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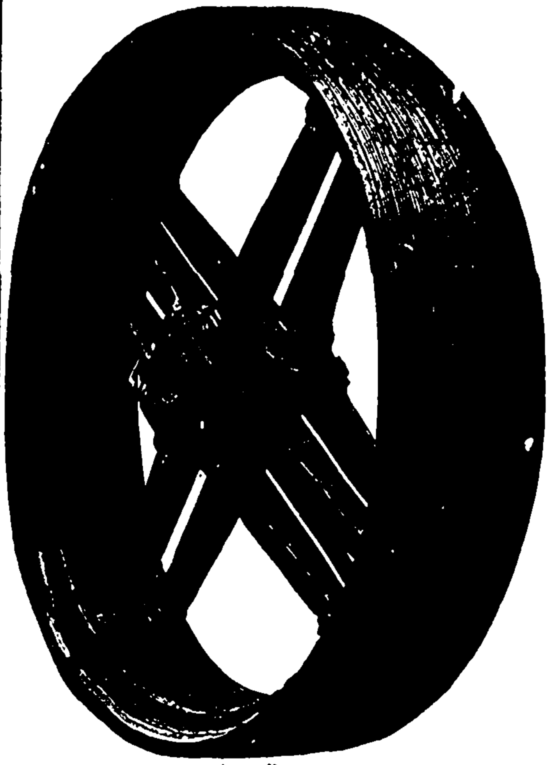

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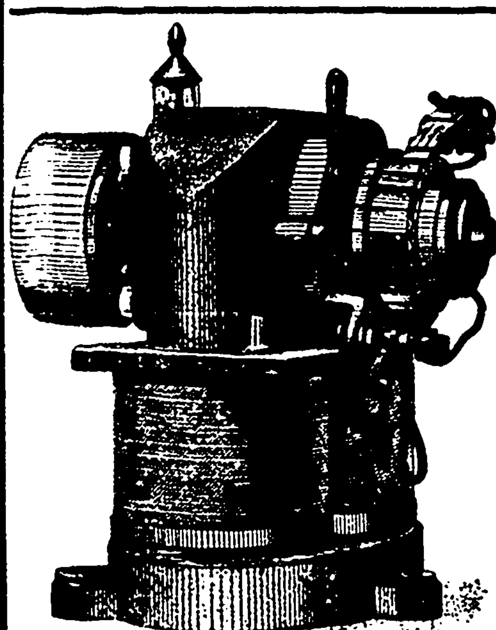

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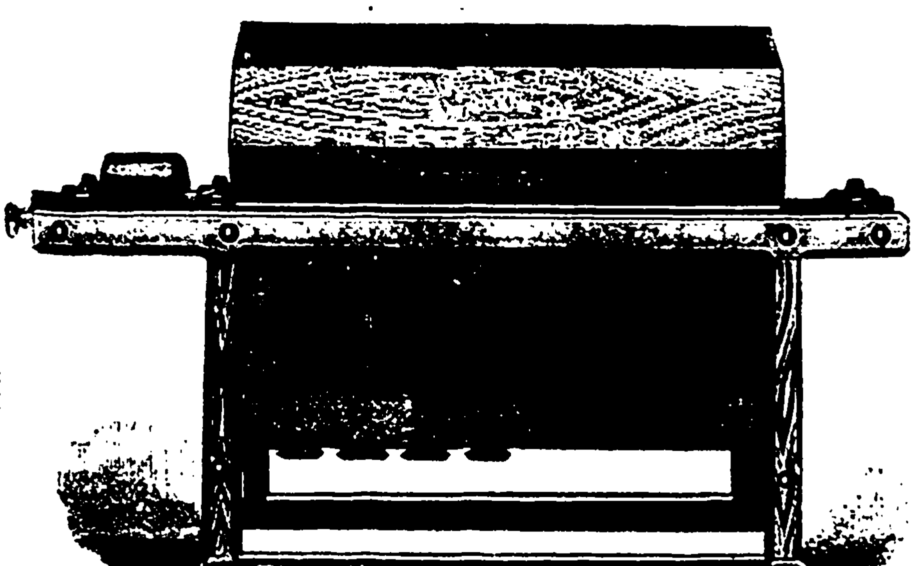

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ELECTRICAL MECHANICAL AND MILLING NEWS

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EDITOR'S ANNOUNCEMENTS.

Correspondence is invited upon all topics pertinent to the electrical, mechanical and milling interests.

DURING the past few years all millers manufacturing the higher grades of flour have adopted the practice of mixing Manitoba wheat with Ontario fall wheat, especially for family and bread purposes, and it is universally admitted that the flour is thereby greatly improved. But while mixing is almost universal, the manner of mixing is very different. Flour of a certain strength is required for the miller's trade, and by experiments and test baking, he ascertains what proportion of the dearer Manitoba wheat is required, and thus he mixes and grinds them together. Another miller, whose mill is on equal footing in point of equipment, uses the same on a smaller proportion of Manitoba wheat, and produces flour that is better and stronger. What makes the difference? One miller, instead of mixing the wheat together, grinds his Manitoba wheat by itself, and afterward when grinding his fall wheat, puts in his proportion of Manitoba wheat flour with a flour mixer; the trouble involved in the one method is considerably more than in the other, but the benefits derived by mixing the flour instead of wheat far more than compensate for the extra trouble. If any miller has an experience to the contrary, we would be obliged for the information.

THE latest development in arc lighting is the new alternating machine of the Westinghouse Company. Their claims for it are many and big, but just at present they ought to be taken with the proverbial grain of salt, at least until experience proves them to have a solid foundation. Apart from the fact that it necessitates the use of primary currents of high tension, making the lamps rather ticklish to handle, it has not been clearly shown that the illuminating power of the alternating is as great as would be obtained from a direct current requiring the same power to produce. Unlike the light from a direct current which is mostly thrown in a downward direction and utilized to its best advantage, the light from the alternating is diffused equally both up and down, and consequently a certain amount must be lost unless it were possible to utilize it by some system of reflectors. In alternating current apparatus, again, there is also a certain amount of power lost in heating the magnet cores of the lamps and converters, as, no matter how soft the iron may be, or how thoroughly laminated in construction, the rapid reversals of magnetism occasion some loss from this cause. The leading wires of the system may no doubt be made safe by thorough and durable insulation, but there must be very good reasons for the change before the present systems of direct current lighting are superseded by the alternating.

IT is to be hoped Canadian manufacturers will heartily respond to the efforts of the Dominion Government to secure a good display of Canadian products at the Jamaica Exhibition to be held in January next. The *Globe* wants to know why so much trouble is being taken to secure a market in the West Indies, while the United States market is being neglected. The answer to this does not appear difficult. United States markets are overflowing with goods in all lines of Canadian production, and American producers are seeking foreign markets where they may bestow their surplus above the requirements of their home market. To find an outlet there for our products would be as difficult as to add to the contents of a full measure. The conditions in the West Indies are entirely different. Canada produces what they require, and *vice versa*, therefore the development of a mutually profitable trade is entirely possible, which accounts for the efforts that are being made to secure it. Canadians are wise in not wasting their time trying to coax the United States to lower their protective wall and let them into a market which is already overcrowded, while there exist markets like those of the West Indies which are certain to well repay any attention which may be bestowed upon them.

THE telephone company of Toronto have commenced what is evidently intended to be a very comprehensive system of underground distribution. We pointed out in our last issue the fact that the telephone companies had in their own hands the remedy for inductive interference with their circuits. Placing the wires underground and making use of metallic circuits, while expensive, is a sure cure for the evils that beset them. The total cost, however, should not be figured against the improvement of their service. The growing feeling on the part of the public that the streets should not be blockaded with a forest of poles and a massive network of wires must be recognized, and it shows a commendable amount of foresight as well as business enterprise on the part of the telephone company in endeavoring to meet this growing opposition as well as to improve their service. When the work is accomplished a considerable saving will be effected in the matter of repairs, and the annoyance of lines broken or crossed after every little atmospheric disturbance will be eliminated. The conduits being laid are of creosoted plank grooved and laid one over the other to form pipe 3 inches in diameter, through which it is intended the cables shall be drawn. The company evidently considers the institution as a permanent one, as the extent and number of tubes being laid afford provision for an immense increase in the number of wires.

THE latest move on the part of the Consumers' Gas Company of Toronto to checkmate its electrical opponents is their decision to charge a rent for meters to all customers who have put in the electric light. No figures appear to have been given as to what the proposed rent shall amount to. If the Gas Company's idea is to make it excessive so as to try and prohibit the use of electric light where gas is supplied, they never made a greater mistake. A move of this kind might have succeeded in the early days of electric lighting, when the service was more or less liable to interruption, but now that it is practically continuous, and reserve machinery at hand to meet all conceivable emergencies, the position is different. Electric lighting is an infant industry just now, but a pretty healthy infant, and promising so rapidly to assume the proportions of a giant, that an attempt to crush the life out of it is not at all likely to succeed. Our friends of the Gas company should keep cool. There is plenty of room for them yet, and the biggest vacuity they have to fill is the room for improvement in the quality of their gas. If they would look after this, and check the exuberance of the little gas meter as it gets in its fine work at unholy seasons, they need not be so much in the condition that in our schoolboy days we used to denominate as "a state of funk." There are immense areas of both business and domestic lighting which for many years the electric light will be unable to reach, and they have been so busy raking in the shekels for the supply of illumination that the extensive field open to gas for both heating and power purposes has been left comparatively untouched. Its profits may be smaller, perhaps, but still enough to make the "calling and election" of a ten per cent. dividend as sure and certain as anything can be considered in this mundane sphere.

ON the eve of another harvest, it may be well to look our milling future in the face, and see if there is a possibility of opening up some new markets for our flour. In the olden times when Ontario farmers grew in great abundance prime white and red winter wheat of varieties which produced flour that no other country could surpass, it was easy to find markets for all our product, because the abundance of wheat kept the price down to export basis. But Ontario fields have now ceased to yield those kinds of wheat in abundance, hence our prices for wheat are hardly ever down to export basis. There is, however, one variety of spring wheat that our farmers say they can grow plentifully, viz., goose wheat. But it will not produce flour suitable for the markets we are accustomed to supply, consequently millers will not give the farmer any encouragement to grow this variety extensively. Leading farmers have assured us that they would willingly do so if certain that a market could be found for either the wheat or flour, and because of its prolificacy, would be willing to market it at 20 to 22 cents less than the better flour producing varieties. This being the case, would it not be well for our Millers' Association to endeavor to find out if a foreign market cannot be found for this flour which can be produced at 20 per cent. less than the better grades? This recommendation would of course be entirely out of place if any hopes could be held out of our farmers again raising in abundance varieties suitable for the higher grades, but until science shall have taught them to bring back to the fields their original wheat producing property, there is small hope indeed in this direction. Let us try and do something with the kind of wheat our farmers can raise. If an effort were made to introduce this flour in Belgium from wheat costing about 65 cents per bushel, there seems ground for the belief that it eventually would pay. No doubt a little money would be lost in introducing it at Antwerp and Brussels, but when once introduced, with a strong probability that this grade of flour could be supplied regularly at much lower prices than the better grades, a new market would be opened up which would employ some of our flour mills during part of their idle time, as well as give the farmers a market for something to take the place of their barley, which the McKinley Bill is intended to deprive them of.

The cable news in our morning papers of July 15th give us the information that Sir Charles Tupper, our representative to the English Government, had been to Brussels endeavoring to open up trade between Canada and Belgium. Why should not our Millers' Association endeavor to get Sir Charles to assist them in this matter? As it would appear that the Government is willing to assist other industries, where by so doing the general good of the Dominion at large is promoted, what more fitting than that something should be done to assist our farmers to a new market just at this juncture? Should such assistance not be obtainable, it is important that our millers should take the question up at their annual meeting in Toronto in September, and endeavor to get one or more millers to try and open up this trade, and if need be subscribe a small guarantee fund against any loss on first transactions. If it should be ascertained that a remunerative trade could be done, farmers could be induced to sow this wheat largely next spring. Some millers may say: "It don't affect me; I can get all the good wheat I want; I will not endeavor myself or assist others to open up this new outlet." To this we reply, it does affect you. Every sack of flour exported out of this country takes away to some extent the cut trade opposition in selling flour in the home market. We should be glad if some of our subscribers would give us their views on this matter.

ONE of the most important results of the rapidly increasing adoption of electricity for lighting and power purposes, has been the enormous impetus given to the engine building industry. Thousands of horse power are now manufactured where ten years ago the production was reckoned by hundreds. The demand for increased economy in the operation of large steam plants has led to a higher standard of design and more efficient workmanship. The electric light machine is exacting in its demands on the prime mover. The governor must be accurate and sensitive. The speed must be uniform under greatly varying loads, and the motion smooth and steady. The engine must be capable of a long and continuous run with a minimum of wear and tear, and must be as simple in construction as may be compatible with efficiency, in order that there may be no necessity for stoppage to adjust complicated mechanism or to provide for proper lubrication. In short, a machine that a few years ago would be considered a fairly good engine, would not be looked at by the electrical engineer of to-day as fit for any better destiny than to furnish motive power for a backwoods sawmill. Among the improvements coming to the front is compounding, both double and triple, and with a view to still further economy even a quadruple engine is suggested, using the steam successively in its four cylinders. The higher initial pressure of steam required for this expansive working, calls for boilers of improved construction and superior material. In fact, the skill of the boiler maker is taxed to as great an extent as is that of his brother engineer, and the impetus given to the industry of boiler manufacture and the adoption of improved methods of both workmanship and construction is not less marked in this than in the parallel field of engine building. With the introduction of the electric railway and the extension of isolated and public electric light plants, there is still a large demand ahead for motive power, and those of our engine builders who best appreciate the importance of this fact and strive to meet the varied and exacting requirements of the electric lighting engine and to produce it at the minimum of cost, will reap substantial rewards for their enterprise.

FOR many years the project of a ship canal to connect the Georgian Bay and Lake Ontario was before the Canadian people. The advantages of such a canal in shortening the distance from Chicago and the west to the seaboard, were clearly apprehended, but the great expense of the undertaking, which was estimated at $24,000,000, prevented its being carried out. It is now proposed to substitute for the ship canal a ship railway, which it is said could be constructed for $12,000,000, or half the cost of the canal scheme. The practicability of ship railways has been fully demonstrated. As our readers are aware such a railway is now in course of construction, and nearing completion, across the isthmus of Chignecto between the Bay of Fundy and the Gulf of St. Lawrence, designed to transport vessels weighing with cargo and machinery 2,000 tons. Its length is 18 miles. The distance between Lake Ontario and the Georgian Bay from the mouth of the Humber to the mouth of the Nottawasaga River is 66 miles. The construction of a ship railway between these two points would be the means of saving 428 miles of lake navigation and 28 miles of canal between Chicago and Montreal, and undoubtedly would divert a large portion of the western trade from the St. Lawrence to Montreal and Quebec. By this route it is said a propeller leaving Chicago would reach Montreal or even Quebec before it could reach Buffalo. It is stated that a syndicate is prepared to carry out the undertaking if the Canadian Government can be induced to grant a liberal subsidy. The matter is of sufficient importance to warrant the fullest investigation. Canada has spent upwards of $50,000,000 on the construction of canals, and she could afford a further expenditure if thereby she might obtain such a decided advantage over her American competitors for western trade, as it is claimed the proposed Toronto and Georgian Bay ship railway would afford.

BETTER counsel seems to have prevailed with some of the municipalities who were being agitated into the idea that wonderful saving would result if they owned their own electric light plant. About every town that has so far tried it would be willing to withdraw and relegate the business to private enterprise if it could be done without too much loss of both prestige and cash. Even the people of Chicago, after spending half a million dollars for the privilege of being about the poorest lighted city on the continent for the money, are beginning to realize a dawning consciousness of the fact that they have made a mistake. The experience of Bangor, Maine, is a case in point. They got away with the idea that as they had a water power the light would cost them nothing (a fallacy, which, by the way, we hear repeated every day). The estimated cost of the outfit was $17,000, but up to date, from one cause or another, it has cost over $41,000 with very little prospect of the cost coming to an end. Municipal control of business enterprises, especially of those requiring considerable technical knowledge and skill, has never proved a profitable investment for the citizens. In Philadelphia for the past quarter of a century, the city has owned the gas works. With gas at $2.50 per thousand feet and with cheap coal to make it of, the citizens have been called upon to provide for a deficit of many thousand dollars yearly until in despair they have sold the works to a syndicate of private capitalists for a good round sum, whose first proceeding was to reduce the price of gas! It is probable that by private enterprise electric light could be supplied in a large city with profit to the producers at a lower price than it would *cost* the municipality to make it. This is not to be wondered at when the astounding ignorance of the average city father in regard to technical matters is considered. Even in enlightened Toronto it is gravely proposed to "utilize the engines at the pumping-houses to light the city." It would be just about as sensible a proposition to utilize the hearse horses belonging to the undertakers to run the street railroad. It is this lack of knowledge and the demoralizing influence of political partizanship that is preventing municipal operations, as opposed to private enterprise, from being a conspicuous success.

