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The Canadian Engineer

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The Canadian Engineer.

ISSUED MONTHLY IN THE INTERESTS OF THE

CIVIL, MECHANICAL, ELECTRICAL, LOCOMOTIVE, STATIONARY, MARINE, MINING AND SANITARY ENGINEER, THE SURVEYOR, THE MANUFACTURER, THE CONTRACTOR AND THE MERCHANT IN THE METAL TRADES.

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CONTENTS OF THIS NUMBER :

NEWFOUNDLAND AND CANADA.

It is the green hill far away that charms us most. The great things in prospect are more alluring than the modest possibilities of the moment. This disposition to look beyond—and often to overlook—the facts and duties immediately at hand, seems to be prevalent in trade as well as in philosophy. We find our neighbor the United States spending hundreds of thousands of dollars and publishing volumes of reports with the object of cultivating trade and of introducing United States manufacturers into South America and other parts of the world more distant and more alien, while Canada its nearest neighbor buys more United States goods than the whole continent of South America. Canada in her turn has commercial agents in Australia, New Zealand, South Africa, the West Indies, Norway and Sweden, and is establishing direct commercial relations with other countries more or less remote, while here at our Atlantic gateway is Newfoundland, one of the very best customers this Dominion has ever had, with no direct commercial representation on our part, and with a record of diplomatic dealings which has been no credit to this country. Indeed, it is questionable if a more criminal blunder was ever committed in the political history of Canada, than that through which the negotiations opened up some years ago by the Newfoundland delegates for the entry of the Island into the Canadian confederation were broken off through the haggling over a matter of $5,000,000. But it must be confessed that the halting and narrow spirit which has characterized our relations with Newfoundland has not been peculiar to any political party or period, but has been because of our immature notions of Imperial relationship. We had not yet learned to think of Newfoundland as our nearest sister in the Imperial family to whom we owed the duty of a little help and counsel. We were all absorbed in our own selfish concerns, and as is the case in individual life with extremely selfish people, we are reaping commercially what we sowed politically and morally.

We have nothing to say against the establishment of commercial agents in the British Colonies and other parts of the world, but these steps should have been taken and the weightier matter of relations with our nearest sister colony not neglected. Our United States neighbors at all events have not neglected their commercial opportunities—as they have active commercial consuls there—and the results will be seen in the figures which follow.

In 1886, out of a total trade of over $7,000,000, Newfoundland did $3,123,716 with Great Britain, $2,132,850 with Canada, and $1,961,263 with the United States. Of these totals the island's imports were as follows: From Great Britain, $1,911,001, from Canada $1,937,605, from the United States $1,672,810. In 1893 Newfoundland's imports from Great Britain stood at $2,680,853, from Canada at $2,886,901, and from the United States at $1,665,227. Coming down to 1903 we find a remarkable change in the positions of the three countries, for in this year the island imported $2,143,464 from Great Britain, $2,869,897 from Canada, and $2,920,914 from the United States. This out of a grand total import of $8,479,944, and a grand total export of $9,976,504 from the island.

Taking the export side of the account we find that Newfoundland shipped goods in 1886 to the value of $195,245 to Canada, $1,212,715 to Great Britain, and $288,453 to the United States; but in 1903 she exported the following amounts: $2,173,000 to Great Britain, $1,102,659 to Canada, and $1,357,031 to the United States.

The reader will see that the United States has in these ten years gained relatively at the expense of both Canada and the Mother Country. Stated in terms of 100,000s., the United States has gained from 16 to 29, Great Britain has fallen from 26 to 21, and Canada has stood still. It must be remembered that the general foreign trade of Canada has more than doubled in the ten years referred to. There is a

startling significance in these figures, and if our statesmen are not awake to the meaning of the change our commercal men and manufacturers ought to use the speaking trumpet.

As a matter of interest to merchants and manufacturers, we may note some of the items in which the three countries named still lead in the trade with Newfoundland. Canada led in exports there in the following lines: Live stock, fruit, belting, biscuits, bricks, brushes, butter and cheese, grain, cabinet ware, canoes, carriages, casks, eggs, flour, ships' dories, hair cloth, harness, hay, iron bridges, rough leather and leather goods, ships' masts, oiled clothing, picture frames, ploughs, saws, tinware, and wooden ware. The United States has now got first place in bicycles, blocks (ship) candles, canvas, certain lines of wagons and wagon and carriage bodies, wheelbarrows, spokes, springs, clocks and watches, feathers, boot and shoe findings, flag stones, groceries, hardware in certain lines, rubber goods, iron and steel bars, sole leather, locomotives, several classes of lumber, machinery under each of the three classes, dutiable at 35, 25 and 10 per cent. respectively, nails, of the class dutiable at 35 and 25 per cent., nets, staves and headings, window shades; Great Britain holds first position still in textile fabrics generally; cement, several lines of hardware, chemicals, china and earthenware, cordage, drain pipes, explosives, fancy goods, hats and caps, hoop iron, metal tubes, nails dutiable at 10 per cent, paints, wall papers, pianos, ready-made clothing, small wares, spirits and liquors, shaftings, some classes of steel, etc.

Writing on the development of United States trade, a special correspondent of the Toronto Globe who recently visited the island, says: "The alarming increase in the trade with the United States led me to a special investigation among the business men of St. John's. I was told that it was due largely to neglect on the part of Canadians and enterprise on the part of Americans. The United States Consul in St. John's, Mr. J. O. Cornelius, has, since his appointment some years ago, been indefatigable in working up trade between his country and Newfoundland. He is ever on the alert for new avenues of commerce, and, the better to do so he is constantly in communication with sub-Consuls in every fishing settlement throughout the island. He studies the requirements of the people, and watches, lynx-eyed, for new developments in the colony. Immediately he discovers an opening for trade he corresponds with firms in the United States. His reports to the Washington Government are frequent and complete. He is an energetic commercial agent. The result is that American firms, quick to respond, have not only sent down travelling representatives, but have opened permanent agencies here, by means of which a great deal of business has been turned away from Canada and Britain. On the other hand, there is no representative of the Canadian Government in this important centre of trade, and I am informed by hotel men that comparatively few Canadian commercial travellers come this way. When they do they frequently find that business has been already grabbed by their American competitors."

The same correspondent interviewed Hon. E. M. Jackman, the Colonial Minister of Customs, who frankly expressed himself against confederation with Canada. "We would lose our political autonomy," he said, "and would become the fag-end of the Dominion." He went on to say that the colony was endowed with great natural resources, such as timber, pulpwood, iron, copper pyrites, slate and other minerals, and these were now being developed by the railway. In addition to these resources and its fisheries, the colony practically controlled the bait supply of the North Atlantic. In estimating the value of the last named asset, he said: "Some of your people may think we place too much value on the control of the last named asset, he said; Some of your people the French the privilege of purchasing bait from our fishermen, and they, receiving large bounties, were driving us out of the Mediterranean markets and ruining our people. We passed an act known as the Bait Act, the object of which was to prevent the French from either catching or purchasing bait in our own waters on the northeast or southwest coast. By a strict enforcement of the Bait Act we have crippled the French. In 1886, the first year we enforced the Act, their catch was 909,953 quintals, but it has been decreasing steadily ever since, and last year it only amounted to 418,307 quintals. This is the direct result of our refusal to give bait to the French. If we transfer to Ottawa the power to deal with these bait fishes and our general fishery laws, it may suit Canadian statesmen to use this leverage in their commercial treaties with France or the United States. It may be argued that Canadian statesmen would be jealous to safeguard the interests of this colony in this matter, but we feel that our interests in this respect are safer in our own hands than in the hands of the farmers of Ontario or our French-Canadian friends in Quebec. We can to-day control our own destiny, make our own treaties (subject, of course, to Imperial ratification) and are, as Kipling says, daughter in our mother's house, but mistress in our own. If we join the Dominion we lose our status as a self-governing colony and become, to use a localism, 'the back linney,' or lean-to, of Canada. The best policy for this colony is to remain independent and be in a position to have two great producing countries competing for our trade and placing their goods on this market cheaper than they will sell to their own people."

