Pages Missing

LUMBER PRICES.

LUMBER.

CAR OR CARGO LOTS.

1¼ and 1½ ker clear picks, Am. ins..	$30 00@	32 00
1¼ and 1½ ker, three uppers, Am ins.		37 00
1¼ and 1½ ker, pickings, Am ins.....		27 00
12 x 12 to 12 dressing and better.....	20 00	22 00
12 x 12 to 12 mill run.....	15 00	16 00
12 x 12 to 12 dressing.....	15 00	16 00
12 x 12 to 12 common.....	12 00	13 00
12 x 12 to 12 spruce culls.....	10 00	11 00
12 x 12 to 12 maple culls.....		9 00
1 inch clear and picks.....	23 00	25 00
1 inch dressing and better.....	18 00	20 00
1 inch strips, mill run.....	13 00	15 00
1 inch strips, common.....	12 00	13 00
1 inch strips, ship culls.....	10 00	11 00
1 inch strips, mill culls.....	8 00	9 00
Cull scantling.....	8 00	9 00
1¼ and 1½ ker cutting up plank	22 00	25 00
1 inch strips, 4 in. to 8 in. mill run....	14 00	16 00
1 inch strips, common.....	11 00	12 00
1¼ inch flooring		15 00
1¼ inch flooring		16 00
XXX shingles, sawn	$2 40@	2 50
XX shingles, sawn.....	1 30	1 50
Eastlake galvanized steel shingles, 24 W. to per square.....		5 25
Eastlake galvanized steel shingles, 26 W. to per square		5 00
Eastlake painted steel shingles, per sq.		4 00
Eastlake painted steel siding, per sq.		3 50
Manitoba galvanized steel siding, per square		4 50
Manitoba painted steel siding, per sq.		3 50
Special galvanized steel siding, per sq.		4 50
Special painted steel siding, per sq....		3 50
Imitation brick siding, per square.....		3 50

YARD QUOTATIONS.

Mill cull boards and scantling.....		10 00
Shipping cull boards, promiscuous widths		13 00
Shipping cull boards, stocks.....		11 00
Hemlock scantling and joist up to 16 ft.	11 00	12 00
" " " 18 "	12 00	13 00
" " " 20 "	13 00	14 00
Scantling and joist, up to 16 ft.....		14 00
" " 18 ft.....		15 00
" " 20 ft.....		16 00
" " 22 ft.....		17 00
" " 24 ft.....		19 00
" " 26 ft.....		20 00
" " 28 ft.....		22 00
" " 30 ft.....		24 00
" " 32 ft.....		26 00
" " 34 ft.....		28 50
" " 36 ft.....		30 00
" " 38 ft.....		32 00
" " 40 to 44 ft..		35 00
Cutting up planks, 1¾ and thicker, dry	25 00	26 00
" " board,	18 00	22 00
Dressing stocks.....	16 00	22 00
Picks, American inspection.....		40 00
Three uppers, American inspection....		50 00
Cedar for Deck paving, per cord.....		5 00
Cedar for Kerbing, 4 x 14, per M....		14 00

B. M.

1¼ inch flooring, dressed, F. M.....	28 00	32 00
1¼ inch flooring tough, B. M.....	18 00	22 00
1¼ " dressed, F. M.	25 00	28 00
" undressed, B. M...	18 00	19 00
" dressed.....	18 00	22 00
" undressed	12 00	15 00
Beaded sheeting, dressed	22 00	25 00
Clapboarding, dressed.....		12 00
XXX sawn shingles, per M, 16 in....		2 75
Sawn lath	2 00	2 25
Red oak	30 00	40 00
White	35 00	45 00
Basswood, No. 1 and 2	18 00	20 00
Cherry, No. 1 and 2.....	70 00	70 00
White ash, No. 1 and 2.....	25 00	25 00
Black ash, No. 1 and 2.....	20 00	30 00

MONTREAL PRICES.

Lumber, Etc.

Ash, 1 to 4 in., M.....	$15 00@	20 00
Birch, 1 to 4 inch, M.	18 00	25 00
Basswood.....	14 00	20 00
Walnut, per M.....	55 00	100 00
Buttermut, per M	25 00	40 00
Cedar, flat.....	00 06	00 10
Cherry, per M.....	65 00	90 00
Elm, Soft, 1st	15 00	17 00
Elm, Rock	25 00	30 00
Maple, hard, M.....	25 00	30 00
Maple, Soft.....	16 00	20 00
Oak, M.....	40 00	75 00
Pine, select, M.	35 00	40 00
Pine, 2nd quality, M.....	25 00	30 00
Shipping Culls.....	13 00	16 00
Mill Culls.....	8 00	10 00
Lath, M.....	1 50	1 75
Spruce, 1 to 2 inch, M	10 00	12 00
Spruce Culls	4 50	6 00
Shingles, 1st quality.....	2 00	3 20
" 2nd "	1 25	2 00

Cement, etc.

Portland Cement, per barrel	$ 2 75@	3 05
Roman " "	2 75	3 00
Fire Bricks, per M	22 00	30 00

NEW YORK PRICES.

WHITE PINE.

Uppers	$46 00@	62 00
Selects	40 00	53 00
Fine common	35 00	48 00
Cutting up.....	21 00	30 00
Common	17 00	25 00
Norway.....	19 50	26 50
Pickets.....	14 00	23 00
Shippers, according to quality, for different ports	17 50	52 00
Coffin boards	21 00	23 00
Box.....	15 50	17 00
Ceiling.....	24 00	42 00
Shelving	25 00	32 00
Moulding.....	34 00	37 00
Bevel siding.....	16 00	23 00
Bridge timber.....	38 00	50 00

EASTERN SPRUCE.

6 to 12 in.....	15 00	17 00
8 to 12 in.....	16 00	16 50
6 to 12 in	15 50	16 00
6 to 9 in.....	15 00	15 50
Special lengths.....	16 50	18 50
Lath	2 10	2 15
Piling, per lineal feet.....	5	06

SHINGLES.

Pine, 16 in., extra.....$	3 10@	3 25
18 in. extra.....	4 35	4 50
18 in. clear butts.....	3 15	3 25
16 & 18 in. stocks.....	4 50	5 30
Cedar.....	8 75	19 00
Cypress.....	6 00	16 00
Redwood, per bunch	1 25	1 50
Various widths.....		1 00

HEMLOCK.

Timber.....	12 00	13 50
Joists.....	11 00	12 00
Boards.....	12 00	13 00
Lath.....		2 00

DRESSED LUMBER, CAR LOAD LOTS.

No 1 flooring, ⅞ in.....	23 00	24 00
No 1 ceiling, ⅞ in.....	25 00	26 00
No. 1 ceiling, ½ in.....	18 00	19 00
Timber.....	14 00	15 00

ALBANY, N. Y. PRICES

SHINGLES AND LATH.

Shingles, shaved pine.....		6 50
2d quality		5 00
Sawed, extra.....	4 80	4 90
Sawed clear butts.....		3 75
Cedar, XXX.....	3 50	4 30
Shingles, cedar mixed.....	2 60	3 00
Hemlock.....		2 25
Lath, pine.....	2 25	2 35
Spruce.....	2 00	2 25
Hemlock.....	1 75	2 00

HEMLOCK.

Boards, 10 in., each.....	13½
Joist, 4x6.....	33
Joist, 2½x4, each.	13
Wall strips, 2x4.	10

PINE.

2½ in. and up, good	58 00	60 00
4ths.....	53 00	55 00
Selects.....	48 00	50 00
Pickings.....	43 00	45 00
1¼ to 2 in., good.....	50 00	55 00
4ths.....	45 00	52 00
Selects	40 00	45 00
Pickings.....	35 00	40 00
1 in., good.	50 00	55 00
4ths.....	45 00	48 00
Select.....	40 00	43 00
Pickings.....	35 00	38 00
Cutting up, 1 to 2 in	30 00	35 00
Bracket plank.....	32 00	36 00
Shelving boards, 12 in. and up....	28 00	32 00
Dressing bds., narrow..	20 00	22 00
Shipping boards.....	10 00	18 00
Box boards.....	13 00	15 00
10 in. boards and better..	30 00	31 00
Common..	16 00	22 00
12 in. boards dressing and better.	32 00	36 00
Common..	16 00	22 00
1¾ in. siding selected 13 ft.. ..	43 00	45 00
Common..	16 00	21 00
1¾ in. siding selected..	43 00	46 00
Common..	14 00	19 00
Norway, selected..	24 00	26 00
Common..	12 00	16 00
10 in. p k. 13 ft. dressing and better, each..	42 00	45 00
Culls..	23 00	25 00
10 in. boards, 13 ft., dress, and better each..	28 00	33 00
Culls..	17 00	22 00

BUFFALO AND TONAWANDA PRICES.

NORWAY PINE—ROUGH.

No. 1, 1 and 1¼ in.....	20 00	22 00
No. 2, 1 and 1¼ in.....	15 00	15 50
No. 3, 1 and 1¼ in.	11 50	12 00
Stocks No. 1, 1 and 1¼ in.....		22 00
No. 2, 1 and 1¼ in.....		17 00

WHITE PINE—ROUGH.

Uppers, 1 and 1¼ in	42 00	44 00
1½ and 2 in	42 00	44 00
2½, 3 and 4 in	52 00	55 00
Selects, 1 inch.....	30 00	38 00
1¼, 1½ and 2 in ..	34 00	35 00
2½, 3 and 4 inch ..	44 00	48 00
Cuts, No. 1, 1 inch	27 00	28 00
1¼, 1½ and 2 inch..	30 00	32 00
2½, 3 and 4 inch...	37 00	40 00
No. 2, 1 inch....	16 00	17 00
1¼, 1½ and 2 inch ..	20 00	22 00
Moulding, 1 inch.....	30 00	31 00

Electrical Mechanical and Milling News

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ELECTRICAL,

Mechanical and Milling News,

PUBLISHED MONTHLY BY

CHAS. H. MORTIMER,

Office, 31 King Street West,

TORONTO, - - CANADA.

TO OUR READERS.

IN directing the attention of our subscribers and readers to the change in the name and appearance of this journal as presented for the first time in the present number, we desire to add a few words of explanation. Realizing how rapid has been the development of electrical science, how varied and important its applications in the future are certain to be, and how closely allied it will be with the manufacturing industries of the Dominion, we have determined to make it a prominent feature of this journal for the future. This step has been taken after consultation with a number of the leading electrical concerns throughout Canada, whose hearty approval has been given to it. Electrical interests in Canada have reached the stage where their importance demands that they should have a representative among the technical journals of the country. To worthily represent this great and growing industry, in conjunction with the mechanical and milling interests, will in future be the earnest aim of the ELECTRICAL, MECHANICAL AND MILLING NEWS.

In addition to the large circulation which this journal has hitherto enjoyed amongst flour mills, saw mills, planing mills and iron-working establishments from Prince Edward Island to Vancouver, it will in future be brought to the attention of persons interested in the multiplied uses of electricity, including the heads of town and city municipalities. In a word, the electrical field in Canada will be thoroughly covered, while the manufacturers of engines, belting, and steam users' appliances will find in the ELECTRICAL, MECHANICAL AND MILLING NEWS the medium through which to introduce their goods to the widest market. The services of a gentleman who enjoys the reputation of being well abreast of the times in his knowledge of electrical science, have been secured to contribute for and supervise this department of the paper. Persons interested in electrical matters are earnestly invited to make free use of our columns for the purpose of obtaining or imparting information.

A RELIABLE indication of the increasing demand for electric motive power, may be found in the fact that every manufactory of motors in the United States is crowded to its utmost capacity.

WE print in another column a description of a new method of setting steam boilers for the purpose of burning saw-dust. The question of the disposal of saw-dust has for years troubled the minds of mill-owners, and in the Province of New Brunswick at present a large number of saw-mills have been obliged to cease operations owing to the enforcement of the Dominion law prohibiting mill-owners from throwing their refuse into the rivers and streams. The manufacturers of the new device referred to should find a profitable field of operation amongst the mill-men of Nova Scotia and New Brunswick.

THE *Northwestern Lumberman* says: "The Canadian export duty on logs is a contemptible act of spoliation and confiscation directed against American lumbermen who have invested money in timber limits on the Canadian side of Lake Huron for the purpose of securing a supply of logs for American saw mills. When these investments were made the export duty was $1. It has since been increased to $3." Our contemporary has become excited, and taken ground which is not tenable. It insinuates that the Canadian Government, by increasing the export duty, is guilty of a breach of faith with Americans who purchased timber limits in Canada, with the object of exporting logs to their mills across the line. This charge has no foundation, inasmuch as no promise was made to the American purchaser of Canadian timber that the export duty would not be increased.

THE mass meeting of millers to be called shortly by the grain section of the Toronto Board of Trade, should result in the formation of a strong Association of Ontario Millers. We hope also that when an Association shall have been organized, it will appoint a paid secretary to devote his time entirely to furthering the objects which the millers desire to see accomplished. The man for the position should be a miller thoroughly conversant with the position of affairs, ready of speech and full of energy and enthusiasm in his work. This description fits the person of Mr. Plewes, of Brantford, who has done so much for the furtherance of the present movement for a readjustment of the tariff, and who, if he could be induced to accept the position, could be relied upon to "make things hum" in the interests of the millers.

IF we may rely upon statistics recently published, more American saw logs are brought into Canada to be manufactured than are exported from Canada to be manufactured in the United States. This important bit of information appears not to have been in the possession of either the Government or the lumbermen when the recent Order-in-Council was passed increasing the export duty on Canadian logs to $3. If it had been, it is reasonable to suppose that the duty would not have been increased at the present time. We believe the time will come when such a measure will be necessary. In the meantime, however, in deference to the expressed wish of Canadian lumbermen, and to allay the irritation which the carrying into force of the order has caused in the United States, the Government might well rescind the order until such time as a change of circumstances shall demand its reinforcement.

PROBABLY the largest gathering of millers ever held, will take place shortly in the city of Paris, France. It will be composed of members of the National Associations of France, Great Britain and Ireland, Germany, Italy, Belgium. America may also be represented, if enough members of the "National" Association can be got together for the purpose. Such a world-wide gathering as this should certainly result to the benefit of those engaged in flour manufacture. We should like to be in a position to suggest that a representation of Canadian millers should attend this important congress. In the present condition of the business in Canada, however, we scarcely know where money enough could be got for the purpose.

THERE is reason for the belief that a combination of brokers exists in Toronto, with the object of lowering the price of offal. This object has succeeded so well that the price at present is about $8 per ton—exactly half the figure for which it sold little more than a year ago. The price of offal reflects to a very large extent the condition of the milling business. When the price is high the miller as a rule will be found to be prosperous; and *vice versa*. It is estimated that a drop of one dollar per ton in the price of offal means a loss of three cents on each barrel of flour manufactured. As the price has dropped during the past few months at least six dollars per ton, it follows that the millers are losing eighteen cents on every barrel of flour manufactured. In the present condition of the milling business, 18 cents in many cases is more than sufficient to wipe out the miller's margin of profit altogether. We therefore urge millers to insist upon getting a fair price for their offal, and not allow themselves to be duped by speculators who may seek to bring undue influence to bear to depress prices in the interest of their own pockets.

A NATIONAL Committee on State and Municipal Legislation, having one member in each State of the Union, has been appointed by the National Electric Light Association of the United States. The important duties devolving upon the Committee are outlined as follows: (1.) An examination will be made of the laws in each State to see in what particulars, if any, the electrical industry can be benefited by securing any practicable change in such laws. (2.) All bills, affecting in any way the interests of the electrical industry, that were introduced at the last session of the Legislature of any State, but which did not become laws, will be examined to ascertain the tendency of legislation and to see if it is desirable that they should be passed. (3.) Whenever any legislation is desired in any State, or if legislation is proposed that is not desired, copies of the bill proposed will be furnished to the chairman of the committee. He will then furnish the member of the committee for that State such data, arguments and citations as he may be able to provide, to enable said member to place information in the hands of proper persons through whom the desired result may be secured. (4.) All work done in one State will be kept in printed form, so that it can be used at once in any other State. The work will thus become accumulative, and of such a thorough character as to be practically irresistible. (5.) No legislative measure or economic principle will be advocated in any manner in the name of the committee without the approval of a majority of the whole

number of its members, nor will the committee undertake to secure legislation in any State without the approval of the member for that State, and then only when sufficient preparation has been made to render success a reasonable certainty. (6.) Each member of the committee will recommend to the chairman an attorney for his State, who will receive and preserve for reference, copies of all documents published or approved by the committee to the end that if at any time it becomes necessary to employ counsel in that State, or if any special interest requires such service, said attorney will have the desired information and can represent the committee, or such special interest as may wish to employ him, and have at his command much of the data necessary to familiarize himself with the subject. (7.) All other considerations being equal, an attorney residing at the capital of the State will be preferable. (8.) The funds of the Association are not to be used for any of the expenses of this committee in any manner whatever.

THE time seems not far distant when the street railways in Canada will be operated by electricity. The first step in this direction has just been taken by the Woodstock Electric Light, Power and Railway Company, who have asked the council of that town to permit them to construct and operate a system of street railway with electricity as the motive power.

THE news comes from Ottawa that instructions have been issued by the Department of Railways and Canals for the opening of all the St. Lawrence canals from midnight on Saturday until six o'clock on Sunday morning and after nine o'clock on Sunday evening. This order is the outcome of the strong representations of Canadian forwarders, that by closing the canals the whole of Sunday they are being discriminated against, and that traffic is being diverted to the Erie canal, which otherwise would take the St. Lawrence route.

ARRANGEMENTS are in progress for the holding of an Electrical Exhibition at St. John, N. B., early in July. The following Companies have signified their intention of exhibiting: Standard Underground Cable Co; Holmes, Booth & Hayden; North American Phonograph Co.; Westinghouse Electric Co.; Western Electric Company; Edison Electric Lamp Co.; Electrical Annunciator Co.; The North Galvanic Battery Co.; The Julien Storage Battery Co.; The Law Telephone Co.; and John A. Roebling Sons & Co., New York City. Thompson-Houston Electric Co.; Simplex Wire Co.; American Electric Wire Works (Providence, R. I.); Bernstein Electric Co., F. W. Kimball, F. S. Pearson, Holtzar & Cabot, Nott Telephone Manufacturing Co., Frank Ridlon, Pettingall, Andrews & Co., Seth W. Fuller, C. C. Motor Co., Thomas Hall, and American Electric Register Co., of Boston, Mass. Canadian Electric Co., Amherst, Nova Scotia; The Calkin Electric and St. John Gas and Electric Companies, Messrs. Bromwell & Co., St. John, N. B.; The Thomson-Houston International Electric Light Company, and the Brush Electric Company, of Cleveland. The Exhibition, which will be in charge of an expert electrician, bids fair to bring together the largest variety of electrical appliances and novelties ever yet displayed. Readers of the ELECTRICAL, MECHANICAL AND MILLING NEWS will be kept fully posted concerning this novel and interesting exhibition.