THE evolution of the electric lighting engine and its construction in many forms has opened a wide field for discussion as to the relative merits of small high speed, and larger slower moving engines, and the question has not been fully decided yet. The advantages claimed for the small, quick running machine, are the absence of counter shafting, they being belted direct to the dynamo, much lower cost in construction, and also less liability to cause a serious stoppage of a large number of lights as would be the case were an accident to happen to a larger engine. On the other hand, the advocate of the single unit points out the smaller wear and tear, increased economy of fuel and oil, especially the latter, and its greater adaptability to the use of a condenser in situations where water is obtainable. It would appear, however, that the peculiar conditions under which each electric plant is called upon to operate, would decide the question of the adaptability of one or the other type of engine. For a small isolated installation where the lights are required for only a short time daily, the high speed would be considerably the best. Its simplicity would recommend it, and the trifling extra cost of fuel would be more than made up by its cheapness and consequent saving of interest, which in the case of a large and costly, though economical engine, is continually going on. But when the power required is constant, as in a public electric light station, every pound of coal saved is so much profit to the concern, and it is here that the massive and powerful engine finds its place. The minimum of condensation and waste, less attendance than its equivalent in small engines, saving in repairs and oil, make it the most suitable and economical that can be used. A few years back central stations were almost universally equipped with a large number of small engines, but they have been largely replaced as business grew by the more powerful, slow-moving variety. There is a danger, however, of running to the other extreme. Engines are now being built of the compound variety, of three thousand horse power for electric lighting. This is carrying too many eggs in one basket entirely, for it means that if a station is to have a proper reserve in case of accident, that a three thousand horse power engine is lying idle all the time. The best practice would seem to be in constructing large central stations to have the power divided in units of from three hundred to five hundred horse power, and have these engines of the cross-compound variety, so that either side of any engine could be utilized in case of accident to the other.

IN view of the early termination of the charter of the Toronto Street Railway Company and probable changes that will be made in the provisions of a new one, the problem of improved methods of street car propulsion is assuming considerable importance. It is universally conceded that an improvement upon horse power is desirable, both on the score of humanity, cleanliness, and to meet the modern requirements of rapid service. Steam has been frequently tried and found wanting, it being dirty, noisy and dangerous. The use of continuous cables driven by a stationary engine of large power have proved to be a long step in advance, and where the streets are straight, moderately level, and the conditions generally favorable, is considered to be a success. The maintenance and renewal of the cables, however, constitutes a heavy item of expenditure, and there is a certain amount of risk in a crowded thoroughfare through the inability of the cars to go backward in case of an obstruction or jam of traffic, while, as has sometimes happened, the fouling of the "grip" with a loose strand of the cable so that it cannot let go, is apt to make things pretty lively for a time until the engines can be stopped. When this happens the entire system is brought to a standstill till the defective part can be remedied. The electric car is free from these defects, but like everything finite develops a few drawbacks of its own; not the least of these is the maze of overhead wires necessary for the transmission of the electric current to the cars. Many schemes have been tried to keep the wires in a subway or conduit between the tracks, but they have not as yet been considered a success. Here is a chance for the inventive genius to make a mark for himself. The invention of a practicable conduit would remove the worst objection to the electric car, and the one that prevents it taking an assured place as the successful solution of the important problem of interurban traffic. The requirements of a successful conduit are, perfect insulation, especially during wet weather, freedom from interference by snow and ice in winter, accessibility for inspection and repairs, and a construction that, while fulfilling all these requirements would not interfere with the ordinary traffic of the street. It must be admitted these are rather difficult demands to meet, but the obstacles once overcome, the electric railroad would rank as the crowning triumph of the age. The cars, bright, clean, independent of each other and rapid in their movements; under perfect control, forward or back, lighted with electric light, one car pushing another in case of accident to its machinery, or pulling a train of three or four during the crowded hours of the day, would make a picture that would be a brilliant contrast to the slow-moving, evil-smelling horse cars of to-day. In fact, a prospect such as this would even go a long way towards reconciling us to a few more wires overhead, and an extra pole or two along the streets, but let the successful conduit be evolved from the brain of some ingenious inventor, then the triumph of the electric railroad will be indeed complete.

THE very fact that new developments are to be looked for in the electrical field is bringing to the front, as usual, the electrical fake. In a paragraph now going the rounds of the various newspapers, we read of a Hartford genius who has solved the problem of converting heat into electricity direct. After a glowing account of the wonders performed, we are naively told that "it had not been demonstrated fully that the invention was of commercial value, but enough had been shown to convince people that it could be made so with the proper apparatus." In other words, a man could live a thousand years if he did not die in the meantime. The article referred to, which by the way appeared in the Toronto *World*, goes on to say that "it was admitted that more than forty years ago the discovery was made that the action of heat on two different metals produced a current of electricity." The fact is that the whole business is the old story repeated of a vamped up laboratory experiment of years ago trotted out and made to do duty as something wonderful and new, and foisted off on credulous capitalist who is usually ready to bite in these days when anything electrical "has the call" as it were. Electricity has done many wonderful things and has been applied to many new and useful purposes. Smart rascals take advantage of this fact, and of the mystery which to the average mind surrounds the science, to make their victims believe their plausible stories of wonderful inventions which are to revolutionize the world, and it is only when the victim's hard-earned shekels have been transferred to the capacious pockets of the fakir that he begins to realize the fact that he is more kinds of a fool than he had given himself credit for being. With this class of frauds may be classed the primary battery fake. Although the bottom has fallen out of these schemes time and again, if we mistake not, a number of too-confiding Toronto citizens have reason to regret ever listening to the voice of the charmer in the shape of the individual who had invented "a new kind of electricity" made from water and air, did not cost anything to produce, would run on any kind of wires without resistance and as far as you pleased without loss, and so forth, *ad infinitum*. In fact, while his victims were being nearly choked with the fumes of hydrogen gas from the rapidly decomposing zincs of the battery, he would coolly assert tha this plates lasted for years—in fact, never wore out. As electricity and electrical phenomena come to be better understood, however, the field of operation of these sharpers will necessarily become more and more restricted, and the ordinary, everyday developments of the science will be as well understood as are those of any branch of mechanics to-day. But because these wild-cat schemes of unprincipled men have caused financial loss to over-sanguine investors, there is no reason why the legitimate development of well-organized electrical enterprise should not obtain the support of solid business men and capitalists of the community. We are but in the early dawn of the electric day, as it were, and what has been accomplished, wonderful as it is, will yet be eclipsed by the splendid achievements of the future. There is no field of enterprise at the present time on which steady progress and development promises more solid returns than the electrical one, but, all the same, beware of the man who has made the wonderful discovery, but whose "apparatus is not quite finished yet."

Our Western Letter.

THE crop situation in Manitoba is just now at its most interesting point. It is just near enough to the harvest to look forward with considerable assurance to the result, and to estimate with some degree of accuracy what the crop will be. Still, it will be some time yet before the harvest will commence, and there may yet be some occurrence which will considerably alter the situation. It is never safe to count your chickens before they are hatched, and even after the hatching process has been consummated the number of chicks may be seriously reduced before they attain that age when they are known as broilers, at which period they provide such a dainty morsel, designed to tickle the palate of the epicure. So with the crops which are yet subject to many adverse influences, and not until the harvest is complete will we be perfectly sure of the result. As the horses come near the wires on the home stretch the interest becomes more intense. The nearer we come to the goal of our ambition, the greater will be the effort to reach it. The experience which Manitoba has had in the past renders the last week or two previous to harvest a period of intense interest, amounting to anxiety. There is that bugaboo frost looming up before our imagination, and we tremble lest he will strike a blow before the binder can get in its work. This situation we say has been caused by the experience of some recent years. Older settlers claim that it was not always thus, and that until recent years this fear did not trouble the people. It is to be hoped that this will again prove to be the case, and that through exemption from this evil for a few years in succession, the dreaded monster will disappear from remembrance.

This is the interesting situation now prevailing in Manitoba. At the time of writing the outlook is, generally speaking, very good indeed all over Manitoba and throughout the territories to the west as well. But we have some little time yet to harvest. With warm dry weather which is needed for the balance of the growing and ripening season, harvest will be on about the tenth of August, but cool weather would prolong it a week to ten days later. In one of the past years in which wheat was damaged by frost, three warm days would put almost the entire crop past danger, but instead of this we had heavy rains, followed by a long spell of cool weather, culminating in a sharp frost. During the cool, damp weather, the grain remained in a stationary condition, and finally was damaged by the frost. However, with the average weather there should be no danger from frost this year; but it all depends upon the weather for the next few days, or weeks at most, whether or not it is warm and dry enough to hasten the ripening of the crop.

Crop reports and crop estimates have been flying around very freely of late. In fact there has been a perfect deluge of crop "news" ever since the season started in this country. This is undoubtedly the greatest community for gathering crop reports in the world. One would think that the very existence of the country depended upon the multiplicity of crop reports. Banks, loan companies, railway companies, implement firms, newspapers, etc., all have systems of crop reporting, while many private individuals take a trip through the province to see for themselves how the crops stand. Indeed, the interest in Manitoba is so keen that many prominent business men from eastern Canada make it a point to visit this country once a year to inspect the crops. There is no region in the world where the crops are more talked about than in Manitoba. The number of special reports and the number of estimates of the probable yield may be reckoned by the score. Where so many reports are sent out, a great many mistakes must of necessity be made, and it often occurs that the most unlikely reports gain the greatest currency abroad. For instance, a leading business man from the East makes a trip through the country and on his return publishes abroad his estimate of the probable crop of wheat. The gentleman may hardly be able to tell wheat from oats, but all the same he is quite positive as to his estimate. Forth it goes that Manitoba will have 20,000,000 bushels of wheat. This is published in papers throughout the length and breadth of the land, but when the grain has been marketed the quantity is discovered to be but five or six million bushels. This is why there has been so much misrepresentation about Manitoba crops. The same features have been at work this season, and it is safe to say that there has been more or less exaggeration about the most of the reports sent out. When it comes to estimating average yields per acre, and the probable total crop of the province, the figures as a rule are the merest guesswork, and generally the guess is on the big side by a long ways.

Your correspondent has had an extended trip through the entire prairie country from Winnipeg to the Rocky Mountains, and is in perhaps as good a position to give a crop report from personal observation as many of those who have published reports. Speaking generally, it may be said that the country looks fine. I have had a trip through the country every year since 1880, and certainly in my estimation the country never looked better. Everywhere the appearance of the country is pleasant to behold. In fact Nature seems to have a robe of more than average beauty this year. This is due to the frequent showers which have occurred this summer, and which has had the effect of keeping vegetation fresh and green. Though the grain crops are perhaps a little later than usual, the fields look very healthy, and are remarkably even. There are no poor spots in the fields, but miles of grain fields may be seen as even as the floor. The very regular growth is one of the remarkable features of this season. Over a large portion of the province the prospect is for a large crop, and the same is true of the territories westward from Manitoba. There is a considerable section in the central portion of Manitoba, however, extending from the main line of the Canadian Pacific Railway to the Dakota boundary, which suffered quite severely from drought during the month of June. Since the latter part of June, copious rains have fallen all over the province, and the crops in the dry section have vastly improved, so that a fair crop is now looked for, even in the localities least favored with rain during June. In some fields, however, weeds got the start of the grain during the dry spell in the section referred to. This would be on old land, and where such is the case the crop will be poor. The area affected in this way is not large, but sufficient to reduce the average yield in some sections considerably.

Now, as to the probable yield, I may say that according to the numerous crop reports which have been published, the lowest estimated yield in any one district is fifteen bushels per acre for wheat. This is in a section where the drought was most severe in June, and it is also from a section where very little grain is grown. The highest estimate from a single section is forty bushels per acre. The average estimate is twenty-five to thirty bushels per acre. Allowing something for the general disposition to overdo crop reports, I think it would be safe to reduce the estimate to twenty bushels per acre for the entire province. This is a pretty safe figure, and with favorable weather for the balance of the season, the actual return is likely to be above rather than below this amount, by perhaps one to five bushels per acre. However, at twenty bushels per acre, Manitoba will produce this year a crop about 15,000,000 bushels of wheat, providing that the local government figures of the area in wheat are correct. The area under wheat in Manitoba this year is placed by the official returns at 746,058 acres, being an increase of over 120,000 acres over last year. At 25 bushels per acre Manitoba would have a crop of 18,500,000 bushels, in round figures. I am inclined to believe, however, from my experience of past years, that the fifteen million bushels will about cover the amount. These figures do not include the territories, which will add a couple of million bushels or so to the total crop.

So far this season there has been no damage to crops from miscellaneous causes. The gophers, which were so destructive last year, have done no harm this year. This is owing to the fact that the grass has been kept green and moist by the frequent showers. The gophers only leave the meadows to attack grain crops when the grass has been dried up by drought. Insects have done no harm, and in fact since the days of the grasshopper visitation in the seventies, there has never been any trouble from insects in Manitoba. There is no rust or blight heard of, though the showery weather of late, with warm days, is not looked upon as favorable. There has been one serious hail storm in the province to the time of writing. This occurred about the first of July, and cut down about 5,000 acres of grain. This crop was considered destroyed at the time, but the grain has made a rapid second growth, and if frost does not come too soon, a fair crop will yet be secured. One or two hail storms have since been reported from the territories, but the damage done in any instance is not large.

Quite a large number of new elevators will be put up this season. The favorable crop outlook is causing activity in this direction. No further milling projects, however, are reported. The new railway mileage opened this season, which is considerable, also opens new points for the construction of elevators.

The report of the grain examiners for the crop year ending June 30th, shows 2,207,400 bushels of wheat inspected at Winnipeg, of which 39 per cent. graded No. 1 hard, 29¾ per cent. graded No. 2 hard, 2¼ per cent. graded extra hard, which is better than No. 1 hard, 1¼ per cent. graded No. 1 Northern, and ¾ per cent. graded No. 1 white fyfe. This shows a total of 73 per cent. high grade, and 27 per cent. grading No. 2 Northern and under.

THE COST OF TRANSMITTING POWER.

THE following comparisons of cost of transmission of power by various methods appeared in the *Revue Universelle des Mines*: (1) Comparative cost of 10 h. p. transmitted 1,093 yards; By cables, 1.77 per effective h. p. hour; by electricity, 2.21; by hydraulics, 2.90; by compressed air, 2.98. (3) Comparative cost of 50 h. p. transmitted 1,093 yards: By cables, 1.35 per effective h. p. hour; by hydraulics, 1.87; by electricity, 2.07; by compressed air, 2.99. (3) Comparative cost of 10 effective h. p. transmitted 5,465 yards: By electricity, 2.64 per effective h. p. hour; by compressed air, 4.66; by cables, 4.69; by hydraulics, 5.29. (4) Comparative cost of 50 h. p. transmitted 5,465 yards: By electricity, 2.37 per effective h. p. hour; by cables, 2.65; by compressed air, 2.99; by hydraulics, 3.02. Steam was the prime mover used in each of the above instances.

USEFUL MEMORANDA.

IN a paper read before the Manchester (England) Association of Engineers by Mr. M. Longridge, member Ins. C. E. &c., the following advice to boiler owners is given:

1. Get your boilers designed for the work they have to do, and not made 7 ft. 6 in. by 30 ft., or 8 ft. by 28 ft. as the case may be, because it is the fashion to have boilers of these particular dimensions.

2. Do not stick to 6 ft. grates if a shorter length is required to burn the coal at the rate of from 16 lbs. to 21 lbs. per hour.

3. Reduce your draught as much as the nature of the coal and the smoke inspector will permit. Try and reduce it till the fire is hot enough to melt a piece of steel boiler plate.

4. Buy your coal dry and keep it dry. Weigh the ashes which come out of the furnaces as well as the coal that goes into them.

5. Be most careful to stop up air leaks in the brickwork, and between the brickwork and the boiler.

PERSONAL.

Mr. Frank Leonard of London attended the recent meeting of the American Boiler Makers' Association in New York city.

ON THE BRACING OF STEAM DOMES.

A SHORT time ago our attention was called to a steam dome arranged as shown in the accompanying cut. It was 30 inches in diameter, and had a flat wrought-iron head which was braced to the shell of the drum by four flat braces, each of which was $2\frac{1}{2}$ inches wide and $\frac{5}{8}$ of an inch thick. These were each twelve inches long, and were attached to head and shell in the manner shown in the cut, by a single $\frac{3}{4}$-inch rivet. Two $3\frac{1}{2}$-inch openings were made in the head for steam connections, each being re-enforced by a 7-16 inch plate, seven inches in diameter.

The boiler, which was 66-inches in diameter and $\frac{3}{8}$ inch thick, communicated with the drum by a circular opening 15-inches in diameter, which was not re-enforced. Since the steam pressure came equally upon the upper and lower sides of that part of the shell which lay within the dome, there was no strain produced in it, and therefore no need of bracing. Nevertheless, four braces had been put in similar to those above, except that they were ten inches long, and running from the shell of the drum to the edge of the hole in the boiler. Each of these was secured by a $\frac{3}{4}$-inch rivet at the upper end, and by a $\frac{5}{8}$-inch bolt at the lower end.

Allowing three inches all around the outside of the head of the dome, as the amount that can be safely considered to be stiffened sufficiently by the flange, we have left a 30-inch circle which is to be stayed by the braces. The area of this circle, in round numbers, is 707 square inches; and as it was proposed to carry 80 pounds steam pressure, the total pressure of the steam against the area to be stayed was $80 \times 707 = 56{,}560$ lbs. The sectional area of each of the braces was 1.56 square inches, so that, if we allow 7,500 lbs. as the safe working strain on the iron per inch of section, the safe working strain on each brace would be $1.56 \times 7{,}500 = 11{,}700$ lbs. It would be safer, therefore, to have five braces instead of four, or, better yet, to make the braces smaller and more numerous, so as to give the head more points of support. In the actual construction there was a circle on the head, 22 inches in diameter, that had no braces within it. This circle is indicated by the figures, though the engraver has shown it slightly out of proportion.