These reasons, it will be observed, are partly commercial, partly political, and partly sentimental. They are reasons which naturally influence a public man at a time of material prosperity, such as Newfoundland is now enjoying. But they are not of permanent force. A new generation of public men in place in a time of adversity, or face to face with problems that far outweigh questions of yearly revenue, or which, indeed, may have no connection with commerce at all, may view this subject in a wholly different light. Meantime, the commercial aspect of the case appears to be largely influencing public opinion in the colony, and we cannot blame the islanders for taking a restricted view of federation, when Canadian public men with wider experience have taken such a narrow view of this country's relations with Newfoundland in the past.

Many Newfoundlanders realize that the industrial birth of the colony dates from the advent about six years ago of a firm of Canadians, the Reid Bros., of Montreal, who built the colony's railway and gave a chance for its mines and factories. Previous to that time, the one great industry was the fisheries. What one Canadian firm has so well started can be expanded by other Canadian firms, and our capitalists who have hitherto been putting money into enterprises in South America, Cuba, Mexico, and the West Indies, might well turn their attention to this island where investments would be safe from political disturbances, and where the people are of our own race and of an industrious hardy character.

Meantime has the Canadian Government no offer of preference or of reciprocity to make towards Newfoundland, while the question of the colony's fishery negotiations with the United States are still unsettled?

Sir Robert Bond, the Premier, while opposed to confederation with Canada, pointed out in an interview in London the other day that the United States while getting special privileges in Newfoundland in the fisheries regulations, is taxing, almost to a prohibitive degree, Newfoundland products that go to the United States, and said that Newfoundland could not let this question stand open forever. He hinted at a preferential tariff with Canada. Such a tariff would ultimately be of great advantage to both countries, and the Canadian Government should send a commission of four or five broad-gauge men to St. John's, to negotiate a commercial treaty or preferential tariff in such a spirit as will make amends for the follies of the past.

* * *

THERMIT.

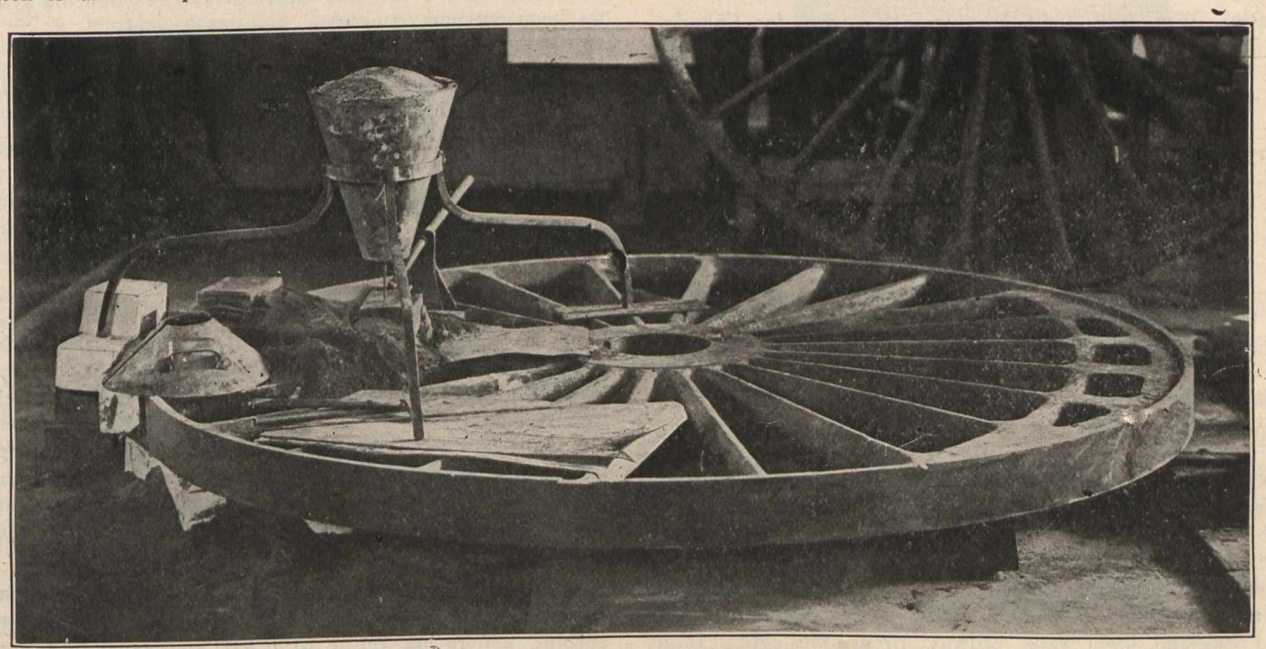
By producing in a suitable manner the chemical combination of oxygen and aluminum, a temperature is created which is almost equal to that of the electric arc. Fifty years ago attempts were made to apply the reducing properties of aluminum, but it was not until within the last few years that the reaction has been brought within the sphere of practical operations, when Dr. Hans Goldschmidt, of Essen-Ruhr, Germany, after many years of experimenting, solved the problem.

Iron oxide is mixed with finely granulated or pulverized aluminum and the resulting mixture is the heat producer to which the trade mark name "Thermit" is applied. The thermit is poured into a sheet metal crucible lined with magnesite tar; a pinch of ignition powder is placed on top and is ignited with a match. The chemical reaction is started at once and combustion is continued throughout the whole mass, and a temperature of 5,400 degrees Fahrenheit is produced without any external supply of heat. The reaction is complete in thirty seconds, whatever the size of the crucible, and the result is a pure liquid steel which sinks to the bottom and is covered by a perfectly distinct layer of aluminum slag. The steel and slag are run out

Railwelding by means of Thermit.

by tapping the crucible from the bottom, and, by regulating the quantity of thermit according to the size of the mould used, the mould may be filled with steel and the slag allowed to flow off.

This is the operation in steel casting or welding by the use of thermit. For the engineer this is the great use of thermit. It is only about a year and a half since this process has been introduced on a large commercial scale, and so far the most important use to which it has been put, is that of welding rails in trolley road construction. The great advantage of the process is the absence of any bulky equipment; all that is required is a crucible, a mould-box, and in some instances, where a complete buttweld of the head of the rail is desired, a rail-clamp. All of these materials, including the necessary quantity of thermit, can be easily moved on a hand-truck. Moulds are made of an ordinary mixture of sand and loam rammed into a sheet metal case and baked. Formerly the rails were superheated before applying thermit, but this is found to be quite un-

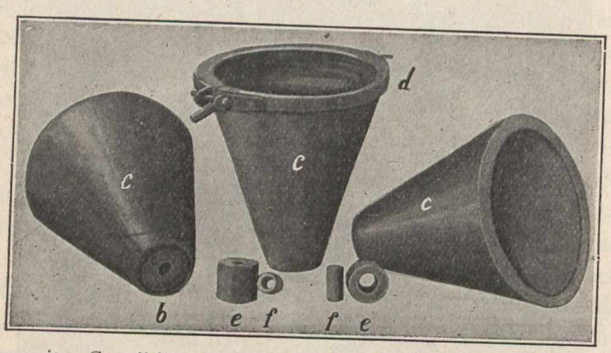


Repair of a Large Engine Wheel with Thermit.

necessary, and, in fact, dangerous, as tending to produce explosions.