A MEETING of representatives of the British grain interests was called by the Secretary of State for India on May 8th, to consider means for the improvement of the condition of wheat imported from India. We have not learned at the time of writing what the outcome of the conference was. After reading the following description of the methods employed in India for raising and preparing wheat for the European market, we are ready to agree in the opinion expressed by the London *Miller*, that under present conditions of rural life in the East, the most that can be hoped for is improvement of a very gradual character. Our London contemporary says: The ryot pursues (as his fathers and forefathers have pursued for thousands of years before him) a most primitive system of agriculture. In several parts of India wheat is grown side by side with gram or pulse, a custom which is responsible for the large quantity of this seed that is to be found in many shipments of Indian wheat. This inveterate habit is said to have its roots in the fact that wheat and gram severally absorb a different constituent of the soil, and that each flourishes best with different kinds of weather. Now the ryot reasons—and from his point of view he may be showing himself a shrewd man of business—that if he has two crops on the ground at once he is almost bound to win, however the season may go. This method of "hedging," to use a popular phrase, is highly inconvenient no doubt to the customers of the wheat raiser, but there is no evidence to show that at present, and perhaps for a long time to come, the cultivator may not find it distinctly to his advantage. Then, when the wheat is reaped, it is threshed on a threshing floor of dried mud, the flail being replaced by the feet of oxen, which detach little particles of earth from every portion of the floor and deftly mingle them with the grain. On the presence of other impurities inevitable to this process of corn dressing it is unnecessary to dwell, but it may be noted that the collection of wheat berries, chaff and miscellaneous foreign bodies left on the threshing floor, are gathered up and winnowed by hand in the wind, an operation which has, as might be anticipated, but little effect in removing impurities. These being the normal conditions of Indian agriculture, it is not surprising that grain merchants both in India and England should have introduced the practice known to the corn trade as "five per cent. refraction."

THE meeting of millers at Listowel a few days ago, has the appearance of being the first step in a determined movement to secure justice under our so-called "National Policy" for the great flour manufacturing industry of Canada. We sincerely hope that appearances in this instance will not prove to be deceitful.

Since the revival of the agitation for an increased duty on flour, we have had it in mind to speak a few plain words to the millers with regard to this matter, and as the present time seems fitting, we shall speak them now. We speak them with the best interests of the millers at heart, and trust that we shall not be misunderstood.

There are a number of things essential to the success of this movement. First of all, the millers must understand that if the objects sought are not attained as the result of the steps which are about to be taken, all hope of success may as well be forever abandoned. In a word, this is the millers' last chance to have their wrongs righted, and it behooves them to make the most of it. Thanks to the assistance of the daily press, public opinion has been aroused on this question as it perhaps never can be aroused again, and much sympathy is felt and expressed for the millers. This being the case, the time for action is now.

Action on the part of a few of the more energetic, wide-awake millers is not enough. Every miller in Canada must be wide-awake to the importance of the present movement, and must be willing to speak and work as though its success depended entirely upon his individual effort. If every miller will do this, we do not hesitate to declare that justice will be done the millers within twelve months.

The mill owners and mill employees in Canada number about 10,000 votes. They have the power to influence at the very least five times as many more. They have, as we have already said, the power in their own hands to secure fair treatment at the hands of the Government. Then, why has not fair treatment been secured long ere this? Simply because power accomplishes nothing unless exercised. The millers have not attempted to use their power; hence continue to groan under the burden of wrong treatment. What shall be said of the man who suffers injustice when he possesses the power to compel justice to be done him? Simply, that he deserves to suffer. The large majority of Canadian millers have shown no willingness to sacrifice either time or money to secure a remedy for the present state of things, consequently their condition has remained unchanged, and will so remain until the end of time unless those whose interests are at stake awake to duty. These are facts that the millers will do well to consider before entering upon a crusade against tariff injustice. If they are not prepared to work individually, collectively, unitedly, and with determination to succeed, the movement is foredoomed to fail, and had better not be attempted. On the other hand, if they are prepared so to work, their ultimate success is certain. To every miller individually we put the question: What do you propose to do about it?

The plan of action presented to the Listowel meeting by Mr. Plewes, of Brantford, may or may not prove prove practicable, but it has at least the merit of tangibility. Further than this, it recognizes the importance of securing the co-operation of the farmers, which is one of the most important objects to be attained. The farmers' interests are bound up with those of the millers in this matter. As yet the farmers as a class do not realize this. The millers have been competing with each other at every point for the privilege of paying the farmer the highest price for his wheat. The results to the farmers have been most satisfactory, but ruinous to the millers. The latter have paid more for their wheat than it was worth, thereby increasing the cost of manufacturing flour to a point which has deprived them of any profit. In other words, the millers have been cutting one another's throats for the benefit of the farmer. So long as they continue to do this, they need not count upon getting the help of the farmers in their attempt to secure the readjustment of the flour duties. Mr. Plewes' scheme for the millers to combine to keep the price of wheat down to an export basis, is a good one. If carried out, a portion of the load which the millers have been carrying will fall upon the shoulders of the farmers, who will then be able to see more clearly the identity of interest existing between themselves and the millers, and will quickly join hands with the latter to bring about the needed reform.

NOW that the question of putting all electric wires underground is being agitated in Toronto and other Canadian cities, it is well to look into the matter carefully, and ask: 1st. What is the cause of the agitation on the subject? 2nd. Is it possible to work all electric wires underground successfully? 3rd. Is it possible to attain the end sought by any other method than by burying the wires?

It is hardly necessary to discuss the first question at any great length, as it is now quite generally known that overhead electric light wires of any description are believed by the general public to be a source of imminent danger to life and property, and as far as telephone, telegraph, fire alarm, and other low tension wires are concerned, they, and the poles that carry them, are simply looked upon as a disfigurement to the streets, and hence the removal and burial of all electric wires is being demanded by civic authorities.

As regards the second question, it has been demonstrated by practical experience that it is quite practicable to work telegraph, telephone, fire alarm, and other low tension wires underground successfully, and in order to demonstrate this fact, we have only to look at the experience of New York, Chicago, Philadelphia, Boston, Detroit, Buffalo, London, England, and others of the larger cities, the authorities of all of which unanimously agree that the question of placing of such wires underground has now been practically solved, and that outside of the expense and the inconvenience caused by the opening up of the streets, there is no reason why overhead wires and poles of this description should not be immediately removed. In regard to wires carrying low tension currents for incandescent lighting, it has been found that they will work fully as well underground as overhead, provided that the very best of insulation is used, and that the details of the work are carefully carried out under the direct supervision of a skilled expert. There is, however, at least one difficulty to be surmounted in the burial of incandescent electric light wires, and that is the question of house to house or general distribution of the current from the main conduit or leads. This is generally accomplished by branching of wires from the manholes in the streets to the subscriber's premises, necessitating the frequent tearing up of the pavements and a portion of the streets, which is of itself fully as great, if not a greater source of danger and inconvenience than an ordinary pole line. In regard to wires carrying high tension currents of 1000 volts or more for arc lighting, and for the alternating system of incandescent lighting, although there are many places where such wires are at present working underground, still the expense of keeping them in proper working order is found to be such that the companies operating them have either to double their rates or else withdraw from the business altogether. It is true that the civic authorities in New York city are at present forcing all the companies to bury their wires, but what is the result? Gas explosions in the conduits are of frequent occurrence, workmen are instantly killed while working in the man-holes, and the lighting service generally is poor and unreliable.

Now let us consider the third question. With regard to the telephone wires, their number is increasing so rapidly and their underground working has proved so successful, that there is little doubt but that they will all have to go underground ultimately. Almost the same may be said of telegraph, fire alarm, and low tension electric light wires, but when it comes to the high tension arc light wires the case is entirely different, and the companies operating arc lights and alternating system incandescent lights, have certainly excellent reasons for fighting the movement to compel them to bury their

wires. If these companies were to adopt the underground system in the Canadian cities (where high tension stations are operated on a much closer margin of profit than in the American cities where the field is larger), they would be compelled to at least double their rates, and the question here arises as to whether the odds gained by burying the wires are not more than offset by the consequent increase in rates and unreliable service rendered. It is not our purpose here to go into details in order to show why the higher tension wires do not work successfully underground, as the reasons are only too well known to the electrical fraternity, but we wish to draw the attention of the authorities of Canadian cities to the fact, that it is perfectly feasible for electric light companies to build pole lines in such a manner that they would be an ornament instead of an eyesore to the streets, and at the same time the danger from accidents would be entirely removed. It does not seem to be recognized by the general public that the liability to accidents from high tension electric light wires is almost entirely due to the fact that the insulation of the wires in general use in Canada is not waterproof, the consequence being that in moist or rainy weather the wires are almost as dangerous as if they were bare, and if a telephone wire (or any other conductor in connection with the earth) comes in contact with them, the deadly current is diverted from its proper course and in all probability will deal death to some unsuspecting individual before the trouble is discovered and removed. Now, there is no necessity whatever for the existence of this state of affairs, as there are any number of makes of wire on the market at present provided with insulated covering that, besides being absolutely water-proof, is so tough and durable that it will stand abrasion for years without cutting through to the wire. It is easily seen that even if wires of this description were to come in contact with other wires, the current would not be diverted from its course, and consequently no harm could possibly result. Of course, in order to build a neat and safe pole line, it is necessary to use nothing but the very best of material, but as the cost of these is but a trifle compared with the expense of burying the wires, it will be found that electric light companies generally would willingly rebuild their pole lines to the satisfaction of the civic expert, if offered this as an alternative to placing their wires underground. These being the actual facts of the case, we contend that by far the wisest course for civic authorities who are dissatisfied with the overhead wires, would be to compel the burial of all low tension wires within a reasonable time, and at the same time compel the companies operating high tension wires to rebuild their overhead lines in a safe and sightly manner, and to allow these companies to operate their overhead lines until such time as some perfectly practical method is discovered for working high tension wires underground as successfully as *low tension*.

Let us now glance at the results of such a policy and we find, that the mass of telephone and telegraph wires which form by far the largest portion of the overhead system have entirely disappeared, and in their place we see nothing but a single line of straight neatly painted poles bearing a small number of properly insulated high tension wires securely attached to their supports in such a manner that it impossible for one of them to fall, which indeed would now make little difference, as the insulation is calculated to stand abrasion and handling; and besides, there are now no other wires above ground to get crossed with the high tension. At first glance it may seem absurd to seemingly highly favor the high tension companies, but when we consider the many sweeping objections to the burial of their wires, we cannot but feel that for the present at least, it is to the public interest that all high tension wires of 1000 volts or over should remain above ground, subject to the restrictions enumerated above.

ELECTRICAL TERMS.

WE, in common with most of our mechanical brethern, use electrical terms with "fear and trembling," always looking forward to the inevitable electrician's letter saying "how stupid." Our present purpose is not to define electrical terms, but to suggest a method of arriving at their meaning, by comparison with those applied to dynamic qualities. The terms now in use are the result of a learned commission appointed by the British Association in 1863, who, after eight years of effort, produced the "volt," "ohm," "ampere," "coulomb," "watt," *et al.* We mean the values these terms apply to.

The "volt" is a measure of electro-motive force, or original energy. Corresponding to the dynamic term "pressure," but not of "power." It is based upon the product of one Daniell cell of a battery.

The "ohm" is the measure of resistance, and compares to the dynamic term of "loss by transmission." It is based on the resistance offered by a copper wire .05 inch diameter, 250 feet long; or a copper wire, 32 gauge, 10 feet long.

The "ampere," is the measure for current, or what passes; the intensity it may be called, and is comparable to the dynamic term of "power transmitted," or "effect." It is the residual force or one "volt" after passing through one "ohm" of resistance.

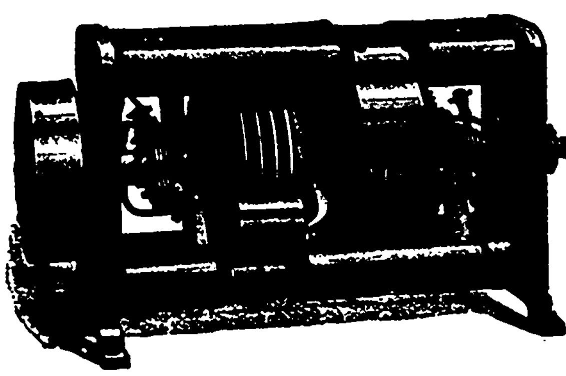
The "coulomb" is a measure of current, qualified by time; one ampere acting for one second of time, comparing in nature with the dynamic "foot pound."

The "watt" is the unit for dynamic effect produced by electro-motive force, or current. It equals 44.22 foot pounds, or 1,746 horse-power.

These terms, and many more, are derived from the names of celebrated electricians and scientific men. The reasons for a new and distinct nomenclature is the minute quantities to be dealt with, and also the want of dynamic terms to fit the peculiar conditions.—*Industry.*

THE "BALL" DYNAMO.

THE accompanying illustration shows the Ball Dynamo, as manufactured by the Ball Electric Light Company, Toronto. It is made of wrought iron, end frames, bars and poles (a feature of the Ball Dynamo alone, and covered by patents), the object being to obtain the most economical field. The poles are widely separated, and there is no leakage of lines of force from wing to wing of poles. A bar of iron of a field magnet is nearly saturated as it approaches its poles. The lines of force have a tendency to escape and close through air. In the Ball Dynamo, as can be seen from the illustration, each armature takes any loss of magnetic force that was intended for the other armature. The mechanical parts for holding the commutator and driving armature, are constructed of gun metal, and afford



no passage-way for the magnetic lines of force other than through the cores of the armature. These mechanical details are so constructed as to form no closed loops or large masses of metal for generation of waste or Foucault currents—a feature peculiar to the Ball machine, and covered by patents. By taking a given weight of wire and spreading it over two cores, as in the Ball Dynamo, the iron of each armature is brought much nearer the pole pieces than is possible with single armature machines, and the average distance of the copper wire from the poles is much less; hence the manufacturers claim a greater output from the Ball than from any single armature machine; also that when a given amount of copper wire is wound on two cores instead of one, the average distance of wire to core is less, and the wire is wound with greater economy. Another economical advantage claimed for this dynamo is, that having two armatures, the heat and energy lost in both from Foucault currents will be but half that of a similar core revolving before both poles or full field.

As will be seen by reference to the cut, the machine is so constructed that the force of pull of belt, magnetic pull of armatures by pole, and the force of gravity, balance and neutralize each other. The pure and simple Gramme armature is used—an endless iron ring entirely surrounded and covered by an endless coil of insulated copper wire. It is impossible with this armature to be troubled by its striking through or burning to the core, as the core is electrically connected with nothing, and protected for all time by its continuous and solid surrounding of insulated copper wire from having its insulation affected by dust or moisture. The Ball machine has two armatures. Each armature raises the tension one-half of the full machine, thus reducing by one-half the electrical tension. The dynamo is coupled with the armatures as terminals, and the field circuit between them. By this method it is impossible for the field or any part of the dynamo to be subjected to more than one-half of the tension of the machine, and, as it is impossible for the core to become electrically connected with frame of machine, the field is practically subjected to the tension of its own resistance only.

ST. JOHN, N. B., MILLS.

BELOW we republish from the St. John *Sun* a table showing the extent of the milling industry in the St. John district during the past year. It has been compiled with a view to presenting in as clear a manner as possible the character and capacity of the St. John mills:

Amount paid for Wages.	$ 29,000	28,800	17,400	65,300	41,000	24,160	80,000	20,700	15,000	12,500	4,000	20,800	22,800		3,750	600	2,160	5,075	$395,045
Wages per week.	$ 1,150	800	600	1,700	1,000	755	2,000	650	600	500	500	800	600		75	50	80	175	$12,015
No. weeks operated.	26	30	20	30	41	32	40	32	25	25	[illegible]	25	38		50	12	30	20	524
Number Hands.	145	100	60	180	125	100	300	70	60	70	75	110	90	85	9	7	9	15	1,511
Headings Pieces.	70,612	30,000				25,000	175,000			100,000									400,812
Staves Pieces.	708,219	20,100	500,000		78,500	105,000	2,000,000												3,411,819
Clapbo'rds Pieces.					32,000		495,000						200,000						992,000
Number Boxes.					3,000			200		280,000				¶	81,000				364,200
Laths. Pieces.	13,177,000	9,000,000	7,500,000	17,000,000	11,319,000	13,000,000	13,000,000	800,000	700,000	8,000,000	1,200,000	6,750,000	4,000,000	¶			200,000		105,446,000
Shingles Pieces.	2,990,000	3,000,000		10,000,000			32,000,000							¶	250,000	400,000	700,000	9,000,000	58,340,000
Deals, Boards, etc. Spll. Feet.	16,607,000	10,000,000	9,000,000	23,295,000	14,086,863	15,621,000	19,500,000	10,000,000	10,090,000	9,130,000	2,000,000	7,781,065	10,000,000	¶			3,000,000		157,026,928
Heading Machine.	1				1	2	1		1					1					7
Stave Machine.	1		2			2	2							1					8
Clapboard Machine.				1	1		2												4
Box Machine.				1	1		12	1		1		1		1	1				19
Paling Machine.										1			1						2
Lath Machine.	3	2	2	2	2	2	3	2	2		2	2	1	1			1		27
Shingle Machine.	1	2	1	10					1				1		2	1	1	4	24
Muley.				1	1										1				3
Single Saw.		1			2						1		1	1					6
Rotary.			1			1	1	1	1	1							1		7
Gangs.	2	2	1	1	2	1	2	1	1	1	2	2	2	1					21
NAMES.	Randolph & Baker	S. T. King & Sons	George E. Barnhill	Miller & Woodman (2)	Andre Cushing & Co.	Marble Cove Mills*	Stetson, Cutler & Co. (2)	James R. Warner & Co.	Chas. Hamilton & Co.	Hilyard Bros.	Kirk & Daniel	R. A. Gregory	E. G. Dunn	Clark Bros.	D. W. Clark & Son	Robert Roberts & Son	M. E. Cowan & Son	John McMulkin	Totals

*W. H. Murray, manager.
¶Not operated last year.

In addition to the above there is a one gang mill located near Millidgeville, of which no authentic data could be obtained. All the above mills save Randolph & Baker's and Chas. Hamilton & Co.'s have at some time in their history been destroyed by fire. The Messrs. Miller and Woodman, Andre Cushing & Co., and Hilyard Bros., have been the chief sufferers. Each of these firms are now opening their third mill, the former one having been swept away by the flames.

The lumbermen of Nipissing and Algoma are said to be expressing fears that the unusually low water in the rivers and creeks this spring will greatly retard, if not quite prevent, the transport to market of much of the square timber and log cut of the past winter. Unless the timber districts are favored with a heavy rainfall soon, many will suffer heavy loss. Those which reach Quebec will doubtless realize good prices on account of the reduction in the supply called for this year.