The most important point to be noticed, however, is, that the ends of the braces are secured by single rivets only, which are entirely inadequate to bear the stress that comes upon them with safety. A $\frac{3}{4}$-inch rivet has a sectional area of 0.442 sq. in., and if we allow it 7,500 lbs. of safe working strain per square inch, it will bear $7{,}500 \times 0.442 = 3{,}315$ lbs. Four such rivets will, therefore, safely bear $4 \times 3{,}315 = 13{,}260$ lbs., while, as we have seen, they are called upon in the construction shown in the cut, to carry a total load of 56,560 lbs., that is, they are loaded to over four times their safe working strain. We have assumed in this calculation, that if the rivets failed they would fail by pulling apart in the shank. In reality the heads would pull off before the shank parted, so that the bracing is even less secure than the foregoing calculation indicates.

The 15-inch hole cut in the boiler reduces the strength of the shell, and if high pressures were to be carried, it would be necessary to re-enforce it; but in consideration of the fact that 80 lbs. was the highest pressure it was proposed to carry, we did not consider it imperative that it should be re-enforced in this particular case.

The principal points about the dome we have illustrated this month, are, that in its original condition it was unsafe, and that it could have been made safe in the first place without much extra work, if the useless braces running from the shell of the dome to the boiler had been left off, and some extra ones had been put in to stay the top, in their stead. More rivets should be used in attaching the braces to the shell and head, and, with our apologies to the advocates of the style of brace shown in the cut, crow-foot braces would be much stronger and better. The "hinge" brace, as we call the kind here shown, must yield and straighten out at angles before it can exert much holding power.—*Locomotive.*

The cloth on any reel or bolt making flour ready for the packer I would never use for the same purpose after having once removed it, says a writer in the *Roller Mill*, because when the cloth is stretched into place for the second time the meshes will no longer be even. This is a point on which good millers may have doubts, because it has not occurred to them, but by referring the matter to a magnifying glass they may decide it for themselves by a careful count of the meshes. Some prominent millers I know who are so thoroughly satisfied of the injury wrought by re-stretching that they will destroy cloth after taking it from the reel. Now that is what may be called false economy, for surely a cloth which has been removed from a flour reel can with perfect safety be used for dusting or on a low-grade finishing reel. Specky and uneven flour, whose origin is so often puzzling to the miller, can in many cases be traced to twice-used cloths on the high grade reels.

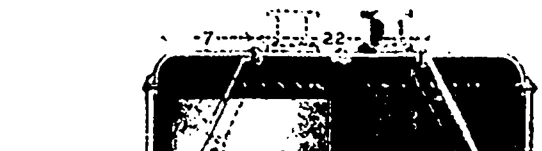
NOTES ON KEROSENE IN STEAM BOILERS.*

THE paper on this subject by L. F. Lyne, published in Vol. IX. of *Transactions*, induced me to give the oil a trial in the boilers of the steam-heating plant of our State Agricultural College at Lansing, Mich.

The boilers experimented on are of the ordinary tubular type, each being 12' in height, four are 4' in diameter each, and the remaining two each 5' in diameter.

The use of the boiler was commenced in April, 1889, with the boilers very badly incrusted with a hard scale. Previous to this time the only method used to remove the scale had been by employing a workman to go inside the boiler and knock off what could be reached with a hammer and scaling iron. The estimated cost of this method of cleaning was \$18 to \$25 per annum for each boiler, and the results were very unsatisfactory, as more than two-thirds of the heating surface was entirely inaccessible. The scale was fully three-eighths of an inch thick in many places.

The first application of the oil was made while the boilers were being but little used in the warm season by inserting a gallon of oil, filling with water, heating to the boiling point and allowing the water to stand in the boiler two or three weeks before removal. By this method fully one-half the scale was removed during the warm season and before the boilers were needed for heavy firing. We found, however, that a more effectual way was to apply the oil in small quantities when the boiler was in actual use. There is no question regarding the action of the kerosene oil in softening the particular scale deposited from the water which we used (an analysis of that water is appended), and it also seems to work in between the scale and the boiler plate in such a manner as to loosen large flakes of the scale, sometimes fully a foot in length. On opening the boiler they are



AN IMPROPERLY BRACED HEAD.

found deposited on the bottom and readily removed by rakes, the great mass of scale, however, is removed as a fine mud through the blow-off pipe.

In regard to the quantity to be used, we found that beyond a certain amount no benefit seemed to result; for boilers 4' in diameter and 12' long we obtained the best results by the use of two quarts or one-half gallon for each boiler per week, and for each boiler 5' in diameter three quarts per week.

The oil was readily fed by adding a one-fourth inch branch to the suction pipe of the feed pump and leading it to a vessel containing kerosene oil. By this method a quantity as large or small as desired could be introduced into the boiler at the same time with the usual feed, and in the form of an emulsion of water and oil.

At the present writing our boilers have less scale in them than at any previous time during the past four years, and the small amount running in them seems to be soft and gradually disappearing. A large portion of each boiler shows the clean, black steel, apparently in as good condition as when new.

I do not believe that the oil will produce any injurious effect on the iron; in fact, I cannot see why it is not the best possible preservative for it.

Our boilers are some distance from the various buildings heated, and steam is transported through underground pipes, the extreme distance being about 800' in opposite directions. Despite the small quantity of kerosene used in the boilers, the odor was perceptible by opening an air valve to any steam radiator in any of the buildings.

When as much as a gallon per week per boiler was used, the odor was very strong, but with one-half that amount it was hardly perceptible, and only to be noticed when an air valve had been open a long time.

* A paper read by R. C. Carpenter, Lansing, Mich., at the Cincinnati, Ohio, Convention of American Society of Mechanical Engineers, May, 1890.

Since commencing to use the oil, a much greater deposit of rust scales than usual has been found in the various steam traps in the buildings, indicating, in my opinion, that the oil is also exerting a cleansing influence on the pipes of our whole system.

The expense of the oil is very light, as compared with any other preparation for cleansing boilers known to the writer. The expense to the college per boiler has not exceeded \$2 per annum for the kerosene used.

The water used in our boilers is obtained from a flowing well having a depth of 260'. The following analysis, by Dr. R. C. Redgie, shows its composition:

$CaCO_3$ (Carbonate Calcium)........	206 parts in 1,000,000
$MgCO_3$ (Carbonate Magnesium).......	78 " " "
$FeCO_3$ (Carbonate Iron)..............	22 " " "

Traces of sulphates and chlorides of potash and soda.

Total solid parts, 325 to 1,000,000.

THE FUEL OF THE FUTURE.

THE fuel of the future, what it shall be and its cost, is a subject that is just at present receiving a marked degree of attention; to those engaged in manufacturing it is naturally one of momentous interest, especially among those who have in the past few years used natural gas as a fuel. In the current issue of the *Arena*, Prof. N. S. Shaler has a very interesting article on this question. He takes the position that what is popularly termed natural gas is destined to speedy exhaustion, but he thinks its effect on the economic methods of our civilization are certain to be enduring; and that the superior cleanliness and convenience of gas as a fuel will bring the world to the use of manufactured gas for fuel purposes when the supply of natural gas has given out, and in those localities where geological formation is such that the discovery of natural gas can not be hoped for. The professor says:

"Though the natural combustible gases are destined to speedy exhaustion, their effects on the economic methods of our civilization are certain to be enduring. The use of this new fuel has accustomed the public to a better way of bringing burnable material to the factories and dwellings than has been pursued since the dawn of civilization. It will certainly be a matter of surprise to the future historian of the economic science of our day that we have so long persisted in the practice of bring'ng crude fuel to our furnaces and domestic fire-places, and have patiently endured the trials which smoke, dust and ashes have imposed upon us. It is not to be expected that any of the thrifty cities which have enjoyed the advantages of rock gas will be willing to return to the ruder processes of firing which they have so long abandoned. Nor is it likely that other rival towns will be content to accept the deprivation of this good which their geological condition imposes upon them, provided any economic method whereby artificial gas may be furnished them can be devised.

The invention of water gas seems to provide an art by which we may hope to supply a vaporous fuel at a cost which will little exceed the average in tax laid upon the consumers by the companies which pipe the rock gas to many of the Western towns. This form of fuel is produced by passing steam through large vessels containing incandescent carbon in the form of coke or anthracite coal, and the result is a mixture principally composed of one atom of carbon and one of oxygen, known as carbonic oxide, together with hydrogen. The water of the steam is, in fact, decomposed, the oxygen combining with the carbon, and the hydrogen remaining uncombined.

When burnt at the point of use, the carbonic oxide (CO) takes up from the air another atom of oxygen, forming carbonic dioxide (CO_2), and the hydrogen also combines with oxygen, forming water. These processes give rise to the evolution of a great heat. By enriching the gas with vapor of petroleum or other hydrocarbons, the material may be made to afford an excellent light. Although only 1-14 of the weight of water gas is hydrogen, this element is extremely valuable in giving heat to the flame, for it yields caloric in burning in larger share than any other known substance."

The professor echoes a very general belief among all advanced thinkers who have studied the matter when he thinks that "it will be a matter of surprise to the historian of the economic science of our day that we have so long persisted in bringing crude fuel to our furnaces and domestic fire-places, and have patiently endured the trials which smoke, dust and ashes have imposed upon us."

The statement by a manufacturer of machinery, that his machines are "far superior to anything of the kind in the market," is not likely to convince anybody that it is a fact says the *Woodworker*. A reputation founded on years of square dealing, in any line of trade, is what counts.

FROSTED OR DAMAGED SEED WHEAT.

FROM a series of experiments conducted at the Minnesota agricultural experimental station, on the Minnesota wheat of 1888, the following conclusions have been adduced by D. N. Harper of that department:

The wheat grain although apparently so simple is yet a very complex body. Of the numerous varieties of wheat, all, if uninjured, have essentially the same structure and contain the same chemical compounds, but in different proportions. At one end of the grain there is a depression where the germ is enclosed a immature plant folded up—and at the other end is a multitude of very fine hairs called the beard. The interior of the grain, the endosperm, comprising about 85 (%) per cent. of its weight, is almost exclusively starch and gluten. Oblong grains of starch are surrounded by numerous smaller grains of gluten, and, according to Mege Mouries, the proportion of gluten increases from the centre of this interior part outwards to its limits. Surrounding this interior part is a thick, tough, tight-fitting covering, the perisperm, which ends at the top and bottom of the germ, and comprises about one tenth of the total weight of the grain. Contrary to the general opinion it contains no gluten, but the albumen of the grain, oil, mineral salts, (phosphates, etc.), and cerealine, which, according to Mege Mouries, is a ferment the same as in yeast. This layer acts as a sort of digestive apparatus for the wheat germ. It takes up the moisture from the soil, converts the albumen, starch, gluten, etc., into soluble forms, and carries these to the germ as food. Outside this covering and surrounding the entire grain are two very thin layers making about 2 per cent., (1-50) of its weight. The inner one, the tegmen, is transparent and the outer one, the testa, is colored. The color of the wheat, yellow, red, etc., is derived from this layer. Surrounding these and not adhering very closely are three layers, the endocarp, the epicarp, the epidermis or cuticle, of the same chemical composition as the straw. All are transparent and elastic, and comprise about 3 per cent. (1-33) of the weight of the grain. In milling, these outer layers are first separated and then by the Hungarian system (the roller process) the other layers are separated down to the interior of gluten and starch. The old process of milling does not remove the three layers immediately surrounding the gluten and starch, or does so only imperfectly, and this makes the distinction between such flour and "patent" flour. If any of the perisperm is ground up and left in the flour it causes this to be more or less discolored when moistened. Wheat can be milled the more easily and economically the smoother the hull is, and if for any reason this has been badly injured the value of the wheat for making patent flour is thereby decreased. The hull of wheat may be badly injured without affecting the germ or the interior, so that although for milling it is poor and consequently grades low, it may be of good quality for seed, inasmuch as the power to grow and reproduce does not depend upon the smoothness of the hull but upon the vitality of the germ and the amount of readily derived food. In 1888 unfavorable conditions affected the wheat so that it failed to grade well according to our empirical standards; for commercial purposes it was therefore generally known as "poor" wheat without further distinction being made. But the causes producing this "poor" wheat were different and they effected different results so that there were really several kinds of "poor" wheat. These differ in appearance as well as in the nature and proportion of the chemical constituents. As indicating the cause of injury, I have classified them as bleached, rusted, blistered and frozen.

Bleaching is caused by the wheat grains being subjected after harvest to a succession of rains and hot suns whereby the outer envelopes, instead of being trasparent and elastic, are rendered opaque and brittle. This is a purely physical injury and it does not affect the wheat for seed unless this succession of drenching rains and hot suns has continued for a considerable time. Then indeed the injury may be more than superficial. No wheat in 1888 was rendered poor for seed by reason of its being bleached, but there is doubtless some of the last crop thus injured.

The greater part of the Red river valley in Minnesota was affected more or less by rust. The eastern border of the valley where the soil is light and sandy and therefore drained well was least affected or not at all. Some places in the interior of the valley and many others on the lands nearest the river also escaped or were but slightly affected on account of favorable local conditions. Rust was prevalent in Dakota, too, but I have not observed its limitation as closely as in Minnesota. Where the parasite rust had longest to operate while the wheat was yet far from mature we find the worst diseased or rusted wheat. Between these extremes of only slightly rusted and badly rusted wheats are many grades of "poor" rusted wheat. Rusted (blighted) wheat is more or less shrunken in appearance, usually of deeper amber color than normally and has had the relation of its chemical constituents somewhat altered without there being any chemical change in these. Rusted wheat of 1888 contains more gluten and protein and less starch than were normal, so that it appears likely that the rust has lived upon the saccharine and starchy juices of the plant, thus diminishing the amount of starch. It is a poor wheat for milling because of the bad condition of the hull. If not too much injured the results of this year show it may be made good for seed.

In some localities the frosts of August, 1888, caused other results. Wheat that had not been attacked by the rust was for the most part too far advanced to be injured by frost, if indeed not already harvested; or the conditions which had prevented rust operating also prevented frost. The effects of low temperature on the wheat grain vary greatly according to the stage of growth and the severity of the low temperature. Before maturity water is present, holding substances in solution. As the grain ripens these are deposited, and when mature the amount of water present is directly dependent upon the atmosphere, and its condition is similar—being excess moisture. Our cured wheat is not affected by our lowest temperature, but a few degrees below freezing has its effects on immature and uncured wheat. In the early stage of the grain, water is the chief constituent, but this becomes less and less as the grain approaches maturity, when there is the least. "In the milk" the grain consists of about 75 per cent. water while when mature this is only about 10 per cent. of its weight. By sweating, still more water is taken out. Wheat well into "the dough" stage if subjected to a temperature below freezing may be blistered (frosted), but when "in the milk" the same temperature produces frozen wheat. As blisters may be caused by other means than frost and even after the wheat is cut, it is not correct to call all such wheat frosted.

Blisters are an unnatural condition of the hull which, instead of being tough and elastic, is brittle; but no change in the chemical constituents of the grain is apparent. In blistered wheat, where the cause was frost, the life of the plant may have been cut short by a few days or more and the small amount of food (it may be exclusively starch) which would then have been laid up is lost, but that already stored up has not been affected. Blistered (frosted) wheat retains the normal amber color but has in many cases more gluten and protein and less starch than sound wheat, and is injured for milling on account of the bad condition of the hull. Only in extreme cases has there been any injury to the germ and its surrounding food, so that it is all right for seed, if well cleaned, except in some cases where frost has caused the injury because of the tardiness of the wheat to mature. Killing frosts may be expected in the most northern countries by the middle of August, and it requires at least 85 to 90 days from the time the seed is sown and sprouted for a crop to mature. If under favorable conditions the wheat has required much more than that time it shows a tendency to become later ripening and although the grain in itself may not be injured this fact renders it unfit for seed.

Frozen wheat if badly shrunken, has lost the normal translucent amber color, is of an opaque, bronzed appearance and has had the composition of its chemical constituents changed, as well as the internal structure of its cells destroyed. It is unfit for milling because no middlings can be separated and there is left no gluten or only slight quantities, very badly injured. The best samples of frozen wheat may be no worse for seed than the poorest grades of blistered wheat—both are bad.

These various kinds of poor wheat were used for seed in the spring of 1889, and after the beginning of June I made a number of trips through the portions of the state affected, studying the results. Many samples of the seed and its crop have been collected and analyzed and from these analyses, the reports of farmers raising the grain and my own observations, it is shown (1) that seed of the different kinds of poor wheat of 1888, directly affected the crop, producing differences in its quality and quantity; (2) frozen wheat has not yielded a good crop, either in quantity or quality; (3) rusted and frosted wheats have exceeded all expectations and where well cleaned have yielded a good crop so that (4) the inspection grade of wheat, which is based upon the commercial value for milling purposes, does not, invariably, determine the value of wheat for seed; (6) the better the seed as determined by its density, the greater its vitality and the better the crop in every way.