The same process holds good for the repair of castings, the thermit steel burning itself into the old piece so as to form one solid mass. This is one of the great fields of usefulness for thermit, as in the case of breakdowns of all kinds its use permits the bringing of the repair outfit to the break, instead of necessitating the removal of the break to the shop.

The metal to be cast may be varied by changing the thermit mixture; manganese, carbon, silicon, phosphorus nickel, etc., may be used as ingredients according to the quality of metal desired. In practice, steel turnings are added to the thermit powder, as it is found that by this means the temperature is somewhat reduced, and the formation of gases and the consequent blow holes in the metal, is avoided.



Thermit Crucibles lined with Magnesia. **b** Flow-hole. **c** Sheet-iron shell. **d** Protecting ring. **e** Large magnesia stone. **f** Small magnesia stone (thimble).

Besides its uses in welding, casting, repairing, etc., thermit has uses of more especial interest to the metallurgist. By the use of the alumino-genetic reaction, pure metals may be produced, such as: chromium, used in the manufacture of steel; manganese, used in copper and nickel manufacture, and in some sorts of manganese steel; molybdenum, and ferro-vanadium. A number of metals or alloys are also produced, such as ferro-boron, manganese-boron, and lead-boron. Another use for thermit, is a method by which piping is avoided in casting large steel ingots.

Tests are now in progress at the Toronto Railway Company's power house, to demonstrate the feasibility of thermit for welding and repairing. These tests are under the supervision of R. E. H. Buchner, the Toronto representative, Wm. Abbott, of Montreal, the agent for Canada, and Mr. Cole, an expert from New York.

BUSINESS OF THE LATE JAMES COOPER.

It is announced that the railway contractors' and miners' plant business carried on by the late James Cooper, Montreal, has been taken in hand by a new company under the style of F. H. Hopkins & Company, with offices in the new Imperial Bank Building, St. James street. With the co-operation of the executors of the estate, the new firm has been able to retain all the agencies of the old firm, which keeps it in the front rank in this line. The new firm comprises F. H. Hopkins, J. J. Rosevear and R. A. C. McNally. Mr Hopkins was associated with the late James Cooper, and previously with the old firm of Cooper, Fairman and Company for upwards of twenty-three years; Mr. McNally was manager of the Mining Machinery Department, at Rossland, B.C., and later at Halifax, N.S., and Mr. Rosevear was in charge of the finances of the late firm. Therefore, all the associates are familiar with the business. Among the agencies taken over by the new firm are the following: Cammell, Laird & Co., Limited, Sheffield, England, steel rails, railway tires, axles, etc.; John Hy. Andrew & Co., Limited, Sheffield, England, saw steel, tool and drill steel; Glasgow Iron & Steel Co., Wishaw, Scotland, structural steel, steel plates, etc.; A. C. Wells & Co., London, England, celebrated Wells lamps; Marion Steam Shovel Company, Marion, Ohio, steam shovels, dredges, unloaders, etc.; Kilbourne & Jacobs Manufacturing Company, Columbus, Ohio, wheel and drag scrapers, wheelbarrows, trucks, cars, carts, etc.; Pittsburg Meter Company, East Pittsburg, Pa., water meters; Ransome Concrete Machinery Company, New York, N.Y., concrete mixers, etc.; Rodger Ballast Car Company, Chicago, Ill., ballast cars, etc.; Duff Manufacturing Company, Allegheny, Pa., track jacks—all kinds; Alexander Car Replacer Manufacturing Company, Scranton, Pa., car replacers; Roberts Car and Wheel Company, Three Rivers, Mich., velocipedes, etc.; Canton Pump Company, Canton, Ohio, steam pumps, etc.; Dominion Wire Rope Company, Limited, Montreal, wire ropes, fittings, etc.

LIGHT, HEAT, POWER, ETC.

Renfrew is now lighted by the Power Company, instead of by the Renfrew Electric Company.

The Ottawa and Hull Power Company is installing a new generator in its power house at the Chaudiere.

An electric light system is being installed for Harbor Grace, Carbonear, and Heart's Content, Newfoundland, using water power. W. A. Mackay is the contractor in charge.

A general meeting of the shareholders of the Winnipeg Electric Street Railway Company will be held on August 2nd to consider the purchase of the capital stock of the Winnipeg General Power Company.

The Toronto & Niagara Power Co. has given a contract to the Dominion Wire Manufacturing Co., of Montreal, for 1,500,000 pounds of copper cable for the power transmission line. The contract is worth about $250,000.

The Manitoba Water Power Electric Company has been incorporated with a capital of $5,000,000 to develop power at Silver Falls, on Winnipeg river, which is claimed to be the greatest electrical power in Canada outside of Niagara.

It is expected that so soon as the Kingston lighting plants are municipalized, the citizens who voted $182,000 to buy the works will be asked to vote another $100,000 to $120,000 to thoroughly equip them, and fit them so as to meet all requirements and to cope with the increasing business for the next ten years.

The St. John (N.B.) Railway Co. has completed an addition to their power plant consisting of a 1,500 h.p. horizontal cross compound automatic condensing Corliss engine, and a 650 k.w. direct connected generator. It is stated that the machinery for the St. John Railway Co.'s lighting system has been entirely renewed.

Frederick Nicholls, of the Canadian General Electric Company, and of the Toronto & Niagara Power Company, E. R. Wood, and D. E. Thompson, K.C., have secured the controlling interests in the Niagara Falls Gas & Electric Light Company. This company has been reorganized, with Mr. Nicholls as vice-president and treasurer. It is their intention to exploit the franchises which the company owns in Niagara Falls, N.Y., and other municipalities along the east side of the river to Buffalo.

The Niagara County Irrigation and Water Supply Company propose to build a power canal from LaSalle, N.Y., where it takes in the water of Niagara river, to the Devil's Hole below the Falls, where there is a sheer drop of three hundred feet. The power house will be located at Devil's Hole. It is stated that the financial end of the enterprise has been arranged through New York parties whose names have not been divulged. The company is operating under a charter procured in 1891. The plant will produce 150,000 horse power, and will cost $10,000,000.

The De Beers Mines Company, Ltd., Kimberly, South Africa, have ordered a third Westinghouse-Parsons steam turbine generating outfit of 1,500 kw. capacity for their power plant at Kimberly. The new turbine unit will be similar in every respect to the two which have been in operation for somewhat over a year. It will operate at 150 pounds boiler pressure, 55 degrees superheat, and about 23 in. vacuum. Taking into account the altitude of Kimberly, this would be equivalent to about 27 in. vacuum at sea level.

NEW CATALOGUES.

The following catalogues may be obtained by those interested by referring to the Canadian Engineer:

The Wm. Hamilton Manufacturing Co., Peterborough: "The McNaull Water Tube Boiler," a fifty-page descriptive booklet, with numerous illustrations.