The mills to be erected on the Fraser River at New Westminster, B. C., by the McLaren-Ross Lumber Company, will be the largest on the coast. Every portion will be of the strongest character. The main mill will be 445 feet long by 72 feet in width, and supplied with band mills, circulars and gangs, all of the most approved makes. The Company have secured valuable and extensive timber limits from both the Provincial and Dominion Governments, comprising a large quantity of red cedar. The site is an admirable one and the shipping facilities excellent.

JOTTINGS OF A TRIP OVER THE MARITIME PROVINCES.

By L. A. Morrison.

I CONSIDER it to be quite within the range of any intelligent mechanic to form a fairly correct estimate of the growth, extent and condition—past and present—of the mechanical appliances and development of any country by a visit to its machine shops.

To illustrate: I remember, in 1877, having a call from a wide-awake salesman of an American tool building concern, who, on his way eastward over the Province of Ontario, stopped over in Toronto for a day or two. In the course of conversation, he remarked: "This is my first visit to Canada, and I am astonished to find the machine business so dull, and your mechanical men and your machine shop equipments apparently so far behind our average shops in the United States. I note, with very few exceptions, your shops are poorly arranged, badly ventilated, worse lighted, having old-style, old-fashioned tools in them; your method of doing work in almost every department seems to be old-fashioned, and before your machine men can make any money in competition with our shops, they will require to modernize their shops and tools, and adopt a better method and system of production. I am especially astonished to find a city the size of this city of Toronto without a machine shop worthy the name."

This impeachment was literally true, as any one cognizant of the condition of things in mechanical matters in Ontario during the years from 1874 to 1880 can bear testimony, and although having no desire in any way to say an unkind or uncharitable thing of the masters' shops, tools, mechanical appliances and methods of production of these Provinces, I shall endeavor to point out where I consider they are at fault or behind the times, and at the same time suggest where improvements may be introduced along the line of either local or provincial need.

* * *

Some of the larger manufacturing concerns in both provinces have a fairly good equipment of tools for their work—modern in their build and capable of producing work up to the measure of similar tools anywhere in the same branch of industry—but the arrangement of the shops, the placing of the tools, the convenient handling of the production, the system that takes the raw material in at one end of the shop and keeps it on the move until it passes out finished at the other end of the shop, seems to be lacking in almost every one of them. A good deal of hurry-scurry, carrying work back and forward more than is profitable or necessary, is done in all of them. Shops were evidently built piece by piece and little by little, as the necessities or demands of the business required the extension, so that in some of them, where a remunerative business is being done even, a fire would not be an unmixed evil, as it or any other radical cause that would result in a modern outfit and the adoption of improved methods and appliances would make the business interested much more profitable.

If, however, what I have said of the *best shops* is true, then the condition of the ordinary jobbing machine shops can be easily understood. In these, scattered over the two provinces, it is a matter of astonishment to a progressive Westerner that any money at all can be made by the proprietors. Of course there are exceptions. A number of the general jobbing shops in Nova Scotia and a few in New Brunswick, are pretty well arranged, and have a fairly good equipment of tools, some of which, although not modern, are fairly well adapted to the work being done, but in almost all the jobbing shops the tools are old-fashioned, having been purchased twenty, or thirty, or forty years ago.

The rating of some of these old concerns (who cannot possibly be making money at the present time), shows that they must have done both a considerable and profitable business in years past.

* * *

Natural privileges are not always taken advantage of by our Eastern brethren any more than by ourselves. (1.) *Light.* It is not a very expensive affair in any machine shop to keep the windows clean, nor does it cost a great deal to sweep down the walls once a year, and give them a coat of whitewash. It pays well to do it; men can do better work, and more of it with better light. (2.) *Order.* I do like in a machine shop to see a rack for the boring bars, a box for nuts, a box for bolts, another for cap screws, another for set screws, a corner in which to put cuttings and short bars, shelves for castings, &c., &c. in short, a place for everything, and everything in its place. I saw some machine shops in New Brunswick with piles of *debris* in every convenient place over the floor, with no evidence that there had been a straightening up in the shop since it was built, away back in the "forties," and every one of those heaps representing from $25 to $500 in cash.

* * *

It is evident from the smallness of the staff and the general appearance of some of the shops, that a considerable portion of the machine business which ought to be done by the local men in the provinces, is done by the more progressive Ontario manufacturing concerns, who can bring the iron from Nova Scotia, pay five to six dollars a ton for coal, manufacture the raw material into tools, machinery, engines, boilers, etc., and pay a dollar per hundred weight of freight back into these provinces, and undersell local shops right in their own legitimate market. This ought not to be so. With abundance of raw material, with coal costing not over two dollars per ton; with plenty of room to build commodious shops; with first-class tools to be obtained, and mechanical skill within easy reach, I do not hesitate to say that the manufacturing concerns of these provinces are in a far better natural position to supply goods to Ontario and the other provinces, than Ontario and the other provinces are to supply manufactured goods to them.

ONTARIO MILLERS PREPARING FOR ACTION.

A LARGELY attended and very enthusiastic meeting of millers was held at Listowel, Ont., on May 21st, to consider what steps should be taken to improve the condition of the milling business in view of the unfair operation of the existing tariff on flour.

The meeting was held under the auspices of the local Millers' Association of the counties of Huron, North Grey, Wellington and Bruce. There were present, however, prominent millers from Toronto and other points outside the boundaries of the Association. The attendance included the following: Messrs. J. C. Hay, Listowel, president; W. B. Hutton, Wingham, secretary; John Carr, Wingham; A. H. Plewes, Winnipeg; Wm. Austin, Cargill; John Lee, Walkerton: J. McFarlane, Dumblane; D. Plewes, Brantford; Archibald Fisher, Paisley; Jacob Steinmiller, Walkerton; Hodd & Co., Stratford; George Elphick, Pinkerton; Thomas Wilson, Harriston; N. Wenger, Ayton; McKechnie Bros., Durham; James Pringle, Stratford; Henry Cook, Hensall; A. Watt, Palmerston; Moyer & Co., Listowel; Howson & Co., Teeswater; W. G. Hay, W. F. Hay, Listowel; R. B. Clement, Walkerton; Stewart & Lowick, Brussels; Williams & Co., Zurich; James Fair, Clinton; James Stark, Paisley; W. Hagerman, of Dodds & Co., Orchardville; Robert Black, Gorrie; Thos. Gibson, Wroxeter; John Brown, Citizens' Milling Co., Toronto, and Wm. Stark, of Stark Bros., Toronto.

The President briefly explained the reason why the meeting had been called, and stated, as had been already intimated, Mr. David Plewes, of Brantford, had a plan arranged which it was intended to present, and which if adopted by the millers of Ontario would, he thought, go a long way towards obtaining the measure of relief wanted, if it did not produce the full effect desired.

Mr. Plewes, whom he then called on, was received with applause, and in a pointed speech reviewed the history of the millers' difficulties, and how, when they asked, begged, and petitioned the Government either to decrease the duty on wheat or increase the duty on flour, the statesmen at Ottawa had met them with promises, assurances, and smooth answers; but how the change that they wanted never came. Mr. Plewes therefore saw nothing before the millers but to take up their own cause and fight it as best they could, and the only remedy that suggested itself as being practical in its application and immediate in its results was to force down the price of wheat to a figure at which it was possible to export, and at once raise a howl among the farmers, who would at once see that the millers were compelled to do so, and would press upon the Government in the shape of votes the extreme advisability of making a change in the millers' favor. The scheme proposed is that a convention of the millers of Ontario be called in Toronto at an early date, and that an association be then formed with a constitution somewhat as follows:—

Clause 1.—*Entrance Fee.*—There is to be an entrance fee as follows: Fifty barrel mill, $5; 100 barrel mill, $10; larger mills, $15 to $20.

Clause 2.—*Forfeits.*—There shall be a forfeit put up by each member as follows: 50 barrel mill, $100; 100 barrel mill, $200; larger mill, $300, $400.

Secretary.—There shall be employed by the association a paid secretary, who shall visit all points to explain the scheme to the millers, and influence them to join the association, also to arrange where there are sufficient mills to use all the wheat in the neighborhood, and when such millers become members this point shall be a closed point, debarring all other members from buying directly or indirectly at such point.

Open Points.—Any miller refusing to become a member shall be treated as follows: His point shall be considered an open point, and the secretary shall arrange for any member to buy there permanently.

Appeal Committee.—As soon as the secretary has arranged for the closing or opening of any point after a personal visit, he shall submit his plans for the same to a committee appointed by the association for approval or readjustment, and shall discuss every feature of the said plan at such committee meeting, but shall thereat have no vote. When the secretary and committee have finally arranged all available places, a mass meeting shall be called to discuss the scheme and adopt it. We do not ask or expect purely wheat exporters to join us, as if wheat touches an export basis the surplus flour will move out of the country instead of being sent to the provinces on consignment, and there will our trouble cease.

Testing Wheat.—That all Canadian wheat bought by members of the association be subject to the same test as farmers' wheat bought by tester.

It was then moved by Mr. W. G. Hay, seconded by Mr. N. Wenger, that this meeting do recommend the millers of Ontario, who may be assembled at a mass meeting at Toronto, to adopt Mr. Plewes' idea or a suitable amendment thereof, as a means of securing the rights and privileges which properly belong to them.

Moved by Mr. Jas. Stark, seconded by Mr. N. Wenger, that in view of the fact that the people of the maritime provinces of Canada have declared against granting an adequate measure of protection to the manufacturers of breadstuff in Ontario, and that whereas the duty on soft coal has been retained as a set off against the duty on breadstuff, be it therefore resolved that we, the millers assembled in this meeting, humbly petition Her Majesty's Government at Ottawa to abrogate the duty on soft coal, and that the Boards of Trade, Manufacturers' Associations, and Farmers' Institutes be asked to co-operate with this association with a view to forcing the maritime provinces to grant us justice.

A resolution was also adopted asking the millers' section of the Toronto Board of Trade to convene the millers of Ontario at Toronto at as early a date as possible, and to lay the question before them.

THE STARTING OF THE DYNAMO-ELECTRIC CURRENT.

A DYNAMO-ELECTRIC current is a magneto-electric current which is reinforced by the mutual action of the current and the magnetic field. In order, therefore, that any dynamo-electric current may be started, there must be some residual magnetism to enable the machine to work as a magneto-electric machine.

It is, however, by no means true that any, however small, residual magnetism will give rise to a dynamo-electric current. The fact is, that it is essential that the speed should exceed a certain number of revolutions per minute; and this speed depends on the amount of the residual magnetism. There is thus for every machine a certain critical speed.

This statement may be verified by experiment. A machine is given the residual magnetism (r) by a current from some external source, and it is then driven at a speed n. If there is some kind of current meter in the circuit, it will indicate either the existence of a very weak current or the pointer will be driven far up the scale. In the former case n is less than the critical speed, in the latter greater; in the former it is only a magneto-electric current which is set up, in the second it is true dynamo-electric current.

The experiments made by the author on a Gramme and a Siemens machine go to confirm the exactness of Clausius' theoretical deduction, that for slow speeds the machine gives no (dynamo-electric) current; but it first begins to work after having reached a certain speed. The two cases are, however, not exactly similar, as Clausius considered that the machine first began to run at a very slow speed which gradually increased; while in the author's case the speed is always below the critical, so that no dynamo-electrical current will be produced however long the machine is kept running.

The question may be looked at from another point of view. In the first instance, the residual magnetism (r) produces a magneto-electric current $p\,r\,n$. This current produces a magnetic field $p\,r\,n.\,q$, which again gives rise to a current $p\,r\,n.\,q.\,p\,n$, and so on. The current can therefore be expressed by the infinite series:

$$i = p\,r\,n\,(1 + p\,q\,n + (p\,q\,n)^2 + (p\,q\,n)^3 + \ldots).$$

This series is convergent or divergent, accordingly as n is less or greater than $1/p\,q$—*i. e.*, accordingly as n is equal to or greater than a certain value which is constant for the same machine. In the above series, q is not a constant, but a quantity into which r enters as a factor, hence it follows that the critical speed decreases with an increase of the residual magnetism—a conclusion which is confirmed by the experiments.—*Annalen der Physik und Chemie.*

Johnston & Blair's shingle mill at Uhthoff, which was burned a short time ago, is being rebuilt.

STEAM BOILERS AND BOILER JOINTS.

By O. P. St. John, Steamboat Inspector, Toronto.

[*Continued from last month.*]

In calculating the strength of a boiler joint we have to consider, first, the strength of the plate left between the rivet holes, and, second, the strength of the rivets to resist shearing.

We will take for example a piece of plate 4 inches wide and 1 inch thick, giving a sectional area of 4 square inches of plate. Now, if at one edge of that plate we drill a hole 1 inch in diameter, we have 3 square inches of sectional area of plate left, or ¾ of the strength of the solid plate. From this we obtain the rule for ascertaining the percentage of plate left between rivet holes, which is

$$\frac{\text{Pitch minus diameter of rivet hole}}{\text{Pitch}} \text{ or } \frac{P - D}{P} = \text{per}$$

centage of strength of plate at joint as compared with the solid plate. If we take a second strip of plate 4 inches wide and join it at the edge of the first piece, we have a strip 8 inches wide; drilling an inch hole in the edge of this plate, we have 2 holes, each one inch in diameter, and subtracting this from the total 8 inches leaves us 6/8, or ¾ = .75 %. So that the result is the same whether we take the whole width of the plate and subtract the sum of the diameter of the rivet holes, or if we take one pitch and treat it by itself. This is assuming that the rivet holes are uniformly spaced. In the example before us we have therefore .75 % of solid plate left between rivet holes. We next have to consider the shearing strength of the rivet, and for this purpose we assume what has been found by experiment to be approximately correct, viz., that the ultimate resistance to shearing is proportionate to the sectional area of the rivet, and that its strength in that direction is practically the same as its tensile strength. Such being the case we have the sectional area of the rivet in the example given .7854 of one square inch. Comparing this with the strength of the solid plate, we have

$$\frac{\text{Area} \times \text{No. of rows of rivets} \times 100}{\text{Pitch} \times \text{thickness of plate}} = \frac{.7854 \times 1 \times 100}{4 \times 1} = .19635 \%$$

a trifle over 19½ per cent. *of the strength of rivet* as compared with the strength of the solid plate. As the strength of a joint is the strength of its weakest part, we have here 19½ per cent. as the strength of the joint compared with the solid plate. There are three ways in which we can make the strength of plate and strength of rivet more nearly approximate. First, by putting in larger rivets; second, by placing the rivets closer together, and, third, by double or treble riveting the seam. The first plan is objectionable, as the rivets become too large to drive well, and also because they have to be placed so far back from the edge of the plate to obtain a sectional area of metal in front of rivet equal to the area of the rivet. The second plan, that of placing the rivets closer together, while it increases the percentage of strength of rivet, proportionately decreases the percentage of plate. Example, with plate 1 inch thick, rivets 1¼ inch diameter, and pitched 2½ inch centres, we would have $\frac{2.5 - 1.25}{2.5} = 50\ \%$ of plate as compared with solid plate.

$$\frac{1.25 \times 1.25 \times .7854 \times 1 \times 100}{2.5 \times 1} = .94\ \% \text{ of rivet as compared}$$

with solid plate. I may say here that it has been found that about 57 per cent. in single riveted lap joints, and about 70 per cent. *in double riveted lap joints, are the* best results that can be obtained, and this is possible only when the diameter of the rivet is about ½ greater than the thickness of the plate.

We next come to the third means of overcoming the difficulty, that is, by double riveting the seam, and to illustrate this I will take a fresh example. Assume the plate to be ½ inch thick, the rivets to be pitched 2½ inches apart, and the rivet holes to be ¾ inch diameter,

$$\frac{2.5 - .75}{2.5} = 70 = \text{strength of plate as compared with solid}$$

plate.

$$\frac{(.75 \times .75 \times .7854) \times 2 \times 100}{2.5 \times .5} = .70\% = \text{strength of rivet as}$$

compared to solid plate.

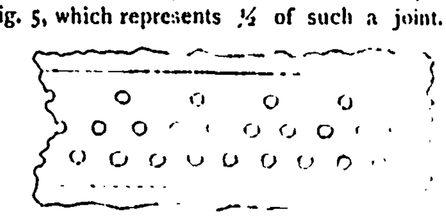
There are two styles of double riveting in common use, one in which the inner row of rivets is placed directly back of the outside row, and which is called "chain riveting," and the other in which the inner row of rivets is placed between the outer row, which is called "zigzag riveting." This latter is the form more commonly used and is the best, as the strain is more evenly distributed throughout the plate, and is more likely to make tight work.

In the examples made use of thus far, you will observe that we have assumed the diameter of the rivet to be the same as that of the rivet hole. If we could depend upon the rivet holes being perfectly fair and true in all cases, and upon the rivets being driven so as to completely fill the rivet holes, we might safely assume such to be the case; but, as you are all well aware, no matter how fair the holes may be drilled in the first place, when the plates come to be riveted and laid up close, there will be more or less of a variation in the holes. In addition to this it has been found that the shearing strength of rivets varies with circumstances. With steel plates and iron rivets the shearing strength was found to be less than where iron plates of about the same quality as the rivets were used. This was probably owing to the harder nature of the steel, and it is probably for this reason, that the Imperial Board of Trade require that steel rivets shall be used with steel plates, and iron rivets with iron plates. For the reasons I have just mentioned, it is necessary to have the percentage of rivet section exceed the percentage of plate section. The Board of Trade rules require that in the case of iron plates and iron rivets, the rivet section shall exceed the plate section in the proportion of 13 to 8, and in steel rivets and steel plates, the excess shall be as 28 is to 23. Taking the illustrations last used of ½ inch plate with ¾ inch rivet holes pitched 3½ inches apart, we have the section of plate equal to 70 per cent. of the solid plate. To meet the requirements of the Board of Trade we would require, if the rivets were iron,

$$\frac{.70 \times 13}{8} = 1.13 \text{ of rivet section, that is, the rivet section}$$

would require to be 13 per cent. greater than the solid plate. If steel rivets were used, the rivet section would require to be $\frac{.70 \times 28}{23} = .85$ per cent. of the strength of the solid plate. The next question is, how shall we obtain this increased rivet section? There are two ways in which it may be done. First, by putting another row of rivets, making the joint treble riveted, and second, by butting the edges of the plates, and covering the joint with a "strap" (or fish plate, as it is called) on the inside and outside. By this means we sometimes subject the rivet to "double shear," or in other words, the rivet has to be cut in two plans before the *plates can be pulled from between the butt straps.* We can safely assume that by this means the shearing strength of the rivet is increased 75 per cent., besides which we preserve the circular form of the shell or cylinder. There is another element of strength in the double butt strapped joint, which is, so far as I know, seldom taken into account, and yet is no small factor in making up the total strength of the joint, that is, the friction of the plates which are held between the straps as in a vise. Some very interesting experiments have been made with a view to ascertaining the amount of friction caused by the contraction of rivets in cooling. Mr. E. Clark, in his work on the Brittania and Conway tubular bridges, gives a very interesting account of a series of such experiments made by him. In his work on "Ship Building," Mr. E. J. Reed records some similar experiments of a detailed description, from which I quote as follows: "Three plates were united by what is known as a 'chain joint'—that is, the ends of the two outer plates overlapped the end of the middle plate. The connection of the plates was made by three rivets passing through the lap, the rivet holes in the outer plates being filled by the rivets, but the bearing surface of the holes in the middle plate being slotted out. It will thus be obvious that when a tensile strain was brought upon the middle plate, the amount of the friction could be measured by the force, just able to produce a sliding motion. The breadth of the lap was 3 diameters, the rivets were a diameter clear of the edge of the plates, and their pitch was four diameters. There were two sets of experiments made with iron plates and rivets, and in each set two experiments were made with rivets having heads and points snap headed, two others with rivets having pan heads and conical points, and the remaining two with rivets having countersunk heads and points. The experiments were made in duplicate, in order to reduce the chance of error. The first set of experiments were made with ½ inch plates 8¼ inches wide, the rivets being ¾ inch diameter." The result obtained showed that the mean friction per rivet was 4.61 tons per rivet. With plates 11 inches wide, ⅞ inch thick, and rivets 1 inch diameter, the mean result of a similar set of experiments, showed the friction to be 5.6 tons per rivet. From the result of these experiments, it is quite within the range of possibility that a properly constructed butt joint with double straps, may be actually stronger than the solid plate. When we realize the tremendous force confined within a steam boiler, it is not prudent to place much value upon the element of friction, which is necessarily dependent on circumstances, which cannot in all cases be determined.

