character of the soil is such that it is necessary to go still deeper for a suitable bearing stratum, a concrete pile foundation is much cheaper than any other type of construction. Under these conditions a solid masonry pier on a timber pile foundation would require, first, an excavation to below water level properly sheeted and braced. Second, driving of piles and cutting them off below the water level. Third, would be capping of the piles and building the solid pier to grade. Fourth, continuance of pumping through most of the operation. Fifth, back filling the excavation, the whole constituting a long, tedious operation lasting several days for each pier. In contrast to this, a pier of simplex concrete piles is built from the surface of the ground, no excavation being necessary except for the cap itself. An extra heavy pile driver especially equipped for this work drives a hollow steel form of suitable length, 16 inches in diameter, and equipped with a special driving point to resistance. A small batch of 1-2-4 Portland cement concrete is then dropped into the steel form, which form is raised about a foot by a pulling arrangement attached to the leads, and a heavy metal rammer dropped on the concrete. The effect of this impact is to open the jaws of the driving point and force the concrete out of the pipe and into the adjoining soil. Another batch of concrete is then inserted, the form raised a short distance and the concrete rammed. These operations are repeated until the form has been raised above the ground and the space it occupied in the ground has been filled with concrete.

The time taken to install one pile may run from 15 minutes to 1 hour, depending on circumstances. Twenty-eight piles 20 feet long were driven, on a recent contract, by one machine in six hours. Thus a four-pile pier to support 120 tons can readily be built in one-half a day, as against the time (several days) required by the other method. The simplex concrete pile thus formed (of the same diameter throughout) acts as a column and also develops a very great skin friction from the extreme roughness of its exterior surface caused by the ramming of the concrete into the surrounding material. The use of simplex concrete piles is increasing, not only in New York, but all over the States, and some installations have been made in England, Germany and France. In some of the foundations built on simplex concrete piles in New York City, the Building Department tested the piles with a loading of pig iron amounting to 50 tons per pile without any settlement. In practice the piles are designed to carry 30 tons each.—Carpentry and Building.

A new use of tar is reported from East Palestine, Ohio, where a mason erecting a number of brick houses ran short of black mortar color, and was unable to get a new supply in the time at his disposal. Accordingly he tried a little partially refined tar, and had no difficulty in getting the right color for the mortar for pointing and beading between the bricks. Fearing defects from this material, the mason watched the houses very carefully, and recently reported that after a lapse of several years he found the color as strong as ever.

CANADIAN PLUMBER
HEATING AND LIGHTING ENGINEER

[NOTE.—Contributions suitable for publication in this Department are invited from subscribers and readers.]

HEATING AND VENTILATING TESTS

It is doubtful if any branch of mechanical engineering practice offers a more fertile field for investigation at the present time than heating and ventilation. The design of an important installation of this character involves many assumptions as to the leakage co-efficients, radiation losses, and aid friction expected; and while a great deal of excellent work is being done in this line, as the results in many installations show, there is certainly need of more definite knowledge of the conditions which insure success or failure in specific plants. Taken in itself the heating problem is much less difficult to solve in most cases than the securing of good ventilation, but the two are bound so closely together that they ought not to be considered separately either in designing or testing the performance of individual plants. Failure to appreciate the particular conditions of plants from both standpoints has injured the reputation of heating and ventilating practice not a few times in the judgment of the general public, which estimates the performance of an installation by its personal feelings and comfort rather than by quantitative tests.

In a branch of engineering where so many uncertainties are involved, or at least so many assumptions, the accumulation of a large quantity of test data is essential, beyond the usual extent, to the harmonizing of theory and practice. Many engineers are collecting this kind of information for their own private use, and of course much of it is rightly considered as personal stock in trade. At the same time, there is great need of bringing the technical considerations of the work down to a more generally available form, and the presentation at this time of two or three exhaustive papers by men in practice on specific problems in heating and ventilation, either in the technical press or before the engineering societies, would stimulate progress and be widely helpful in breaking down the eccentricities of a highly individualized practice. No matter how fully data may be published, on complex work of this kind, the value of judgment can never be replaced by the mere possession of formulas and constants. The right use of the latter with knowledge of their limitations must invariably be largely settled by experience. When these are supplemented by tests, real progress lies close at hand.

The range of tests possible in a heating and ventilating installation is very broad, and in many commercial instances only the fundamental issues can be determined. The quantity of air supplied per capita per hour, the quality of the supply and the temperatures obtained in the principal rooms are essential to any proper appreciation of the working of an installation. Combined with these factors in the comfort of the users of the premises is the question of operating economy, expressed more or less indirectly by the size of the coal bills. It is quite as important to keep a daily log of the heating plant as to prepare and submit regular operating records of a power installation to its owners, though in many quarters this is not yet fully realized.

As soon as one begins to measure the quantities required in a heating and ventilating test he must realize that scientific accuracy is a very difficult thing to secure. Temperature measurements can, of course, be carried to great refinement if desired, but accurate determinations of air velocity and volume are not easy to make. An error of even 2 or 3 per cent. in the velocity measurement means the inclusion or exclusion of a large volume of air when multiplied by a considerable duct area in a building seating several thousand people. The calibration of anemometers is sometimes attempted by timing with a stop watch the speed of an observer traversing a known distance with an instrument in his hand, but it is a question if such a calibration can be relied upon to any considerable extent. Certainly for an accurate test upon a plant moving scores of thousands of cubic feet of air per minute, the anemometers used should be calibrated by physical laboratory methods. In some tests air velocities measured in one or two representative ducts have been taken as bases of operation throughout the entire installation, particularly where the ducts are not readily accessible. Such assumptions are dangerous to make if accurate figures are desired, and in any test carried out thoroughly as far as it goes, the data secured will show the velocity of air at every outlet which is essential to the proper operation of the system installed.

Fan speeds measured with a tachometer and not taken from the manufacturer's name plates are equally essential. One of the most important interpretations to be made from a heating and ventilating test when forced or induced draft is employed is the relation of fan speed to the volume of air delivered. Even if the exhaust from the fan engines be delivered to the indirect heating coils, the supply of the necessary quantity of air per capita per hour calls for the adjustment of fan speeds in rela-

tion to the external temperature and weather conditions; and in the case of variable speed motor driven fans, the saving in power gained by not operating at abnormal speeds in relation to the requirements is well worth securing.

Air discharges in outlet ducts furnish helpful data in almost every case where the test is carefully made. The effect of damper adjustments, both automatic and manually operated, is interesting to study in a concrete installation, especially in plants where mixing dampers are in service. In this connection, the sensitiveness and speed of automatic thermostat control deserve more attention than they ordinarily receive. In tests or refrigerating systems the response of the regulating valves to slight changes in temperature is almost always carefully watched, and no less of a working examination should accompany a newly completed or a long established installation. Complete temperature readings in all the vital portions of a heating and ventilating system are imperative if correct deductions are to be made. The mean of several readings per duct or per room is none too good an index of the varying conditions to be expected in practice.

For the majority of cases the purity of the air can be sufficiently well determined by the phenoephthalein lime-water test, in which the time required to eliminate the pink color in a carefully prepared solution is noted when the solution and the air sample are brought into intimate contrast. According to Coyne's method, this time with a properly prepared solution is indirectly proportional to the amount of carbon dioxide present. Nothing short of a chemical analysis will show the accompanying atmospheric impurities in an air sample, but in the absence of any fixed standard of impurity other than the carbon dioxide figure, this simple test is doubtless acceptable enough for all but the most disputed cases. No heating or ventilating system can eliminate the dangers of atmospheric pollution from bacteriological causes, but in securing the presence of a low percentage of carbon dioxide the engineer helps to keep the standard of vitality at a high point per capita. Hence no test of the general value of a heating and ventilating system is complete without careful approximate measurements of the carbon dioxide present. The cleanliness of the air sipply is well worth noting in such tests, by reference to scrubbing and washing apparatus when the installation contains such equipment.