In frozen wheat, beside the life of the plant having been cut short, there has also been a change in the chemical constituents and a further mechanical change of the interior, whereby the former cell structure has been destroyed. This destruction of the cell structure and sudden change in the chemical constituents did not cease with the cause that produced them. Fermentation set in and the chemical constituents were further changed into acetic acid, etc., so that stacks of such wheat are spoken of as "vinegar factories." This wheat when planted in the spring was much worse than when harvested and threshed. But in the majority of the grains the germ was not killed so that the wheat therefore grew and produced the same kind of wheat.

Where the frozen seed was sown on land on which such wheat was raised in 1888 the greatest number of similar grains are to be found in the crop. Even where the seed was good, if the previous crop on the land was badly frozen there are such grains in this last crop, and this is to be expected. Every year there is more or less volunteer wheat; this spring there was less than for many years because the condition of temperature and moisture last fall were most favorable for germination of wheat which shelled in harvesting, and of course the subsequent cold weather has destroyed these plants. But the fall of 1888 was very dry, the wheat shelled badly in harvesting and the dry fall forced most of these grains to wait over until spring for germination.

The results of this year seem to show that here we have an example of the transmission to the offspring of a characteristic developed in the parent by accidental outside influences. I have not attempted to establish this by the product from individual frozen grains, but wherever 1888 wheat containing frozen grains has been used for seed, there are so many grains in the crop similar in appearance and properties to these frozen grains, and without a repetition of the conditions which originally produced them, that it can be explained only in this way.

All the poor wheat of 1889 is not to be attributed to the seed sown. In some localities, I am informed that some of the wheat which was planted early in April did not sprout until after the rains, the latter part of June and beginning of July. This caused the wheat to ripen unevenly and of course there are in all such cases immature grains.

To determine the value for seed an altogether different basis must be had than the rules for its state inspection. These do not anticipate this matter, but the farmer can readily make himself the most competent judge by understanding the distinction between a good "grade" of wheat for milling and the same for seed.

To most successfully carry on the mechanical operations of milling it is first necessary to have plump wheat in which the hull has not been injured. Then the best flour, after the hull is gotten rid of, is made of that wheat which contains the most gluten and the least water Other conditions of the wheat also enter as a factor.

To grow the best crops the first necessity is to have the germ of the wheat sound and then to have compactly stored up plenty of the proper kind of food—gluten, etc. Outside influences may cause the hull to be uneven or brittle without injuriously affecting the germ and its food. And this wrinkling of the hull may not be a property which will be transmitted by the seed to the crop, although in some cases it doubtless is. But certain changes in the character of the germ and its food are unmistakably transmitted. In blistered, rusted and bleached wheats the superficial characteristics of the wheat are changed, while in frozen wheat changes seem to have been made in the reproductive faculties.

In any lot of wheat, even of the highest grade, some grains are vastly better than others for seed, and it is a simple matter to determine which they are and how to secure them. If it had not been clearly proven before, the 1888 wheat crop has conclusively shown that the denser any grain of wheat the better it is for seed. These are the grains which are the heaviest for their size. If wheat is well cleaned by a blast of wind the lightest grains are cast out and the heaviest remain. In these the germ is best developed and protected and has most readily available the greatest amount of necessary food. Of this, gluten is of chief importance, and its quality and quantity can be easily determined.

From the cases above cited and many others I draw the following general conclusions:

1. A vast difference as to their seed value exists between the various kinds of "poor" wheat.

2. Rusted wheat and blistered (frosted) if well cleaned are safe to use for seed.

3. Frozen wheat, which is utterly worthless for milling, is likewise of no value for seed. It can not produce a good crop.

4. The more thoroughly wheat is cleaned the better the seed resulting and the better the crop—particularly in yield. And by cleaning, I mean besides separating the dirt, also casting out the weaker grains of wheat. Thus

poor milling wheat may be made vastly better for seed than wheat of high milling value if the latter is uncleaned.

5. Wheat should invariably be tested as regards its gluten and percentage of germination before being seeded. It seems absolutely necessary that the seed shall contain good gluten if it is to be in the crop.

While the results of 1888 seem very conclusive, it is desirable that our investigations shall be continued. Anyone can easily and without appreciable expense make observations of great value. I should suggest that every farmer keep in a stoppered bottle six ounces or more of the seed just as he planted it, and make a memorandum of the kind of soil, its condition, etc., when seeded, and the number of times thus successively cropped. When the wheat is about mature, select representative heads from different parts of the farm. After the wheat is harvested and cured, shell out from the shocks sufficient to make a fair sample of the crop and preserve this in another bottle. Compare these samples with the wheat after it has been threshed. In this way a fair judgment can be made of the results due to the seed, and, if rains, etc., have occurred between harvest and threshing, their effects are seen. Such samples exhibited at the state and county fairs must result in great good. I desire to have such samples sent me by mail at any time, and, if the analysis can give more light, I shall be glad to make the same. One can not remember sufficiently clearly the quality of any seed sown if no sample has been preserved. With this, however, our judgment need not err.

FLOUR BLENDING.*

By I. W. Hillard.

MR. PRESIDENT AND GENTLEMEN, When your President asked me if I would read a paper at your annual meeting, I felt very much honoured, but at the same time uncertain whether I could give you anything interesting and useful. If you honor me by thinking it interesting, I trust you will contribute to its usefulness by having a full discussion on the points raised. During the last decade two striking points are to be noted in the milling industry. First, there has been a complete revolution in the art of converting wheat into flour; and, second, an enormous extension of flour manufactories, North America, Atlantic and Pacific, Australia, Austro-Hungary, Russia, Germany, etc., all competing for your business. Taking the first point, it will be necessary just to touch lightly upon the methods of milling, and first the old, to show by contrast the new. The old method was very simple. The wheat passed through millstones, which were set close enough together to reduce the wheat, so that when the product was separated by silk reels and other appliances, the result was one grade of flour. The new method is much longer and the reverse of simple, but I will endeavor so to present it to you as to enable those present not conversant with it to grasp the main points which affect the title of this paper. The wheat passes successively through four or five pairs of suitably grooved chilled iron rolls, one roll of each pair running at a much higher speed than the other, thus tearing open and separating the floury part (endosperm) from the outer skins. Between each rolling a sifting process takes place, and the product thus obtained is first freed from flour (named break flour) and then purified by passing air currents through it as it slowly travels over an inclined vibrating sieve. This operation removes the impurities, such as small bits of skin, beard, fibre, cellulose, dust, etc., discoloring matter. We take the largest size of purified broken particles, called semolina or middlings (which contain the germ), pass through smooth rolls, which crush the middlings and flatten the germ; the later is then sieved off. Next the crushed product is freed from flour and purified as before; then joining, the smaller size of purified middlings are reduced by smooth rolls, and the flour dressed out successively until all high grade flour is extracted. The germy tailings, purifier tailings, etc., are then rolled and dressed until all the remaining flour is removed, the flour getting poorer in color as the end is approached. This flour goes as households or bakers flour. The last two or three per cent., however, is so poor as to render it unfit for households; it is named low grade. The product of the last break roll is usually treated by itself, and the flour can be kept separate or blended with households or low grade, as desired; it is named bran flour.

The high grade would produce a loaf sweet and clean, of medium size, beautiful bloom and appearance.

Households, a loaf larger than high grade, wanting in colour and bloom and with a tendency to coarseness in flavour.

The break flour is a loaf devoid of bloom, flavourless, poor colour, chippy and dry.

The bran flour would contain the most gluten, and produce a large loaf of bread, dark in colour and moist.

Low grade, a loaf of a dark yellowish sodden appearance and coarse flavour, which becomes much worse as the flour gets aged.

The foregoing fairly represents the flour products of a modern flour mill, either working upon single or blended wheats. You thus have flours varying in colour, strength, clearness, bloom, flavour and dryness from the same wheat or mixture of wheats, and these characteristics will have to be taken into account when blending for your bakehouse. You will also have to take into consideration the very many varieties of wheat usually selling on British and Irish markets (each having its special characteristics), and deal with them if you determine to work as recommended by high authorities on baking, namely, on single-milled wheat flours. To most bakers the mere enumeration of the number of sorts he might have to blend would be sufficient to deter him. But some of you may say, we will only take certain sorts with which we are well acquainted. The answer to that would be, such sorts may not be obtainable at all in some years, or if obtainable, only at a relatively high cost, compared with other equally good flours, as entirely as to forbid their use. The quality of most wheats varies considerably from year to year (witness this and last year's American wheats), therefore the flour must vary. As a matter of fact, the baker who would be his own blender, and who, at the same time, wishes to keep the cost price of his mixture down, so as to compete with his brothers around, must be constantly changing his blend, with possibly disastrous results as regards his trade; very frequently that which looks right in theory does not work well in practice. The price of bread is the same frequently many months together; while the price of wheats of about the same intrinsic value alters materially, in fact, constantly occurring, hence the desirability of buying that which is (quality considered) cheapest. Evidently, then, a thorough knowledge of blending is absolutely necessary, and the question must be answered, Who is to do it—the miller or the baker? I will suggest some reasons why the miller is the fittest, you to draw your own conclusions. Knowing the characteristics of all the important wheats of the earth, with the variations due to season, is a part of the education of a miller, and upon his knowledge in this respect, with constant watchfulness, will mainly depend his custom from you, gentlemen, and success in life. English wheat, you will know, gives a sweet, nice flavour to your bread. It varies considerably both in quality and condition (that is to say, from dry to quite damp), therefore a good knowledge of how to treat such wheats is essential. Some very dry wheats, such as Californian, are required for blending, to absorb the moisture given out while milling; Russian, also, to give elasticity and height to the loaf. The various Russian shipping ports widely differ in the quality of their wheats; scarcely two samples are just alike. Here judgment is needed. By a careful selection of wheats, and blending them with judgment, a high grade and households from a high to a medium standard, can be and is obtained in our best British and Irish mills, with a variation of not more than sixpence to a shilling per sack from year to year on a given brand. The baker buying from such mills knows what he is going to get within sixpence (as a rule) per sack. When he buys a foreign brand of flour can he tell what he is to get? I only put the query, not having a very large experience; but, judging from what I hear from bakers, the variation is sometimes very considerable. It has been in my own particular district a custom on the part of millers to study the requirements of their customers as to the peculiar quality suitable for their trade. For instance, there is a demand in one large centre for flour made mainly from cone wheat (which is a bearded red wheat), and how to produce this flour is the miller's trade secret. This flour produces quite a small (comparatively) number of loaves to the sack, but the bread is like the good wine which needs no bush. It is an advertisement to the baker on each customer's tea-table. A journeyman baker I know well, by his industry and a free use of this blend of flour, in a few years worked up a trade of thirty sacks per week, and that in the face of opposition on every side in the shape of one penny less per four pound loaf. This is a case where the miller's blending has scored a point. Flour mills always have every facility for mixing flours, but there is no system of mixing which can compare with the thorough assimilation of the products of various wheats blended previous to grinding in a modern flour mill. How does the case stand with the bakers? I think you will concede the large majority have not facilities for accurately mixing varying quantities of different sorts of flours. The simplest, and in my opinion, the best mode of blending flour would require motive power, such as a steam or gas engine; a set of automatic mixers set in a line, adjustable to various quantities per hour; a conveyor, arranged to take from all the mixers and discharge on to a sieve, either rotary or reciprocating, of sufficient capacity. The sieve should be set over the flour-bin, and there should be a space of a few feet for the flour to fall, so that each granule of flour should come in contact with the air and with each other. The good result of aerating the flour in this way would be found in an increase of loaves per sack. The baker's usual method of mixing by shooting sacks of flour into a bin is a mixture, but it is not blended, and the good results of blending are not obtained. All violent means (rubbing and dashing about) should be avoided, as it tends to make soft, dead flour, a loss both in strength and bloom. The flour, after blending, should be allowed a few days to assimilate; therefore it would be well to have two flour-bins, to be drawn from alternately.

It is at least questionable whether it would pay a baker to buy single milled flours had he even every appliance for mixing, inasmuch as it would be necessary for him to buy large parcels to get the price right, owing to the wheat being specially milled; and if he used many sorts, his stock would be very large. It may, however, be pointed out (and this brings me to the second notable point) that most countries which send wheat also send flour, and that the baker can buy single-milled wheat flours in that way. Yes, he can buy some (particularly American brands) if he will take the risk of variation of quality, the brands being generally importers' brands.

There is a widespread notion that only by blending American flours with British makes can lofty, sound loaves be made. This notion is extensively pushed by American flour dealers. But is it a fact? Let us turn to last year. The American crop of 1888 was a comparative failure, and American wheat and flour so high in price as to be practically out of the market. Were the loaves smaller or less sound? Rather the other way. The household bread has not been better for many years, and chiefly so because low grades of American flour, which constitute the bulk of the imports, were so high in price that even the chronic undersellers were compelled to buy sweet British-made flour. Bakers should set themselves a better task than lowering the character of their products by a too free use of this cheap, low-grade American, generally called "bakers' grade" (really low grade), as if bakers were not to have any cream, but only doubly skimmed milk. It is only just to the baking trade to say it is believed, and with good cause, that most of the second-grade American "bakers'" imported finds its way into the British mill chiefly to those mainly working on native wheats. Wherever this flour is extensively used, there you will find poor bread and low prices, and frequently, when some baker does study excellence and produces really nutritious, sweet, inviting-looking bread (which cannot be done with low-priced flours) at a living rate, he is held up to public execration by some philanthropic individual in a local newspaper for overcharging, and his price is contrasted with the cheap stuff. Nevertheless, let excellence be your motto; you can mould public taste if you will mould your loaves from sweet, coloury flours. The new mode of flour manufacture has put in the hands of millers, during the last few years, such possibilities of improvement in quality that a higher grade was to be expected in the loaf; yet that is exactly the time the baker has fostered the use of inferior flours. It is quite a common complaint amongst millers of the lack of demand for their high-grade flour. In selecting flours for blending, the following points, in addition to cost, should be considered: Yield, colour, appearance, and, above all, sweet flavour when converted into bread. The latter is the criterion of excellence with the general public. Witness the enormous extension of the business of the late Mr. Nevill. The flour he bought was not cheap, not manufactured abroad, yielded but a moderate number of loaves, not extra prepossessing in appearance, but eminently sweet and nutty-flavoured, nutritious and satisfying. The metropolitan public, grateful for a good article, gave him their custom; in other words, a fortune. Having called attention to American low grades, I now come to consider their higher grades, Atlantic and Pacific, as well as those from other countries, sending appreciable quantities, with which some of you may deal. Patents made from American No. 1 hard spring wheat, and only from thoroughly purified stuff, if such can be obtained regularly and up to grade, are perhaps the most useful flours for blending a baker can have for a high class trade. The good points possessed by such a flour would outweigh any other in the world. When used with such a flour as before spoken of, viz., the cones flour—the latter put in at the dough stage—the loaf pro-

*Paper read at the Convention of the British National Association of Master Bakers and Confectioners.

doued would be most excellent. Spring straights make good sponging flours when a large proportion of fine English wheat flours are used. Winter patents may be used to advantage blended with fine mellow flours when the sponging process is used, and the loaf would be what is called "home made" sweet, coloury, and nice eating. Winter straights are somewhat similar to patent, but lower in colour. All these flours give a fulness to the loaf. Pacific flours are very dry, and produce a very small, uninviting loaf, chippy and flavourless, but are useful for blending. A blend of Californian and Oregon with English wheat flours results in a wonderful improvement in the loaf, as compared with either separately. This is due to the extreme dryness of the one, combined with the highly matured starch and small percentage of soluble albuminoids counteracting the softness in the other, due to moisture and large percentage of soluble albuminoids. If to this blend a proportion of, say, one-sixth of Walla Walla is added, a richer-looking flour is produced. In either case the loaf would be small, but sweet and very fine coloured. With the same blend, with 30 per cent. of fine spring patent, the loaf produced would be very showy. Australian flours produced by roller process and of high grades, are very high class. The loaf produced would be of good bloom and medium size; it would blend well with English wheat flour and almost any strong variety. Indian flours milled abroad are not at the baker's disposal, but can be obtained from English mills, and generally at a comparatively low price. The high grades from Bombay are fairly good, being of a fair colour. Generally speaking, Indian wheat flours produce bread of poor flavour, chippy and dry; a tough crumb, but wanting completely in size and appearance—not inviting, not gratifying; where excellence is sought to be avoided. Hungarian flours of high grades, when properly treated, produce bread of beautiful bloom, sweet and rich. Such flour blended with cone flour and flour from "Talavera" wheat would produce the sweetest and most inviting bread. If a loaf is desired which shall be sweet and nutty flavored, of good size and appearance, of fine bloom, and which shall keep nice and moist for days—in fact, perfection—this is the mixture I should recommend: Twenty per cent. high grade American spring patent and 10 per cent. high grade from White Dantzic for the sponging, 25 per cent. cones flour (high grade or medium grade), 25 per cent. Talaver straight grade ground on millstones), 10 per cent. fine winter American patent or fine Polish patent, and 10 per cent. fine Hungarian for the dough stage properly assimilated, using brewers' yeast, and baking in an oven heated with wood.

To sum up, if bread is required as follows, the flours best adapted for blending, whether British and Irish or foreign make, will be for—

Size of Loaf.—Russian and American spring straight grades.

Size and Quality.—Russian, American spring and winter high grades, with an admixture of fine English high grades.