From time to time many ingenious devices have been brought forward to construct a joint that should have a strength more nearly approaching the strength of the solid plate, and I shall close my address to you this evening by giving you an example of a joint which appears to be coming into general use in Great Britain, and which is approved by both the Board of Trade and "Lloyd's" Surveyors. In this joint the seam is butted and double strapped, with three rows of rivets on each side of the joint, the two inner rows on each side being pitched in the usual manner, so as to give from 60 to 70 per cent. of the solid plate. Each alternate rivet in the third or outer row, on each side, is left out, as shown in Fig. 5, which represents ½ of such a joint. The



claim for this joint is that before the plate at the inner or smaller pitch can tear asunder, at least 1 rivet in each group or section must shear, consequently, such proportion of the rivet section can be added to the percentage of plate in the smaller pitch. In Fig. 5, there are 5 rivets in each section, consequently 1-5 the rivet section could be added to the percentage of plate at smaller pitch. Assuming the thickness of plate in the above Figure to be 1 inch, diameter of rivet holes 1 inch, smaller or inside pitch 3½ inches, larger pitch 7 inches, the calculation of the joint would be as follows,

$$\frac{(3.5'' - 1'') \times 100}{3.5} = 71 \text{ per cent.} = \text{strength of plate}$$

at smaller pitch.

$$\frac{(7'' - 1'') \times 100}{7} = .857 \text{ per cent.} = \text{strength of plate at}$$

larger pitch.

$$\frac{100 \times 23 \times .7854 \times 5 \times 1.75 \times 5.1}{5 \times 28 \times 7 \times 1} = 822 \text{ per cent.} = \text{percen-}$$

tage of strength of all rivets.

Now adding 1-5 the strength of all rivets to the percentage of plate at smaller pitch we have $71 \times \frac{822}{5} =$ 874 per cent. = percentage of combined plate and rivet section.

We have then the three percentages to work with

1st. Percentage of plate at larger pitch = 857.

2nd. Percentage of combined plate and rivet section = 874.

3rd. Percentage of all rivets = 822.

This last percentage being the smallest of the three, is the one to be used in the calculation of the allowable working pressure on the boiler. There are several varieties of joints constructed on much the same principle as the one I have just shown you, but time will not *permit of my giving any further illustrations* to-night. There is also a joint known as the diagonal joint, which is claimed to approach very nearly to the strength of the solid plate, but I must confess that I have not given it much attention, and therefore am not able to give you any information in regard to it.

In what I have said to you to-night, I do not claim to have advanced any opinions of my own, or to have given you any new facts. I have simply endeavored to place before you in as plain a manner as possible, information that I have been enabled to collect from various sources, and if I have been enabled in any degree to interest and instruct you, I shall feel amply repaid for any trouble I may have taken in preparing this address.

THE SITUATION AS VIEWED BY OUTSIDERS.

CERTAINLY the millers of Canada are in a distressful predicament, not of their own seeking or making, from which the Dominion Government could easily and promptly relieve them by either abolishing the 15-cent duty on imported wheat, or by advancing the duty on imported flour. Under the present conditions the duty in Canada actually discriminates against the Canadian miller to the extent of 20 cents on a barrel of flour, and to that extent in favor of the American miller who sends flour into Canada. The reasons for refusing to place the Canadian millers at least on a level footing with their American competitors are purely political, and they are also purely discreditable. There is no good reason why Ontario and Manitoba should be sacrificed for the benefit of New Brunswick and Nova Scotia, but they are thus sacrificed to-day.—Buffalo *Milling World.*

An English inventor endeavors to increase the efficiency of the heating surface in steam boilers by placing within the tubes a number (eight or more) of ribs running nearly from end to end. These ribs project into the space through which the gas flows and offer a large surface for the absorption of heat. In addition to this they penetrate into the hot centre of the gaseous column. Trials with and without the ribbed tubes show an average gain in evaporation of 20 per cent. in favor of the ribbed tubes.

THE MILLERS' GRIEVANCE.

TORONTO, May 20th, 1889.

Editor ELECTRICAL, MECHANICAL AND MILLING NEWS.

DEAR SIR,—The millers of Ontario and Manitoba have a grievance, and such a real one, that it is sure sooner or later to involve not only the whole agricultural community, but also the manufacturers in general. The history of their trouble extends over a period of nearly ten years, beginning shortly after the inception of our present protective system. When their representative, the late Hon. T. W. Gibbs, speaking in their behalf, declared that a protection of 50 cents per barrel on flour would be ample, the Government then placed the duty at that amount per barrel. Right here was the first mistake, for, as it proved, and as the following figures will show, 50 cents duty was not by any means 50 cents protection.

The Government standard allows 4½ bushels to a barrel of flour, and the duty on wheat is 15 cents per bushel; hence, the duty on wheat to make a barrel of flour is 71¼ cents, or a duty on the raw material of 21¼ cents per barrel above that on the manufactured article, or in other words, a bonus of over 20 cents per barrel to the American miller. This may seem a small thing to those not in the trade, but when we come to think that it means a loss on [illegible] barrel milled [illegible] per [illegible] our friends will forget to [illegible] that the amount [illegible] is enormous. But, says some one, "you do not need to import your wheat from the States." True enough, but we pay the duty all the same to the Canadian farmer, who would otherwise get nothing by the 15 cents duty on wheat.

The next mistake, or in reality a part of the first, was [illegible] on local [illegible] we trusted in the good faith of the representatives of the Maritime Provinces, and the manufacturers of this Province [illegible] a heavy tax on their soft coal on condition that a proper [illegible] protection be granted on the product of our mills. And how did they keep faith with us? When at the first [illegible] should be [illegible] they [illegible] and have ever since [illegible] the Dominion Government that nothing has been done.

The millers have not been [illegible] for want of asking, for their case has been constantly before the Government for the past ten years, and the strangest part of the whole matter is that from the Premier down to the last man in the cabinet, from the leader of [illegible] to the last member, with the exception of the Hon. Peter Mitchell, [illegible] not [illegible] When last winter a deputation of millers, backed up by resolutions from all the leading Boards of Trade, presented their claims to Sir John A. Macdonald, he assured them that he felt keenly their position, but that he doubted whether the Government was strong enough to grant them [illegible] the conservative members of the Maritime Provinces will [illegible] the Government on this question, as also [illegible] members from British Columbia, while those from Manitoba and Ontario [illegible] stand alone as [illegible].

Nothing daunted at this, a petition was circulated among the members of the House, and every [illegible] Conservative members of [illegible] to the delegation [illegible] the Conservative members were afraid [illegible] in the House the claims of their constituents in this Province from fear of embarrassing the Government, while they agreed [illegible] sympathy or [illegible] the vote never saw the return.

Now [illegible] agree with me that the only sympathy worth having [illegible] can stand by while a wrong [illegible] and sympathize with the sufferer. What is wanted is the active co-operation of every member who is honestly a supporter of our protective system—of every member who is prepared to deal out even-handed justice to the people of this country, not in mere sympathetic platitudes, but in active work in our House of Parliament, and if necessary, by resolutions and even "amendments to supply."

The Government are pledged to stand or fall by the protective policy, and they are only asked to carry this policy out in its entirety; for if a Canadian sends a barrel of flour to the U. S., he is taxed $1, while his American competitor is only assessed 50 cents to send his flour into Canada.

It is the duty of the Government at Ottawa to protect Canadian capital, but there are about twelve or fifteen millions of dollars involved in milling in this Province, the greater portion of which is to-day unproductive, because the mills are not making more than half time.

Some freetraders object to an increase in the tariff, because they say it is against their principles, forgetting that the first principles of correct government demand perfect equality of treatment to all those governed, or in other words, that it is manifestly unfair to protect every class in the country but one, or to have free trade for all but one individual industry.

If the milling industry, although one of the largest in Canada, were alone in this matter, the possible effects of the present condition of affairs would not be so serious or so far reaching, but the farmers, now nearly shut out of the barley market, are threatened with the loss of a market for their wheat. The natural result of the recent meetings and consultations of leading millers is a marked fall in the price of wheat, in fact a fall of nearly 15 cents per bushel, and this is the direct outcome of the present agitation, for a reference to American market reports will show that no corresponding decline has taken place across the lines.

Backed up by the agricultural voters, any unbiassed thinker will see at once what power the millers have, and also in what mood they are to wield it. They are about to hold a general mass meeting of the millers of the Province, when they hope that every man who owns or runs a mill will be present. There is not a doubt but the question will be vigorously dealt with, and the whole matter placed in such a position as to make it very embarrassing for the Government to go to the country without a satisfactory settlement of the issue. Whether the millers are successful or not is of equal interest to every manufacturer in the Province, for should the Government finally refuse to grant them justice, there will follow a campaign dangerous to every protected industry in the country.

If the Maritime Provinces, with a population of about five times that of Toronto, should prevail against the claims of justice in this case, whose turn will be next? You, Mr. Manufacturer, are paying $687,901 per annum of a coal tax, and doing it cheerfully, while they in return pay but $5,146 on breadstuffs. Your tax is 21 per cent., theirs 14-5 *ad valorem*. Your tax on coal is 130 times theirs on breadstuffs, and yet they have the effrontery to deny a fair measure of protection to the product of Ontario manufacturers.

Now, if the ordinary duty of 25 per cent. were placed on flour, it would amount to $1.25 per barrel, or 25 cents more than the millers ask, or under the *ad valorem* duty of 21 per cent. which we paid last year on coal, $1.05 per barrel, so that no one can possibly say that the protection asked is exorbitant, or that it now is, or would be under the 50 cents increase, equal to that accorded to our friends "away down by the sea."

Now a few words to millers. *This is your fight. You are individually responsible for its success or failure.*

You have the power in your own hands.

Your place is shoulder to shoulder with every other miller in Canada.

The smaller your mill, the greater your stake—you will be the first to go under.

Talk to the farmers and explain the situation.

Make it a point to see the member for your riding and make him understand your case.

Remember the millers' and farmers' interests are identical.

Cut the price of wheat down until you can make a margin.

Let the farmer do the kicking.

Above all, come along and support us at the millers' mass meeting in Toronto.

JOHN BROWN.

PRETTY PROTECTION!

(Puts a "heavy" duty on the Yankee miller, 50c. per barrel; duty on corresponding amount of wheat imported by Canadian miller, 71¼c.)

SIR JOHN:—My dear milling friend, don't judge by appearances. I too love you (and your vote), and I too hate the unspeakable Yankee. The Yankee [illegible] you know, and besides, you can't deny that I am "protecting" you from the necessity of making your mill [illegible] you see?

—*Grip.*

The Northwest Electric Co. is seeking incorporation, with power to acquire, build, construct, erect, operate and maintain electric-lighting systems or systems, electric street railways, electric motors, or other electrical power, in the Province of Manitoba. The proposed capital stock is $100,000.

An Electric Light Co. is in process of formation at Rat Portage, that offers to light the town with 50 candle power incandescent lights at $4.50 per light per month, and any number in excess of 12 light at $4; any number under 12, $5; arc lights 75 cents per light per night.

The Reliance Electric Light Company asks the City Council of London, Ont. for permission either to erect separate poles, or string their wires on the poles already up, for the purpose of showing the citizens the quality of the Fort Wayne, Jenny, and Reliance systems. No action has yet been taken by the Council.

It is reported that a company is being formed in England to transport logs from British Columbia to England in rafts of the Joggins type. The Canadian export duty stands in the way, but an effort will be made to secure its removal. It unconcealed is that the projectors of the scheme will confine their operations to Washington Territory, Oregon, California and Alaska.

INSULATIONS.

WE have now to consider a very important, and perhaps the most difficult, part of the problem of central station lighting—how are we to preserve our insulation. It must be noticed that we do not require a high insulation for the sake of getting a small loss of current; but only because with many insulators the high insulation is more permanent, and permanency is the quality of insulation which is most desired. I am not going to discuss at present the whole question of insulation, but rather to draw conclusions from the experience of the past. At the present moment vulcanized India rubber and okonite are the substances which have the highest reputation for durability and high insulation under all conditions. These, like other cables, are sometimes covered with lead, but in their case it is only as a mechanical protection, especially during the process of laying, because the destruction of the lead will not destroy the insulation. Of late years a class of cables has been much praised, about which I wish to speak. The copper conducter, stranded or otherwise, is covered with any fibrous material, preferably jute, impregnated with bituminous oils. This covered core is enclosed in the lead pipe. In this class of cable the insulation depends upon the lead being watertight. We all know of many places where this type of cable has done good work for a limited time, and many of us were inclined to believe that it was quite satisfactory; but I think I am right in saying that none of us know of its having worked successfully in any place for three or four years. I have said that a cable of this kind has hitherto been exclusively used in Berlin, the lead being covered with layers of tape or braid soaked in a preservative compound, and the whole armor-plated with two closed spirals of iron ribbon. I regret to have to tell you that this insulation has been a failure. It goes on well enough for about three years, then the lead gives way, the covering on the copper is permeated, and chemical or voltaic action sets up in the copper, which itself becomes disintegrated. So far as experience goes, this type of cable seems to me to be unsuitable for permanent work with the electric light. I trust that in the discussion we shall have some facts brought out. I had hoped, from what Berthoud and Borel, and also Warring, had done, that this would not be so, but the Berlin experience leads me to think otherwise; and on looking through the testimonials of makers I do not find that these cables, when placed underground, have ever worked electric light circuits beyond the three years fixed by the Berlin people as being destructive. I have been told, but I cannot believe it, that there is one company in London actually proposing to put such lead-covered cables, without covering, into iron pipes. Of course, every one knows they would soon be eaten into by galvanic action.

At Berlin and elsewhere I believe there is the intention of trying some modification of the system of using bare conductors, first practically used by Mr. Crompton at South Kensington. Taking economy into account, it is probable that for low tension circuits this is an admirable plan. It is probable that it may also be adapted to high tension circuits by using oil insulators to support the bare conductors. When copper strip is used it is necessary to raise the cover of the trough, in order to increase the number of conductors this is very expensive. For my own part, I would prefer a drawing-in system, if it were otherwise equally good.

At the present moment it seems to me that the only modes of underground cable proved suitable for permanent work, are either bare copper supported on insulators, or else vulcanized India rubber, or perhaps okonite. Special care must be taken to avoid an insulator which is injured by the gases which permeate the soil of a town, or which has the property, like pitch, of becoming porous, and so letting the copper become decentralized.

METERS.

The next lesson which the experience of foreign stations in Europe and America has taught us is the importance of charging the consumers of electricity by meter, like gas. I find that at present most Companies in this country are charging the large proportion of their consumers by contract, making an annual charge for each lamp. This appears, from evidence collected everywhere, to be a fatal mistake. It is the universal experience that those stations pay best where meters are used. In many stations as found to be the best plan to make a fixed annual charge, which may be put down as the rent of meter, and then an additional charge proportionate to the quantity of electric current supplied. This has the advantage of preventing customers putting in place a large number of lamps which, during the greater portion of the year, are idle, but which on festive occasions, may all require current. Such idle lamps are very expensive to the suppliers, because a large reserve of machinery must be lying idle during the whole year, to be ready for such occasions.

Within the last month I have described before the Society of Arts the different meters which are valuable, without pretending to estimate their relative value. For continuous currents we have the Edison and Aron meters; for alternating currents we have the Shallenberger meter, and for both classes my own "Windmill" meter.

CONVERTERS.

The induction apparatus used with alternating currents is called a "converter," "secondary generator," or "transformer." The reduction of pressure from the primary to the secondary circuit is generally 20 to 1, but sometimes more. A large number of types have been invented. I have elsewhere described the Westinghouse converter, which I have tested and found to be very efficient, even though the largest one he is in the habit of supplying is only for forty lights.

Only the larger size of Zipernowski converter is so efficient. Three sizes are made, varying in efficiency from 95 down to 88 per cent., though the latter is a converter suitable for 25 lamps. Many of the types which are made in England, I feel sure are far from efficient. There is a general opinion that the loss in the converter is necessarily small. This is by no means the case. A great deal of care must be taken in the design to get a satisfactory result. I think there is a general idea that any of the converters now on the market in England will give an efficiency for the average number of lamps in circuit of about 90 to 95 per cent. I should be much surprised if there are more than two types in use in this country which have an efficiency for the average number of lamps over 70 per cent. Yet, so far as I am aware, no maker in this country ever tests the efficiency of the converters which he supplies. The efficiency of a converter falls when it is underloaded. If the converter in a house is adapted for 100 lamps, and only three or four lamps are in use, then, with many converters, the current which is being used is double or treble what is required for the lamps. This defect in some converters is clearly shown in the load diagram of the Grosvenor Gallery installation, where, during the hours of minimum supply, the current sent out from the station is seen to be abnormally high—far above that of the load diagram of other central stations—and at the hours from 4 to 6 a.m. in October, current sufficient for 4,000 lamps is indicated on the station meter. This curve shows a loss of 20 per cent. The type of converter which Westinghouse has perfected is one of low magnetic resistance. The worst ones now being made in England are of high magnetic resistance. The waste in a converter, independent of magnetic friction, varies as the square of the magnetic resistance. The waste due to magnetic friction varies as the length of the magnetic circuit, if the induction in the iron is the same. These high magnetic resistance converters require a great deal of copper. The magnetic friction is so great that they would probably work better with an open magnetic circuit, as shown by Lord Rayleigh.