On the heating side the most thorough study of a plant calls for an evaporation test on the boilers, with separate calorific determination of the fuel, and close checking of weights before the efficiency of steam application can be known. Given these boiler data and knowing the heat distributed in the steam supply, a fair check upon the efficiency can be obtained by weighing the returns and noting their temperature on the feed water side of the system. Where the run of piping through tunnels or walls is considerable before the direct radiators are reached, it may be necessary to make separate tests of radiation losses on known lengths of pipe in order to make the necessary deductions from the total heat units supplied to the distributing system. Where both direct and indirect radiation are tested at the same time it is necessary to separately measure the effect of changes in each system if the performance of either is desired in detail.

It is evident upon very limited consideration that the range of quantities and inter-relations open for actual research in heating and ventilating systems is almost unparalleled in the field of mechanico-physics. In the preceding paragraphs only the more important quantities and measurements have been mentioned. The working out of heat losses in detail, the study of the heat conducting and radiating characteristics of different types of apparatus, and of varying forms of wall, ceiling and floor construction, the analysis of resistance in ducts as affected by curves and elbows, the study of air leakage under different conditions of weather, and the consideration of fuel consumption in relation to the plant design and conditions of operation, furnish ample scope for research activities. Still another reason for the practice of heating and ventilating tests is to make sure from time to time that the installation is being handled as well as possible. It frequently happens, especially in school houses and other public buildings, that while a heating plant may start in economically, changes in the use of rooms, alterations in the buildings, or sometimes corrupt political practices place burdens upon the system which it was never designed to meet. The light which a test by a responsible engineer throws upon the conditions obtaining in a heating plant often points the way toward radical economies, either in the purchase and use of fuel, or the handling of the plant itself.—Engineering Record.

AN IMMENSE VENTILATING PLANT.

Owing to the free public use of the Carnegie Library Extension, at Pittsburg, Pa., mechanical ventilation has been provided in all parts and the apparatus, having been designed for conditions of maximum occupancy, is an equipment of great magnitude. In fact, it is one of the largest installations of ventilating fans ever placed in a single building, having an aggregate capacity of over 600,000 cubic feet of fresh air per minute, and similar capacity for exhaust ventilation. To avoid excessively large units and properly sectionalize the equipment, the fresh air apparatus has been arranged in fifteen sections, having nineteen fans, and the exhaust equipment in twenty-one stations with thirty fans.

The ventilation is independent of the heating throughout the building, the fresh air supply systems being designed to deliver air tempered only to the normal temperatures of the rooms supplied. The heating is accomplished by direct radiation throughout. In only one instance is this arrangement departed from, namely, in the music hall, where it was thought desirable to provide in the fresh air supply system sufficient radiation to permit indirect heating if it should be convenient. An incidental advantage of this independence of the heating and ventilating systems is that while the fresh air supply systems are not intended for indirect heating, the tempering coils in all of them are of sufficient capacity to provide satisfactory heating of the building in moderate weather, in case of possible derangement of the direct radiation system.

SEWAGE DISPOSAL AT BERLIN

A sewage disposal plant, comprising two septic tanks, two storage tanks, a pumping station and 14 acres of intermittent sand filters in 16 beds was placed in operation at Berlin, Ont., in 1905. Since then samples of sewage from various parts of the plant have been analyzed by the chemist and bacteriologist of the Provincial Board of Health of Ontario from time to time to determine the efficiency of the plant. The average results determined by these tests are given in the accompanying table. From these results it may be seen that the average removal of albuminoid ammonia from the raw sewage by the septic tanks and filters was 91.8 per cent., and the average removal of albuminoid ammonia from the effluent of the septic tanks was 84.14 per cent. On no occasion was the effluent from the filters putrescible.

This sewage plant and the conditions governing its design and operation were fully described in "The Engineering Record" for December 23, 1905. Briefly, the combined capacity of the septic tanks and storage tanks is 500,000 gallons, which is approximately the average daily sewage flow. Of this flow nearly 200,000 gallons is trade wastes from a brewery, a woollen factory, a gas works and four tanneries. Formerly these wastes rendered the sewage particularly difficult to treat, but a series of experiments conducted prior to the construction of the disposal plant demonstrated that they could be made much less harmless by simple treatment of different kinds before being turned into the sewers. Provisions have been made for the preliminary treatment of these wastes so that their influence on the activities of the septic tanks and filter beds is much reduced.

The disposal plant was designed by Mr. Wm. Mahlon Davis, consulting engineer, of Berlin, Ont., who has supplied the data concerning the results obtained by it.

TABLE 1—AVERAGE RESULTS OF TESTS TO DETERMINE EFFICIENCY OF SEWAGE DISPOSAL PLANT AT BERLIN, ONT.

Description.	No. of Specimens Examined.	Parts per 100,000 — Free Ammonia.	Parts per 100,000 — Albuminoid Ammonia.	Parts per 100,000 — Chlorine.	Percentage Removal by Septic Tanks and Beds of Albuminoid Ammonia Over Raw Sewage.	Percentage Removal by Each Bed of Albuminoid Ammonia from Septic Tank Effluent.
Raw sewage	19	2.935	1.406	29.13	....	....
Septic tank effluent	20	2.450	0.723	27.08	48.5	....
Beds 1 and 2	13	0.594	0.172	20.23	87.7	76.2
Beds 3 and 4	10	0.982	0.169	21.08	87.9	76.6
Beds 5 and 6	11	0.798	0.133	20.78	90.5	81.6
Beds 8 and 11	7	0.5735	0.1159	20.40	91.8	84.0
Beds 9 and 10	9	0.305	0.093	14.83	93.9	87.1
Bed No. 12	8	0.142	0.080	21.05	94.3	88.9
Bed No. 13	8	0.342	0.089	22.82	93.6	87.6
Bed No. 14	8	0.291	0.118	18.37	91.6	83.6
Bed No. 15	3	0.3413	0.0437	18.43	96.9	94.0
Bed No. 16	10	1.176	0.131	24.44	90.6	81.8

THE FACTOR OF COST IN ESTIMATING

The following able discussion on estimating the item of cost in contracting was presented by W. B. McAllister at a meeting of the Carpenter Contractors' Association of Cleveland.

Gentlemen—In discussing with you the matter of keeping cost, I realize that it is a very broad subject, and one that requires a different application for every line of business, as well as a matter to which few fixed rules will apply for all people, even in the same line of business. Still, it is perhaps one of the most important parts of a contractor's business and certainly one that is most often neglected by the average contractor.

I will first point out to you the general rules, principles and objects of cost keeping which are applicable to all lines of business and must, so far as possible, be followed in order to plan a successful cost recording system. Then I will take up in detail the application of these principles to the ordinary work of the carpenter contractor to show you how they may be economically used in his business.

The general rules, principles and objects above referred to I have taken very largely from trade magazines and from a "Hand Book on Cost Data" by H. P. Gillette, and are as follows:

Objects of Cost Keeping:

First, to enable the contractor to determine what will be a fair unit price for similar work in the future.

Second, to enable the contractor to analyze his expenditures with a view to improving his foremanship, class of laborers, plant equipment, etc.

To the contractor the second object is of vital importance.

Up to the present time few contractors have awakened to the possibility of effecting great savings in cost by simply developing a system of daily itemized cost recording.

The cost of maintaining such a system, slight though it is, has not appeared to be justified by the results, because the results have not been made public by those who have developed cost recording systems.

In fact, to the majority of contractors it appears to have occurred that there is but one advantage in accurate cost keeping, namely, the ability to predict the value of future work with slightly greater accuracy.