Sweetness.—Hungarian, Polish, American spring high grades; English, particularly that from Talavera and cones.

White Colour.—Oregon, Californian, Chilian, American winter, and white English—all high grades.

Yellow Colour.—Walla Walla, Kubanka, hard Chilian; some varieties of English.

Size and Cheapness.—Low-grade American springs (bakers'), common Russian, Indian and red English.

Cheapness.—Lowest grade American, Indian, Persian, common English.

BELT STRENGTH.

By Robert Grimsaw, PH.D.

THE problem often presents itself how to figure out in a moment whether or not a certain belt is strong enough to carry a certain horse-power at a certain speed. It is always well not to strain a belt, and sometimes there is not only danger of ruining the belt but a chance that breakage may work damage to business or property.

We will suppose that the belt is a leather one, running upon a cast-iron pulley. We know that the pull it exerts on the pulley is equal to the strain upon its tight "side," or fold, less that upon the slack side, or fold, and that this pull in pounds, multiplied by the belt speed in feet per minute, and divided by 33,000, will give the horse-power. (This is assumed as correct. It is true, and there is no time to prove it now.)

Of course leather varies in strength; and no matter how strong the belt is, if the lacings or other fastenings are weak, the belt will be in danger. The greatest strain upon the belt, in pounds, is equal to the breadth of the belt in inches, times the thickness of the belt in inches, and times the safe working strain per square inch of cross section of the belt; this latter depends upon the kind of leather and upon its fastenings.

As to these fastenings, it is safe to assume, as the result of experiments made, that for ordinary single leather lacings the average breaking strength is 950 pounds per square inch; single rawhide, 1,000; double leather, 1,200; double rawhide, 1,400; and rivited joints, 1,750.

Of course the safe working stress in pounds per square inch will be less than this; and we may put them about as follows: single leather lacing, 325 pounds; single rawhide, 350; double leather, 375; double rawhide, 400; and rivets, 575.

Working from this we find the square inches cross section of the belt to be for belts which are single leather laced 1-325, the greatest tension; where they are laced with single rawhide, 1-350; with double leather, 1-375; with double raw-hide, 1-400; and where they have rivited joints, 1-575.

Thus, if we know that we are going to use a single leather-faced belt ¼th inch thick, and that it will have a force of 500 pounds on the pulley, and that the arc of contact will be 105 degrees, we know that the greatest strain on the belt will be 500 × 1.93 = 965 pounds; and dividing this by 325 gives practically three square inches of cross section needed. As the belt is to be ¼th inch thick, it would need to be 3 ÷ ⅙ = 18 inches wide. If it were ¼ inch thick it would need to be only 3 ÷ ¼ = 12 inches wide; and if ⅓ inch thick, only 3 ÷ ⅓ = 9 inches wide. For every arc of contact there is required a different multiplier; these are got from tables which have calculated by correct theory and proved by accurate experiment. Thus, for 30 degrees arc of contact the amount of pull upon the pulley is 0·189 times the greatest strain on the belt; for 60 degrees it is 0·2967 times; and so on, according to the following table:—

Arc of Contact.	Multiplier.
30°	0·1890
45	·2695
60	.2967
75	·4082
90	·4673
105	·5181
120	·5650
135	·6098
150	·6494
165	·6803
180	·7143
195	·7409
210	·7692
240	·8130
270	·8475
300	·8772

This table from the *Electrical World* is very convenient for ready reference when it is desired to know how much actual drive can be had out of a belt having a given breaking strength. Thus if we have a leather belt the safe-breaking strength of which is 1,000 pounds, we may know that all the pull that it can be made to put upon a cast-iron pulley, with 90 arc of contact, will be 1,000 × ·4673 = ·467·3 pounds; but if the arc is 180° we will be able to get 714·3 pounds pull with the same maximum strain upon the belt.

THREE OBSERVATIONS.

THE good sound business judgment of some mill managers, the misleading prejudice of some and the gullibility of others were recently presented to our observation in a very striking manner. A visit was paid one mill where a "test run" had just been finished and they had accomplished the wonderful feat of making a barrel of straight "extra fancy" flour out of 4.15 bushels of No. 3 wheat; and the proprietors were jubilant, and firm in the belief that they had "just a little the best mill and miller under the cerulean blue." We looked at their products. The flour was excellent, but the bran was poorly finished both as to grinding and dusting; while the shipstuff was both dusty and full of large sharp white middlings. Of course we knew that such a yield from such a mis-finish was preposterous, but knowing that we could not convince the proprietors of this, we "said nothing and sawed wood."

In another mill we were shown the stock, samples and figures of a test run. The stock was better than a No. 3, but not up to a 2—we will not give the percentages. The yield showed 4:32, and all of the feed being absolutely clean, a job of good milling was evident. And yet the proprietors were howling like hyenas—not on account of unsatisfactory percentage of grades, but poor yields.

In the third mill visited they were doing good average milling and the proprietors said: "We don't expect the boys to make a 'silk purse out of a sow's ear,' When they have good wheat they make a good turn out of good flour. When the wheat is not good they hold the flour up to the standard at the expense of an increased per cent. of the lower grades. And so long as the offal shows that good, careful milling is being done we are not disposed to find fault—we think lots of the boys, they are good fellows and we think they earn all they get." We asked the "boys" about it and they said: "We get all we earn and our bosses are perfect gentlemen in every respect."

TRADE NOTES

The Ball Electric Company are putting in their system at Hanover, Chesley and Paisley, Ont.

Messrs. James Jones & Son, of Thorold, have contracted with Mr. V. Denne, of Newmarket, Ont., to equip his flouring mill with their first and second "Climax" break.

Daniel Poucher, of Plainfield, Ont., has decided to change his mill to the full roller process, and has placed his entire order for rolls, purifiers, dressers and all supplies with Wm. & J. G. Greey, Toronto.

The Keegans-Milne Company have been awarded the contract to install an electric light plant in the Manitoba Paper Mills at Portage la Prairie, Man., by J. W. Paterson & Co. of Montreal.

Whitlaw, Baird & Co., of Paris, Ont., are making some improvements in their mill, and have placed their order with Wm. & J. G. Greey, of Toronto. Among other things the order calls for 4 Cyclone Dust Collectors.

The Canadian Locomotive and Engine Company, Kingston, Ont., are building a high speed 100 horse power Armington & Sims steam engine for the Northwest Electric Light Company at Winnipeg for motor and light service.

The old stone mill at Leskard is being remodeled to the roller system and a very complete little roller mill is being put in. Wm. & J. G. Greey, of Toronto, have the contract, and have the machinery about ready for shipment.

Messrs. James Jones & Son, of Thorold, have obtained the contract from Messrs. Wood & Green, Port Dalhousie, Ont., to remodel their mill to the Jones system, using first and second "Climax" breaks. The mill will have a capacity of 75 barrels.

Jas. Goldie, of Guelph, Ont., has been testing the efficiency of the Whirlwind Dust Collectors and put in 3 of them on trial, ordered from Wm. & J. G. Greey, of Toronto. The results have been so satisfactory that that he has placed an additional order for 3 more.

A sample has been shown us from Lambton Mills of work done by first and second "Climax" breaks. The wheat had been reduced to middlings leaving the bran broad and perfect. In the opinion of many millers this new style of break produces the best results of any yet introduced.

J. A. Ramsden, of Mt. Albert, Ont., has decided to thoroughly renovate his grist mill at that place. He is tearing out his old over-shot water wheel and replacing it with a 15 inch Dominion wheel; and is also putting in a full roller system and has placed the order for entire outfit with Wm. & J. G. Greey, Toronto.

Michael P. Frammer is building a new full roller process 75 bbl. water power mill at Benmiller, Ont. The order for the entire outfit is placed with Wm. & J. G. Greey, of Toronto, who also furnish the plans and flow sheet. The building is nearly finished, and will be ready for the machinery about the 10th of August.

The mill at Fordwich, Ont., is undergoing some repairs and additions. Andrew Wilson & Bros., the proprietors, are throwing out the millstones used for grinding middlings, and substituting rolls. The order for the machinery has been placed with Wm. & J. G. Greey, of Toronto, and calls for 3 pairs of rolls, 3 Whirlwind Dust Collectors and other machinery.

The mill at Mildmay, Ont., destroyed some time ago by fire, is being rebuilt by H. N. Schmidt, with a capacity of 50 bbls. per day full roller process. The contract for the complete outfit was placed with Wm. & J. G. Greey, Toronto, who have the job well under way. The machinery has nearly all been shipped, and the millwrights are pushing the job rapidly to completion.

Isidore Cardinal, of Orleans, Ont., is building a three run stone mill at that place, and has engaged Mr. Norval Douglas, of Montreal, to do the work of putting in the plant. The building is just completed, and the order for machinery and supplies was placed through Mr. Douglas with Wm. & J. G. Greey, of Toronto, who have shipped the whole outfit. The mill will be running in about a month.

The grist mill at Shawville, Quebec, has changed hands, Thos. Wilson, Jr., being the purchaser. On assuming possession of the property Mr. Wilson determined to place it on a first-class footing to compete with other millers, by putting in a complete roller system, and for this purpose placed an order with Wm. & J. G. Greey, of Toronto, for the necessary rollers, dressers, iron work, water wheels and supplies. Messrs. Greey have their millwrights at work on the job, and are pushing the work.

J. McLaren & Co., the large lumber dealers, have been changing their mill at Wakefield, Que., to the full roller process, with a capacity of 75 barrels, and have spared no pains or expense to make it the best mill of its kind in the country. The order for the entire outfit, consisting of 12 pairs of rolls, purifiers, centrifugals, dressers, dusters, dust collectors and packers was placed with Wm. & J. G. Greey, Toronto. The mill was started in operation July 23rd, and is reported to have gone off in good form without a hitch of any kind and produced first-class results from the start.

The town of Gananoque, Ont., has been badly in need of a proper flour and grist mill for a long time. This want is now being supplied by Messrs. McClellan, Ried & Shaneman, who own a portion of the water power, and are building a first-class 50 bbl. full roller mill with provender and buckwheat rig in addition. The mill is being built on the site of the old saw mill which has been pulled down. The contract for the whole outfit, including water wheel, rolls, scalpers, cleaners, dressers, purifiers, dusters and all supplies, has been placed with Wm. & J. G. Greey, Toronto, who have a gang of millwrights there and the work well under way, and expect to have the mill running in four weeks.

ON FUSIBLE PLUGS.

THE fusible plug is one of the most abused appliances to be met with around boiler rooms. It is so small, and in such an out-of-the-way position that there is great temptation to let it take care of itself. Again, it is so seldom heard from that a fireman who is not very watchful is liable to forget about it. Yet when it is properly cared for the fusible plug is a most important safeguard.

In the event of an explosion, too, it often furnishes valuable evidence concerning the immediate cause of the explosion. Thus, after the disastrous explosion of the Park Central Hotel in this city, described and illustrated in the March *Locomotive*, the fusible plug was found intact; and by placing it in a retort and carefully ascertaining the melting point of the filling, it was easily shown that at the time of the explosion the water in the boiler was several inches over the tubes. That is, direct proof was obtained that the water in the boiler was not lower than it should have been.

The "fusible" plug illustrated in this number of the *Locomotive* was found in a boiler in the South. The water in this boiler got low one day, and of course the fusible filling melted out and gave the alarm. The owner not having time to have it refilled, and not having another one on hand, drove a nail into it and went ahead as usual until the water got low a second time, when as the nail was not any more fusible than the boiler, both got red hot at the same time. Fortunately this caused such a leak around the nail that the escape of steam relieved the pressure somewhat, and the repairs cost only about seventy five dollars. The boiler was 42 inches in diameter and eight feet long, with an internal flue used as a fire-box. The chances are that the owner will not drive any more nails into fusible plugs.

We remember another instance, in which the fireman had driven an iron rivet into the plug in a similar manner. When we remonstrated with him he answered, "By gar, she do be melting out all the time." We told him if he would be more watchful of his water-line that this would not happen, but he insisted that the water had never been low since he had been fireman.

In Massachusetts the law concerning safety-plugs reads as follows: "No person shall manufacture, set up, use, or caused to be used, a steam boiler, unless it is provided with a fusible safety plug, made of lead or some other equally fusible material, and of a diameter of not less than one-half an inch, placed in the roof of the fire-box, when a fire-box is used, and in all cases in a part of the boiler fully exposed to the action of the fire, and as near the top of the water-line as any part of the fire-surface. . . . Whoever without just and proper cause removes from a boiler the safety-plug thereof, or substitutes therefor any material more capable of resisting the action of the fire than the plug so removed, shall be punished by a fine not exceeding one thousand dollars. Whoever manufactures, sets up, or knowingly uses or causes to be used for six consecutive days a steam boiler unprovided with a safety fusible plug shall be punished by a fine not exceeding one thousand dollars." And it seems to us that it would be wise to have similar laws in all the States.

When fusible alloys are used for filling safety-plugs it is found that their melting point is often considerably raised by long exposure to the heat. The exact cause of this rise in the melting point does not appear to be clearly known. It has been suggested that the metals composing the alloy are gradually separated or crystallized out from one another by the prolonged action of heat. However this may be, it is certain that pure Banca tin is a much more reliable material to use for filling. As tin is an element its melting point remains constant, and it is low enough 420 Fah. to adapt it perfectly for use in fusible plugs.

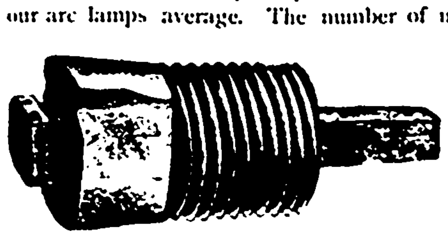
In order to prevent delay, in case a plug should melt out, all owners should see to it that extra ones are constantly kept on hand so that they can be put in place at short notice. *The Locomotive.*

HOW TO MAKE ARC LIGHT CIRCUITS SAFE.

AT the recent electric light convention, Mr. J. D. Lockwood remarked upon the importance of safe arc light circuits, and thought that with proper application of our present knowledge, accidents to human life would be comparatively rare. The first thing to look out for was "grounds," which with properly instructed employees were easily taken care of. The Rudd ground alarm was discussed and explained. Daily tests were the next best thing for locating grounds. In the experience of the speaker, grounds occurred most frequently while circuits were in operation. Methods of testing and dividing and subdividing circuits until the ground was located were treated in full.

Mr. Law's system of locating grounds on live circuits came next, and its failings in the opinion of the speaker were unfolded.

"Now, we should at least be able to test up to 100,000 ohms, and as with a voltage of 3,000, we could only get a current through this high resistance equal to 3,000 divided by 100,000; we could thus only get $\frac{3}{100}$ of one ampere, and we should consequently use a system that could be operated by this amount of current. Now, to make our ground the least factor in the test, and as we would have only about one-half our incandescent lamps or high resistance coils in circuit in most tests, we must use resistance coils and make them of such a resistance that 30 will equal at least one megohm, and thus each one would be about 33,000 ohms. As this high resistance is necessary to apply this system satisfactorily, you can all see plainly why I do not approve of the incandescent lamp system. If, however, incandescent lamps are used for ground testings, only those of the highest possible resistance and that use the smallest fraction of an ampere are suitable; and of all the styles now on the market the eight candle-power 110-volt lamp is the most suitable, because if as many of these lamps are used as there are arc lamps in circuit they will each only get about 50 volts, and consequently about 1 to of one ampere, and will thus enable us to test up to a certain resistance equal to the maximum voltage of our circuit, say 3,000 volts divided by the amperage 1-10 of an ampere, which would be 30,000 ohms, a great increase in range from the low resistance lamps, which only enabled us to test up to 2,400 ohms. If lamps are used we should also use a dead-beat voltmeter, such as is made by the Weston Electrical Instrument Company, and it should be connected in shunt around the first lamp of the series, which should be of enough higher resistance than the rest of the series to make it a resistance when connected in multiple with the voltmeter, just equal to that of each of the other lamps of the series. We could then when making our tests cut out of circuit the incandescent lamps until the voltmeter indicated as nearly as possible the voltage which our arc lamps average. The number of incan-



A FUSIBLE PLUG.

descent lamps still remaining in circuit would then correspond to the number of arc lamps between the end of the circuit being tested from and the ground. I would much prefer thus using a voltmeter and high resistance lamps to using low resistance lamps and bringing them up to normal candle-power. This outfit could also be used to find the average voltage of arc lamps on any circuit; and, having once determined this point, and also how many lamps the line is equal to, and then test and find out at any moment how many lamps are used on any circuit, and if we are running a number of circuits from one dynamo, we could thus find how many lamps are burning on each circuit, and plan our changes and combinations understandingly.

"A great improvement on this system would be a voltmeter to read up to 5,000 or 6,000 volts, such as Mr. Law says can be made by the Weston Electrical Instrument Company, and the amount of improvement would depend entirely upon the fraction of an ampere used to operate this instrument; the smaller the fraction, the greater the improvement. With such an instrument the coming on suddenly of a ground when a test is being made, even if at the opposite extreme of the circuit, would do no harm to the instrument. This instrument should be as nearly as possible dead-beat, so that in testing for a swinging ground the instrument would indicate accurately the voltage at the ground, even if the connection only existed for a moment. We now come to a system of testing, which I think a great improvement over those already mentioned, except in one particular, viz., the testing for swinging grounds. For this purpose the extremely high resistance and high capacity dead beat voltmeter I consider better than anything else. This new system I had the fond belief, until a few days ago, to be original with myself; but I find the old saying that 'there is nothing new under the sun' has been again exemplified, by my finding that practically the same system is in use at the stations of the Arc Light and Power Company, in Chicago, it having been put in, I understand, by Professor Rudd, of the Western Electric Company, of that city.