ELECTRICAL CANADIAN PATENTS.

THE following patents for electrical appliances have recently been granted in Canada: Motor for cars, trams or similar vehicles, National Tramway Motor Co., N. Y.; Electric Thermostat, Electric Temperature Regulators, Electric Valve Controller, Etna H. Davis and Reuben Westervelt, Elmira, New York; Meter for measuring Electrical Currents, Mr. H. Douglas, Stourbridge, Eng.; Coupling for gas and electric light fixtures, Reinhold Hermon, Crafton, Pa.; Electric Stop Valve, Robt. & Jos. Wellens and Hugh Ferguson, Pittsburg, Pa.; Inside Guard for electric light globes, Robert M. Gardiner, Hamilton, and Mr. Hibburn, Ayr, Ont.; Dynamo Electrical Machine, Addison G. Waterhouse, Hartford, Conn.; Electro-thermostatic anti-freezing apparatus for water pipes, Edwin A. Newman, Washington, D. C.; insulating device for supporting telegraph and other wires or electrical conductors, Geo. Fowler, Peckham, Eng.; automatic fire alarm telegraph system, Etna H. Davis and Reuben Westervelt, Elmira, N. Y.

The St. John, N. B., *Telegraph* says that the quantity of lumber of all kinds cut on the Tobique during the past winter is greater than for many years past.

It is said that the syndicate who have purchased Mr. W. P. Sayward's mill property on Rock Bay, B. C., and his extensive timber limits on the northern coast, is composed of Victoria capitalists, and that the business will be carried on as at present. The price paid was $265,000.

Colonel Fanning, Chief Engineer of St. Anthony Falls Water Power Company, Minneapolis, visited Winnipeg a few days ago, at the request of the city corporation for the purpose of reporting upon the development of the water power system by utilizing the Assiniboine. It is said his report is favorable to the scheme.

Mr. D. Sprague, of Winnipeg, is overhauling his mill.

Caldwell's mill recently burned at Clyde Forks, is to be rebuilt.

The Port Blakeley saw mill in British Columbia is said to be the largest in the world.

Tremblay's mills at Lyster, near Montreal, have been burned down. The loss is heavy.

W. D. Ronson will start a saw mill with a capacity of 20,000 feet per day, at Ottertail, in the Rocky Mountains.

Messrs. Carswell, Thistle & McKay have thoroughly overhauled their mill at Calabogie, Ont.

Mr. J. Walker, a millwright, died very suddenly while repairing J. Kerr's mill at Iona Station, Ont.

Francis McCaffrey's saw mill at Riviere Noir, near Three Rivers, P. Q., was destroyed by fire May 7th. Loss, about $5,000.

A large addition has recently been built to J. M. Taylor's planing mill at Portage la Prairie, Man., affording one-third more shop room.

Messrs. J. R. Smith & Sons' saw and planing mill at Southampton, Ont., was burned on May 8th, with a large quantity of lumber. Loss $3,500.

Mr. John Irwin, lumber merchant, of Brampton, Ont., is about taking a trip to British Columbia with a view to purchasing timber limits and erecting saw mills there.

Mr. W. H. Higgins has started a new logging camp on Deep Cove, North Arm of Burrard Inlet, B. C. He proposes to cut some 8,000,000 feet of logs during the year.

Trans-Atlantic freight rates on timber and deals from Dominion ports are firm on the basis of from 60 to 65 shillings for deals from St. John, N. B., to the western coast of England.

John Longeway's mill, seven and a half miles north of Mitchell, Ont., was burned a couple of weeks ago. The machinery was totally destroyed. Loss, $3,000; insured for $1,000.

Mr. E. W. Bowslaugh has sold his planing mill at Grimsby Park to Mr. D. Marsh, for $5,000. Mr. Bowslaugh will move to Kingsville, where he will build and start a similar mill.

McLachlin Bros., of Arnprior, Ont., have erected a large iron crematory for burning the refuse at their saw mill. It is 160 feet high, 30 feet in diameter at the base, and 18 feet at top.

The new saw mill at Brandon has commenced operations, and has a capacity of cutting 30,000 feet per day, employing about 45 men. C. A. Larkin's new planing mill is also in operation.

Mr. Sutton, the Cowichan, B. C., lumberman, in company with capitalists, is building a dam across the Cowichan River, in order to be able to bring logs down from his limits on Cowichan Lake.

Cameron & Kennedy's saw mill at Norman, Ont., started up last month. One hundred men are employed, and with their improved machinery they can turn out about 100,000 feet of lumber daily.

Messrs. Sutherland, Innes & Co.'s stave mills at Harwich Station, near Chatham, Ont., were destroyed by fire on May 7. The building was erected about two years ago at a cost of $17,000. It is being rebuilt.

The saw mill of Mr. W. C. Caldwell, M.P.P., at Clyde Forks, Ont., was burned recently. All the machinery and stock in the mill were destroyed. The loss is estimated at $60,000, with insurances amounting to $30,000.

Saw mill firms who accepted bonuses at the hands of the municipality of Rat Portage, are not getting to work with sufficient alacrity to suit the townspeople, who are calling upon them to begin operations within two months or put up a guarantee.

The fire which recently destroyed Caldwell's mills at Clyde Forks, originated in combustion occasioned by the mixing of dripping oil and saw dust, whose union produces a large percentage of oxygen which is easily excited into ignition when disturbed by a cleaning up process.

The new planing mill at Midland will be run by a joint stock company composed of the following gentlemen: D'Alton McCarthy, barrister; John Eyer, lumberman; J. F. Paterson, lumber; and William Pratt, mechanic. It will be known as the Midland Manufacturing Co.

The Gage Tool Company says that there is no necessity for saw mill men to waste beech slabs, as they contain the best part of the wood, and when three inches thick, or even thinner, they can be used for sawing into plane stock. There is a growing demand for good beech for this purpose, and it is scarce.

A British Columbia exchange informs us that the Columbia River Lumber Company intend building a saw mill at the Beaver, B. C., with a capacity of 80,000 feet a day. The Company has put in a boom across the Columbia River, driven piling for a flume to convey water across the railroad track, and erected the frame work of the mill building. Part of the machinery is on the ground, and some fifty men are now employed by the Company. The main mill building will be 147 feet long by 42 feet wide, and two stories high. It will contain two circulars and a gang saw, besides other machinery. The motive power will be furnished by three 30-inch water wheels, each having a capacity of 142 horse-power, the wheels being driven by a 40-foot head of water. Its capacity when completed will be from 125,000 to 250,000 feet of lumber or shingles per day. The Company own timber limits on the Columbia and its tributaries, from which it is estimated 300,000,000 feet of lumber can be cut; the last limit acquired being one of 24 square miles on the Blackwater. The Company expect to fill a contract for 300,000 sawed ties, and will put in three tie machines, each having a capacity of 1,500 a day.

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* Extract from paper read before the London Institution of Electrical Engineers by Prof. Forbes.

HINTS TO OWNERS AND OPERATORS OF WOOD-WORKING MACHINERY.

WE find the following in the new catalogue of J. S. Graham & Co., of Rochester, N. Y.:

To insure the successful working of any kind of machinery, and particularly the class devoted to wood-working, it is obvious that a certain amount of skill and care is required. We have frequently seen mills fitted up with first class machines turning out poor work, costing much for repairs, and worn out in a short time, and the blame laid on the makers, when it should have been borne by the owners for not furnishing tools and conveniences, and by the foreman or workman running the machines for the careless and slovenly manner in which they are kept.

Every planing mill should have a good work bench with iron vise, light and heavy hammers, hand vise, pliers, try square, balancing scales, complete set of belt tools for hooks, studs or lacing; flat, half round and round coarse files, handles for all the files, good screw wrenches, steel straight edge about three feet long, a complete set of forged wrenches, (the smaller of steel), long nose oil cans, wire hooks for cleaning oil holes, screw driver, ladle for melting babbitt, etc.

These tools should have a place and should be kept in their place when not in use. A very complete set, as mentioned above, will not cost over $50, and if taken care of will last for years, and will enable the operator to keep his machines in order and keep them going so much better without them, that they will frequently pay for themselves in a few months. Without such tools no man can do justice either to the machine in his charge or to himself. We have known parties to pay out thousands for machines, and then refuse to furnish tools required to keep them in order.

We have noticed that operators who pretend they can keep a machine in order with a broken screw wrench, an old file and their fingers, are very apt to be, as they style it, unlucky, and to claim that there is a mysterious something about their machines which sometimes takes possession of it, like an evil spirit, and renders it beyond their control.

Such spirits are best exorcised by good order and cleanliness, and never trouble mills where the machines are oiled and free from gum, and gearing and belts in good order, the lost motion taken up in the bearings and cutters, and the cutter heads and pulleys kept properly balanced. There is nothing mysterious in wood-working machinery; cause and effect govern it as with all material things, and a machine which works well to-day, will, if kept in order, work well until worn out.

There is, of course, much difference in machines of different makers; some seemingly heavy and substantial, from the use of poor material and bad workmanship, give much more trouble than the machines of other makers. It should however, be understood that there is no excuse, except ignorance, for running a machine out of order. We desire to call particular attention to the necessity of oiling freely, particularly during the first few days. If oil does not seem to work into a bearing, but works out thick and black, the bearing should at once be taken out and cleaned. The rolls run so slowly that they will not heat, but will grind fast if not oiled; and when started, every roll and idle gear bearing should be carefully watched to see that the oil works out at each end.

In the best mills the oil holes are carefully picked out and the machine oiled four times each day. Oiling after stopping work for the day allows the oil to work into the bearings as the machine is then warm.

The cutters of planing and molding machines must be balanced or the machine can not do good work. Take up the lost motion, oil freely and regularly. Keep your cutters and heads balanced.

ANOTHER REMARKABLE INVENTION.

RECENTLY there has been brought out a furnace, invented by a Pittsburg, Pa., man named Fales, which is said to be a most remarkable invention. A Pittsburg paper says of it: In a common cylinder stove, with a few kitchen shovels of coal, a fire was lighted which in a few minutes, without artificial draught, created a heat intense enough to melt cast iron, spiegel and manganese ore. These results are accomplished by so arranging the fire that two different currents of air of different temperatures pass through parts of the grate. A partial vacuum is created in the centre of the grate and a cyclone in the drum of the stove, thus producing perfect combustion all over the surface of the coal. In fifteen seconds from the lighting of the fire the drum is red hot. A few seconds later a rapid vibration occurs in the drum and is felt all over the room with startling effect. The cyclone in the stove is raging in full force, the drum loses its heat, and it is discovered that the air is being drawn down the chimney. Within four minutes from the time of lighting, the materials mentioned may be melted, and yet the temperature may be kept at a moderate heat. A 50-pound charge of coal will last 24 hours, so slow and so complete is the combustion. The scientists are puzzled because they can not account for these results on scientific principles. Among those who have taken a deep interest in the experiments are Gen. B. F. Butler, Gen. Hastings, Mr. Andrew Carnegie and other gentlemen of like standing.

A NEW METHOD OF SETTING BOILERS FOR BURNING SAWDUST.

A LAW recently enacted by the Maine legislature prevents the owners of saw mills from dumping their sawdust in the rivers of that State and makes it necessary to dispose of their refuse in some other manner. Burning it was the natural thought, but the problem presented itself that there was more sawdust made than was required by the boilers, and also that the smoke from this extensive burning would be a disagreeable factor. To overcome both of these objections, says the Boston *Journal of Commerce*, the Hartford Steam Boiler Inspection and Insurance Company was appealed to and it has devised and erected at Bangor and other cities in Maine absolutely smokeless furnaces that will dispose of all sawdust as fast as made, whether required to make steam or not. The great danger from burning sawdust has been that the heat in the combustion chamber has been most intense and out of proportion to what it is over the fire. The sawdust is usually dampened before being thrown in, and even if not, the constant opening of the fire door to throw in the fuel cools that portion of the boiler over the fire while the heat in the combustion chamber continues to be very high. The efficiency of the boiler is also considerably impaired, besides the danger from the unequal heating of the shell.

Instead of placing the fire box as in the usual setting for horizontal tubular boilers, the Hartford company now builds, to burn sawdust, a furnace directly in front of the boiler, thus making the combustion chamber extend the whole length of the boiler. The sawdust is taken from the mills through pipes by means of blowers and deposited directly into the furnace, to be burned. The bridge wall is not constructed in the usual way, but is solid, the gases passing through two large circular passages, in clined upward and set to approach each other when delivering into the combustion chamber so that the gases from one passage will cross and mingle with those entering the chamber from the other passage. At the same time a sufficient quantity of air is admitted, and mingling with the now united gases, the combustion becomes perfect, and the gases pass under the boiler and back through the tubes to the up take. In the chimney the ordinary damper is placed to control the generation of steam in the boiler, and just inside the bridge wall in the combustion chamber is placed another damper leading to an underground passage, and thence to the chimney, so that when it is desired to stop the steam production the regular damper being closed and the relief damper opened, the products of combustion are diverted from the boiler into the underground passage and escape without passing through the boiler. In this manner all the sawdust that is made is burned without handling, and as the relief damper is at the bottom of the combustion chamber, the combustion is perfect whether the gases are used or not, consequently there is no trouble from smoke. Indeed, when the boilers were first tried in this way no smoke whatever issued from the chimney, and one of those interested in the mill came down to see why they were not running, he supposing them to be shut down because of the absence of smoke, and this same smokeless feature has existed ever since. The setting has been very carefully constructed with fire brick, and the dampers made of fire-proof material, and up to this time everything has worked in a most satisfactory manner, and the efficiency of the boilers increased so much that the relief dampers can be left open all the time and the steam production controlled by the regular damper.

This principle of an external furnace is to be applied to boilers burning soft coal and other fuels, and with the perfect combustion that will be obtained by the introduction of heated air where the two columns of gases cross each other, together with the increased efficiency of the shell, will no doubt prove a valuable method of setting a boiler. For using coal the construction would differ a little, as the air would need to be heated instead of introduced cold, as is now the case. The furnace and setting has been secured to the Hartford company exclusively, by letters patent, and a large number of boilers are being set in this manner, not only in Maine, but in other sections where sawdust can be used as fuel.

USEFUL INFORMATION

Rubber can be melted by heating in a can over a water bath; that is, the heat must be hot enough to melt, but not burn.

SOFTEN CAST IRON.—This may be done for planing or turning by immersing for 24 hours in a solution of 1 part of aquafortis to 4 of water.

In water the velocity of sound is about 4,708 feet per second, or nearly four times as much as in air; in wood, from 12,000 to 16,000 feet; in iron, 17,500 feet, and in copper, 20,500 feet per second.

The feature of Edison's exhibit at the Paris Exposition will be an enormous model of an incandescent lamp forty feet high and made entirely of small incandescent lights, of which it will be necessary, it is said, to use 20,000.

F. Valton reports in the *Genie Civil* that Alexander Pourcel has succeeded at the new basic open hearth steel works of Bell Bros., of which Sir I. Lowthian Bell is a member, in producing from Middlesborough pig carrying 1.7 per cent. of silicon and as much phosphorus. The lining of the furnace is chrome ore.

"Ardenbrite" is a new invisible lacquer recently introduced into London. It is so strong as to withstand weather, steam, smoke, sea air or sea water; the gold, silver, copper, steel brass or iron does not tarnish when coated with it. As it is so fine as to be unseen on the most delicate instruments, the new lacquer has an extensive field of application.

STEEL HOOPS FOR BARRELS.—A corrugated steel hoop has been invented, which is said to be elastic and firm, hugging a package tightly. Four steel hoops will take the place of ten wooden hoops on a flour-barrel. They are cheaply produced by the aid of electricity, a hoop being welded in two seconds. They are made at Worcester, Mass.

A new method of annealing small pieces of steel is in use among some machinists. The objects to be annealed are first placed in a piece of gas pipe two or three inches in diameter. One end of the pipe is then heated and drawn together, the other end being left open to look into. On the pieces becoming of a cherry red the fire is to be covered with sawdust. A charcoal fire is used for this purpose, and the steel is left in over night.

France claims the honor of utilizing a higher water pressure than that recently put in operation in the Chollar shaft on the Comstock lode, in Nevada. At Bagnond, two kilometres from the valley of Gresivaudan, near Grenoble, a turbine 9 feet 10 inches in diameter was put in operation in the year 1875, utilizing a head of 1938 feet. It is still working, and gives a force of 1500-horse power, with a flow of 300 litres of water per second.

Screws that are too small for separate treatment, may be cleaned from rust as follows: Take a pound of screws and place them in a small box—a cigar box will do; put a small quantity of oil on them, and shake for a minute; then put a piece of cotton-waste in the box and repeat for a minute; finally, put a handful of sawdust in the box, and shake for another minute or so, and remove the sawdust by sifting it from the screws in a sieve.

According to *Le Genie Civil*, Dr. Dujardin-Beaumetz recently exhibited at the Paris Academy of Medicine a new alimentary substance—"fromentine"—which is obtained from wheat by the aid of special millstone (sic). Fromentine is the embryo of wheat reduced to flour and deprived of the oil which it contains. The substance contains three times more nitrogenous substance than meat, and a strong proportion of sugar. Thus, the amount of nitrogenous matter in it is 51 per cent., while that of the richest meat, mutton, is but 21 per cent, and the proportion of digestible substance reaches [illegible]7 per cent. of the total weight. Hence it would appear that it might advantageously replace powdered meat as a concentrated food. It can be used for making soups, and even for making biscuits, the taste of which would not be disagreeable. The wheat germs employed are a by-product in the Schweitzer process of manufacturing a flour which can be kept for a long time without deteriorating.

A St. Petersburg journal states that a Russian civil engineer, M. de Nicaloff, has succeeded in producing a fuel from peat greatly resembling anthracite coal. The inventor has obtained a patent for his process, which is said to be accomplished by the aid of certain chemicals, and lately an imperial commission has been engaged in experimenting with the fuel, the result having been very favorable. The peat was found to give a little less heat than ordinary coal, but more than fir or birch wood, which is largely used on railways, steamers and in factories in Russia. In other respects, however, the peat is superior to coal, being cheaper, containing but a very small percentage of sulphur, and being much smaller in bulk. The artificial fuel throws off no dirt, and emits no smell, whilst burning with a clear white flame. It is believed that the new fuel has a great future before it, the Russian government being much interested in the invention.