Keller Heater Co. of Canada, Ltd., Montreal: "Economy in Feed Water and Fuel," a neat booklet, descriptive of the Keller Feed Water Heater and Purifier.

Darling Bros., "Reliance Works," Montreal: Section VII. of General Catalogue, describing the Webster System of steam circulation for heating purposes at or below the pressure of the atmosphere.

The Fairbanks Co., Montreal: Leaflet giving description and price list of Fairbanks' Semibronze Packing.

Canadian General Electric Co., Toronto: Bulletin 831, "Meridian Lamps"; also, Bulletin 834, "Curtis' Steam Turbine."

Geo. B. Meadows, Toronto Wire, Iron and Brass Works Co., Ltd.: Catalogue No. 4, descriptive of bank and office fittings.

J. E. Shantz & Co., Berlin, Ont.: "The Howard Hot Water Heater," an illustrated booklet.

Niles-Bement-Pond Co., New York: "The Progress Reporter," July, 1904; Louisiana Purchase Exposition special number.

Westinghouse Industries: A booklet descriptive of the twenty-three Westinghouse companies exhibiting at the St. Louis Fair.

Mason Regulator Co., Boston: Price List Mason Reducing Valve Parts, issued July 15th.

Morse Twist Drill Co., New Bedford, Mass.: 1904 Catalogue. A 250-page catalogue of drills, reamers, milling tools, etc., together with appendix containing tables, instructions, etc.

Link Belt Engineering Co., Philadelphia: "The Renold Silent Chain Gear, 1904 edition," a neat booklet descriptive of the Renold silent chain for power transmission. Also, "Retail Coal Pockets," a booklet giving detailed information as to equipment, plan, etc.

Berger Manufacturing Co., Canton, Ohio: "Steel vs. Wood," a booklet describing steel office furniture and appliances.

Diamond Saw and Stamping Works, Buffalo, N.Y.: Booklet and price list of Sterling hack saws.

St. Louis Expanded Metal Fireproofing Co., St. Louis, Mo.: "Corrugated Steel Bars as Applied to Steel-Concrete Construction," a 125-page booklet, profusely illustrated with photographs and diagrams, and also containing many tables and formulæ for concrete construction.

Abner Doble Co., San Francisco, Cal.: "Tangential Water Wheels," descriptive of Doble ellipsoidal-bucket water-wheels.

Arthur Koppel, New York: Supplement to Catalogue No. 77, showing illustrations of narrow gauge locomotives.

Westinghouse Machine Co., East Pittsburg: "Steam Turbine Test," being brake tests of a 400 k.w. Westinghouse-Parsons steam turbine.

Jeffrey Manufacturing Co., Columbus, Ohio: "Electric Locomotives for Gathering Purposes," Bulletin No. 8; also, "Jeffrey Water Elevators," a price list.

Chicago Pneumatic Tool Co.: Catalogue of Air Compressors built at Franklin, Pa., containing information as to erection, care and adjustment of compressors and tables of value to those interested in pneumatics.

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The city council of Montreal has voted $10,000, towards the preliminary expenses of a permanent exhibition.

TELEPHONE AND TELEGRAPH.

J. E. MacMahon, who invented the tape ticker, died recently at Newmarket, Eng.

Tenders for a telephone franchise in Toronto will be received on or before October 1st.

Manchester, Eng., is about to establish a great intermunicipal telephone plant in co-operation with a dozen neighboring towns.

Arnprior has followed the example of Carleton Place in disposing of the Bell Telephone Co.'s appeal by adding another $1,000 to their assessment.

The British Government will bring in a bill making wireless telegraphy throughout the United Kingdom a Government monopoly. The post-office officials have been experimenting with a new system of their own.

The Bell Telephone Co. has won its case against Owen Sound. The company began putting a conduit across Poulette Street, but the town interfered. An injunction to restrain the town from interfering was asked for, and is granted. Justice Meredith characterized Owen Sound's claims as extravagant.

Two of the six Marconi wireless telegraph stations being constructed on the St. Lawrence for the Dominion Government are now in operation—one at Fame Point and one at Heath Point, Anticosti. The Parisian was reported on July 15th by the Heath Point station, being the first vessel to hold communication with the station.

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MISS RAE PETRIE.

Miss Petrie, whose likeness appears above, is a daughter of H. W. Petrie, head of the machinery firm in Toronto bearing his name. On July 20th Miss Petrie distinguished herself by a daring rescue off Toronto Island. A party of three, two ladies and a gentleman, were seen about a mile off the shore clinging to an upturned canoe. Finding that none of the men near by would venture out, Miss Petrie seized a canoe which was handy and went to the rescue, accompanied by a young boy whom she induced to go along. Miss Cosgrave, a sister of one of the party in danger, went out in a canoe a little later, and by lashing the two canoes together they managed to get all three safely on board, and brought them to shore. The party rescued were Miss D. Cosgrave, Miss I. Kidner, and Mr. Arthur Murdoch. Miss Kidner had sunk once before Miss Petrie's approach. Miss Petrie has been recommended for a Humane Society medal. She is the recipient of many letters of congratulation from relatives of those rescued and others. This is the first time The Canadian Engineer has published in its columns an individual portrait of a lady, but, like others, it wishes, in some slight measure to recognize Miss Petrie's heroism.

PERSONAL.

Louis Terven, E.E. (University of Wisconsin) has been appointed chief electrician of the Nernst Lamp Company, Pittsburg, Pa. Mr. Terven was for some time electrician of the United States Navy Yard, Port Royal, S.C.

Mr. T. C. Streeter, who has been connected with the B. and M. Railway for the past twenty-five years, has resigned his position with that road to enter the service of the Quebec Central R.R. as a member of the head office staff.

It is reported that F. B. Wade, M.P., is to be chairman of the commission to build the eastern section of the Grand Trunk Pacific Railway. Mr. Wade was born at Granville, N.S., in 1852, and educated at Belle Isle. He was elected to the House of Commons for Annapolis in 1900.

A. L. Waterbury, who was at one time first vice-president and general manager of the Citizens' Telephone Co., of Houston, Tex., has accepted a position as general manager of the sales department of the American Conduit Co. Mr. Waterbury will have his headquarters at the Chicago office of this company, 1005-6 Manhattan Building.

John J. Long, president of the Collingwood Shipbuilding Co., was mysteriously drowned in the Don at Toronto early in July. He was a very hard worker, and was not in good health. Besides being president of the shipbuilding company he was a member of Long Bros., Collingwood, vice-president of the Collingwood Meat Co., vice-president of the Anglo-American Fire Insurance Co., director of the Bank of Toronto, director of the Northern Navigation Co., and was connected with various other companies. He was born in Limerick, Ireland, in 1843.

It is stated that Sir Percy Girouard, late Commissioner of Railways in the Transvaal and Orange River Colony, may be asked by the Dominion Government to take charge of the Moncton-Winnipeg section of the Grand Trunk Pacific. Sir Percy was born in Montreal, and received his education at the Royal Military College. His work in connection with the construction of the Egyptian and Soudan railways, between 1896 and 1899, won for him international prestige as a railway builder, and his subsequent services in connection with railway construction and reorganization in South Africa have enhanced the high reputation previously won.