The truth is, however, that this advantage is slight indeed compared with the discovery of laziness that is easily made by keeping an itemized daily record of costs.

As incidental consequences of pro-

per cost keeping there are certain other advantages, among which are the following:

First, the wits of the managers, foremen and skilled workers are sharpened because each man feels that he is under a strict watch and that there is a chance for merit to become known and being known to receive its reward.

Second, fewer foremen are required and one good foreman can direct the work of a far greater number of men than without such system.

Third, padded pay rolls are practically done away with and thefts of tools and materials reduced to a minimum.

Fourth, machines are kept in better order and less subject to abuse, because a falling off in output of any machine due to such abuse is quickly discovered.

Fifth, when a contractor is known to have a good system of daily recording his work, architects are more likely to favor giving him extra work, paying him actual cost plus a fixed sum or plus a percentage for his supervision and the use of his plant.

These are some of the incidental advantages of keeping such a system of costs, as I am about to outline, but the term "incidental advantages" should not deceive you by making it appear that they are of minor importance, thrown in for good measure, as it were. Any one of them may be sufficient to turn a loss into a profit on work of magnitude.

Contractors, as a rule, if they keep a cost record at all, do it in a general way and under a general head, as for instance the total cost of any one job; but they do not keep an accurate cost of the individual items that make up the total contract, and cannot tell when the work is completed on what items their price was right and on what terms they lost money.

Sometimes costs are balanced once a month and effort made to compare these costs with the actual value of work done. This is better than to wait until the contract is finished, but this plan has the disadvantage of not giving the cost of individual items. At best this method serves only one object, and that is the least important object of cost keeping, namely, to indicate whether the contract prices are too low or too high. Scarcely any light is thrown upon the vital question of efficiency of men and plant, and even when the monthly returns do indicate an unreasonably low output, the finger of the contractor usually cannot be laid upon the cases. Therefore, to secure the most important advantages of cost recordsing a system must be devised that will give daily records of progress.

Without a daily record of work done, the foreman and workmen feel at liberty to work fast one day and slow the next—fast when the contractor is about and slow when he is away.

The work moves by fits and starts, and the reactions of slowness that occur after the spells of activity are generally so prolonged as to more than overbalance all gains due to unusual diligence.

Then again, it is much easier to make excuses for failure to have made necessary progress when the excuses have to be made once a month than when they must be made once a day.

The day is the unit of pay for work done, and it should be the unit in which the work is measured, if satisfactory attempt is to be made to secure a fair return for the wages paid.

The ideal system of cost keeping should show not only the daily output of each class of work, but the individual output of every worker.

But the work of the carpenter contractor involves the co-operation of several men, making it impracticable in all cases to obtain a record of the work done by each. Then the aim should be to divide the forces into separate crews, each crew having its special work, which can be measured and recorded daily. Usually it is desirable to put each crew under a foreman who is held responsible for the output.

In many cases it is sufficient to select one of the workers as boss of the crew. The aim in any case is to secure a group working as a unit with some one man in charge of the unit and responsible for its output. Then if the work is such that the output of each man in the group can be measured separately the most perfect system of cost recording can be established.

There are three general classes of contract work that are easily measured:

First, work on single units;

Second, work that progresses along a straight line;

Third, work that progresses over an area.

There are many good examples of linear work, such as laying base, moudings, plates, etc. Of work on single units, which need but to be counted, there are innumerable examples, such as erecting fence posts, hanging doors, hauling lumber, setting window frames, etc.

Under the head of work that progresses over an area would come floor joists, roof rafters, sheathing, flooring, siding. etc.

When we consider these three classes of work that are easily measured we have left comparatively few classes that are measured with difficulty. Enough are left, however, to be a source of worry to the man who is installing a cost recording system. I believe, nevertheless, that no class of work is so complex that some satisfactory method of daily measurement cannot be devised for it. It is the devising of a simple and practical way of measuring the daily output of the men that will test the ingenuity of the contractor.

The ordinary foreman is not an engineer or even a fair mathematician. Often he cannot write clearly. Any system that does not take this fact into account will be a failure. With this in mind the aim should be to make the method of recording progress so simple that scarcely any mental effort is required on the part of the foreman or time keeper or workman who records the daily results.

Many kinds of work can be divided into units of equal size and the cost kept by simply counting the units. As in the case of laying floor joists or roof rafters one may compute the area to be covered in square feet and give that particular area a number. The foreman can turn in the time of the men charged to that number and

(Continued on page 25.)

Contracts Department

News of Special Interest to Contractors, Engineers, Manufacturers and Dealers in Building Supplies.

CONTRACTS OPEN.

Whitby, Ont.

A site has been selected for the erection of a new post office building in this town.

Dominion, N.S.

Plans have been prepared and estimates secured for the installation of a new water works system.

Truro, N.S.

The effects of the Truro Foundry and Machine Company are advertised for sale by auction on November 30th.

Dawson, B.C.

The Public Works Committee have recommended the appropriation of $140,000 for public roads and bridges.

Portage la Prairie, Man.

The Directors of the Central Elec-Light Company will carry out extensions to the power plant at a cost of $35,000.

Cobalt, Ont.

The council are considering a proposition made by the Cleveland Cobalt Company for the electric lighting of the town.

Oakville, Ont.

A proposition is before the town to guarantee 5 per cent on a first mortgage of $30,000 for the establishment of a tile works.

Banff, Alta.

The C.P.R. will shortly enlarge their hotel here, estimated cost $200,000. Hayter Reid, Superintendent C.P.R. Hotels, Montreal, Que.

Port Arthur, Ont.

At a meeting of the city council last week it was submitted by Alderman Ferguson to call for competive plans for a city hall to cost $150,000. The matter is in abeyance.

Charlottetown, P.E.I.

In connection with the new telephone system considerable improvements are to be made, including the erection of two large buildings and the putting in of a power plant.

Amherst, N.S.

The Quinpool Road Baptists have decided to proceed at once with the rebuilding of their church, and have appointed a committee under the chairmanship of A. J. Davis to obtain plans.

Calgary, Alta.

A Cabinet meeting will shortly be held at Edmondton when the plans for the new Registry Office at Calgary will be submitted. It is expected that tenders will be taken after this meeting.

Maple Creek, Sask.

Tenders are invited by Fred Gelinas, Secretary, Department of Public Works, Ottawa, up to November 25th for the construction of a public building here. Specifications with local postmaster and at the department.

Neepawa, Man.

Fred Gelinas, Secretary, Department of Public Works, Ottawa, will receive tenders up to November 27th for the erection of a public building in this town. Specifications with local postmaster and at the department.

Shawbridge, Que.

The Chairman of the Farm Committee is taking tenders this week for the erection of an industrial school building on the Boy's Farm. Separate tenderers are invited for heating and plumbing. C. S. Burgess, A.R.I.B.A., architect.

Welland, Ont.

Engineer Chipman has reported on a sewer system for Ross, Major, east Main and Queen streets, estimated to cost $40,000. In addition to accommodating the present factories the sewer will provide for future industries. A by-law will likely be submitted to the ratepayers in January.

Tillsonburg, Ont.

The council have come to an agreement with the Borden Condensed Milk Company for the establishment of a branch factory in this town, and a by-law for the ratepayers is being prepared. It is understood that the company are already negotiating for the purchase of McDonald's farm.

Sault Ste. Marie, Ont.

E. D. Warren and A. G. Penman, of the Canadian Smelting and Refining Company, of Toronto, were recently in the Soo in connection with the establishment of the large smelting works which will shortly be erected here. A site has been selected and work on the plant will commence about December 1st.

Goderich, Ont.

A deputation headed by the Mayor waited upon the Minister of Public Works at Ottawa last week with the object of obtaining the completion of the breakwater and other improvements to the harbor at a cost of some $200,000. The Minister promised that the matter should be carefully considered.