NICKEL AND COBALT SPLIT UP.—Recently it was announced that Dr. Kruess, of Munich, had succeeded in splitting up the metals nickel and cobalt into other substances. This was believed to be one of the sensational rumors that come along three or four times a year, wearing such a look of plausibility that the reader often don't know whether to credit them or not. This time the report appears to be true. The atomic weights of cobalt and nickel have long been considered to be equal, each 58.6, and Professors Kruess and Schmidt have been carrying on very delicate measurements with each of the two, presumably for discovering whether the equality is real or only apparent. After careful investigation, ten different methods of splitting either cobalt or nickel were found, and considerable quantities of a substance common to the two were isolated. A black metal was the result, to which no name has yet been given.

ELECTRICAL SPARKS.

Campbellford, Ont., is putting in an electric light plant.

Port Hope, Ont., is advertising for tenders for lighting the town by electricity.

Beauharnois, P. Q., has completed arrangements for putting in electric light in the fall.

The Electric Light By-law voted upon at Stratford, has been carried by a majority of 51 for the light.

During the first three weeks of the present month 113 electrical plants were issued in the United States.

The by-law to guarantee 5 per cent. on $40,000 to build an electric street railway in Victoria, B. C., has passed.

Special courses in electrical engineering are being made prominent features of American educational institutions.

The by-law to raise $6,000 for the purchase of an electric light plant for the town of Seaforth has been carried.

Last year a total number of 1,611 steamers navigated the Suez Canal by the electric light, as compared with only 305 in 1887.

The Ball Electric Light Company has ordered a large quantity of poles, lamps, wire, etc., to extend their lines to the outskirts of the city of London, Ont.

Incorporation has been granted the Simcoe Electric Light Co. (limited). The Company has a capital of $[illegible] in one thousand shares of $20 each.

During a recent storm the lightning ran along the wires and damaged the large dynamo at the electric light station in Winnipeg, at the same time extinguishing the lights throughout the city.

It is stated that the American combination controlling the price of copper wire has ordered a reduction of [illegible] cents per pound. This is understood to be due to the general decline in price of copper.

Prof. Elisha Gray remarks that electrical science has made a greater advance in the last twenty years than in all the 6000 historic years preceeding. More is discovered in one day now than in a thousand years of the middle ages. We find all sorts of work for electricity to do. We make it carry our messages, drive our engines, ring our door bell, and scare the burglar; we take it as a medicine, light our gas with it, see by it, hear from it, talk with it, and now we are beginning to teach it to write.

The *Shoe and Leather Reporter* reports the formation of a company, with a capital of $800,000, in Chicago and New York, for tanning by electricity, under a process said to be in successful operation in Sweden, where the invention was discovered. It is claimed that by the electric method leather can be made in four days, while the time usually consumed in this operation now averages five months. A tannery for operating by the electric process will soon be built either at Chicago or Boston, to be managed by a tanner from Sweden who is familiar with the business.

The electrical apparatus which is to take the place of the gallows for capital punishment in New York State, consists of a Westinghouse dynamo producing an alternating current; an exciter, to be used as an auxiliary to the dynamo; a strong oaken chair, and electrical cap and electrical shoes. The cap is made of metal covered with sponge, which is saturated with salt water before being placed on the condemned man's head. The shoes are tight laced, with sponge inside. The wires are attached to the cap and the shoes, the current is closed for fifteen seconds, and the execution is completed. The total cost of the apparatus for the State prisons will be about $8,000.

The condensing effect of electricity upon steam has been demonstrated by Professor Sorket, the electrician, at Genoa. In a darkened room he heated some water in a platina basin which was connected with an electric machine. Just above the surface of the water was fixed the other pole of the electric stream which passed through the platina and the water. An arc lamp made the steam visible as it rose from the heated water. As soon as the machine was set to work the steam was observed to fall down upon the edge of the platina basin and there condense itself, instead of rising as usual. When the point was brought quite close to the surface of the water the generation of steam was completely stopped, although the water continued to boil.

A novel use for electricity, was demonstrated at the electric light station, in Rutland, Vt., a few days since. The Howe Scale Company had a number of blue prints of mechanical working parts for railroad scales, which they wished to develop in order to send away. This process is usually effected by the sunlight method, the same as in photography, but owing to the continued cloudy weather, so much delay was experienced that the draftsman of the company was determined to try the power of an electric light. Three arc lamps were accordingly rigged up by the electrician of the light company in the testing room of the station, and the experiment proved most satisfactory, the cuts being full as clear as when subjected to the sun's rays.

The following figures are given out by the Julien Electric Traction Company as actual results attained on the Fourth avenue surface road, New York city, in running cars with storage batteries. A car can run in actual work 57½ miles without recharging. During forty days that the car in question has been at work neither batteries nor motors have required attention or expense for repairs or renewals. The batteries of one car that had been running since September 3, 1888, were examined on the 8th inst. for the first time, and are stated to be in as good condition as when put in. The cost of motive power is calculated at $3.10 per car per day of 60 miles. That is the cost of energy of 2c. per horse-power, at which it is offered to be supplied by the electric companies, and $700 per annum for maintenance of batteries and motor.

Dr. O. J. Lodge, a holder of the theory that light is an electrical vibration of the ether, has been endeavoring to produce these waves by direct electric action without the intervention of heat. The means adopted was the oscillating discharge of a Leyden jar, with a rate of vibration as high as 1,000 000 per second. The waves thus obtained were about three yards long, but, according to Dr. Lodge, were light in every particular except wave length. To reach the wave length of light, they would require to be shortened from three yards to the hundred-thousandth of an inch. The electric waves of Dr. Lodge travel through space at the same speed as light, and are refracted and absorbed by material substances according to the same laws. Hence Dr. Lodge concludes that if we can only generate electric waves sufficiently small we may entirely revolutionize our present modes of obtaining artificial light.

It has long been known that if two plates of different metals are buried in the ground and connected by wire above the surface, an earth battery is formed and a current of electricity is found in the wire. A curious natural instance of the kind recently occurred at Bridgewater, in Nova Scotia, as related by a contemporary, whence a telephone line was run to a gold mining district. A steady current was found to flow through the wire; and the explanation is that the mineral lodes in the neighborhood gave rise to it. There are gold, silver, copper, lead and iron ores there, and it is supposed that the gold, silver, copper and lead formed the negative plate of the battery, while the iron formed the positive, the moist earth and rock completing the circuit with the wire. The natural current is observed to be stronger on rainy days, probably owing to the increased moisture of the earth. Being a steady current it does not interfere with the working of the telephone. This case is evidently to be distinguished from the ordinary "earth current" observed in telegraph lines, when the "earth plates" at their extremities are of the same metal; and it seems to be a real case of natural battery formed by mineral deposits underground.

PUBLICATIONS.

WE have received from Mr. Geo. F. Bostwick, Toronto, manufacturer of Amberg's Cabinet Letter Files, a copy of his handsome new catalogue, containing numerous Canadian testimonials regarding the merits of this labor-saving office device.

PERSONALS.

John H. Thompson, formerly proprietor of the Elgin flour mills, St. Thomas, has been appointed superintendent of the Mechanical Department of the Government Printing Bureau at Ottawa.

We are pleased to see it announced that Mr. John Bertram, the well-known machine tool manufacturer, of Dundas, Ont., has been elected Mayor of that town to fill the vacancy caused by the death of the late Mayor Beckford. We doubt not Mr. Bertram will fill the position with credit to himself and advantage to the town.

Mr. Andrew Leask, of Toronto, has bought property at Hillsburgh, Ont., and will start a sash and door factory there.

Hugh R. Robertson of Juggins raft fame, has been to the Pacific coast exploring the lumber districts there. He says that a company is being formed in England to transport lumber in the shape of rafts from Canada to England. The Pacific coast has been selected as a basis of operations, because it is easier to cut and float the logs there than on the eastern coast. The only obstacle to the plan now is the Canadian export duty, but they are working to have this removed. In the event of the Government deciding otherwise, the company will confine their operations to the American coast in Washington Territory, Oregon, California and Alaska for shipment to the southern states.

MACHINERY MFG.

The Midland Manufacturing Company will operate a planing mill.

Natural gas is being used with satisfactory results in several mills and factories at Kingsville, Ont.

Harris' rolling mills, which were burnt down in St. John, N. B., two months ago, are again in full operation.

A company, styled the Petroleum Fuel Co., will locate a factory at Duluth, Minn., for the manufacture of fuel from sawdust and coaldust.

Mr. Charles Burt, of Detroit, has been examining iron properties in North Hastings, with the view of establishing iron smelting works here.

Mr. E. B. Eddy, of Hull, will dispose of his valuable timber limits in Ontario and Quebec, and devote his attention to the manufacture of sulphide fibre from which paper is made.

The extensive mill-furnishing works of the Case Manufacturing Co., at Columbus, Ohio, were destroyed by fire on May 10th. The loss amounts to about $60,000, and the insurance $25,000.

In Sweden hollow steel ingots are being made by casting steel in molds hung on trunnions, allowing the sides to chill to the required thickness and pouring out the steel still liquid in the center. These hollow ingots go to England, where they are drawn out cold to tubing.

Two blast furnaces for the manufacture of pig iron are about to be erected at New Glasgow, N. S., by the New York and Nova Scotia Iron and Railway Company. One furnace will produce Bessemer and one foundry pig iron, one of them having a capacity of 25,000 tons per annum. There is no limit to the production of iron near New Glasgow.

The scheme for assisting small manufacturers in a practical manner by establishing in the large towns a central workshop, where the manufacturer may at the same time use steam power, has so far been highly successful. These central workshops have for some time existed in some of the large towns of France and Italy. The experiment is now to be tried in Hamburg, where a central workshop of a similar character is to be erected. The result of this new departure will be awaited with great interest.

An Ottawa despatch states that an Order-in-Council has been passed exempting from the Canadian rules and regulations for twelve months all marine boilers constructed in the United Kingdom, according to the rules of the Imperial Board of Trade or through Lloyds, upon the production of satisfactory evidence that they have been so constructed. Steamships which have been in Canada for twelve months, with boilers constructed in the United Kingdom according to the rules above referred to, are to be inspected by a Canadian inspector of machinery and boilers, according to the rules and regulations at present in force in Great Britain, and if necessary shall be inspected by a Canadian inspector of hulls, according to the Canadian rules and regulations pertaining to the inspection of hulls.

A condenser is not an expensive addition to a steam plant as to its first cost, and it will net a positive saving in fuel of from 18 to 25 per cent. Of this there can be no question. During the last few years another addition has been made to the apparatus in engine rooms, which is the means of compounding the engines. An additional cylinder is provided into which the steam passes after being used in the primary or first cylinder. This second cylinder is somewhat larger in diameter than the first, and to it the condenser connection is made; that is, after it has exhausted into a heater. If the condensing engine furnished the horse power with the evaporation of 19 pounds of water, a compound condensing engine will probably reduce the necessary evaporation to 16 pounds of water.

Wire is now being manufactured—whether iron, copper or brass—by a new and greatly improved process, and at a considerably reduced cost. The machine devised for this purpose consists of a series of rolls in a continuous train, geared with a common driver, each pair of rolls having a greater speed than the pair preceding it, with an intervening friction clutch adapted to graduate the speed of the rolls to the speed of the wire in process of rolling. The entire operation of producing the smallest sized wires from rods of one-half inch is done cold. It is alleged that this method obviates the danger of unequal annealing and of burning in the furnaces—in addition to this the wire being more flexible and homogeneous than that made by any ordinary method, and capable of sustaining greater longitudinal strain; in the case of copper wire there is said to be a greatly increased electrical conductivity.

There should not be a projecting set-screw head on any shafting or on any machine where the head of the screw can catch in a person's clothing, says a correspondent of the Mississippi Valley *Lumberman*. Very serious and distressing accidents have occurred and will continue to happen from the custom of using projecting set-screws. It is a barbarous practice, in use because it is cheap and slovenly. The remedy is to recess all collars for set-screw heads. Let the heads be chambered in so that when screwed up the revolving surface is "flush" and can catch no one. Does it call for a special wrench? No! Not if you have your collars made so that a monkey-wrench will take the screw. That is easily done. But even the purchase of a few socket wrenches would be better than to continue the old perilous routine of using outside heads. A firm in Middleton, Ohio, makes a specialty of the manufacture of safety shaft collars. The terrible set-screw is with the collars, but it is snugly stowed away.

The New Brunswick Brass Works, St. John, N. B., of which Messrs. T. McAvity & Sons are the proprietors, have developed to a wonderful extent during the last few years, consequent upon the opening up of business connections in Ontario. The business

was established in 1860, and for some time the proprietors confined their attention to ship work. Gradually, however, they branched out into the manufacture of mill, mining, engineers and plumbers supplies. The staff of employees has grown from ten in 1861 to 148 in 1889, and it is expected that before the close of the year 50 additional hands will be employed. The firm occupy 50,000 feet of factory space, and use about 1,000 pounds of raw copper per day.

The Ontario Government have issued letters of incorporation to the Almonte Fuel, Gas and Light Co.

It is reported that Mr. H. W. Petrie, is considering the advisability of removing his machinery business from Brantford to Toronto.

Porter's foundry and machine shop at Bowmanville has been re-opened. The business will be carried on by the Porter estate, with Mr. Geo. Porter as manager.

As an inducement for manufacturers to locate in that town, the authorities of Collingwood offer exemption from taxation for a term of years, also water and light free.

An engineer proposes heating feed-water by arranging a series of air pipes within the stack, or a chamber between boiler and stack, and forcing this heated air through the feed-water reservoir.

The city clerk of Belleville is in receipt of a number of communications, one being from the United States, relative to the inducements and facilities that are offered to manufacturers to locate there.

EARLY HISTORY OF SAW MILLING IN NEW BRUNSWICK.

WE are indebted to the St. John (N. B.) *Sun* for the following reminiscences concerning the saw-milling industry of New Brunswick. The date of the first shipment can hardly be traced, but is no doubt contemporary with the period when the settlers abandoned the products of the chase as a means of accumulating wealth, and turned from the supplying of a market, the extent of which was limited by the ability of the purchasers to indulge the luxuries. Lumber was then, as now, one of the necessaries of trade, and the raw material was to be had here in abundance. It required only to be chopped and felled into the streams before being floated to the seaboard for shipment. The opportunity for opening up a new trade was a splendid one, which soon attracted attention and led at once to the making of pine timber for export. Probably about the same time the manufacture of sawn lumber for domestic wants was commenced, the old fashioned "frame" saw being the means employed for the purpose. This tedious and laborious manner of sawing lumber soon gave way to the utilizing of the many splendid water powers to be found on the streams, and the now antiquated "jackknife mills" took the place of the "frame" saw, and soon succeeded in piling up a surplus supply of deals and boards. With this surplus came the desire for a more extended market and the prosecution of the business upon a larger scale. Towards the city of St. John the millers naturally looked for an outlet for their product, and no doubt even at so early a period as that, the spirit of enterprise had taken hold upon the people. Goods of all kinds were bartered in exchange for lumber, and St. John entered upon a career as a shipping port which was in after years to assume magnificent proportions. The frosts of winter, however, interfered with the business for a considerable portion of the year, not only closing up the mills, but at the same time blocking the highways to the markets. This barrier to trade was an obstacle however, to be soon removed by the push and energy of the people. The chances for storing lumber in the fall for manufacture during the winter were abundant, and indeed good lumbering was to be found where now lie the suburbs of the city. This led to the erection of saw mills, and, once started, the sawing of lumber commenced to boom. Of course the machinery in vogue was of the most primitive kind and compared with that of the present day but very little superior to the old style of frame sawing. Foundries had not yet been established, and what machinery the millwright could not manufacture had to be imported from England.

Nearly as the year 1767 two saw mills had been erected on the Marsh creek known as Marsh bridge. Following these came the Sand Point Lake Mills, which were located on Union street Carleton, near the present site of the railway works. Some portions of these old frame are still in use. The next in order was the mill on Portland bridge, situated on the lot next adjoining Messrs. Nail factory, to the northward. None of these mills however, were engaged in cutting deals until some years after their erection, their products being mostly pine boards and planks for local consumption. Year by year from this the number of saw mills kept increasing, all of them driven by water power. The steam engine as a motive power was only in its infancy, and had not been so far perfected as to admit of its general use in the work of driving saw mills. However, Boulton & Watt of Birmingham, England, had commenced operations as engine builders on a small scale, and in the year 1822 Capt. Otty (father of the late Col. Otty and Mr. Henry P. Otty, of the P. O. department), conceived the idea of erecting a steam saw mill. To this end he visited England and purchased of the original inventor of the steam engine, an engine and boilers and brought them to this country by ships. The mill was erected on the Strait Shore, Portland, and on the site of what is now known as Hamilton's mill. The engines were low pressure and some portions of them are in use at the present day. This mill enjoys the distinction of being the only one below the falls that was never destroyed by fire. This was the pioneer steam saw mill of New Brunswick, and was started for the first time on the 26th of July, 1822, in the presence of Sir James Kempt, lieutenant governor of Nova Scotia, and Gen. Smyth. Col. Otty had associated with him Mr. R. W. Crookshank, and the mill was known as Otty & Crookshanks. In this year the first shipment of deals was made from St. John to Cork in the schooner Amelia, Capt. Spencer. From this time the manufacture of sawn lumber began to boom, and became associated with hewn timber as the staple exports of the province. Thus from small beginnings the business went ahead by leaps and bounds, till as early as the year 1834 there were in operation in St. John county alone thirty-five mills, employing 525 men.

Southampton, Ont., wants a roller mill.

A flour mill is about to be erected at Austin, Man.

The flour mill at Gladstone, Man., is offered for sale.

The roller flour mill at Verden, Man., is offered for sale.

The Clyde Milling Co., Lanark, Ont., has been incorporated.

A site for a grist mill at Gravenhurst, Ont., is offered by Mr. Cooper.

Messrs. Norris & Pohlmann have taken charge of the Shelburne roller mill.

The Assiniboine roller mills, Portage la Prairie, Man., have been closed down for repairs.

Stodard & Co. are putting up a large grain elevator and engine house at Duck Lake, Man.

Mr. W. L. Puckering, of Horning's Mills, Ont., has leased the Centreville roller mills from E. W. Farr.

Mr. Tremblay's mill at Lyster, Que., has been destroyed by fire. It was uninsured and valued at $2,000.

The Grocers Association of Winnipeg, is complaining because the millers sell at wholesale prices to its customers.

The bonus by-law for the grist mill at Battle, Man., was carried by a good majority, and work has already been commenced.

Ogilvie's flour mill at Winnipeg, is now lighted by eighty-five incandescent lights. The electricity is generated on the premises.

Messrs. Hutton & Carr, of the Wingham Flouring Mills, intend having their mill reconstructed and fitted up with the roller process system.

Mr. W. D. Ronson, whose elevator at Carberry, Man., was burned recently, will rebuild, increasing the capacity to 60,000 bushels.