Alexander Gartshore, the well-known founder, of Hamilton, died on July 13th, in his sixty-fifth year. He was a son of John Gartshore, of Lanarkshire, Scotland, who was one of the pioneer iron founders in Canada, and established a foundry in Dundas in the early days. In 1858 Mr. Gartshore entered his father's works in Dundas, and was admitted to a partnership in 1865. In 1870 the business changed hands, and Alexander Gartshore moved to Hamilton, where he formed a partnership in the manufacture of railway castings, etc., the firm name being Gartshore & Cowie. Mr. Gartshore eventually bought out Mr. Cowie's interest in the business, but a few years ago he took Mr. Thompson in as a partner, the firm becoming the Gartshore-Thompson Pipe and Foundry Co., Ltd. He was the first man to embark in the iron pipe industry in Canada, and he made a great success of his business. He it was who drew the plans for the first pumping engine for the Hamilton waterworks system. That was in 1857. The deceased was active in military matters in his earlier years. He was a member of Notman's Foot Artillery in Dundas in 1858. When the present King of England visited Canada as the Prince of Wales Mr. Gartshore was an officer in the sedentary militia. He was a master Free Mason, a member of St. Andrew's Society and a member of Central Presbyterian Church. In politics he was a Conservative. He is survived by a widow, two daughters, Misses Mary and Jessie, and three sons, Alexander L., of Vancouver, and John William M., of Hamilton.

On Thursday, July 21st, the Montreal branch of the Canadian Manufacturers' Association tendered a banquet to George E. Drummond, the president of the Canadian Manufacturers' Association, and also president of Montreal Board of Trade. The key-note of the speeches of the occasion was Imperialism and the upbuilding of Canada. Mr. Drummond, in reply to the toast, "Our Guest," told of his recent visit to Great Britain, when he met many men prominent in trade and politics in the old land, including Mr. Chamberlain. He described Mr. Chamberlain's characteristics as he had found them, and made a vigorous speech in favor of a reorganization of the Empire along preferential trade lines. Speaking of Canada as the pivotal point in any such scheme, he said he was convinced that the time had arrived when "our Parliament should voice the wish of the Canadian people as expressed by our trade organizations; that the general interests demand that our Parliament should move to get a mutual preferential trade arrangement that will make for the permanent consolidation of the Empire." In an interesting and eloquent manner he argued this position from a trade standpoint, from a Canadian national standpoint, and from an Imperial standpoint. "The Canadian people must unite on a policy for self-preservation and for permanent unity with the Empire. The Halifax platform of the Manufacturers' Association is built upon common sense principles, and the policy outlined therein is born of practical experience in a practical age. Canadians can unite on this platform for the safety, prosperity, and progress of Canada and the Empire." Speeches were made also by Robert Meighen, Hon. Raymond Prefontaine, Hon. L. P. Brodeur, R. L. Borden, M.P., and F. D. Monk, M.P.

Editor Canadian Engineer:

Sir:—In your issue of June last I noticed a "Personal" item respecting T. H. Wiggins, of this department, and think it should be corrected, as this gentleman's name is frequently appearing in print laying claim to undeserved honors, and positions of responsibility. Mr. Wiggins has never been connected in any way with Irrigation work, which is administered here under the direction of the Department of the Interior at Ottawa. B. J. Saunders was Deputy Commissioner of Public Works and Chief Engineer of Irrigation until March 31st last, when he resigned, and was succeeded by John Stocks, then Assistant Chief Engineer of this Department. You will find in the Canadian Society of Civil Engineers list of Associate Members for 1904, that Mr. Wiggins has supplied himself with the position of Assistant Chief Engineer of the North-West Government, a position which he has never held or been offered; I succeeded Mr. Stocks in this position on April 1st of the present year. Mr. Wiggins was formerly Assistant Chief Surveyor of the Department of Public Works, and is now Drainage Engineer and District Engineer & Surveyor. It seems to me that it is time to put a stop to this cheap advertising of imaginary honors to which there is no title, and is never likely to be.

Will you kindly give the same publicity to these facts as was given the original item.

R. W. Macintyre, Assistant Chief Engineer, Department of Public Works, N.W.T.

Regina, July 19th, 1904.

* * *

This year up to June 30th the Yukon has produced $3,866,317.85 worth of gold, an increase over the same period last year of $147,352.75.

A fifty-ton Elmore oil concentrator is being built by the Massey Station Mining Company. The Massey is a copper mine with ore one to seven per cent. About $500,000 worth is said to be on the dump.

Johnson and Fry, gold miners and prospectors, have discovered a rich deposit of scheelite in the Willow Creek region of Cariboo. Hitherto the only place in the world that scheelite has been found is Northern Australia. Johnson and Fry say they have an immense deposit, which they will work at once. Scheelite is the mineral from which tungstic acid is manufactured.

W. E. H. Carter, secretary of the Provincial Bureau of Mines, has returned from a tour of inspection of the mines of New Ontario in the neighborhood of Sault Ste. Marie and Sudbury. At Sudbury the Canadian Copper Company have just completed a new smelter with a capacity of 1,000 tons per day, and it will be put in operation at once. The company's main mine is now yielding ore at the rate of 900 tons per day.

A. C. vs. D. C. ARC SYSTEMS.

A Paper read by W. L. McFarlane before the Canadian Electrical Association.

For reasons apart from arc lighting, the tendency at present in equipping electric power stations is towards the installation of A. C. generators of large capacity. The source of power may be water or steam, or a combination of both. Having regard to this established tendency we will consider the bearing of the arc system on it and the relative costs and advantages of the different systems.

Arrangements Available from the Different Sources of Power.

If water power is used, and the frequency of the system is between 40 and 125 cycles, the arc lighting will probably be done either by arc dynamos driven by A. C. motors of the synchronous or induction type, or by transformers operating A. C. arc lamps. If the frequency in use is lower than 40 cycles, the transformer and A. C. arc lamp arrangement will only be practical through the medium of frequency changers. Should engines be the prime movers, A. C. transformers and arc lamps may be used, or arc dynamos may be driven direct from an engine or by motors.

When, as is often the case, a combination of engines and water power has to be used, A. C. transformers and lamps, or motor driven arc dynamos are possible as in the other two cases, there being also the arrangement where the arc dynamos are operated from line shafting to which are connected both an A. C. motor and an engine. By means of suitable clutches or quills, either the motor or the engine can be used to supply the necessary power to the shafting. When mentioning here the A. C. transformers and arc lamps, the series alternating enclosed arc lamp system operating from constant current transformers is meant. Multiple constant potential arc lamps, of both the open and enclosed type, are extensively used for inside lighting, and occasionally for outside street lighting, but only when there is some special reason for so doing. In the case of the D. C. arc system, we have to consider the open and enclosed lamp, and the small arc dynamo and its larger and more modern rival. Generally speaking, there are four systems of series arc lighting at present in use, namely:

1st. The small arc dynamo supplying about 50 open lamps at 9.6 or 6.6 amperes.

2nd. The larger and more modern arc dynamo supplying as many as 175 open lamps in series, or, by the multi-circuit arrangement.

3rd. Large arc dynamos wound for 6.6 amperes for supplying current to enclosed lamps.

4th. Transformers to which are connected circuits having as many as 100 constant current series alternating enclosed arc lamps.