Montreal, Que.

The Protestant school commissioners have taken out a permit for alterations to the Savard street school to cost $24,000; architects, Hutchison & Wood.

S. H. McDowell has been granted a permit for the erection of a residence on City Councillors' street to cost $11,000.

Rossport, Ont.

Tenders are invited by Fred Gelinas, Secretary, Department of Public Works, Ottawa, up to November 26th for the construction of a wharf and stone approach at this place. Specifications to be seen at offices of J. G. Sing, Resident Engineer, Confederation Life Bldg., Toronto, at the Department, Ottawa, and on application to the local postmaster.

Stratford, Ont.

It is reported that the Board of Trade are negotiating with a new manufacturing concern, lately incorporated with a capital of $1,500,000, with a view to securing their location in this city. If satisfactory arrangements can be made a sum approximating $500,000 will be expended upon buildings and machinery. The line of manufacture is electric fittings and hardware.

Meaford, Ont.

Tenders are invited by Fred Gelinas, Secretary, Department of Public Works, Ottawa, up to December 2nd for the construction of an extension to the breakwater and other works at the harbor according to specifications which may be seen at office of J. G. Sing, Resident Engineer, Confederation Life Bldg., Toronto, on application to the local postmaster and at the Department.

Brandon, Man.

It is understood that the site for the new court house has been practically decided upon and that work will commence early in the spring.

A permit has been issued for the new Salvation Army barracks, estimated cost, $12,000.

It is possible that a by-law will be submitted to the ratepayers in December for the acquisition of a large depot for the city crushing plant.

London, Ont.

The Wilcox Manufacturing Company will shortly undertake the erection of a large building, 110 ft. x 125 ft., adjacent to their present factory at Chelsea Green.

The Western Medical School are contemplating the building of commodious premises on Ottaway Aveune, near the Victoria Hospital.

James A. Blair, of Alma Street, has offered the authorities $20,000 for the building of a tuberculosis hospital and strenuous efforts will be made for its speedy construction.

Peterborough, Ont.

Recent building permits include: Geo. Manning, brick veneer house, Edinburgh and George streets, $2,000; F. R. J. MacPherson, concrete dwelling, Paterson street, $1,200; Chas. H. Huffman, concrete dwelling, Boswell avenue, $1,550.

L. K. Jones, Secretary, Department of Railways and Canals, Ottawa, wants tenders up to November 20th for the construction of the Rosedale section of the Trent Canal. Specifications at office of Superintending Engineer, Trent Canal, and at the Departmeut.

Ottawa, Ont.

The Board of Works have received a report from City Engineer Ker intimating the willingness of the Ottawa Electric Railway to share in the costs of the proposed viaduct on the Richmond Road.

In order to beautify the appearance of Sussex street the Ottawa Improvement Commission and the W. C. Edwards Company have come to an arrangement by which the company will raze several old buildings on the westerly yard. An ornate concrete fence will be placed around the factory and other ornamental work carried out.

Vancouver, B.C.

Hooper & Watkins, architects, of this city, have completed plans to the order of a prominent Chinese merchant, Loo Gee Wing, for the erection of a five storey block on Hastings and Abbot streets; estimated cost $80,000.

More than $5,000 has been collected for the erection of a Sikh Temple and a site has been selected on Second avenue upon which will also be erected a temporary home for Sikhs. Plans have been prepared by Architect Archer and building operations will shortly be commenced.

Recent building permits include: G. McDonald, frame dwelling, Tenth street, $4,000; F. W. Blyth, frame dwelling, Barnard street, $1,500; N. Raine, frame dwelling, Tenth street, $1,500; Western Home & Improvement Co., frame dwelling, Parker street, $4,000; J. G. Mortimer, frame store and dwelling, Robson street, $5,000; Robert Hudson, frame cottage, Bismarck street, $1,000; Morley Anderson, frame dwelling, Fourth street, $1,500; Davison & Tregent, frame dwelling, $2,800; Mason & Findley, frame dwelling, Second avenue $1,600; H. Chaldecott, frame dwelling, Twelfth street, 1,500; Samuel Botsworth, frame cottage, Second avenue, $1,000; J. V. Lightheart, Nelson street, two frame dwellings, $8,000; J. V. Lightheart, four frame dwellings, Nelson street, $16,000; C. J. Osterman, frame cottage, Keefer street, $1,200; C. J. Osterman, frame dwelling, First street, $1,800; C. S. Gustafson, frame dwelling, Davie street, $4,600; E. D. Churchill, frame dwelling, Fourth avenue, $1,000.

Toronto, Ont.

The Bredin Bread Company have just acquired a block of land on Bloor street west, upon which they will erect a large factory next season.

The City Architect has received on application from the James Morrison Company for the erection of a four storey brass factory on Adelaide street to cost $50,000.

In the civic building department the feature of the week has been an application by The T. Eaton Company for a permit to erect a two storey addition at a cost of $50,500.

The Chairman of the Board of Control, Mayor Coatsworth, invites tenders up to November 12th for the super-structure of a steel footbridge at Riverdale Park. Specifications at office of City Engineer.

The Chairman of the Board of Control wants tenders up to November 12th for an alteration to the public lavatory, Adelaide and Toronto streets. Specifications at office of City Engineer.

A new building is to be erected by Knox College on St. George street at a cost approximating $500,000, and a committee has been appointed under the chairmanship of Rev. J. M., Duncan to make active preliminary arrangements.

F. J. Martin, real estate agent, 35 Adelaide street east, has effected the sale of property on Bloor street, west of Major street, to J. Nornabel for the erection of a store, also of land on Brock avenue to Smallwood Bros. for the erection of dwellings.

Fred Gelinas, Secretary, Department of Public Works, Ottawa, wants tenders up to November 21st for the construction of an Astromical Observatory here. Plans at office of Burke and Horwood, 28 Toronto street, and at the Department. Tenders will also be received by Mr. Gelinas up to November 29th for the construction of a wharf and stone approach at White Cloud Island, Georgian Bay, Ont., according to specifications which may be seen at offices of J. G. Sing, Resident Engineer, Confederation Life Bldg., Toronto, on application to the postmaster at North Keppel Ont., and at the Department.

Recent building permits include :— Wm. E. Weale, two 2½-storey brick dwellings, St. Clarens avenue, $6,000; Miss B. Young, pair semi-detached 2-storey rough cast dwellings, Concord avenue, $2,200; H. H. Snydam, 2-storey and attic brick dwelling, Admiral Road, $4,000; W. D. Hird, pair 2-storey semi-detached brick veneered and rough cast dwellings, Gerrard street, 3,000; H. F. Sanders, 2-storey brick dwelling, Pearson avenue, $3,200; W. C. Cunningham, 2-storey and attic brick dwelling, Margueretta street, $4,500; W. G. Churcher, 2-storey brick dwelling, Bartlett avenue, $2,000; W. Nash, three attached 2½-storey brick dwelling, Massey street, $7,500; A Peel, pair 2-storey rough cast dwellings, Melville avenue, $2,000; W. G. Simpson, pair 2½-storey semi-detatched brick dwellings, St. Clarens avenue, $5,000; C. Hibberd, pair 2-storey semi-detached brick dwellings, Lansdowne avenue, $5,000; H. E. Jarman, 2-stoJey brick and stone dwelling, Dundas street, $2,500; J. J. Follett, 2-storey brick dwelling, Wellesley street, $6,000; G. Martin, 2-storey brick dwelling, Dovercourt road, $3,000; Arthur B Brown, pair 2-storey semi-detatched brick dwellings, Cottingham street, $7,000; W. G. Dean, brick dwelling, Avenue road, $12,000; T. Kelly, 2 pair 2-storey semi-detached rough cast dwellings, Lewis street, $5,000; J. A. MacMurchy, pair 2-storey brick dwellings, Alhambra avenue, $6,000; E. R. Diamond, pair 2-storey brick dwellings, Bain avenue, $6,000; C. E. S. Metherell, 2½-storey brick dwelling, Cowan avenue, $3,000; F. J. James, brick addition to warehouse, Church and Colborne streets, $10,000; W. Redburn, 2-storey brick addition, Forest Hill road, $3,500; Wm. Laveck, 2 storey brick dwelling, Beatty avenue, $3,500.