Messrs. H. L. Lovering & Co., Coldwater, Ont., are about to put in the roller system, and generally repair the machinery of their mill.

Mr. John Shellington's saw mill at Hinchinbrooke, was destroyed by fire on the night of May 28th. Loss about $4,000; no insurance.

Mr. McLean, proprietor of the Rockton grist mill, has secured a water privilege at Charlotteville Centre, Ont., and will remove his machinery there.

Crop conditions in all parts of the Canadian northwest are uniformly favorable. Great things are expected as the result of this year's crop.

Manitoba has sown about 650,000 acres to wheat and 357,000 acres to other grains. The crop for 1889 ought to yield nearly 20,000,000 bushels.

The Montreal *Trade Bulletin* says that under the management of Mr Alex. Mitchell, the Keewatin mill was run at a loss of from $75,000 to $100,000.

The large saw and grist mill of Geo. Marks & Co., of Port Arthur, at Bruce Mines, was destroyed by fire recently. The loss is said to be very heavy.

It is said that Mr John Barclay, of Springfield, will shortly commence the erection of a large flour mill near the G. T. R. station in Alymer, Ont.

Alex. Mitchell has retired from the management of the Keewatin Milling Company, and has been succeeded as general manager by John Mather, of Keewatin.

Messrs. McKay & Co.'s mills at Ottawa have suspended operations, owing to the high price of wheat and the refusal of the Government to increase the tariff on flour.

The large mills owned by R. McCarroll and rented by Mitchell Bros., at Lucknow, Ont., were consumed by fire on the night of May 15th. Estimated loss, $5 000, no insurance.

It is reported that the large flour mills at Keewatin, on account of the low price of flour, have decided to close, the price of wheat being too high to sell flour at present prices without making a loss.

There have lately been disputes between the Toronto flour and grain inspector, and the inspector at Winnipeg in regard to the grading of grain. The former passes wheat one grade lower than the latter.

Mackenzie Bros., an extensive flour manufacturing firm, of Courtright, Ont., through endorsing for another firm's paper, have been forced to make an assignment. The business will be wound up for the benefit of creditors.

Messrs. Campbell & Stevens' flouring mill at St. Thomas, Ont., manufactured last year 54,288 barrels of flour, or an average of 327 per day. The mill ran 166 days of 24 hours each, and employed on an average 35 men.

Mr. James Wilson, of the Monkland Mills, Fergus Ont., which were destroyed by fire about three months ago, will rebuild on the same site. The mill will contain an additional pair of stones, and the capacity of machinery for manufacturing rolled meal will be doubled.

We learn with regret of the death of Mr. Fred. R. Tilson, eldest son of Mr. P. D. Tilson, the well-known miller, of Tilsonburg, Ont., which occurred on May 7th. Deceased was a bright, energetic and withal genial young business man, and will be much missed in the locality where he lived.

Messrs. Hastings & McGaw will not likely build their proposed mill either at Winnipeg or Port Arthur, this year. The members of the firm have decided to take an engagement with the Keewatin Milling Co. It is said that Mr. McGaw will buy grain for the Company in Manitoba, and that Mr. G. V. Hastings will take charge of the mill at Keewatin, while Mr. W. A. Hastings will represent the Company in the East.

A corrugated steel hoop has been invented, which is said to be elastic and firm, hugging a package tightly. Four steel hoops will take the place of ten wooden hoops on a flour barrel. They are cheaply produced by the aid of electricity, a hoop being welded in two seconds. They are made at Worcester, Mass.

In the United States the production of oats is rapidly increasing. This is said to be due to the demand caused by a greater consumption of oatmeal, and the use of oats instead of maize to feed the horses in the south. The average crop from 1870 to 1880 was 314,000,000 bushels, and since 1880 the average crop has been 549,000,000 bushels.

The Hercules Manufacturing Company, Petrolea, Ont., have branched out into the mill building line, and have just completed in a highly satisfactory manner a 125 barrel mill for Messrs. May Bros., St. Thomas. We predict for the Company as great success in their new departure as has accompanied them as mill furnishers and manufacturers of mill machinery.

About forty years ago, says the St. John, N. B., *Sun*, Ontario flour was imported via New York in bond. During the American war a very large trade was done in American flour, two famous brands, the Napier and Reindeer, ruling the market. The recent extension of the Canadian flour trade is familiar history. The grinding of corn into meal and feed is at present one of the industries of St. John.

During the six months ended December 31, the total quantity of wheat imported into Canada from the United States and entered for consumption was 1,483,819 bushels, of which 9,705 were entered for home consumption. The total quantity of flour imported during the same period was 171,336 barrels, of which 153,860 were for home consumption. The total amount of flour remaining in bond for the same time was 6,784 barrels.

The Montreal *Gazette* says:—The Government in postponing action upon the flour duty for another year, relies probably upon the hope that a bountiful harvest in the Northwest, safely housed, will remove the grievance of millers by giving them an abundant supply of Canadian hard spring wheat for mixing purposes, but even the temporary contentment of the millers will not blot out the tariff anomaly, nor afford that measure of security to the industry, those engaged in it have a right to expect.

A despatch from Ottawa states that in view of the amendments made last session with respect to the selection of standards for grain inspection, an Order-in-Council has been passed limiting the powers of the Toronto Board of Grain Examiners and Arbitrators relative to the determination of differences between any two inspectors of grain. Hitherto the board has had jurisdiction in this matter all over the Dominion, but its functions are hereafter to be confined to that portion of Canada lying east of the grain inspection district of Port Arthur.

ELECTRICAL POWER FROM NIAGARA FALLS.

IN a recent number of the *Electrical World* H. F. Watts, a well-known electrician, discusses one of the most important and fascinating problems of the age, as follows:—

The issue of *The Electrical World*, February 9, 1889, contains a very interesting account of the effort being made to utilize Niagara Falls on a commercial scale for electric light and manufacturing purposes. The scheme proposed, and which will, I hope, shortly be put in practical operation by Mr. Hamilton, would seem to be the best that can be devised for this purpose, and it would also appear that to him is due the $100,000 prize offered for the solution of the problem. It is, however, to the electrical points that I wish to call the attention of your readers.

In the *Western Electrician* of Aug. 25, 1888, I made the statement that "the successful electrical transmission of the power of Niagara Falls to New York and other cities will be solved by the alternating system if solved at all." The alternating system would seem to possess many points in its favor, which render it most eminently suitable for the transmission of power on such a scale.

The alternating system has already solved one of the greatest engineering problems of this age—the transmission of electric energy over great distances to fulfil commercial economy. The question is therefore asked: Why not use the alternating system and arrange the apparatus something like the following: Take a Westinghouse 3,000-light dynamo just as it is, giving 1,050 volts and amperes. By means of a special converter raise the potential to 5,000 volts and reduce the current to 30 amperes. This, transmitted over 22 miles of No. 3 B. & S. gauge, gives a loss of about 12 per cent., or a No. 0 would, for 44 miles, give about the same loss. The loss in the converter at the other end of the circuit reduces the potential to 1,000 volts or any other desirable pressure for the motors. Three wires will be required and hence the above figures will be modified. The motors will be of high efficiency, will run at a constant speed without brushes or commutators and with a minimum of attention. With 5,000 volts initial pressure, the efficiency can be 70 per cent., notwithstanding the losses in the various conversions. Here is a chance for the alternating system to show its superiority.

In the article in question no mention was made of the proposed construction of the line. The following would seem to best fit the requirements. Let poles be erected not over 50 feet apart, of large size, 20 feet high, and not less than 15 inches in diameter at the ground level. These poles to be set in the earth not less than 8 feet and secured by cement and broken stone. The poles to be "filled" with paraffine and also the short stout cross-arms at the top and the wooden pins that hold them. The base of the poles should be preserved from decay by the use of vitriol, etc. The wire is supported by a large round glass insulator through which the wire slides freely, the glass side being supported from the underside of the cross-arm by a special insulator of large size and of the "rubber-hook" type. The "hook" insulator might also be further protected by a small hand placed above it. Such a line would possess very high insulation, even in wet weather. It could be easily and cheaply constructed, and could be maintained intact in the most violent gales, even when covered with ice.

EXPLOSION OF A VULCANIZING PRESS.

A CURIOUS and interesting explosion of a vulcanizing press recently came to our notice. The press is illustrated in Fig. 1. It consists of a number of plates of cast iron, each four inches thick, and forty inches square, which are contained in a stout framework, and forced upward from below by an 18-inch hydraulic ram, into which water is forced at a pressure of 3,000 lbs. to the square inch. The diameter of the plunger being 18 inches, its area is 254 square inches, and the total pressure upon it was 254 × 3,000 = 762,000 lbs. Between the plates the articles to be vulcanized are placed. They generally consist of a mixture of asbestos and rubber, in varying proportions, according to the purpose for which the finished product is intended; and after being subjected to the desired pressure and temperature they become so dense and compact that they may readily be turned in a lathe in the same manner as iron.

The iron plates between which the articles are placed are cast hollow, one inch of iron being left all around, on top, bottom, sides, and ends; and into them steam, at 80 lbs. pressure, is introduced by means of a sow and a series of telescoping pipes, as shown in Fig. 1. Each pipe is braced to its plate, and each is provided with a cock so that the pressure may be removed from any desired plate at will. In this way a temperature of 324° F. is obtained, which is sufficient for the purpose required. The surface acted upon by the steam we will consider to be 38 square inches, or 38 × 38 = 1,444 square inches. The total pressure tending to burst the plate is therefore 1,444 × 80 = 115,520 lbs. This is so far within the collapsing pressure exerted by the water below that there is evidently no likelihood of the plates bursting in a vertical direction when the press is in operation, provided the articles to be compressed are properly arranged so as to distribute the stress over the surface of the plates, and not allow it to be concentrated on a small area anywhere.

Cast-iron staybolts an inch and a half in diameter extend from face to face of the plates. They are spaced six inches apart in both directions; there are thirty-six of them in all, and they form an integral part of the plate. When steam pressure is on and the hydraulic ram is in action, the staybolts sustain a compressive strain; and when the steam pressure is on and the ram is not in action, they are exposed to tension.

The press had been in use for about eight months, when one morning, after running for about twenty minutes, one of the plates fractured under the steam. A workman near by narrowly escaped death from a flying core bolt, and several others were so shaken up as to be unable to work for the rest of the day. The appearance of the fractured plate, after its removal from the press, is shown in Fig. 2. The upper portion of it was broken into two nearly equal parts, and the fracture along the edges of the fragments was bright and crystalline, and had the appearance of good cast iron. The same is true of the fractured surface of the outer row of staybolts, completely round the plate. The sixteen staybolts composing the inner rows, however, presented a very different appearance. In nearly every case the surface of separation was of a dull reddish brown, and on most of these bolts no sign of a bright fracture was to be seen. Some showed small bright spots at the centre; and the appearance of all was as though flaws had started along the under surface of the plate, approaching the centre of the bolt from all sides, and that in most cases the flaws had reached the centre of the bolts long before the time of the accident, while in a few cases the separation at the centre was not yet quite complete. Some slight action might possibly result from slight but repeated flexure of the surfaces of the plate by the unequal distribution of strains through the points of contact of the articles placed in the press to be vulcanized. It is hard to understand, however, why nearly all the bolts broke out at the same end, if the flaws resulted simply from the figure of the plate; for in that case there is obviously no reason why the bolts would break off at either end in preference to the other end. Moreover, such of the fractures as were dull appear to have been so for a long time—probably for as long a time as the press has been in use.

In casting work like this it is hard enough to get a sound casting, even when every possible precaution is taken; but when the foundry is run under pressure, and the acticles cast must be delivered almost immediately, there is a great temptation to uncover the molds and expose the contents to the air so as to facilitate their cooling. Castings cooled in this way have been known to explode with violence, and even to wreck the foundry in which they were lying. A plate like the one under consideration should be allowed at least twenty-four to thirty six hours to cool in, and it is possible that its

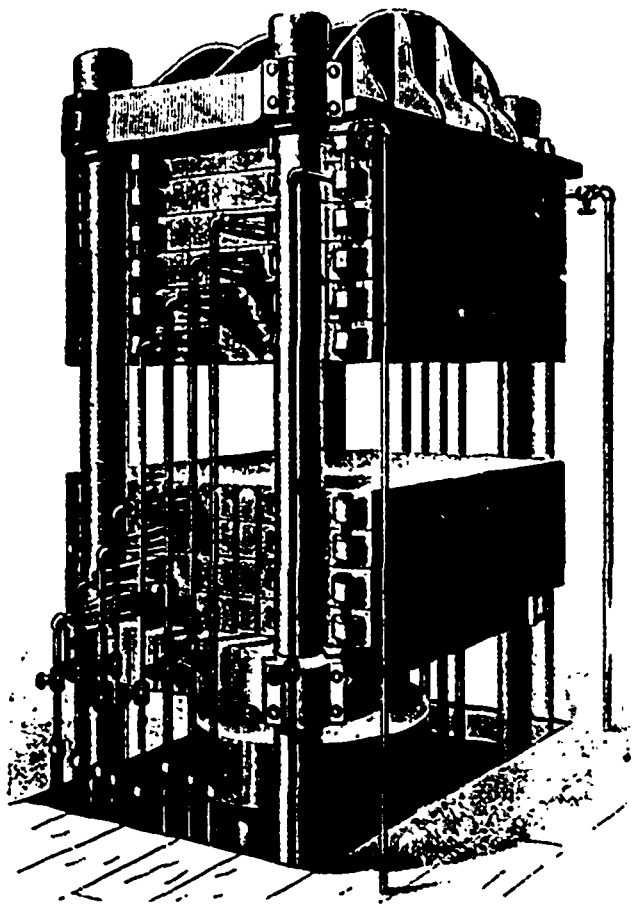


FIG. 1.—PERSPECTIVE VIEW OF PRESS.

cooling was hastened by removing the sand above it, and that the observed fractures were caused in this way.

Another bad habit that some foundrymen have, in working on jobs of this kind, is to let them cool down almost to 212° F., and then introduce a little water into them. The steam so produced removes the sand from the interior in a lively manner, and considerable laborious digging and scraping is avoided. We should not like to say that the man who cast these plates adopted

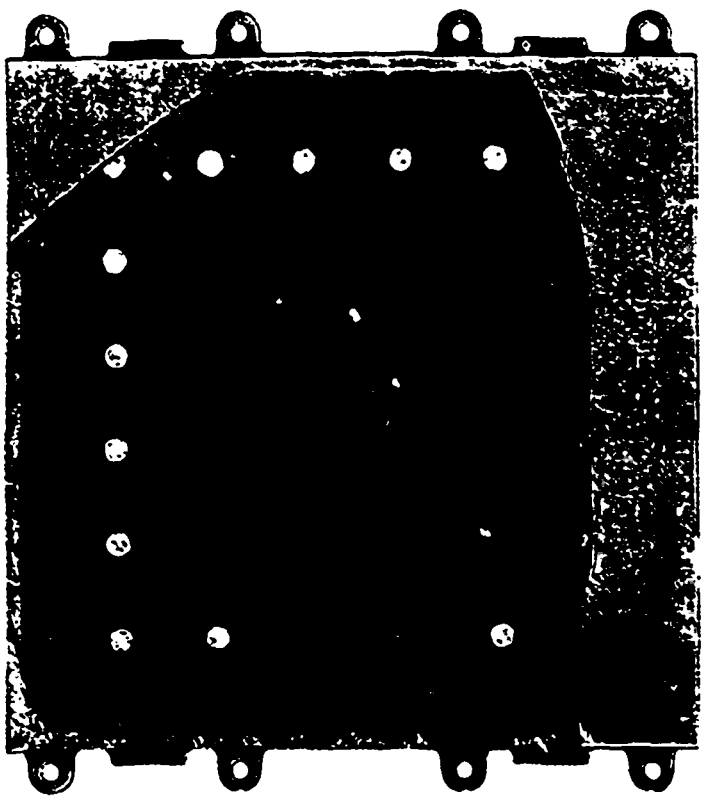


FIG. 2.—APPEARANCE OF EXPLODED PLATE.

that method, but still it is possible, and if it were so we could hardly be surprised at finding the bolts broken off.

However the original fractures were made it is apparent that after the plate had been under hydraulic pressure for twenty minutes, it would hardly burst without some immediate cause; and it would be interesting to know what that cause was. By reference to Fig. 1 it will be seen that one end of the press was provided with steam pipes, and the other end with drip pipes to remove the water of condensation. Those attached to the near end in the engraving are the drip pipes. They are braced in such a manner that it is convenient to have them enter the plates at about midway of their thickness; and an examination on the morning of the explosion showed what evidently must be the fact, namely, that every plate must be constantly half filled with water, since the drip pipes are so arranged that they cannot drain the lower part of any plate. It is probable, therefore, that with this large surface of water exposed, some sort of a water-hammer action was set up, which, acting in addition to local strain caused by the articles under treatment, caused the fracture. All drip pipes should open into the space to be drained at the lowest point.

One of the staybolts in the exploded plate was placed in a planer and cut apart longitudinally. The tool pushed its way through with a soft, unresisting sound; no chips were thrown off, but the tool pushed out before it a pulverized, dark-colored substance, very unlike the ordinary chips from common cast iron. This suggests that, under the peculiar condition of strain and temperature to which these staybolts were exposed, the metal may undergo a modification of structure. The staybolt in question was planed down and polished to a perfectly smooth surface and then immersed in an acid bath. It was etched all over very evenly, and seemed to be of very uniform composition.

In Fig. 2 the engraver has given a very good representation of the plate as it appeared after the accident, the brightness or dullness of each fracture being faithfully imitated by a corresponding shade in the wood cut.—*The Locomotive.*

MOTIVE POWER AT THE PARIS EXPOSITION.