Whichever one of these systems of arc lighting is in use in a station, in all probability only a small portion of the total energy generated is delivered to the arc system, the larger portion being taken care of by comparatively large A. C. generators arranged with the object of keeping operating, maintenance, and all other costs at a minimum. Under these circumstances we will consider the four different systems of arc lighting mentioned, assuming, for the sake of simplicity, an arc equipment of 500-480 watt lamps, in a station of 3,000 K. W. capacity. For the same reason, and owing to the great difference of opinion on the subject, the induction motor will be considered instead of the synchronous motor; the former, while having a poorer power factor, will be less affected by trouble on the system, besides requiring a much simpler means of control and less experienced attendants than the synchronous motor.

Small Dynamos of About Fifty Lights Capacity.

For this class of service, about eleven arc dynamos, with the necessary shafting and belting, and an engine or motors to drive them will be required, and owing to the space occupied, a special department, or perhaps a special station, will require to be devoted to it, thus incurring special ex-

TABLE No. 1.

Showing Comparative Approximate Annual Station Costs, Using Small Arc Dynamos.

Items of Cost		Water Power 60 Cycles	Water Power 25 Cycles	Steam Power 60 Cycles		Water Power with Steam Reserve 60 Cycles		25 Cycles	
Account	Sub-Account	Motors and Shafting	Motors and Shafting	Motors and Shafting	Engine and Shafting	Engine and Motors Driving Shafting	Motors and Shafting	Engines and Motors Driving Shafting	Motors Driving Shafting, Reserve Steam Power Through Frequency Changers
		$	$	$	$	$	$	$	$
Construction..	Engine	....	....	....	10000	10000	....	10000	....
	Motors Motor S.B. and Conn.	11000	11000	11000	....	11000	11000	11000	11000
	Shafting and Belting	2888	2888	2888	3161	4328	2888	4328	2888
	Arc Dynamos Arc S.B. and Conn.	11000	11000	11000	11000	11000	11000	11000	11000
	Foundations	880	880	880	1720	1880	880	1880	880
	Total	25768	25768	25768	25881	38208	25768	38208	25768
Maintenance..	Interest and Depreciation	3865	3865	3865	3882	5731	3865	5731	3865
	Engine	....	....	....	200	50	....	50	....
	Motors Motor S.B. and Conn.	120	120	120	....	120	120	120	120
	Shafting and Belting	202	202	202	221	303	202	303	202
	Arc Dynamos Arc S.B. and Conn.	650	650	650	650	650	650	650	650
	Total	972	972	972	1071	1123	972	1123	972
Operating.....	Wages	1768	1768	1768	2253	1768	1768	1768	1768
	Supplies	462	462	462	612	462	462	462	462
	Total	2230	2230	2230	2865	2230	2230	2230	2230
Grand Total		7067	7067	7067	7818	9084	7067	9084	7067

penses, which can only be determined for individual cases. However, three men at least will be required for operating, and as the efficiency of this system will be about 54 per cent., the power required will be approximately 600 h.p. The conditions of operating necessary for an arc plant of this kind are too well known to require their being mentioned in detail here.

Table No. 1 is intended to show the comparative annual station costs when small arc dynamos are operated under the different conditions of motive power, namely: Water power with 60 or 25 cycle motors; steam power using an engine direct, or motors obtaining current from large A. C. units; and water power with steam reserve employing a combination of engines and motors. In the extreme right-hand column of this table the heading is "25 cycle motors driving shafting, the reserve steam power being obtained through frequency changers." No portion of the cost of these frequency changers has been charged to the arc installation, as doubtless frequency changers will have been installed for the incandescent service, and in the event of the 60 cycle steam reserve being required, these frequency changers will be available for use in connection with the motors driving the arc apparatus, changing the 60 cycle steam power to 25 cycles for the motors.

Large Dynamos of About 125 Lights Capacity.

We will here consider large arc dynamos of both the 9.6 and 6.6 ampere type, as they rank about the same as regards their convenience in the station, and should it be desired to change the current of the former, they can be rewound for approximately 25 per cent. of their original cost. Owing to their compactness and cleanliness, it may not be necessary to isolate these arc machines, whether engine or motor driven. About five dynamos will be required, which, if motor driven, can be connected direct, two to each motor, while, if engine, or engine and motor driven, it will probably be necessary to employ shafting, which, while occupying considerably more space, can likely be accommodated in the main station. If this arrangement is adopted, it is likely that the engineer on duty will be sufficient to attend to the engine, which might be driving the arc dynamos, and under most conditions it will not be necessary to employ additional dynamo attendants, although the men called upon to attend the arc dynamos will have to be more intelligent than would otherwise be necessary, and owing to the increased work an extra cleaner will have to be provided. Most modern plants operating twenty-four hours per day work their operators on eight-hour shifts, having them change shifts fortnightly, and as arc dynamos often have individual and variable peculiarities in their operation, this continual changing of operators often results in more or less deterioration in the service; this is reduced to a minimum, however, by employing a high class of operators. For the keeping of these dynamos in first-class condition, about half the time of a first-class attendant is required during the daytime; this work should always be done by the same man.

The type of arc dynamo which allows of the use of either the straight series or the multi-circuit arrangement of circuits is a decided advantage in allowing of the use of large dynamos without the necessity of increasing the P. M. F., and, to a great extent, the insulation of the circuits. It has been found, however, that the circuits have to be kept in much better repair when the multi-circuit arrangement is in use than is necessary when using small dynamos, because if any grounds or leakage occur between any of the circuits operated by means of the first-mentioned arrangement, it has a tendency to short-circuit sections of the armature, and act on the commutator, causing flashing to an extent which very materially affects the operation, making it necessary at times to separate the circuits.

Intermittent trouble of this nature is particularly annoying, and the linemen find it very hard to locate. In one place, where considerable trouble of this nature was experienced, the cause was found to be due, to a great extent, to the use of film cut-outs, having wooden mountings, enclosed in iron cases. In the place referred to the conditions are such that it is very hard to maintain the circuits in perfect condition, and, while the best of attendants are provided, and these dynamos have been in service for more than two

TABLE No. 2.

Showing Comparative Approximate Annual Station Costs, Using Large Arc Dynamos.

Items of Cost		Water Power 60 Cycles	Water Power 25 Cycles	Steam Power 60 Cycles		Water Power with Steam Reserve 60 Cycles		25 Cycles	
Accounts	Sub-Accounts	Direct Connected Sets	Direct Connected Sets	Direct Connected Sets	Engine and Shafting	Direct Connected Sets. Power A.C., G. Water or Steam	Engine and Motors Driving Shafting.	Engine and Motors Driving Shafting	Direct Connected Sets. Steam Power Through Frequency Changers
		$	$	$	$	$	$	$	$
Construction..	Engine	....	....	....	10000	....	10000	10000	....
	Motors Motor S.B. and Conn.	13500	13500	13500	....	13500	11000	11000	13500
	Shafting and Belting	....	....	....	2618	....	3893	3893	....
	Arc Dynamos Arc S.B. and Conn.	19200	19200	19200	19200	19200	19200	19200	19200
	Foundations	400	400	400	1400	400	1510	1510	400
	Total	33100	33100	33100	33218	33100	45603	45603	33100
Maintenance..	Interest and Depreciation	4965	4965	4965	4982	4965	6840	6840	4965
	Engine	....	....	....	200	....	50	50	....
	Motors Motor S.B. and Conn.	180	180	180	....	180	180	180	180
	Shafting and Belting	....	....	....	183	....	282	282	....
	Arc Dynamos Arc S.B. and Conn.	300	300	300	300	300	300	300	300
	Total	480	480	480	683	480	812	812	480
Operating.....	Wages	832	832	832	1317	832	832	832	832
	Supplies	176	176	176	276	176	176	176	176
	Total	1008	1008	1008	1593	1008	1008	1008	1008
Grand Total		6453	6453	6453	7258	6453	8660	8660	6453

years, to this day there is not as good service obtained from them as was obtained from the smaller machines. This is not intended as a reflection on large arc dynamos, as, of course, the remedy for the trouble above mentioned is to look after the circuits; but very often this is not appreciated, especially if the line trouble men have been educated on the old system.