CONTRACTS AWARDED.

Medicine Hat, Alta.

P. Burns, of this city, was the successful tenderer for the new armory building at 16,600.

Fort William, Ont.

Russell Bros., of this town, have been awarded the contract for the new residence of W. Stephenson, Manager of the Bank of Montreal; estimated cost $20,000.

Edmonton, Alta.

R. J. Manson, of this city, has secured the contract at about $6,000 for the erection of a two storey brick block on First street for Senator Mc.-Mullen, of Mount Forest, Ont.

Toronto, Ont.

The Elmira Interior Wood-work Company, Elmira, Ont., have secured the contract at $7,000 for the office and interior fittings of the Birbeck Investment Company's new building on Adelaide street east.

Vancouver, B.C.

The contract for the erection of the new monkey house in Stanley Park has been awarded to Mc.Pherson and Sinclair, at $4,900. Other tenderers were Glover & Lloyd, at 4,990, and J. Caulson of this city, $5,090.

Montreal, Que.

The Water Committee have awarded the contract for a new brick chimney at Point St. Charles to the Eadie-Douglas Company, of this city, at $3,995. The Weber Steel Company also tendered, offering to put up a concrete chimney for $3,400. L. Amiot secured the contract for the excavation and brick work for the new boiler house at $3,393, and J. Sauvageau the carpentry cantract at $1,173.

The following tenders have been received for supplying three new boilers for the wheel house at Point St. Charles: Babcock & Wilcox, $15,780.

NEW COMPANIES.

Canadian Concrete Machinery Company, Limited, Toronto, Ont., incorporated, capital $20,000. Incorporators, W. C. Cork, G. T. Elder, G. M. Howard, W. H. Innes and T. A. World, all of Toronto.

City and District Realty Company, Limited, Montreal, Que., incorporated, canital $49,000. Incorporators, Henry Smith, of Outremont, Que.; Edward Sweeting, J. B. Johnson, J. Sellars and Chas. Mitchell, all of Montreal.

E. Dufault Milling Company, Limited, Ste. Helene, Que., incorporated as lumbermen etc., capital $20,000. Incorporators, E. Dufault, G. E. Dufault, L. A. Fefevre and others.

Glenn Stove & Furnace Company, Limited, Toronto, Ont., incorporated, capital $50,000. Incorporators, W. G. Glenn, D. W. Jameson and E. G. Morris, of Toronto; John McQuaker of Owen Sound, Ont., and J. C. Spence, of London, Ont.

Schierholtz Furniture Company, Limited, New Hamburg, Ont., incorporated, capital $50,000. Incorporators, E. Schierholtz, Thomas Wenzel, W. Leaper and others.

Toronto Brass Mills, Limited, Toronto, Ont.,incorporated, capital $500,000. Incorporators, A. E. J. Blackman, A. Munro, J. E. Fennell, Charles Henderson and J. Algate, all of Toronto.

Western Central Construction Company, Limited, Toronto, Ont., incorporated, capital $350,000. Incorporators,A. T. Drummond, H. M. Mowat, Geo. H. Kilmer, H. W. Shapley and F. Wilson, all of Toronto.

Automatic Grain Shocker Machine Company, Limited, Hamilton, Ont., incorporated, capital $100,000. Incorporators, C. T. Grantham, A. Zimmerrman, A. J. Turner and others.

Canada Brick Fields, Limited, London,Ont., incorporated, capital $100,000. Incorporators, J. D. Wilson, F. P. Drake, S. F. Glass, C. B. Edwards, P. W. Broderick and J. L. Thomas, all of London.

National Light & Manufacturing Company, Limited, London, Ont., incorporated, capital $50,000. Incorporators, S. T. Husband, A. G. Mill, James Lowe and others.

Toronto Iron Works, Limited, Toronto, Ont., incorporated, capital, $40,000. Incorporators, J. H. Malone, W. A. Manion, A. L. Ellsworth and W. Hohlstein, all of Toronto.

Seine River Lumber Company, Limited, Toronto,Ont., incorporated, capital $300,000. Incorporators, J. S. Lovell, W. Bain, Robert Gowans and others.

Kimmel Felt Company, Limited, Berlin, Ont., incorporated, capital $200,000. Incorporators, T. H. Rieder, A. J. Kimmel, A. H. Kimmel, all of Berlin, and others.

Ontario Hide, Wool and Fur Company, Limited, Toronto, Ont., incorporated, capital $100,000. Incorporators, A. J. Bickerstaff, F. H. Potts, M. G. Carroll, T. A. Silverthorn and E. N. Carruthers, all of Toronto.

Domestic Specialty Company, Limited, Hamilton, Ont., incorporated, capital $40,000. Incorporators, J. D. Trenaman, C. Wideman, Robert Stoddard and others.

Treasure Island Gold Mining Company, Limited, Toronto, Ont., incorporated, capital $1,000,000. Incorporators, A. H. Russell, J. G. Chester, James Baird, W. H. Hodges and Kenneth McKenzie, all of Toronto.

FIRES.

Manufacturing plant of Blakeney and Company, Hull, Que., loss $7,500.

Buildings of F. D. MacFarlane Foundry, and Ottawa Plating Works, Ottawa, Ont., loss $6,000.

Building and furnishings of the Greek Church, Wostok, Alta., loss $10,000.

Customs Warehouse, Montreal, Que., loss, including goods, $40,000.

Hamilton Facing Mills, Hamilton, Ont., total loss $3,000.

NOTES.

Notice is given of the incorporation of Canada Brick Fields, Limited, London, Ont., with a capital of $100,000.

The city council of Saskatoon, Sask., have sold debentures amounting to $250,000 to Scottish capitalists at 90.

Bolduc & Lemay, contractors, of Montreal, are reported to have dissolved.

It is reported that the Empire Plumbing Company, of Winnipeg, have dissolved.

The Canadian Railway and Contractors' Supply, Limited, of Montreal, Que., have registered.

The Western Central Construction Company, Limited, have just been incorporated with a capital of $350,000. The head office of the company is at Toronto.

The Eiffel Tower at Paris is to be re-painted for the fourth time since 1889. Forty painters will be engaged upon the work for three months. The undertaking is estimated to cost $15,000.

A retrospect of building operations at Edmondton, Alta., is highly encouraging. The figures for 1905 were $750,000; for 1906, $1,868,069; and for 1907, $2,027,375, showing an increase in three years of $1,277,375.

A building catastrophe is reported from Port Arthur, Ont., where Clavet's new three storey flour and feed warehouse collapsed killing one man and injuring several others. The building had just been completed at a cost of $18,000.

A campaign is being inaugurated by the Methodist young men of Montreal with the object of raising $10,000 from November 17th to December 14th for church extensions in that city.

The capital stock of the Doty Engine Works Company, Limited, has been increased from $40,000 to $100,000.

John Davis, Engineer of Peel County, Ont., met with a painful accident last week at Kelly's Crossing on

the C.P.R., near Caledon, Ont., as the result of which the left foot had to be amputated. Mr. Davis was chief engigeer on the Guelph Junction Railway and a member of the C.P.R. survey staff.