THE exhibits in the main hall of the Palais des Machines will be arranged in six rows, extending lengthwise of the building. Four of the rows will be 50 feet wide, and two 33 feet. There will be four lines of main shafting, one to each of the four wide rows. Steam will be supplied, says *Industries*, by a variety of boilers, all of which will be placed in one of the courts, so that the visitor may conveniently compare the different types of steam generators. The total power of the boilers is estimated at about 40 tons of feed water evaporated per hour. The following firms are among the exhibitors in the boiler department: Belleville, de Mayer, Knap (London); Babcock & Wilcox (New York and Glasgow); Davey Paxman (Colchester), Wehyor & Richmond, Fives-Lille, Dayde & Pille, Roser, and Dulac. The distribution of steam to the various engines will be effected by underground steam pipes laid in conduits throughout the length of the main building. The size of the pipes is calculated so as to give a maximum velocity of flow of 33 feet per second. Various boiler pressures will be used, but in the majority of cases the pressure will be between 90 and 120 pounds per square inch. To provide for the condensing engines there will be two water mains running parallel with the steam pipes, and both two feet in diameter—one for the cold-water service, bringing the water to the condensers, and the other for the return of the warm water. The administration pays the exhibitors of boilers who supply steam for the general service, at the rate of 8,500 francs (£340) per ton of steam delivered per hour during seven hours per day, for 180 working days. Should steam be required for a longer period than seven hours daily, the administration makes a further payment of 6 francs for each ton of steam: and if the exhibitors should be prolonged beyond the 180 days, the payment will be 5 francs for each ton of steam supplied. Taking an average of 26 pounds of steam per horse-power hour, it will be seen from the above figures that the administration pays at the rate of about ¾ d. per *horse-power hour.*

Of steam engines there will be shown a great variety. The administration pays 40 francs per horse power supplied during the whole time the exhibition is open, viz., seven hours per day for 180 days; and if the power is required after this period, the payment will be ½ d. per horse power per hour. The four lines of shafting will be supported on bearings fixed to a system of standards, cross girders and longitudinal girders, the latter also serving as supports for the traveling platforms, which will run the whole length of the main hall. These will be electrically worked, and used as travelers during the installment of the exhibits, and later on for the convenience of visitors, who will thus be carried from one end of the machinery hall to the other. The supply of feed and condensing water for a plant of boilers and engines representing about 4,000-horse power is a matter of some importance. The total quantity of water required per day is estimated at 6,000 tons, or 850 tons per hour. The water will be pumped from the Seine and stored in elevated tanks of 166 tons' capacity, the pumping plant being in duplicate one of MM Quilacq & Meunier (Wheelock engine) and the other by M. Thomas Powell, Rouen (Worthington steam pumps). The water will be carried to the machinery gallery by a main of two feet in diameter, placed along the Avenue Suffren.

There is said to be more money invested in the milling business than in the woollen and cotton concerns of the Dominion. In Ontario alone between twelve and fifteen million dollars are invested in 2,000 mills.

MODERN MILLWRIGHTING.

PROFESSOR Kick says: "We have already remarked that the tendency of modern millwrighting is to construct mills so as to reduce human labor to a minimum. And much can be done in this direction by means of cup elevators, grain and flour worms and spouts. The screen-house, or wheat-cleaning department, may be completely automatic, with the exception of the necessary watchman. But so far as regards the mill proper there is much more to be done; for in high grinding, be the process but half carried out, the co-operation of hand labor for the grading of the products is necessary, and for this reason, that from the different wheats, middlings varying in quantity and quality are obtained by the different breaks, and that for the grading and further distribution of those products, the co-operation of human and intelligent labor is to a certain extent indispensable, unless good and inferior materials are to be mingled with the result of injuring the quality of the product. A complete automatic plant can be recommended only where the quality of the products is of less account than their quantity and cheapness. The same remark applies to mills in which rolls are exclusively used for the process of reduction. Such mills will require more power for the grinding of fine middlings (dunst) than plants in which millstones or dismembrators are also brought into use, and the bran will be less thoroughly cleaned. Where country customers do not object to brammy flour, and where power is cheap, the miller may, from a commercial point, get along well enough with a pure roller plant; but if these conditions are not altogether fulfilled, as will happen in the great majority of cases, then such plants are to be rejected, however much they may be admired and praised."

THE WINNIPEG LIGHTING PLANT.

THE Winnipeg, Man., *Sun*, gives an extended description of the new plant of the Electric and Gas Light Company, from which we glean that the two systems of lighting have until recently been operated from separate points, but have now been consolidated, the electric light machinery having been moved to the gas works, and now both works are carried on under the same roof. An extensive addition, 80 x 80 feet, has been erected to the south of the old building, and is now utilized for the electric machinery. A moonlight season was selected for the change of the plant, and the work was done in time to be in readiness for lighting the city in accordance with the contract between the council and the company. That evening, on the first starting of the machinery in the new premises, several prominent ladies and gentlemen visited the works to witness the proceedings; and Mrs. W. Bathgate, wife of the general manager of the Electric and Gas Light Company, then turned on the steam to start the machinery in motion. The machinery of the Electric Light Company is of the most modern and improved pattern, and all arrangements are very complete. A large portion of the east side of the new addition is taken up by the large steel boilers, of which two of sixty horse power each are already in position, and the foundations are being built for two more, which will give them a total boiler capacity of 250 horse power. In the northwestern portion of the building are located the two very fine engines, considered the most powerful in the province, of 200 horse power. The steam enters a high pressure cylinder, and after doing its work there, is discharged into a low pressure cylinder. In an ordinary high pressure cylinder, the steam after doing its work in the cylinder is exhausted into the air against atmospheric pressure, which is 14.7 pounds per square inch; but in the case of these engines an air pump creates a vacuum in the condenser and low pressure cylinder, thereby destroying the resistance of the atmosphere, and consequently saving a considerable quantity of power; then the steam, entering the low pressure cylinder, does the same amount of work as in the high pressure, indicating a saving of nearly 50 per cent. But ten per cent. of this saving is utilized in driving the air and circulating pump, leaving a net saving of about forty per cent. against the old style engine. The engines have cylinders of 14 x 36 and 24 x 36 respectively, and set in motion a mammoth driving wheel forty-four feet in circumference and of great breadth. From this belting is attached to a pulley (of six feet diameter) on the line shaft, and which are pulleys belted back and front to the several dynamo machines. Underneath the engine house are the water pump, the condensed water basin and water pump. There are at present five dynamo machines in operation, and preparations are being made for putting in two more. The dynamos now used are four ten-arc lights of the Western pattern, and one forty-light of the Thomson-Houston, to supply the extra lights contracted for by the city council in the new agreement, and a 1,000 sixteen-candle light incandescent dynamo, to furnish incandescent lights throughout the city. The former will be ready shortly, while the latter, it is expected, will be in operation in July, as there is very little to be done other than to place the machinery and string the wires. Superintendent Stewart said the company intended going extensively into providing incandescent lights, as there were many inquiries for the light for stores and private residences. He expects to be running these lights to their full capacity in the early fall, and if the demand requires it, a second machine will be put in, of the same capacity as the one now being provided for. The incandescent light will be principally used in the outlying districts of the city, where gas pipes are not laid, and where the residents are desirous of having a better light for their houses than the murky coal oil lamp.

RAPID INTRODUCTION OF THE ELECTRIC MOTOR.

VERY quietly and with astonishing rapidity has the electric motor made its way into the hearts of power users, says the *Electrical Review*. It is really astonishing, even to the electrical enthusiast, how great has been the headway made by this modern servant of man. It has displaced steam engines in many instances in almost every branch of industrial manufacture; it even has been substituted for water power to the extent of using the latter for electrical generator, the leads for distribution and the indefatigable motor for local service, since greater economy is generally obtainable in this manner. It is fast relieving the horse in traction work, and bids fair even to do the uncomplaining mule out of his job. In all parts of the country the electric motor's busy hum can be heard. It is probably safe to say that there is not a town large enough to support a lighting plant that has not also advanced enough to adopt the motor to a greater or less extent. And we predict that the time is not far distant when the electric motor, as the immediate source of applied power, will be a greater factor in the field of usefulness than the steam engine, and the latter will be relegated to the driving of electric generators.

In certain lines of work, however, the electric motor has a long way to go in the way of improvement before it can be used, if ever. For instance, in rolling mills and other establishments of a kindred nature, where the required power cannot be subdivided, and enormous strains are put upon the driving engines, as at present constructed, the electric motor has no place, and we doubt if it ever will have. But in all cases where the useful effect is wanted at many points and in moderate amount, the electric motor will have the best of the contest. Already it has made great strides in the propulsion of street cars, and there are for this purpose alone a great number of motors in daily operation. Certainly this new servant of man is proving to be a rich prize.

ECONOMY IN MILLING.

ONE of the remarkable things connected with the manufacture of flour says the *Millstone*, is that the business of manufacturing has never been placed upon that economical basis of operation which characterizes manufacturing of other lines of staple products. For instance, cotton and woolen mills, machinery, boilers and engines, machine tools and general mechanical supplies. The cotton and woolen manufacturers of New England, and some of the engine builders and other machinists of the country are making fair dividends out of the waste which now belongs to flour mills. Not that all of their operations are essentially wasteful, but the whole arrangement for the production of flour with respect to insurance, convenience of handling, cost of fuel, labor and all is conditioned on an extravagant basis. It is entirely possible by proper means and united action on the part of any respectable number of millers to reduce their insurance to one-third its present cost. This would mean, say, a reduction of 2 per cent. upon the value of the destructible property on which insurance is carried. There are few mills which we have in mind wherein a saving of 25 per cent. of the wages paid for roustabout labor could not be made by the application of power shovels, and cars and scales which would hold and weigh say, one-half, if not a whole car of wheat. By such means, and with an elevator which would carry the wheat to the scale without waiting for a lower hopper to discharge itself, or for weighing or other waste of time, the matter of handling wheat would be a small thing. Small reservoirs for holding flour which make it necessary to pack out as soon as made, is another source of expense. There are few mills which one goes into where they cannot see the opportunity for great improvements of many kinds in handling flour after it is packed. Again, this is true of all milling products received or discharged. Machinery which is out of the line or not well proportioned, requires a great deal of extra attention, and therefore extra help. A mill where provisions are not made for collecting dust or exhausts from the rolls and conveyors, requires extra help in the way of sweepers. Generally speaking, mills could be arranged to operate on their present capacity with a much less complicated scheme. The general design of the mill and the workmanship from a mechanical sense, and its general arrangement, has a great deal deal to do with expense of its operation by millers, machine men, oilers and sweepers. We have in mind one mill, which is not an exceptional instance, where the pay-roll was $50 a day, which was afterwards reduced 20 per cent. by a few very simple devices. The general category of labor-saving arrangements which we have suggested here was not undertaken. We say that the neglect of all of these things is extravagance, that it is waste; that in no line of manufacturing business are these things so generally disregarded. A great many mills are operating at a great loss of fuel through cheap steam plants. Oftentimes the difference between a second class and first-class engine could be made up in a six months' run.

We do not wish to institute any radical reforms along this line, but make the suggestion in order that millers may have them in mind, and come to them through the course of years as they find it convenient and agreeable to do so. It may be done by taking up one detail at a time, and thus, without great immediate outlay, improve the earning capacity of their milling property.

POINTS FOR ENGINEERS.

THE area of a chimney is generally made 0.16 of the area of the fire grate.

The average quantity of incombustible matter is 10½ per centum.

All grates should have an inclination of about one inch in every one foot of length, sloping downward from the fire door toward the bridge wall.

When air is admitted behind a bridge wall to aid in consuming the gases, it must be at a point where the temperature is not less than 800 Fah.

When wood is to be the fuel employed under a boiler, the grate area should be from 25 to 40 per cent. larger than if coal is to be used.

The aggregate amount of air opening through the grate should never be less than one quarter the total grate area, as a minimum, and may be increased with advantage.

Look well after the masonry of a boiler; stop all cracks in the walls with mortar or cement as soon as discovered. They impede the draught and cool the plates of the boiler, causing a waste of fuel.

The benefits derived from heating the feed-water are found not only in a saving of fuel but also in a diminution of the intermittent contraction and expansion, in purification of the water, and in steadiness in steaming.

The part of the bottom of an externally fired boiler acted upon most severely by the fire is just behind the bridge wall, and if a girth seam unavoidably comes at that point, the edge of the lap must not face towards the fire.

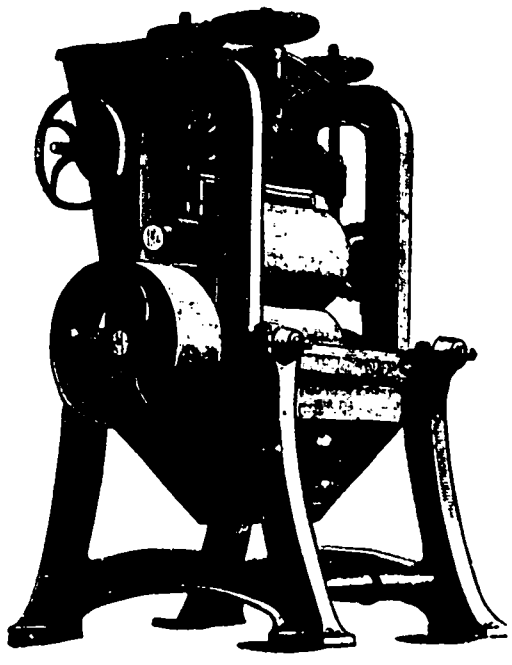
Plates of iron are tested cold by punching holes near the edges, and by bending them to angles of different degrees, corresponding to the thickness of the plates. They should bear these tests without showing any signs of cracks or laminations.

Remember that the efficiency and safety of a boiler depend as much upon the efficacy of the water circulation as they do upon the strength and disposal of the boiler, therefore crowding of tubes in a boiler should be avoided.

One very important cause of deterioration in boilers is due to the fact of their becoming too small to do the work without forcing, so that the pulsations of the engine cause a well marked succession of shocks on the boiler, which results in a weakening of the material. By placing one's hand on the head or shell of the boiler, the vibrations of the metal can be felt, similar to the rising and falling of a man's chest while breathing.

Whenever a hard patch is to be put on a boiler, it must have the same thickness as the sheet to which it is to be riveted, and should be of the same quality of material, and it should be so arranged that no pocket is formed for the collection of scale or sediment.

When a safety valve of more than five inches in diameter is required for a boiler, it is preferable, as well as much safer, to make use of two valves, each having an area of one-half the total valve. Valves having a diameter of more than five inches are apt to spring on their seats, are clumsy to handle, and more difficult to keep tight.—*Manufacturer and Builder.*



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Respectfully yours, F. HAINES.

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TRADE NOTES

The Jenckes Machine Co., of Sherbrooke, P. Q., have given an order for smelting furnaces.

Messrs. Runeman Bros., of Goderich, have contracted with Mr. Yuras of Keene, Ont., to change his flour mill to the roller system.

Messrs. J. & S. Clemens & Co., of Preston, Ont., have added one of Goldie & McCulloch's largest sized moulding and matching machines to their planing mill.

Mr. Geo Cassady of False Creek, B. C., has purchased through Messrs. Strickland & Co., of New Westminster, a Goldie & McCulloch 75 horse power Wheelock engine, and moulding machine.

The contract for remodeling Sir. W. P. Howland's flour mills at Thorold, Ont. has been let to the Geo. T. Smith Co., Stratford. The mill when completed will have a capacity of 400 barrels per day. The cost will be about $15 000.

Mr. H. W. Petrie, of Brantford, has shipped a car load of iron working machinery to a large Detroit Iron Works which is being erected there. It is a most unusual thing for Canadian machinery to be sold in the United States, and speaks well for Mr. Petrie.

Messrs. Goldie & McCulloch, of Galt, are making some extensive improvements to Taylor & Co's. mill at Chatham, Ont. The plant includes thirteen sets 9 x 30 rolls, 4 scalpers, six purifiers, including three of Holts' new patent "dustless" machines, the first of the kind in use in Western Ontario. The capacity of the mill will in future be 300 barrels daily.

It is stated that the Cochrane Roller Mill Company of Escanaba, Mich., of which Valancy E. Fuller is President, has absorbed the W. F. Cochrane Roller Mill Supply Co. of Dundas. This was not an unlooked for event, as the former President of the Canadian Co., V. E. Fuller, the Superintendent, F. H. Brewster, and the Chill Roll Maker, Edward Condor, now occupy similar positions, at Escanaba, in the American Co. We do not know whether the Dundas shops will be operated by the American Co. or not, but we understand that the Cochrane train of rolls will be manufactured and supplied to the millers in Canada.

PROGRESS IN INCANDESCENT LIGHTING.

GREAT progress is being made in incandescent lighting. The difficulty heretofore has been in supplying incandescent lights at a distance from the source of power by a safe, economical, and practical method. The low-tension currents in use are only suitable for lighting within a circle say, three-fourths of a mile in diameter, the power being located in the centre. The Ball Electric Light Co. have recently brought out a system for supplying 10, 25, or 50 c. p. lamps at any distance from the power, say, within five miles, which means a circuit of ten miles. This is done with a purely constant current, doing away with the danger which is incurred from the use of the alternating current of high electro-motive force. The current is carried on a single wire, which makes the appearance of the wiring on the streets and in the houses much neater. Perfect safety is assured from the fact that all proportions of the lamps and sockets are completely insulated. No metallic portion of the circuit can come in contact with the person, and even should it do so the current used is so small and of such low-tension that the wires may be handled with safety. The loss from overcoming the resistance is but one 25 c. p. lamp in each mile of wire, No. 8 wire being used, and about 220 c. p. is obtained to the horse-power. A new type of Ball double armature dynamo is used with this system, and regulation is obtained by novel contrivance. It is claimed that this is the most economical system, both in installation and maintenance, that has yet been brought forward for incandescent lighting, and the cost for the renewals of lamps is very slight, as they have a long life and do not blacken and there is no annoyance from burning out of armatures, fuses and converters as in the alternating systems.

FILING SHINGLE SAWS.

OF this style of saw we hear and see but little in the way of information about keeping it in order, says a writer in the *Woodworker*. This can be attributed to the fact that good shingle saw filers are as scarce as rotary filers who can master their own saws. I have the opinion of but few on this subject, and have caught what I know about shingle saws almost from my own experience, and while I do not wish to boast, will say that I am actually sawing $25 worth of timber a day in using 18 and 19-gauge saws over my neighboring filers who are using 15 and 16-gauge saws; besides I am making the smoothest shingle on the same feed. This assertion can be proven.

These filers are considered first-class, and are paid from four to five dollars per day for their work. What can be the trouble? First, I run 120 teeth to a saw, to their 80 and 90. Now there is hardly a limit to the amount of teeth a shingle saw can have. A saw running on ¼-inch feed does well with 140 teeth, and should have that number if economy in timber is sought for, which certainly ought to be the aim in sawing shingles.

Talk about economy in thin saws for board sawing, I have seen men have the thin saw craze as far as their large circulars were concerned, yet pay no attention to what their shingle saws were doing, when in reality the shingle saws were throwing away thousands of dollars annually in sawdust.

A thin shingle saw will not run with the same number of teeth that a thick one will. A 16-gauge saw will not run as well with 80 teeth, as a 19-gauge will with 130. Each tooth cuts then a fine shaving, making a perfectly smooth shingle, where if the same saw had a much less number of teeth, they would be springing, dodging and making clips.

There are many things to be taken into consideration in using thin shingle saws. First, collar, saw and pulley must be in perfect balance, and run at a high speed; teeth as short as possible to clear, with round throats, filed perfectly square, with a partly spring set and a little swaging. This latter many will condemn until they have had experience with thin saws running on a power feed machine. Some may ask, why should and how can such thin teeth be swaged? The reason that they must be swaged a trifle is this: The teeth of an 18 or 19-guage saw are very thin, and to give the saw the set that it must have, leaves a little core or part in the centre of the cut that the teeth does not remove.