The power required where large arc dynamos are used varies from 397 to 427 h.p., and the efficiency is from 75 per cent. to 81 per cent., depending on whether direct connected sets, motors and shafting, or engines and shafting are in use.

Table No. 2 gives the approximate annual station costs when large arc dynamos are used under the different conditions mentioned. A comparison of tables numbers one and two shows a saving of only about one dollar per lamp in favor of the large dynamos, but, we must remember the saving in floor space, and that we have not yet taken into account the lamps themselves; also, that there is a saving in power of about 175 h.p.

Series A. C. Arc Lamp Transformers.

It is not absolutely necessary to use transformers for the operation of series A. C. lamps, as circuits of 25 and 50 lamps after passing through regulators could be connected direct to the station busbars, the E. M. F. of which would require to be 2,000 and 4,000 volts respectively, and, while this arrangement would give an increased power factor, and might give fairly good results, when used in small plants having but one or two circuits, it should not be used in a plant of 500 arc lamps such as we are considering, for the reason that any defects in the arc circuits would affect the remainder of the system.

When using transformers, whether these should be arranged to supply circuits of 25, 50, 75 or 100 or more arc lamps would depend on conditions which usually have to be considered before determining the E. M. F. most suitable for use on any circuit. The higher the E. M. F., the better must be the insulation of the equipment generally, and, in the event of a break down, a larger number of lamps are affected. As the insulation and general lay-out of the arc equipment of most of the existing plants has been arranged for circuits of about 50 lamps, and as this represents in the case of enclosed lamps an E. M. F. of 4,000 volts, an amount which, with the exception of a few minor details, is within the safety limits of the existing construction, it would seem that in adopting the A. C. system, circuits of about 50 lamps or 4,000 volts should be recommended. If circuits of 50 lamps are used, the space necessary for the installation of the transformers will be about 325 square feet. With the object of reducing the length of the circuits, some of these transformers might be located in possibly existing sub-stations, but this would result in increasing the operating expenses, and the cost of switchboards, therefore the locating of the complete arc system in the main station, would most likely be advisable. The switch-board, preferably of the universal type, should be fitted with an ammeter, fuses, incandescent pilot lamp, and switch for each circuit, and if, as is likely the the case, the main system is polyphase, the circuit switches should be suitable for connecting the circuits which they control to any of the different phases, this having been found a very convenient means of balancing the load on the system. A testing panel should also be part of this switchboard, being fitted with a volt, ampere and watt meter for obtaining power factors, etc., and for checking ammeters on the circuits. This panel should have a ground detector, as well as a transformer or other suitable means of obtaining about 300 volts to be used for testing the circuits during the daytime, and for supplying current to assist in the closing of open circuits during night or day. This arrangement reduces the danger to linemen, who work with only 300 volts on the defective circuit, testing from place to place with a lamp, which they use as they formerly did the wire jumper. This arrangement of testing is, of course, not possible where shunt lamps are in use, as in this type the carbons remain apart. For the system of 500 lamps under consideration, eleven 50 lamp transformers should be installed, one of these being used as a spare. If suitable taps are brought out from the winding of the transformers, a variable ratio may be obtained, allowing for the number of lamps on the circuit being a few more or less than 50 without the power factor being changed to any extent.

Constant current transformers having movable primary or secondary coils are much more compact and neater than the constant potential transformers used in conjunction with an inductive regulator, and the former may have the advantage of the multi-circuit arrangement, but this necessitates double the number of circuits being brought back to the station, which is practically the same as making our circuits for 25 lamps. We might, however, use 100 lamp transformers with the multi-circuit arrangement and same floor space, but this also applies in a measure to constant potential transformers. The inductive regulator is a much more substantial piece of apparatus than the movable mechanism in a constant current transformer, and in cases of intermittent circuit trouble, when the regulating mechanism is severely taxed, the separate regulator will give the best satisfaction, and require the least attention. With the A. C. system installed in the main station, no additional attendants will be required, and the operating supplies will hardly be appreciable, while the maintenance as compared with the same capacity of revolving machinery will be very small indeed. Of course, the power for this system is obtained from revolving machines, but it is probable that it is only a portion of the full load capacity of one of a number of units employed. If a frequency of 25 cycles is being used, the operation of the A. C. arc system is made more complicated, owing to frequency changers being necessary, and while these may be employed in any case in connection with all or a portion of the main system, yet they lower the efficiency, and there is always the danger of interruption to the service due to the synchronous machines getting out of step from short-circuits or other causes, which objection does not exist to the same extent when induction motor driven arc dynamos are used.

TABLE No. 3.

Showing Comparative Approximate Annual Station Costs, Using Constant Current Transformers.

Account	Items of Cost Sub-Account	Water Power 60 Cycles	Water Power 25 Cycles	Steam Power 60 Cycles	Water Power Using Steam Reserve 60 Cycles	Water Power Using Steam Reserve 25 Cycles
		$	$	$	$	$
Construction..	Transformers	6600	6600	6600	6600	6600
	Switchboard	1500	1500	1500	1500	1500
	Total	8100	8100	8100	8100	8100
Maintenance..	Interest and Depreciation.....	1215	1215	1215	1215	1215
	Transformers	....	....	....	....	....
	Switchboards	150	150	150	150	150
Operation.....	Wages	....	....	....	.....	....
	Supplies	50	50	50	50	50
Grand Total.....		1415	1415	1415	1415	1415

With A. C. transformers on a 60 cycle system, the power required will be about 347 h.p., the efficiency being 93 per cent. As in the other two systems of arc apparatus considered, a tabulated sheet (No. 3) has been made, showing the comparative annual cost of this system. As it is impossible to say (except in individual cases) what proportion of the cost of frequency changers should be charged to the arc system, when 25 cycles are in use, this item has been omitted in this table, but will be considered in the cost of power later.

(To be concluded in September issue.)

* * *

MINING MATTERS.

The Sault Express announces rich gold strikes in the vicinity of Webbwood.

The Edmonton Gas and Oil Company, is engaging drillers and buying apparatus to begin drilling immediately for gas or oil in the vicinity of Edmonton.

The Foley mine at Fort Frances, is to be reopened. Mr Bowden, of Haughton, Mich., the president of the company, is satisfied that the property will pay for operation.

Preston has passed a by-law to raise $27,000 to purchase the incandescent and arc plants now in use. A new power station will be erected and a first-class plant will be installed.

The Vermilion mine, which has been idle for several years, is now operated, yielding gold, nickel, cobalt, silver, platinum and copper. It belongs to the International Company.

Foundations have just been laid for four hundred coke ovens for the International Coal and Coke Company, at Coleman, Alta. The company expects soon to be able to get out 1,000 tons of coal, and make 500 tons of coke daily.

The Canada Refining Company, with headquarters at Ottawa, has leased the Black Donald graphite mines for a period of two years, and has started in to carry on operations on an enlarged scale. Electric power will be utilized.