The system, in brief, is similar to the Wheatstone bridge, as the principle is to form a shunt circuit between the terminals of the arc circuit, by means of from 60 to 100 coils of high resistance, connected in series, and then by means of any very high resistance galvanometer, finding the point on the shunt circuit, from which no current will flow to grounds; then, by noting at what point on the shunt or testing circuit this neutral point is, the ground for it can be easily located. In applying this system, I would provide means for cutting out of circuit any number of these coils, with the idea of using at each test only as many coils as there are arc lamps burning on the circuit at the time of the test; then when the neutral point is found, you can see at once, without any figuring, between what lamps on your circuit the ground exists. The advantages of this system are: First, it creates no new dangers. Second, the question of how high a resistance ground can be tested, depends simply upon the sensitiveness of the galvanometer. Third, it is quick and accurate, but cannot be damaged by grounds suddenly coming on when testing.

Now, as a necessary adjunct to any of these systems of testing, there should be prepared a list of the lights and service on each circuit, arranged in the order in which they are connected in the circuit, and stating which is the positive and which the negative end of the circuit. With such lists a competent lineman, when notified that there is a ground so many lamps distant from the negative or positive end, as it may be, of a certain circuit, should have no difficulty in quickly locating the same, and, to enable him to safely and quickly do this, he should be provided with a high reading voltmeter, so that by going directly to the point where he thinks the ground exists, and testing from the circuit to the ground with his voltmeter, he could tell whether the ground was very near or not, and if not, about how many lamps were between this point and the ground. Then, by testing again a little farther on, he would immediately see whether he was approaching or leaving the ground, and thus could quickly locate the same.

In conclusion, I would say that I firmly believe that, if with such a system of testing as last mentioned, and equipping our circuits with good lightning arresters, and some such device as the circuit openers lately brought out to disconnect the dynamo from the circuit when the current ceases for an instant, through the breakage of a wire or any other cause, and then see that our employees use these appliances and do their utmost to keep all lines clear of grounds, we will have few accidents, and the press will have little or nothing more to say about the dangers of electricity."

The paper was well received, and an interesting discussion followed.

SHAFT SPEED REQUIRED.

THE following table gives the minimum shaft speed in rotations per minute, of wrought iron shafts, (not subject to bending nor to sudden change of load or speed) of different diameters to give various horse powers. They are based upon the rule which multiplies the desired horse power by 190 for wrought iron, and divides the product by the cube of the diameter in inches. Thus, a wrought iron shaft 3.5" actual diameter, to give 50 horse power, should turn 50 × 190 ÷ 42.875 = 221.5 times per minute, as a minimum.

Shaft Diam Ins.	Cube of Diam.	HORSE POWERS. 10	20	30	40	50	100	200	300	400
		1900	3800	5700	7600	9500	19000	38000	57000	76000
1.	1.	1900	3800	5700	7600	9500	19000	38000	57000	76000
1.25	1.953	973	1947	2920	3893	4867	9734	19467	29301	38935
1.5	3.375	563	1126	1689	2252	2815	5630	11259	16890	22519
1.75	5.359	353	705	1058	1411	1763	3527	7053	10580	14107
2.	8.	238	475	713	950	1188	2375	4750	7120	9500
2.25	11.390	167	334	500	667	834	1667	3336	5004	6672
2.5	15.625	122	243	365	486	608	1216	2433	3648	4866
2.75	20.796	91	183	274	365	457	914	1827	2741	3654
3.	27.	70	141	211	282	352	704	1408	2111	3185
3.5	42.875	44	89	133	177	222	443	886	1329	1773
4.	64.	30	59	89	119	148	297	594	891	1188
4.5	91.125	21	42	62	83	104	208	417	625	834
5.	125.	15	30	46	61	76	153	304	456	608
6.	216.	9	18	26	35	44	88	176	264	352

—*Power and Transmission.*

THE MILLER AS A WHEAT BUYER.*

THE first requisite of a good wheat buyer is a good bank account. A great many other things may [be] dispensed with, but cold, hard cash is the only thing [th]at you can well swap for wheat. Farmers, in this [co]unty, at least, rely more upon their wheat crop bring[ing] them in what ready money they must have than [up]on anything else.

Next to a good supply of money, the miller must have [a] good stock of patience. A farmer may ask him a [gre]at [m]any times what he is paying for wheat, and whether [it is] going up or down, and then sell to some grain [sh]ipper. A good knowledge of the soil in his territory [an]d the kind of wheat it produces is almost indispensable [to] the buyer, as well as a knowledge of what kind of [far]mer the seller is. Some farmers nearly always have [go]od wheat. You may call it luck, if you will, but I say [it i]s to be attributed to science, skill, good management [an]d industry. The season and the soil are great factors, [but] man wields an immense power over both. A cold [cla]y soil should be drained, while sandy soil should be [ke]pt well enriched with fertilizers of various kinds.

The good wheat buyer knows, therefore, in which [dire]ction to look for good wheat, as well as what farmers [m]ay be expected to have it. As to the price, I think [th]at the buyer should always follow the market. He [sho]uld have no convictions of his own regarding the [fut]ure. If wheat goes down he should drop the price [gre]atly, and on the contrary, if it advances in the great [m]arkets, his bids should correspond with the advance. [He] is bound to follow wheat sooner or later. If the [buye]r should fail to advance his bids in case of a rise in [the m]arket, he will drive the farmers in his neighborhood [to the] grain shippers. Some millers make a practice of [pay]ing a few favored farmers, who have an extra quality [of] wheat, a trifle over the market price on the sly. I [thin]k it right enough to give an extra price for wheat of [su]perior quality, but I would give all the publicity possi[ble] to the transaction. Make it an inducement to the [farme]r to raise the best of wheat. Tell the farmer who [offe]rs you ordinary wheat that he cannot expect an [extr]a price. Don't buy wheat as the country grocer [bu]ys butter. He is afraid to tell the farmer's wife that [her] butter is poor, when such is the fact, for fear of [losin]g her trade. Therefore, he pays the market price [for g]ood and poor butter alike. This is not dealing fair [wit]h the vendor of the good article.

The miller should have a grain tester, of course; and, [furt]hermore, he should use it.

There are some farmers who object to the use of the [test]er, to be sure, but the farmers are in the wrong, not [the] tester. No farmer whose wheat weighs 60 lbs. or [ove]r fears the tester. It is only treating all with equal [just]ice to use it. Wheat testing 56 lbs. should not com[man]d the same price that wheat weighing 60 lbs. does. [How]ever, we cannot rely wholly upon the tester in de[term]ining the value of the wheat. It seems to me that [the] miller would do well to be guided largely by the [boa]rd of grain inspection in the nearest large grain [mar]ket.

The best time to buy is when people want to sell. [Mill]s should have large storage capacity, so that when [farme]rs wish to rush their wheat in, he can accommodate [them]. Many desire to sell immediately after harvest; [som]e about tax-paying time, while all wish to have as [little a]s possible when the assessor comes round. A [farme]r does not like to pay high taxes. We can't blame [him]. No one in the community works more hours or as [hard] as he does. Nothing that he sells is enchanced in [price] by the tariff, while many things that he must have [are m]ade more dear by it.

[Thu]s, a good wheat buyer will do everything possible [to ma]ke the *supply abundant and the quality excellent.* [It sta]nds to reason, then, that the interests of the [farme]r and the miller are identical. The more wheat [the far]mer raises the more the miller can buy; and the [better] the quality the greater the worth. On the other [hand, i]f the miller is able to dispose of his flour to good [advan]tage, the more money he has to hand over to the [farme]r. Therefore, the two classes are similarly affected [by the] same great laws of trade. The miller should [have] the privilege of disposing of the farmer's wheat [made i]nto flour anywhere in the world, unhampered by [re]strictive laws. So, too, should the farmer be [permit]ted to gather his supplies from every quarter of [the ear]th, unfettered by any duty, so that he can grow [wheat] successfully and with as little expense as possible, [and se]ll to the miller at prices that will enable the latter [to com]pete with the English miller, who buys wheat at [his le]isure from Russia, India, Australia, and the whole [world i]n fact.

[A]s the miller buying wheat in the great markets in Chicago, for instance I will simply say that I see no money in it, during the season of lake navigation at least. The low water-freights show that the wheat or flour should go east via the lake the most economical route. If the wheat or flour goes east via Goshen, it must go all rail, at an expense of 10c. per barrel (and at present much more than this, over the Lake route from Chicago or Duluth.) Even in winter time, this low lake freight operates to our injury, as the wheat is stored and the holder awaits the opening of navigation. The miller is debarred from shipping by lake from Toledo as the railroads not only charge a high local rate to that point, but would also charge a high local rate from Chicago on wheat in case the flour was not given to them for through shipment.

I believe, therefore, neither in buying Chicago wheat nor Chicago options. Some millers argue that if they make large sales of flour they must protect themselves by buying options. The miller's sales should be limited by the stock of wheat that he has on hand and what he has a reasonable certainty of getting. If he is protected (?) by an option and wheat should decline, all the profit on the sale of his flour may be lost. It is vastly better, in my opinion, to carry the cash wheat in your own elevator, even if you have to work on borrowed capital. Then, when farmers haven't time to deliver wheat, you *will not be obliged to spring the price out of all reason* to get enough to supply your regular trade.

I read in one of the Chicago dailies not long ago that Charley Pillsbury, previous to his departure for the East, had signed checks to the amount of a million or two to buy wheat. This is an extremely easy way of buying wheat, and I would suggest it to the Indiana millers, but fear that their banks would be unwilling to cash their cheques when drawn for such large amounts. Very likely, however, Michigan and Ohio millers would meet with no such trouble. The wheat buyer should not be too talkative. Let the other fellow have his say, as all men, and some women, like to talk. My first experience in business was in a hardware store, and the first customer I had wanted to purchase a razor. He picked out the cheapest one in stock, a fifty-cent razor, and you can very well imagine that it was a poor one, as it was then war times, and anything of worth came high. He explained to me, however, that it was an excellent article, as, in looking at it, his face appeared exactly straight up and down. I had hard work to keep my face straight, I assure you. He told me afterward that the razor was a most miserable affair, but he could find no fault with me, as I had not said a word about it. In conclusion, gentlemen, don't fail to buy wheat on the breaks and sell flour on the bulges, and you will make your wives happy and yourselves rich.

*[P]aper read by F. L. C. Hawks at the Tri-state Millers' Convention, [Fort Way]ne, Ind., May 14, 1890.

PROPERTIES OF ALUMINUM.

THE specific gravity of aluminum being taken as one, soft steel is very nearly 2.95 times as heavy; *copper, 3.6 times as heavy; ordinary high brass, 3.45* times as heavy; nickel, 3.5 times as heavy; silver, 4 times as heavy; lead, 4.8 times as heavy; gold, 7.7 times as heavy.

A sheet of aluminum 12 inches square and one inch thick weighs 14.03 pounds; a bar of aluminum one inch square and 21 inches long will weigh 1.17 pounds; a bar of aluminum one inch in diameter and 12 inches long will weigh 0.918 pounds.

A cubic inch of cast aluminum weighs..........	0.092 lb.
A cubic foot of cast aluminum weighs..........	158.967 "
" " soft steel weighs..................	490.450 "
" " wrought iron weighs..............	485.874 "
" " copper weighs................	554.988 "
" " ordinary brass weighs..........	524.160 "

Aluminum has about the tensile strength of cast iron, with only about one-third of its weight, and casts equally as easily and successfully, and will, therefore, be very advantageously used to replace cast iron in the parts of moving machinery that have to be reversed or otherwise have their momentum overcome; for with one-third the weight, and consequently one-third the momentum, aluminum will work very satisfactorily.

Pure aluminum melts and becomes fluid at about 1,200 degrees Fahrenheit. The amount of impurity in aluminum materially alters its melting point. One per cent. of iron raises the melting point over 100 degrees. It does not remain firm like lead almost to the fluid point and then suddenly give away, but has a stage of from 1,000 to 1,200 degrees Fahrenheit, in which the metal becomes pasty, loses much of its power of cohesion, and during which stage, if the metal be gently pressed together, it can be readily welded. It is, however, very red-short at this temperature, and will not stand hammering to weld the metal without crumbling down. If the metal is not too long a time in this pasty condition it does not seem to become injured after being again cooled down.

USEFUL INFORMATION

It is said that minute variations in the lengths of metallic bars are determined by the vibrations of a wire connected with a callipering device. The tension of the wire determines the number of vibrations, as in a piano wire or a violin string.

Hand grenades, for which a fancy price is often charged, are *filled*, it is said, with a mixture of one pound common salt and a half pound of sal ammoniac dissolved in two quarts of water. Ordinary bottles filled with this mixture will serve every purpose.

RECIPE.—For varnishing new copper work boiled linseed oil is recommended. It stands the weather as well as the best coach varnish and is much cheaper, although it does not make so smooth a surface. Two coats are sufficient; let the first coat dry thoroughly before the second is applied.

WORTH TRYING.—In order to keep machinery from rusting, take one ounce of camphor and dissolve it in a pound of melted lard, take off the scum and mix as much fine black lead as will give it color. Clean the machinery and smear it with this mixture. After twenty-four hours rub clean with soft linen cloth. It will keep clean for months under ordinary circumstances.

A new way of annealing small pieces of steel is given by a writer in the *English Mechanic*. Heat the piece as slowly as possible, and when at a low red heat put it between two pieces of dry boards and screw them up tight in a vise. The steel burns its way into the boards, and on coming together around it, they form a practically air-tight charcoal bed. When it cools off, the steel is apt to be found thoroughly annealed.

A new alloy is described for use in the place of steel in the manufacture of various parts of watches, such as the balance wheel and hair spring, so as to obviate the disadvantages which follow on their magnetization or oxidation. The composition of the alloy is as follows: Gold, 30 to 40 parts; palladium, 30 to 40 parts; rhodium, 1-10 to 5 parts; copper, 10 to 20 parts; manganese, 1-10 to 5 parts; silver, 1-10 to 5 parts; and platinum, 1-10 to 5 parts. The copper and manganese are first of all to be melted, and the other metals afterwards added, or the whole of the constituents may be placed in the crucible at once, with the manganese at the bottom.

SAFETY OF FERRANTI CONDUCTORS. An interesting experiment was recently tried with the Ferranti mains at Deptford, England. The London Board of Trade had put forward an *objection that in case of a workman cutting the conductor the act* would be dangerous to life. This was denied by the engineers, and the experiment was carried out to demonstrate that it was not the case. A length of the main was charged with the 10,000 volt current, and the main was then cut through with a hammer and a smith's set. This was done in front of the visitors, without the slightest effect upon the workman who held the tools. The main was of course short-circuited, and the fuse at the other end went, but otherwise there was no accident.

A large amount of slashing about and thrashing up and down has been indulged in a shop where a coil of rope was to be wound on a cylinder for use. The rope was drawn off over one end of the coil, and every turn was putting in a turn of twist which gave a kink for every once so often, which corresponded very closely with the circumference of the coil, so all hands were engaged in a jump-rope performance in the hope of coaxing out some of the crooks that held together amazingly tight. Had the rope been taken from the inside of the coil, a turn of twist would have been taken out for every rotation of the rope. Better place the coil on an arbor and put an end to all trouble to start with.—Boston *Journal of Commerce*.

The sensitiveness of electrical apparatus to changes of temperature has been employed not only in constructing automatic fire alarms, but also to give notice on shipboard of the approach of icebergs. And electrical appliances can be used not only to register and give notice of changes of temperature, but also of variations in light, sound and every other form of force, and this in degrees of the utmost minuteness. Indeed, so sensitive is Prof. Bell's photophone to changes in the intensity of light that he can find no artificial source of illumination which does not create a continuous noise in it. Since the approach of an ironclad ship can be clearly indicated by a delicate electrical appliance, a range-finder has been added to the resources of the United States navy, whereby its gunners can correctly fire at a ship they cannot see.

POWER REQUIRED TO DO VARIOUS KINDS OF MACHINE WORK.—*The following interesting and valuable table, giving the* amount of power necessary to drive drills, planers, shaping machines, blowers, etc., under various conditions of operation, was compiled by Mr. Robert E. Dunstan, president and electrician of the Connecticut Motor Company, Plantsville, Conn., and has been kindly furnished for publication: (1) Shop shafting 2 3-16 inches by 180 feet at 160 revolutions, carrying 26 pulleys, varying in diameter from 6 inches to 36 inches, and running 20 idle machine belts, 1.32 h. p. (2) Lodge-Davis upright back-grand drill press, having table, 28 inch swing, drilling three-quarter inch hole in cast iron, with a feed of one inch per minute, 6.78 h. p. (3) Morse twist drill grinder No. 2, carrying 26-inch wheels at 3,200 revolutions, 0.29 h. p. (4) Pease planing machine 30 x 36 inches, table 6 feet, planing cast iron, cut ⅛ inch deep, planing 6 square inches per minute at 9 reversals, 1.06 h. p. (5) Shaping machine 22-inch stroke, cutting steel die, 6-inch stroke and ⅛-inch deep, shaping at rate of 1.7 square inch per minute, 0.57 h. p. (6) Engine lathe, 17 inches swing, turning steel shaft 2¼ inches diameter, cut 3-16 inch deep, feeding 7.92 inches per minute, 0.43 h. p. (7) Engine lathe, 21 inches swing, boring cast iron, hole 5 inches diameter, cut 3-16 inches deep, feeding 0.3 inches per minute, 0.23 h. p. (8) Sturtevant No. 2 monogram blower at 1,800 reversals, no piping, 0.8 h. p. (9) Heavy planer about 28 x 28 x 14 feet bed, stroke 8 inches, cutting steel making 22 reversals per minute, 3.2 h. p.—*Electrical World.*

ELECTRICAL

Rat Portage is to be lighted by electricity.