Special inducements are being offered by the Government to young men desirious of becoming surveyors and engineers. The supply of properly trained men is quite inadequate to meet the demand and in order to make the profession more attractive the Goverment have decided to help pupils who have passed the preliminary examination by offering them places on survey parties. Positions will be found for graduates in engineering at $4,00 a day and for others at $3,00 a day.

Work on the foundations of the high level bridge at Lethbridge, Alta.. was recently commenced in the presence of A. A. Raymond, of Chicago, the inventor of the Raymond concrete pile driver and President of the Ray-Concrete Pile Company who have the sub-contract for putting in the piles from John Gunn & Sons. The pile driver used in this work is an ingenious affair. The most prominent part of it is the cone-shaped steel core. This core is about twenty feet in length and about eighteen inches in diameter at the top and four at the foot. It is covered with a casing of sheet tin and driven into the ground by the sixty to the minute blows of the powerful steam hammer. When the required depth is reached the core is withdrawn and the casing left in. The hole is then filled with concrete and forms a concrete pile. The number of piles in the foundation for each tower varies from eighteen to thirty six.

The Anglo-Canadian Engineering Company, of London, England, recently offered to take five millions of Winnipeg's debentures, on condition that half of this amount be applied to their tender on the Point du Bois power scheme, and the Board of Control have passed the following resolution: "That the tender of the Anglo-Canadian Engineering Co. of London, England, for construction and equipment of Point du Bois hydro-electric development plant for the sum of $2,500,000 be accepted, on condition that the said company agree to take $2,500,000 of city debentures at 92, delivered and stamped, London; the proceeds of one-half of which amount shall be applied to the city's use and the balance to apply in payment of power works, and on the further condition that an additional amount of $2,500,000 of the debentures be taken by the aforesaid company at the same price and on the same conditions." In spite of the Mayor's opposition this measure has also been adopted by the City Council. A number of prominent ratepayers have requested Mayor Ashdown to exercise his official veto which it is understood he will do. This affair will prove the main issue of the election campaign.

THE FACTOR OF COST IN ESTIMATING.

(Continued from page 21.)

the cost of that particular area is easily determined. This unit recording system is the secret of the success of several well-known firms.

In any stationery store time books can be bought that are ruled and lettered to suit most classes of contract work.

The home addresses of all workmen, particularly the permanent addresses of skilled workmen and foremen, should be carefully recorded either in the time book or in another book especially provided for the purpose. A few postal cards will thus enable one quickly to gather together a crew of skilled workmen for a new job. Of course, those of us who use the employment bureau as it is now running need only to see that the names of their workmen are entered in the bureau and will not need to keep such a record.

It may be that no time book is made that will keep the time in the manner you wish it kept. In such cases the contractor will have to devise his own time cards. These can be printed without much expense or can be produced on a Mimeograph nearly as satisfactorly and perhaps more cheaply. The advantage of a Mimeograph is that you can make the cards as you need them, and at any time you want to change the card it can be done without losing those already on hand. And then, too, a special form of card can be made to take care of the cost on any specific job and that form can be discontinued as soon as the job is over.

Short time observations with a minute hand of a watch are often used to prove the efficiency of men or machines. These observations are frequently misleading, as they do not include the common delays incident to shifting tools, to break-downs, and the like, and may lead to a serious underestimate of the cost of work.

On the other hand, when the so-called short time observation is made long enough to include the time spent in necessary rests, in moving machines, and the like, exceedingly valuable results may be obtained.

When it is desired to find whether men are indolent, whether a foreman knows his business, whether the method of doing the work can be bettered or whether the tool or machine is susceptible of improvement, there is no method to be compared with the method of timing work with the minute hand of a watch.

There is little work, however, that is done by a carpenter that can be satisfactorily timed with a watch, and we will not dwell longer on this method of cost keeping, although you will find it sometimes valuable in special cases.

In estimating a unit price for any kind of work contractors often place too much reliance on published prices for similar work.

There are seven serious sources of error in so doing:

First, the conditions vary greatly in places but a few miles apart.

Second, rates of wages also vary widely, being, for example, higher in large cities than in small cities or in the country.

Third, specifications and interpretations of identical specification clauses by different architects vary greatly.

Fourth, contractors inexperienced in the particular work in question often bid prices altogether too low.

Fifth, the bidding prices may be purposely unbalanced, being too high on certain items and too low on others.

Sixth, a unit price that is fair for a large job is generally too low for a small one.

Seventh, a contractor already equipped with a plant can often afford to bid lower than contractors not so equipped.

While previous bidding prices should be used as a guide they should never be relied upon implicitly if the work is of any considerable magnitude. Each item should be estimated in detail and this estimating should

be done systematically to avoid some serious omission.

The cost of any item of work may be divided into five parts:

First, development expense;

Second, plant expense and supplies;

Third, materials;

Fourth, labor;

Fifth, superintendence and general expense.

Development expense includes the cost of making roads, delivering and installing tools and equipment, draining the site of the work, salaries of foremen and others on the idle list pending the beginning of work, and all other expenses involved in getting ready to build the structure.

On small jobs this item of development expense is often a very large percentage of the total cost; and on large jobs it seldom can be neglected in estimating probable unit costs.

Development expense has to be estimated for each particular job by securing freight rates or estimating for carting, etc. In such cases it includes temporary road building, installing water pipes for water supply, etc.

Plant expense includes interest and depreciation on all tools, machines, buildings, stored materials, trestles, false work, also the cost of maintainthe plant during its operation, new parts, fuel, oil, etc.

Materials include only such materials as actually go into the finished structure, and the wastage of material due to breakage in handling or sawing and shaping.

The cost of material includes freight and hauling to the site of work.

Labor includes all skilled and common labor, except clerks and office men and foremen.

Superintendence and general expense includes foremen, contractors, timekeepers, watchman, bookkeepers, supply clerks, rents, taxes, traveling and entertaining expenses, stationery, etc.

It is a common practice among some contractors when asked to give unit prices on work to present an unbalanced bid, that is, making the prices low on items that in their opinion will be left out and high on items they think will be added.

There are three objects in unbalancing bids:

First, to secure an abnormally high profit on any item that is likely to be increased after the contract has been awarded.

Second, to secure a large profit on items of work that must be done first, thus skimming the cream of the contract in the very beginning.

Third, to conceal from architects and from competitors what each item of work is actually worth.

An unbalanced bid is a two-edged sword. It may actually ruin the contractor that makes it if it happens that he has erred and that the quantities on which he has bid too low are greatly increased without a corresponding increase in the quantities on which he has bid high. Like all tricky practices it is a dangerous one, and the owner or architect will discover it sooner or later and the contractor will get the reputation of being tricky and unfair, with the result that the loss of business due to that reputation will more than offset the profit to be gained.

We will now take up the application of these principles so far as possible by the carpenter contractor. It is at once apparent that a few of these principles are not applicable to us, and that others must be greatly simplified in order to be of use to us. We will therefore start by dividing our costs into three parts:

First, overhead expense;

Second, labor;

Third, material.

Under the head of overhead expense should be charged the salary of the contractor, his bookkeeper, stenographer, watchman and any other employe who is not a real producer. It should also include rent of factory or office, insurance on equipment, tools and material, employers' liability, taxes on all articles and money used in the busines, interest on the money invested, depreciation on tools and equipment, cost of membership in employers' associations, cost of all trade journals, office supplies and other items not directly chargeable to any specific job.

Under the head of labor should be charged the wages paid to mechanics, laborers, foremen and other productive labor, including car fare, railroad fare, board and lodging, etc.

Under the head of material should be charged all material actually used in the construction of the building, including cartage, freight and handling, and any other expense necessary to get the material on the site of the building.