The Portage Milling Company will light their mill at Portage la Prairie with electricity.

A company is being formed at Moose Jaw, N. W. T., to furnish electric light for that town.

The Cobourg Electric Light Company is said to be desirous of acquiring the ownership of the gas works.

Coaticook, P. Q., will adopt a system of electric lighting, having signed a contract for 30 arc and 500 incandescent lights.

The citizens of Terrebonne, P. Q., have awarded a bonus of $10,000 to the Canadian Electrical Works to establish its works there.

The Eastern Electric Company (limited) St. John, N. B., will supply incandescent light, etc., besides supplying power for the street railway.

The street railway company of St. John, N. B., are having their electric motors constructed and will commence at once the erection of their new station.

The Ottawa City Council have agreed to accept the offer of the syndicate represented by W. H. Howland, of Toronto, to build a system of electric street railway there.

The electric street railway at Vancouver, B. C., is doing a large business and the line will be extended without delay. The new system of arc lighting on the streets is now in operation.

The St. John Electric Light Company has been organized at St. John, N. B., with a capital stock of $50,000, for furnishing electric light to cities, towns, etc., and for manufacturing electric machinery.

A number of Canadian cities and towns are said to be offering inducements to the Thomson-Houston Electric Company, whose works and headquarters are at Lynn, Mass., to establish branch works in Canada.

It is reported that the Canadian Edison Manufacturing Company, whose works are now at Sherbrooke, P. Q., have secured a desirable site and power at St. Catharines, Ont., and will remove their plant, machinery, etc., to that city.

One of the principal objects of the electrical exhibition which is to be held at Frankfort-on the Main in 1891, will be to demonstrate which is the most economical method of transmitting and distributing electrical power in factories and wherever else it is used, instead of steam and other power.

It is proposed by the Toronto Corporation to expend $20,000 in purchasing an electric plant to supply 1,000 arc lights at an average of twenty-four cents per light. This, it is estimated, would mean an expenditure of $87,000 per annum for lighting as compared with an expenditure of $140,000, the present annual gas and electric light bill.

The accomplishment of an hitherto apparently impossible feat, the useful transformation of mechanical work directly into electricity, is claimed by Prof. Braun of Tubingen. He winds nickle wire into spirals, and as each spiral is elongated or compressed, a current of considerable strength is generated. This is increased by putting a number of spirals in parallel. Such positive results are stated to have been attained that the professor is hopeful of being able to construct a practical generator on this principle.

Prof. R. H. Thurston, in a recent article gives a graphic description of what electricity will do in the near future. He says it will break up the present factory system and enable the home worker once more to compete on living terms with great aggregations of capital in unscrupulous hands. Great steam engines will undoubtedly become generally the sources of power in large cities and will send out the electric wire in every corner of the town, helping the sewing woman at her machine, the weaver at his pattern loom, the mechanic at his engine lathe, giving every house the mechanical aids needed in the kitchen, the laundry, the elevator, and at the same time giving light, and possibly heat, in liberal quantity and intensity.

In 1851 Wiedemann discovered that if a tube containing bisulphide of carbon is surrounded with a wire carrying a current, the rotation of the plane of polarization is exactly proportional to the strength of the current. Starting from this point, M. d'Arsonval has devised a very simple arrangement for measuring currents and testing the accuracy of ammeters. In the apparatus recently shown to the Societe de Physique, a coil of wire was wrapped round an ordinary saccharimeter tube containing pure water or bisulphide of carbon. The E. M. F. of a single Leclanche cell will cause a rotation of one degree. The apparatus can be made as sensitive as one pleases, since for a given current the sensibility depends simply upon the number of convolutions of the coil.

When the Duke of Connaught decided to cross the Atlantic on the Allan S. S. *Sardinian* the Messrs. Allan decided to offer superior accommodation to His Royal Highness. As the ship was only a short time in the port of Montreal previous to her sailing, they were allowed very little time to prepare any very extensive arrangements. Electric lighting is now almost an absolute necessity on ocean passenger steamers. The Royal Electric Company, of Montreal, hearing of this, seized the opportunity to offer the use of an incandescent electric plant of their system, and accordingly the Duke's state rooms and the main saloons were equipped with electric light. The success attending the lighting of the steamer for this trip, and the superior class of work done by the Royal Electric Company, being far superior to the work done abroad, decided the Messrs. Allan to permanently equip several more of their steamers, and the Royal Electric Company have been entrusted with orders to equip the *Sardinian* and two other steamships this season. Next year they expect to equip the entire fleet. This speaks well for the enterprise and superior quality of work done by the Canadian company, and the Royal Electric Company deserve the highest credit for the estimable manner in which their work was done and appreciated, notwithstanding all old country opposition.

A very fine station has just been started at Halifax, N. S., by the Halifax Illuminating and Motor Co. The electric station is erected on Moren's wharf, which is situated very centrally at the south eastern portion of the city. This property was purchased by the company some time in the month of November, and consists of a lot with a frontage on Water street of about fifty feet and runs eastwardly to the harbour about 230 feet, where the width for about one hundred feet is over eighty five feet. The water lot is 80 by 300 feet, and has upon it a new and capacious wharf, while the depth of water is ample for all kinds of shipping. The station is a substantial two storey brick building. The boiler room is about 40 feet square and the engine and dynamo room is 40 x 50 feet. The boiler room is furnished with four tubular boilers six feet in diameter and 16 feet in length, made of half inch steel and so constructed as to stand a pressure of at least 120 pounds to the square inch. Each boiler connects from the top by an eight inch steam pipe with a twelve inch pipe running the whole length of the engine room about three feet from the second floor. In the engine room nearly beneath this pipe are set four compound engines. These engines were all made to order and specially designed in all their running parts for the special work of this company. The dynamos belt direct from the fly wheels of the engine. The engines are all high speed and are run at the rate of about 200 revolutions per minute. Their united capacity aggregates about 600 h. p. The electrical plant consists of seven new arc dynamos, each of a capacity of fifty lights, of 2,000 candle power, two incandescent alternating dynamos, of a united capacity of 3,650 sixteen candle power lights. The switch board covers an area of about 30 x 12 feet, is made of black walnut and cherry and in its arrangement and construction was designed by the superintendent, R. A. Cogswell. J. W. DeBlois is manager of the company, R. A. Cogswell, superintendent, and W. Wisdom, chief engineer.

WATER POWER ELECTRIC MOTOR SERVICE.

OUR recent article on some of the results obtained by Mr. G. A. Redman, of Rochester, in the introduction of the electric motor, has, we are glad to find, awakened very general interest. It will be remembered that the Rochester Brush Electric Light Company utilizes the lower falls of the Genesee river. It has built up a large lighting business and has now turned its attention to power with such success that it has already over 500 motors in active service. We mentioned as one example of the manner in which the business had been worked up that the company was furnishing power to no fewer than 108 tailor shops.

Several inquiries have been addressed to us on the subject, and the question that seems to arouse most interest is that of rates. We are glad to be able to give the information required, and in doing so would point out that the ruling idea has been to build up a good business at a steady income. Another point deserving comment is that Mr. Redman has attained his results on arc circuits which have not always, so far, been the best to work upon, owing to obvious difficulties with many of the motors hitherto obtainable. The rate charged at Rochester for one-eighth h.p. for sewing machines is $18 per annum. A special rate of $15 for a one-eighth is made for fan service, for the season, from June 1 to October 1. In view of the fact that such fan motors are practically kept at it without cessation during that season, the charge is very reasonable. At any rate it is cheerfully paid, and in cases of sickness the motor has been such an inestimable boon that the customers were willing to pay any price for it. For a one-half h. p. motor the fan service is $35 for the season; and $50 for one h. p. For the half h. p. on ordinary work, the yearly rate is $58, and for one h. p., $73. In other words, for 25 cents a day, a small manufacturer, printer, tailor, or storekeeper has one h. p. always at his command without bother or thought or attention on his part; and the amount of work that a steady one h. p. will do is not fully realized. It is this easy command of cheap power in small units that, in our opinion, is destined to bring about some notable industrial changes in due time.

Coming to the larger sizes, we find that Mr. Redman gets $120 per annum for two h. p.; $250 for five; $300 for six; $400 for eight; $475 for ten and $700 for fifteen. The last quotation brings the rate down to only a little over $46 per horse power per year. What better can a manufacturer using 15 h. p. ask than such a rate, which gives him the fullest power he is paying for, by the mere closing of a switch, and upon the instant?

We hope to see the Rochester results duplicated elsewhere; in fact we know of several instances where the utilization of the water power in this manner will be among the most striking advances of the time in this field. It is no longer necessary to huddle together down in the unhealthy valley, close to the turbid stream, on ground that costs as much as the mills built upon it. The power developed by the water can be delivered miles away in the smallest as well as the largest quantities, under conditions favorable to the well-being of the employees and to the higher perfection of the factory product.

A COMPOSITE BOILER.

A SAN FRANCISCO engineer is constructing a kind of steam boiler that may be called "composite." It is a combination of the Cornish flue and tubular systems. There is a lower or furnace section internally fired, and a tubular return section above the flue of the Cornish section being returned to the tube above, so the main shells by reason of their small diameters are much reduced in weight and cost. The gases of combustion are led back around the main shells by a jacket or casing to a chimney at the rear, so no masonry is required in setting the boilers. In some recent experiments, 9.7 pounds water were evaporated per pound of coast coal, which result shows a much higher efficiency than is usually attained with stationary boilers.

Industry says they are among the old-fashioned people who believe in internally-fired boilers, with a full body of water around a furnace, slow combustion and a free "rise" for steam. Boiler makers and others, in estimating the cost and maintenance of boilers, are very apt to omit the expense of brickwork furnace required for external firing, but this is as much a part of maintenance as the shells and flues are, and with some kinds of boilers a good deal more. The setting of a common tubular boiler, exclusive of a chimney, is said to be 33 per cent. of the whole cost, and this should be credited to any type of boilers not requiring masonry furnaces.

THE ELECTRIC MOTOR.

PERHAPS the electric transmission of energy for the production of power, through the medium of the electric motor, is destined to meet with the greatest development and to become the most valuable of all the industrial applications of electricity.

The economical transmission and subdivision of power is a problem that has engaged the attention of engineers in as great a degree as any other department of engineering, and the progress of the last ten years shows conclusively that electricity is the agent we must look to for its solution.

Considered from a mechanical point of view, the electric motor, though only a product of the past decade, has already reached a point of perfection that the steam engine, with its century of development, does not begin to approach. In it there are no reciprocating parts; the pull or torque is continuous and applied to the point where it can do the most good; there are no dead points; the motor will start from any position under full load; it does not require constant and skilled attention; produces no dirt or noise; is applicable to places where a steam engine or any other motor except this is out of the question; does not need any mechanical governor, that only begins to govern after the speed has varied; is perfectly self-regulating in the matter of energy consumed, which is always proportional to the work in hand; entails no danger of fire, with increased insurance rates; does not increase the temperature of the shop—a point to which the prevailing weather has given no little importance; can be started, stopped and reversed almost instantly, and, in a word, offers so many points of advantage that its universal employment in place of the existing small steam engines, and for the thousands of small industries that only await a cheap and flexible source of power to spring into existence, is but a question of a very few years.

The success of the great number of electric railways throughout the country offers unmistakable testimony to the reliability of the most marvelous production of an age of marvels. With the advent of cheaper means for the production of electricity will come a revolution in the existing methods of power production, and it does not require any great stretch of the imagination to see our ponderous steam locomotives giving place to this infant that is even now a giant. A great field for development, opened up by the electric motor, is the utilization of the numberless natural water powers that, by reason of their distance from populous cities, are now going to waste. The power of Tallulah Falls, for instance, transmitted electrically—which is the only possible method—would suffice to turn every wheel in Atlanta; and that very soon, this dream will be realized, scarcely admits of a doubt.

As an illustration of the rapidity with which the electric motor is displacing other power producing machines, let us look at the work in Atlanta, for though it is but little over a year since the first electric motor was introduced, there are now, including the power used by the electric railways, something over three hundred horse power produced and used, and the various uses to which this power is put would surprise those not familiar with the facts.—*Dixie.*

MILLING FLOUR & GRAIN

Mr. Hill's flour mill at Sarnia is being remodelled to the roller system.

Mr. Hutchins will rebuild at once his elevator at Sarnia recently destroyed by fire.

The High Bluff, Man., grist mill has been purchased by W. R. [illegible], of Winnipeg.

The repairs in the Virden, Man., roller mill are completed, and the mill ready for business.

The grist mill at Essex, Ont., will be shut down while new machinery is being put in.

The Scotia Mills, Embro, Ont., were broken into recently and about $10 or $12 worth of oat chop and grist carried off.

E. & A. B. Snider, the well-known millers of Waterloo, Ont., have gone to May City, Iowa, where they will go extensively into business of a varied character.

The American syndicate which recently set about the undertaking of establishing an industrial town at Kakabeka Falls, Ont., is going to erect a flouring mill.

The Kingston *Whig* says that D. H. Price, of St. Thomas, Ont., who is in that city, is interested in a patent which promises to revolutionize the flour trade. We have heard of such patents before.

Owing to the displacement of the piston, the cylinder and crank connected with the engine in the Portage la Prairie Flouring Mills were broken recently, and the establishment was obliged to shut down for repairs.

Messrs. G. Copeland & Sons have been making considerable alterations and improvements in their flouring mills at Penetanguishene, Ont., and are building an addition in which to place [illegible] machinery.

The Hagarsville Milling Company, Ltd., capital stock $40,000 in [illegible] shares, are seeking incorporation. The promoters are R. A. Smith, Wm. Rutherford, J. W. Kett, Oneida, Ham Hind, A. D. Clark, J. H. Smith, Walpole.

An employee of Norris's mills at St. Catherines, Ont., named [illegible] made a determined effort to put an end to his existence by swallowing a dose of laudanum, but was forced to take an [illegible] and arrested on a charge of insanity.

There is a good opening at McLeod, Alberta, for a flour mill. A bonus of 3,000 bushels of wheat is offered as an inducement to [illegible] mill to have a capacity of fifty or more barrels per day. Samples of wheat grown in the district will be sent to anyone addressing the board.

Mr. Percy F. Pimm, of Wandsworth, England, is at present on a visit to this country and the United States for the purpose of observing how the milling business is conducted on this side of the Atlantic. The information thus acquired will be utilized on his return by the firm with which he is connected. Mr. Pimm [illegible] the Canadian Northwest during last month.

At the semi-annual meeting of the Winnipeg Board of Trade on [illegible] the following boards of examiners were elected: Grain—Mitchell, Balf, McGaw and Spink. Flour and meal—Colonel [illegible], Spink, Thomson and Anderson. Hides and leather—[illegible]ngs, Johnson, Balf, Gallagher, Osenbrugge. The board of grain examiners for the year ending 30th June last, reported that [illegible] cars of wheat, containing 2,207,400 bushels, had been inspected here. Seventy-three per cent. reached high grade per[illegible]. There was only one appeal from the inspector's finding during the year, and the board sustained the inspector.

At a meeting of the Local Millers' Association of the [illegible] district, Mr. Campbell, St. Thomas, President, presiding, [illegible] matters affecting millers' interests were discussed. Very [illegible] samples of new wheat were shown. The matter of the Government withdrawing the order-in-council making the small tester [illegible] measure was fully considered. It was unanimously resolved to continue buying wheat by tester, using the present one-[illegible] bushel tester, and in the case of contract sale where [illegible] were dissatisfied, to abide by the decision of a peck or half [illegible] measure to be used to legally decide the matter of the [illegible] weight. Some millers stated that they were already doing [illegible] it was ascertained that as a rule now they had no difficulty with farmers on account of the use of the small tester, the [illegible] majority of farmers being in favor of the system of buying [illegible].

CONVERTING HEAT INTO ELECTRICITY.

For fifty years electricians have been trying to discover a method of converting heat directly into electricity. Until [illegible] no results of commercial value have been obtained. Such [illegible] it seems now to have been discovered or invented by a [illegible] man from Maine, H. B. Cox. If Mr. Cox's claims are just and capitalists have confidence enough in them to have formed a company with a capital of $1,000,000—the whole system of [illegible] lighting will be revolutionized and steam will be regarded [illegible] expensive for ordinary uses. It is impossible to estimate [illegible] the immense value of Mr. Cox's invention, but it is [illegible] that he expects almost incredible results from it and that [illegible] pared with his confidence some of the shrewdest business[illegible] Hartford and Boston.

As has been said, a company has been organized and incorporated [illegible] Maine, where Mr. Cox was when some Hartford men met [illegible] then the business has all been brought to Hartford, [illegible] it has been done since has been done at the factory of the Pratt & Cady company. The capital stock is $1,000,000, and [illegible] is now for sale. Francis A. Pratt, of the Pratt & Whitney company, is vice-president, and Ernest Cady of the same company, is the treasurer. E. Henry Hyde, of Hyde & Joslyn, is a stockholder, one of the directors, and legal adviser of the new company. All the patents asked for by Mr. Cox have been allowed, and they will be issued in a few days. Both foreign and domestic patents have been applied for.

The apparatus used for converting the heat into electricity is so simple that the company does not dignify it by the name of machine. By Mr. Cox's method heat is changed to electricity as simply as water is changed to steam. His furnace is all that may be seen. From glowing coals comes the subtle current, without the aid of boiler, engine or dynamo. A jet of gas can be made to run a dental machine, a sewing-machine, and anything which requires no more power than these. No power has ever been discovered that is half so cheap as will be electricity obtained by this new process. This has been the dream—apparently impossible of realization—of all electricians, and even the wizard of Menlo Park has almost despaired of its ever being brought about. Yet a young man only 28 years of age seems to have solved the puzzling problem.

Before the company was formed, Mr. Cox had a furnace at home by which he ran many electric lights. This furnace was injured in being transferred to Hartford, and a new one of the same size has not yet been completed. Experiments and private exhibitions have been conducted here on a smaller scale, but in a short time the company intends to show to the world that with the power thus obtained anything that steam or electricity now does may be done. Several members of the company saw what could be done with the furnace of Mr. Cox before any attempt was made to remove it. The one now being built will be an improvement on the old one, and the results from it are expected to be correspondingly better.

Most of the stock of the company is owned in Hartford. Some of it is held in Boston. The whole affair has been kept secret until the company should be ready to make it public. Even now the officers of the company are unwilling to talk for publication, but gossip about the new invention has been so frequent in Hartford and elsewhere that it seems proper to print a general statement. The officers of the company say they will be ready for exhibition in a few weeks.—Hartford *Courant*.

FINANCIAL STATEMENT OF SOME ELECTRIC STREET RAILWAYS IN NEW ENGLAND.

THE Bangor, Me., Electric Street Railway has an equipment of 4 cars and was opened for traffic May 21st of this year. From that time till October 1st the net earnings of the road were $6,561.60. As the yearly interest on its bonds is but $4,200, this means that in a little over one-third of the year the road has paid its fixed charges for the entire year and has a clear profit of over $2,300 remaining in its treasury.

The Brockton, Mass., East Side Street Railway has a single track road 4½ miles long, and an equipment of 2 box cars and 2 open cars each fitted with two electric motors. The road was opened for passenger traffic November 1, 1888. The report of the treasurer for the eleven months of operation ending Sept. 30th shows the total receipts for passenger fares to be $11,316. Power for the road has been furnished by the Edison Illuminating Company at a cost to the railway company of $1,805. Only two cars were operated at one time, except on special occasions.

The Boston and Revere Electric Street Railway, in its annual report to the State Railroad Commissioners for the year ending September 30th, makes the statement that at the beginning of the year it had a deficit of $2,645. This amount has been made up and a surplus of $512 remains in the treasury. No dividend was paid. The capital stock of the company is $30,000 held by eight shareholders, its track mileage 4.3, and its equipment consists of 5 motor cars and 7 ton cars. It has 15 employees and during the year carried 161,570 passengers and made a total car mileage of 21,408. As high as 10,780 passengers were carried in one day with 5 motor cars.

PRACTICAL HINTS ON BOILERS TO PRACTICAL MEN WHO USE THEM.

AN experienced inspector of boilers, one who has studied the various types through their various stages of development, and traced backward from defect of explosion to probable cause, was called upon recently by the *Safety Valve* in the interest of its readers. The questions put to him and his answers thereto are given herewith:

Q. Why are boiler tops covered? What material is best for the purpose?

A. Boilers are covered on the top for the purpose of protecting the shell and preventing condensation of steam. The best material for covering is some mineral felt (asbestos.)

Q. As to air entering the furnace above the burning fuel, is it desirable?

A. A proper amount of air (oxygen) entering the furnace above the fuel in small quantities assist very materially in the combustion of the gases, but a great quantity is detrimental and injurious.

Q. From a practical and economical standpoint, is forced draught to be preferred to that produced by the chimney alone?

A. From a practical and economical standpoint natural draught through proper area of flues and chimney is preferable for many reasons. First: The natural draught combustion is slow and easy and the boiler is not forced, when in the other case force draught is injurious and detrimental to the boilers and also expensive for it requires steam and power to produce.

Q. As to the proportion between area of grate and the clear area through the flues or tubes—what should it be?

A. If the areas of flues is meant, grate surface one to nine or ten, but if it is the grate surface to the heating surface, one to thirty is very effective, though some allow more.

Q. What is the government rule for the area of a safety valve for a boiler?

A. Lever safety valve area should not be less than one square inch or two square feet of grate surface in a boiler, and the seat of the safety valve should have an angle of 45 degrees to axis of valve. Spring loaded safety valves are constructed to give an increased load by the operation of steam after being raised from the seat. They may be used in place of lever valves and should have an area of not less than one square inch to three square feet of grate surface in a boiler.

Q. What is a surface blow valve?

A. A surface blow is connected at the water-line of the boiler and acts as a skimmer for the purpose of taking off all the impurities, grease, etc., that may be in the water; rising to the surface it can be removed before it becomes so heavy as to precipitate onto the heated surface of the boilers, forming bags and blisters, also covering the tubes and flues, which will interfere very materially with the generation of the steam, and as it is accumulated between the water and the shell, it is a non-conductor. Where there is any oil, grease or vegetable matter in the water that enters the boiler, the surface blow is of great value.

CHOOSING A RUBBER BELT.

THERE having been expressed a desire for a table which would show about how much rubber belt cross section there was needed to carry various horse powers at various speeds, the following table is offered as being convenient and practical for horse powers from 10 to 100, inclusive, and for belt speeds from 2,000 to 2,750, inclusive. The belt is supposed to be fastened with single leather lacing. Doubling the lacing adds about one-eighth to the driving power, other things being equal, and, of course, calls for only eight-ninths as much cross section for a given horse power. If the joints were riveted there would be required only five-ninths as much belt for a given power.

BELT CROSS SECTIONS.

Horse-Power.	Belt Speeds. 2,000	2,250	Feet per Minute. 2,500	2,750
10	.7	.62	.56	.51
15	1.	.7	.8	.8
20	1.4	1.2	1.1	1.
25	1.7	1.6	1.4	1.3
30	2.1	1.9	1.7	1.5
35	2.4	2.2	2.	1.8
40	2.8	2.5	2.2	2.
45	3.1	2.8	2.5	2.3
50	3.5	3.1	2.8	2.5
55	3.8	3.4	3.1	2.8
60	4.2	3.7	3.4	3.1
65	4.5	4.	3.6	3.3
70	4.9	4.4	3.9	3.6
75	5.2	4.7	4.2	3.8
80	5.6	5.	4.5	4.1
85	6.	5.3	4.8	4.3
90	6.3	5.6	5.	4.6
95	6.6	5.9	5.3	4.8
100	7.	6.2	4.6	5.1

Thus, if we have to carry 50 horse-power and know that we are going to have belts running 2,250 feet per minute, we can see at once that it will take 3.1 square inches of cross section of rubber belt laced with single lacing, and having 180 arc of contact upon a cast-iron pulley in good condition. We can make about this by having 12 inches of belt one-quarter inch thick or 15 inches of belt one-fifth inch thick; or if we know how wide we shall have to have our belt, we can figure up very readily what thickness to get. Thus, if we cannot have more than a 10 inch belt we shall know very quickly that it will require 3.1 divided by 10, equal to 0.31 inch of belt thickness.

For other belt speeds than those given it will take in inverse proportion; thus, for 1,125 feet of belt speed per minute it will require double the quantity; that is, 30 inches of one-fifth inch belt, or 24 inches of one-quarter inch, and so on.—Robert Grimshaw in *India Rubber World*.

Please mention the ELECTRICAL, MECHANICAL AND MILLING NEWS when corresponding with advertisers.

MACHINERY MFG.

The Calgary Water Power Company has been organized. The following are the directors: I. K. Kerr, P. A. Prince, I. H. Moon, D. R. Moon and J. J. Prince.

The Ontario and Sault Ste. Marie Water, Light and Power Company, proposes building a water power canal with the necessary works and require to obtain 10,000 horse power. The works are extensive, and include excavation, masonry construction, erection of gates, etc.

Tenders are being considered by the American company which has been formed at Niagara Falls, N. Y., to utilize the immense power of the cataracts for the construction of a tunnel of 8,000 ft., with a cross-section of about 18 feet by 20 feet. The tunnel, 8,000 feet long, is to form the chief waterway, and an immense motor will be erected in the cross section, capable of almost incalculable power.

What is the best color of paint to use in an engine and boiler room is the question an engineer was debating. His final conclusion led him to paint the pulleys and moving part vermilion, the body a dark green and the hangers a brown, the brick walls *being whitewashed*. The vermilion was varnished, and the effect of a line of bright pulleys in motion is very pleasing. We believe in the use of bright paint in an engine room, and vermilion and green are very lasting colors.—*American Implement Herald.*

The death is announced of Mr. S. B. Jenckes, President of the Jenckes Machine Co., Sherbrooke, Que., at the advanced age of 81 years. He came to Sherbrooke in 1845 with Mr. A. M. Porter, and commenced business as a machinist in the machine shops of the cotton factory. In 1878 he took a son into partnership, and the firm known as S. B. Jenckes & Son was established and gradually extended its operations so widely that in 1889 it was found desirable to form it into the company known as the Jenckes Machine Company, of which he became the president. The business will be continued by the four sons.

LUMBERING.

Messrs. Moffatt Bros, of Carleton Place, have bought a planing mill at Renfrew.

Mr. Mooney, of Minden, Ont., is erecting a steam saw mill on the shore of South lake.

The capacity of G. F. Slater's shingle mill at Vancouver, B. C., *is to be increased to 100,000 shingles per day.*

Mr. Alex. Loomis of Newcombe's Mills, Ont., had his saw mill entirely destroyed by lightning during a recent storm.

Messrs. W. L. Johnston & Co.'s large shingle mill at Gambier Island, Howe Sound, B. C., was destroyed by fire July 1st.

W. E. Anderson's saw mill at Sundridge, Ont., with all the machinery in it, was burned to the ground on July 4. Loss about $1,000. No insurance.

The sawmill owned by Mr. Geo. Nichol on the Pottawatamie river, about a mile from Owen Sound, Ont., was destroyed by fire on the morning of July 3. The premises were occupied by Messrs. Young & Leslie, who lose everything, including their tools and books. About 100,000 feet of lumber was destroyed.

LUMBER PRICES.

LUMBER.

CAR OR CARGO LOTS.

1¼ and thicker clear picks, Am. ins	$[illegible]	42 00
1¼ and thicker, three uppers, Am. ins.		47 00
1¼ and thicker, pickings, Am. ins		27 00
1 x 10 and 12 dressing and better	18 00	20 00
1 x 10 and 12 mill run	13 00	14 00
1 x 10 and 12 dressing	14 00	16 00
1 x 10 and 12 common	12 00	13 00
1 x 10 and 12 spruce culls	10 00	11 00
1 x 10 and 12 maple culls		9 00
1 inch clear and picks	28 00	30 00
1 inch dressing and better	18 00	20 00
1 inch siding, mill run	14 00	15 00
1 inch siding, common	11 00	12 00
1 inch siding, ship culls	10 00	11 00
1 inch siding, mill culls	8 00	9 00
Cull scantling	8 00	9 00
1¼ and thicker cutting up plank	22 00	25 00
1 inch strips, 4 in. to 8 in. mill run	14 00	15 00
1 inch strips, common	11 00	12 00
1¼ inch flooring	14 00	15 00
1½ inch flooring	14 00	16 00
XXX shingles, sawn	2 [illegible]	2 35
XX shingles, sawn	1 [illegible]	1 45
Eastlake galvanized steel shingles, 24 W. G., per square		6 00
Eastlake galvanized steel shingles, 26 W. G., per square		5 50
Eastlake painted steel shingles, per sq		4 00
Round pointed galvanized steel shingles, per sq.		6 00
Round pointed painted steel shingles,		4 25
Round pointed, unpainted, Terne tin shingles		4 00
Manitoba galvanized, steel siding, per square		5 00
Manitoba painted steel siding, per sq.		3 00
Painted sheet steel pressed brick		3 50
Painted crimped steel sheeting		[illegible] 40
Price of Copper shingles according to weight.		

YARD QUOTATIONS.

Mill cull boards and scantling		10 00
Shipping cull boards, promiscuous widths		13 00
Shipping cull boards, stocks		14 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		17 00
" " 22 ft		19 00
" " 24 ft		21 00
" " 26 ft		23 00
" " 28 ft		25 00
" " 30 ft		27 00
" " 32 ft		[illegible]
" " 34 ft		[illegible] 50
" " 36 ft		[illegible] 00
" " 38 ft		[illegible]
" " 40 to 44 ft		[illegible] 00
Cutting up planks, 1¼ and thicker, dry	25 00	26 00
" " board	18 00	22 00
Cedar for block paving, per cord		[illegible]
Cedar for Kerbing, 4 x 14, per M		14 00

B. M.

1¼ inch flooring, dressed, F. M.	25 00	[illegible]
1½ inch flooring, rough, 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	35 00
Clapboarding, dressed		12 00
XXX sawn shingles, per M, 16 in.	2 65	2 75
Sawn lath	[illegible] 00	2 20
Red oak	[illegible] 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	35 00
Black ash, No. 1 and 2	20 00	30 00
Dressing stocks	16 00	22 00
Picks, American inspection		40 00
Three uppers, American inspection		50 00

MONTREAL PRICES.

Lumber, Etc.

Ash, 1 to 4 in., M.	$13 00	18 00
Birch, 1 to 4 inch, M	15 00	25 00
Basswood	12 00	20 00
Walnut, per M	50 00	100 00
Butternut, per M	22 00	40 00
Cedar, flat	00 04	00 06
Cherry, per M	60 00	80 00
Elm, Soft, 1st	15 00	17 00
Elm, Rock	25 00	30 00
Maple, hard, M	20 00	25 00
Maple, Soft	16 00	18 00
Oak, M	40 00	95 00
Pine, select, M.	35 00	40 00
Pine, 2nd quality, M	20 00	25 00
Shipping Culls	13 00	16 00
Mill Culls	8 00	10 00
Lath, M	1 50	1 90
Spruce, 1 to 2 inch, M	10 00	12 00
Spruce Culls	4 50	6 00
Shingles, 1st quality	2 00	3 00
" 2nd "	1 25	1 50

Cement, etc.

Portland Cement, per barrel	$ 2 70	[illegible] 00
Roman " "	2 70	3 00
Fire Bricks, per M	20 00	30 00

NEW YORK PRICES

WHITE PINE.

Uppers	$45 00	62 00
Selects	41 00	53 00
Fine common	36 00	48 00
Cutting up	28 00	30 00
Common	23 00	25 00
Norway	24 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	24 00
Bridge timber	28 00	30 00

EASTERN SPRUCE.

9 to 12 in.	16 50	17 00
8 to 12 in	16 00	16 50
6 to 12 in.	15 00	16 00
6 to 9 in	14 50	15 00
Special lengths	16 50	18 00
Lath	2 15	2 20
Piling, per lineal feet.	05	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 and 18 inch, 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, ¾ in.	23 00	24 00
No. 1 ceiling, ¾ 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
2nd quality		5 00
Sawed, extra	4 80	4 90
Sawed, clear butts	3 00	3 75
Cedar, XXX	3 50	4 30
Shingles, cedar mixed	2 60	3 00
Hemlock		2 25
Lath, pine	2 25	2 30
Spruce	2 00	2 20
Hemlock	1 75	2 00

HEMLOCK.

Boards, 10 inch, each	13½
Joist, 4x6	33
Joist, 2½x4	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
1 inch, good	50 00	55 00
4ths	45 00	48 00
Selects	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 inch and up	28 00	32 00
Dressing boards, narrow	20 00	22 00
Shipping boards	16 00	18 00
Box boards	13 00	15 00
10 inch boards and better	30 00	34 00
Common	16 00	22 00
12 in. boards dressing and better	32 00	36 00
Common	16 00	22 00
1¼ in. siding selected 13 ft	43 00	45 00
Common	16 00	21 00
1½ in. siding, selected	43 00	46 00
Common	16 00	21 00
Norway, selected	24 00	26 00
Common	12 00	16 00
10 in. p. k. 13 ft. dressing and better, each	45	50
Culls	23	25
10 inch boards, 13 ft. dress and better, each	28	33
Culls	17	22

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	43 00	45 00
2½, 3 and 4 in	52 00	55 00
Selects, 1 inch	36 00	37 00
1¼, 1½ and 2 in.	34 00	35 00
2½, 3 and 4 inch	44 00	46 00
Cuts, No. 1, 1 inch	28 00	30 00
1¼, 1½ and 2 inch	31 00	33 00
2½, 3 and 4 inch	37 00	40 00
No. 2, 1 inch	17 00	18 00
1¼, 1½ and 2 inch	23 00	24 00
Moulding, 1 inch	31 00	33 00