The overhead expense increases as the volume of work increases, but contractors who do all their own work should not neglect the overhead item because it may be small. Because a contractor does his own bookkeeping at night is no reason why he should not be paid for it, and why his time

should not be charged up to the job and he get the benefit of it, to which he is rightfully entitled. In other words, the contractor should pay himself a salary equal to what he considers his time worth for doing the duties of a contractor. Then, if he does his own bookkeeping work after hours, he should pay himself an additional salary for that, otherwise he will work for nothing, and that is not business-like, all will admit. If he drives his own wagon, he is entitled to make a charge to each job each day for cartage equal to what a horse and man should earn, just as though he actually paid the money out to a teamster. A charge should always be made for employers' liability, whether it is carried out or not, because if you do not carry it you are yourself assuming it, and you should be paid for taking the risk.

Under the head of depreciation should be charged the loss in value of all tools used, such as ladders, horses, straight edges, plumb rules, etc., and unless extra care is taken, none of these items will have any value at the completion of a fair sized job, in which case the entire cost of the items should be charged to the job. Depreciation on benches, vises, and permanent tools should be determined from the general durability of these articles and a liberal allowance should be made for breakage, etc.

Having arrived at a reasonable amount to be added for the overhead charge in your specific business for one day or one week, care must be taken to see that additional allowances are made for days on which no work is done, either on account of lack of work or inclement weather.

(Continued in next week's issue)

HYGIENE OF PUBLIC THOROUGHFARES.

An interesting account is furnished by the Engineering News of the 14th International Congress for Hygiene and Demography, recently held in Berlin, where more than 3,500 persons prominently identified with the engineering profession met together for the discussion of various matters connected with the public health and weal. The next congress will meet in Washington, three years hence. Following are summaries of two interesting papers upon one of the most important subjects discussed, viz., "Hygiene of Public Thoroughfares":—

The problem of street hygiene consists in providing for the hygienic safety of the traffic on streets by means of suitable roadways, removal of all that which arises on account of dust and which is economically prejudicial and injurious to health, as well as—in new parts—in procuring sufficient light and air in the streets of towns.

Among these problems, combating the dust nuisance is particularly pressing, having regard to the rapid growth of towns and to the continuously increasing street traffic.

The dust nuisance must be fought by:

(1) Teaching the public about the economic and hygienic importance of street dust. Instruction in this and in other questions of sanitation should be begun when feasible in schools.

(2) Technically correct planning of streets and suitable choice of material for the roadway. Those streets which have less traffic are to be treated differently from the principal thoroughfares, the entire population being interested in the constant removal of dust from the latter.

(3) Rational cleaning of the streets and removal of street sweepings without making dust. The employment of suction apparatus (vacuum or compressed air) is to be highly recommended for removing street dust.

(4) Regular abundant sprinkling of the streets with water, or binding the dust by means of oils which are soluble in water, or by means of tar, or material similar to asphalt.—By Schottelius (Freiburg).

In consequence of the stupendous development of automobilism the hygiene of the public roads (and especially the campaign against dust) has become of considerable importance. Macadamized roads are no longer able to resist the strain they are subjected to, and serious drawbacks result from this fact, from the hygienic (dust and mud), as well as the economic point of view (depreciation of buildings and cultivation along the roads, in consequence of intensive motor car traffic, considerable increase in the expenses for repairs and maintenance of the roads, highly disagreeable and often dangerous circulation in the heavy clouds of dust, etc.)

Of all remedies against dust, tarring seems to carry the day; I was the first in Europe to propose, in 1901, the lubrication of the roads, and especially to propose tarring, as a remedy against dust, after special trials carried out at Monaco with the precious assistance of H. H. the Prince of Monaco.

According to the opinion of German, British, Swiss, Italian and French engineers (who were first to develop and introduce the process), the results obtained by judicious and correct tarring are by far the best and most durable. Tar hardens the surface of macadamized roads in a manner to make them comparable to asphalt pavement.

The results have not been satisfactory in all cases: in order to obtain good results, the operation must take place on a well maintained road, well cleaned and perfectly dry; consequently it must be carried out in dry warm weather. Liquid coal tar (liquefied by heat or by the addition of a heavy tar oil) must be spread upon the road either by hand or machine in a uniform thickness, consuming about 1,200 to 1,500 grammes per sq. m. (2.3 to 2.8 lbs. per sq. ft.).

Machine work is preferable for the purpose, in order to take advantage of periods of good weather to cover large surfaces in a few hours, while some weeks are required to do the same work by hand. The wear of macadamized roads is greatly reduced by tarring, so that the cost of the operation, 12 to 15 centimes per sq.

mi. (1 to 1 1-2 cts. per sq. yd.), is largely balanced by the saving of expenses for repairs. The objection to tarring as being too expensive is therefore unfounded. Another objection is made with reference to the mud; but the mud on tarred roads in autumn after the rain is the result of injudicious tarring (operation carried out on wet roads or under unfavorable conditions). A third reproach, to the effect that tar cannot resist for any length of time to heavy traffic, is correct; the tar cannot resist where the substratum gives way. Roads for heavy traffic must not be macadamized, but must have a harder surface.—By Guglielminetti (Monte Carlo and Paris).

A YELLOW STAIN.

Many of the popular recipe books advise the use of nitric acid for this purpose, says the "Woodworkers' Review," and there is no doubt but what it gives a good color. But unfortunately, it injures the texture of the wood. A very bright yellow against which this objection does not lie, may be obtained as follows: Wet the surface of the wood thoroughly with a solution of acetate of lead (sugar of lead), and when it has soaked in well give a wash of bichromate of potassa. The latter will at once produce a brilliant yellow. When dry, the surface may be finished as usual.

The Canadian Fire Underwriters have been asked to look into the question of electric signs which are being hung up on the streets of Toronto in unusual numbers of late. It is pointed out that in many cases proper precautions have been ignored and that the wiring of these signs has been very carelessly performed. A meeting of the city officials and representatives has been arranged to discuss the matter.

The new railroad bridge over the Pasig River, near Fort McKinley, collapsed on November 1 owing to the breaking of the superstructure, and sixty workmen were precipitated into the river. Three Americans and twenty Filipinos were injured. The damage is estimated at $100,000.

HALL DECORATION.

There was a time when people neglected their halls entirely, probably because they considered the public entrance as unworthy of furnishing. The introduction of square halls into even the smallest city houses first called attention to the possibilities the hallway possessed for decoration, and those who did not have square hallways were nevertheless undaunted and straightway set to work to furnish their long, narrow entries with astonishing good results.

In the first place, an entry to a city house is apt to be dark; hence a paper that will lighten it up a little is necessary. On the other hand, too light a paper soils very easily with the continual passing up and down. The latter difficulty is met by an elbow-high figured base, with a light plain colored upper wall and ceiling. But the paper must also show up well under gas light. For this reason greens, mustards and terro cotta are always good in a hall, with a darker or figured base. Red does not light up as well and in a dark entry must be used with discretion, although it is always effective.

The long side walls of a hall make an excellent gallery for engravings and etchings, and in a good light family portraits in oil may be also well placed here. One decorator who had been called upon to provide for several old oil paintings of some extremely homely ancestors was almost in despair until he thought of putting them in the hall, where the light was not too strong to show up the bad points, since the owner's respect for her genealogical tree would not allow her to banish the portraits to the attic.—"Furniture Trade Review."

By the falling of a mill stack at the Newville Lumber Company's mills at Newville, October 31, Horace Leadley was killed and Burton Dyas very badly hurt. The two men were taking down the stack, which was ninety-six feet high, and had it down from the top about thirty-five or forty feet, when, without warning, it collapsed. The men fell fifty-five or sixty feet and were buried in brick or staging, Leadley dying shortly after. Dyas may recover.

HYDRAULIC ENGINEERING PROBLEMS.

The relative importance of various problems in hydraulic engineering has increased to a remarkable extent in the United States and Canada during the last quarter of a century. The energy in the numerous falls was practically valueless until electricity came to the rescue and solved the problem of the successful transmission of their energy. A paper on the work at the University of Wisconsin was given at the Western Society of Engineers in Chicago by Mr. D. W. Meade, Professor of Hydraulic and Sanitary Engineering in the same University. Before he accepted the chair, three years ago, theoretical hydraulics was taught by the department of mechanics. Water supply and sewage disposal were taught by the same man who taught structural engineering. Hydraulic machinery only included a theoretical consideration of the turbine, and the laws of flow in guides and buckets, and laboratory work was taught in connection with the steam laboratory work. The lectures were merely a theoretical discussion of the principles of hydraulics and were entirely unconnected with practice or any experimental work. This system was unsatisfactory. A proper understanding of the subject was difficult and students therefore lost interest. Appreciation of the application of the theory was impossible. The thorough teaching of any subject is only possible when a student has the opportunity to put into practice that which he has learned. He is able to realize the full meaning of a subject from his experience. The author of the paper, however, considered that the proper ideas and conceptions of the subject could be taught best by means of lectures illustrated by actual experiments, and further supplemented by actual laboratory work. In this way proper understanding of both theory and laboratory work is facilitated.—Engineering Times.

The new bridge being built on Loborough Lake, near Kingston, met with a serious loss recently when the pier at the north end disappeared. The water has quicksands and sinkholes, and it is altogether likely that it sank into one of these.

THE VALUE OF BIRCH.

The red birch of the north, while gradually growing in appreciation, still remains a wood whose value is but slightly recognized. In physical quality birch comes very near standing at the head of the list of American hardwoods, being exceeded, and then not in all particulars, only by oak, black walnut and cherry. It has wonderful strength, fine grain and figure, excellent color and good staying qualities. In beauty it approximates the better qualities of mahogany. As a matter of fact, birch has but one drawback as a hardwood of the very highest class—the oil it contains. This oily substance, unless the wood is dry-kilned with great care, makes it extremely difficult to make a glue joint that will be permanent. However, the furniture and interior finish trade is fast learning how to handle birch, and there is much less trouble on this score than there was in the past.

Birch has been esteemed in the eastern trade for many years, where it is regarded as one of the highest types of American hardwoods. The famous growth of birch in Pennsylvania and the Adirondacks is fast nearing extinction, and there will surely be an extraordinary call for the comparatively small remaining stumpage in Northern Michigan and Wisconsin. On relative merit the good end of birch should to-day sell nearly on a parity with oak, and it is the belief of the "Hardwood Record" that the wood will soon achieve a standing in the trade that will command such a price.—"Hardwood Record."

FOR CLEANING GRAINED FLOORS.

Grained and varnished wood imitations of hardwood are best cleaned by rubbing well with cloths wrung out in borax soapsuds, never letting the water touch them, says "Building Management." Afterward they should be rubbed with a flannel barely moistened with kerosene. If there is too much kerosene it will dissolve and blur the colors. Clean hardwood with a flannel wet in turpentine, and rub afterward lightly with boiled linseed oil. Take off spots with fine sand mixed in oil. Apply it with a leather and rub with clean leather afterward to bring back the polish.

Prices of Building Material

PRESSED BRICK, Per M.

TORONTO PRESSED BRICK AND TERRA COTTA WORK

	F.O.B. Milton, Ont.
Red No. 1	$13 00
" 2	11 50
" 3	10 00
Buff No. 1	17 00
" 2	13 00
Brown	25 00
Roman Red	30 00
" Buff	35 00
" Brown	40 00
Hard Building	8 00
" Sewer	6 00
" Backing	7 00

Moulded and Ornamental from $8.00 to $25.00 per 100.
Extra Cotta String Courses and Friese, from 50c. to $2.00 per ft. run.
Roofing Tiles, $20.00 per 1,000.

DON VALLEY BRICK WORKS.

Nos. 1, and 2, Red Pressed Bricks
Nos. 1 and 2 Buff Pressed Brick
No. 1 Brown Pressed Brick
Pompeiian Red, Buff and Brown Pressed Bricks
Ornamental Bricks of all kinds for Manitel purposes
Enameled Bricks of all Colors
Porous Terra Cotta Fireproofing of all Descriptions
Vitrified Street-Paving Bricks
Semi-Vitrified Foundation Bricks
Common Stock Red and Grey Bricks
Sewer Bricks
Stone or Macadamised Roadways

Please write to head office, 34 Toronto St. Toronto, for catalogue and prices.

BEAMSVILLE BRICK AND TERRA COTTA CO.

	F.O.B. Beamsville.
Red Peerless Facing	$16 00
" No. 1	14 00
" No. 2	12 00
" No. 3	10 00
Brown Peerless Facing	20 00
" No. 1	18 00
Buff Peerless	20 00
" No. 1	18 00
" No. 2	15 00
Moulded and Ornamental Brick	from $3 to $20 per C
Roman Red (Size 12 x 4 x 1½ in.)	30 00
" Buff " " "	30 00
" Brown " " "	35 00
Vitrified Paving Brick No. 1	18 00
" " " No. 2	15 00
Sewer	8 00
Roofing Tile	27 00

Sackett Plaster Board, 32" x 36" in size, sold at about 2c. per square foot.

LUMBER

CAR OR CARGO LOTS, F.O.B. TORONTO.

	Per M. Ft.	
1 inch No. 1 Pine cuts and better	$49.00 to	$51.00
1½ to 2 inch No. 1 cuts and better	54.00	58.00
2 inch No. 2, Pine cuts and better	48.00	50.00
1½ to 2 inch No. 3 cuts and better	42.00	46.00
1 inch Pine Dressing and better shorts	28.00	30.00
1 x 4, 6 and 8 Common	27.00	28.00
1 x 10 and 12 Common	30.00	36.00
1 inch mill run sidings	28.00	29.00
1 x 10 and 12 mill culls	22.00	23.00
1 inch dead cull sidings	15.00	16.00
1½ inch Flooring	32.00	34.00
Hemlock, 1 x 4 to 8 inch	19.00	20.00
2 x 4 to 8 inch, 12 to 16 feet	22.00	23.00
2 x 4 to 10 inch, 18 feet	23.00	25.00
1½ inch No. 1 4 ft. Pine Lath	4.75	5.00
1½ inch No. 2 4 ft. Lath	4.25	4.50
1½ inch No. 1 4 ft. Hemlock Lath		4.00
XXXX Pine Shingles	3.50	3.75
XX Cedar Shingles	2.50	2.75
B.C. Shingles:		
XXX 6 butts to 2 inch		3.85
XXXX 6 to 25-16 inch		4.07
XXXXX 5 to 2 inch		4.50

HARDWOODS—PER M. FEET CAR LOTS.

Ash, white, 1sts and 2nds, 1 to 2 inch	$36.00 to	$38.00
Ash, black, 1sts and 2nds, 1 to 1¼ inch	33.00	35.00
Birch, M. R. 1 inch	21.00	22.00
" 1¼ inch to 2	23.00	24.00
Basswood, Common and better, 1 to 1¼ inch	25.00	26.00
Basswood, 1¼ to 2 inch	26.00	28.00
Elm, soft, mill run, 1 to 1¼ in.	23.00	24.00
Elm, rock, mill run, 1 to 1¼ in.	26.00	28.00
Maple, common and better, 1 to 1¼ inch	22.00	23.00
Oak red plain, 1sts and 2nds, 2 to 4 inch	46.00	50.00
Oak, white, 1sts and 2nds, 1 to 1¼ inch	44.00	46.00
Oak, quartered, 1sts and 2nds	70.00	80.00