Diamonds have been discovered in the matrix at Oakley Creek, twenty miles from Inversell, New South Wales. The matrix is of deloric rock, which experts claim to be of similar formation to the South African diamond bed. This is the first discovery of diamonds in Australia.

The Westinghouse Electric Company, of Lancaster, Penn., has installed the electric apparatus in connection with the gold dredge operated on Poorfarm flats, Pine Creek, Atlin, B.C. This method of mining is said to be proving profitable, the dredge having given splendid returns since operations commenced.

The Colonial Copper Company have established extensive works for the concentration of ore at Cape D'Or, in the Minas Channel, N.S. Manager S. G. Painter says the production amounts to 200 tons of ore per day, and that the output will soon be doubled. This copper he declares can be placed in New York at five cents per pound.

Capitalists represented by J. C. Ferneau, have definitely decided to erect a zinc smelter at Fernie, to cost not less than $100,000. The zinc silver-lead ores of the Slocan will be treated. The object in locating at Fernie, is to bring the ore to the fuel, on account of the fuel being the larger tonnage. A zinc enriching plant will be erected at Rosseberry, in the Slocan district by the same people.

It is expected that work on the corundum property owned by the Corundum Refiners, Limited, of Palmer Rapids, Ont., will be commenced shortly. Some delay was caused owing to the inability of the company to secure the water-power at that place, but it is now probable that satisfactory arrangements will be made. This company has secured from the Government and by private purchase, some fourteen hundred acres of rich corundum lands in Raglan township, Renfrew county, this tract representing almost all of the corundum deposit remaining in the Province. The company are erecting a mill, which they expect will be in operation next summer.

Thamesville has decided to purchase the electric light plant.

Star of the East Gold Mine, (near Peterboro,) shows an improvement as the streak descends. Quartz which assayed $180 at the surface now scores $196. E. J. Cowain, the superintendent is now arranging for the installation of a new stamp mill.

Two seams of first-class bituminous coal, one seam eleven feet wide, the other six feet, and in close proximity, have been discovered not far from Ladysmith, B.C. Experts attach great importance to this discovery, owing to the exporting port of Ladysmith. The new coal is declared to be a continuation of the famous Wellington seam, and it can be easily worked owing to the pitch of the veins.

There is a great deal of talk in Kaslo about the discovery of a large ledge of dry ore on the south fork of Kaslo creek, at a distance of 15 miles from the town. Some samples of antimonial silver from the ledge have been brought in which run 2,000 ounces in silver to the ton. The find is causing considerable excitement. It was made by J. P. Miller, a mining man of Kaslo.

Work at the Radnor iron mine in Grattan, Ont., was suspended and will probably remain so for some time. The reason for this move is not clear, but it is generally understood that the owners of the mine, the Messrs. Drummond, of Montreal, are not satisfied with the present condition of the iron industry in Canada, and are endeavoring to induce the Government to increase the duty on ore from the United States.

T. W. Gibson, Director of Mines for Ontario, has received a report from New Caledonia, the French penal island, which is practically the only nickel producing territory in the world besides Ontario, and it shows that the industry is flagging there. While in 1902 the island produced 129,653 tons of nickel ore, it raised only 77,360 tons in 1903, which is only about half of the output of the Copper Cliff, Ont., mines.

The Imperial Coke and Coal Company has acquired control of the Alberta Coal and Coke Company. The conditions demand that the coal lands of the Alberta company be at once developed, and provided with coke ovens and other plant. The Alberta company owns 6,400 acres on the Crow's Nest Railway, near Cowley, Alta. The Imperial Company owns ninety sections of land six miles from Michel, in British Columbia. W. Applequist, D. McLeod, and H. McLeod were the principal owners of the Alberta company.

G. O. Buchanan, inspector of lead bounties, speaking in Nelson, B.C., said: "The production of lead at present is at the rate of 30,000 tons per annum, though I do not know that it will continue at that rate for a year. This heavy production is caused largely by the heavy shipments of the St. Eugene mine, which is producing 1,500 tons of metallic lead per month. This output was never exceeded in this country but once, and that was in 1900, when the output was 31,000 tons, the production that year having been stimulated by the extraordinary prices in London. The country is in a better condition to take care of its lead than it has ever been."

"Cobalt" is to be the name of one of the new towns on the Temiskaming railway. It will, according to the decision of the Town Site Committee, be situated on Long Lake, about fifty-eight miles north of North Bay, and from present indications it will be one of the most important mining towns in Canada. It was in this locality that the rich finds of nickel, cobalt, arsenic, and silver, were made last fall, and cobalt has been given the preference in the naming, because the cobalt ores found are among the richest and finest known to scientists. An army of prospectors are at work in the district, and T. W. Gibson, Director of Mines, states that, although the country is a difficult one to explore, enough new discoveries have been made this spring to demonstrate that the mineral bearing area is larger than was at first supposed.

The deputation sent by the Brantford city council to investigate the municipal telephone system of Port Arthur and Fort William has returned and reported in favor of municipal ownership. It is estimated that Brantford could operate a 500 telephone exchange at $15 for residences and $25 for business places. Applications for municipal phones are now being solicited, and as soon as 500 are received a by-law will be submitted authorizing the issue of debentures to raise the money required to instal the plant.

Webster City, Iowa, is a municipal ownership city, owning its waterworks, electric light and power plant, and heating plant. A year ago the city gave a gas franchise to a private company, but the contract has been proved illegal, and the Practical Gas and Construction Co., of Chicago, is now endeavoring to secure the franchise. Neither of the dailies in the city is strenuous enough in its promulgation of the municipal ownership ideal, so the city council is launching a strictly municipal ownership daily, with a prominent alderman as editor and other members of the council as assistants. With the single exception of the heating plant, all the city's enterprises have proved paying investments. Its latest municipal venture will be watched with interest.

WIND-DRIVEN ELECTRICAL WORKS.

Dr. Alfred Gradenwitz, in Knowledge, London.

Professor Latour, of the Askov Popular Academy (Denmark) has for some years been engaged on behalf of the Danish Government in investigating the problem of utilizing wind power in connection with small electricity works. If, however, the dynamo be direct-coupled to the wind motor, the results obtained are unsatisfactory on account of the exceedingly variable speed of the wind. As pointed out in an address recently delivered by Professor Latour before the Copenhagen Technical and Hygienic Congress, he was met with difficulties in designing a suitable regulator for controlling the speed of the dynamo. At present, however, these difficulties appear to have been overcome, and an electricity central station near Askov has been worked with wind power for a year with satisfactory results.

The arrangement of a similar electricity works is represented diagrammatically in Fig. 1. The regulating device itself is made up of two different parts. The mechanical regulating device is intended for maintaining at constant values the peripheric force transmitted to the belt disc of the dynamo. The two belt discs R R are mounted on a movable arm A, bearing a counterweight P. The resulting tension of the belt is thus kept constant, depending on the weight of the belt discs as well as on the counter-weight P. The ratio of the resulting belt tension and the maximum peripheric force susceptible of being transmitted by the belts is, however, practically constant. The peripheric force transmitted by the wind motor to the belt disc R accordingly cannot exceed a given value, tne torque of the dynamo remaining below a corresponding value. Any surplus energy developed by the wind motor is lost as heat with the friction of the belt. A constant torque of the dynamo axle will, however, correspond with a constant current intensity in the armature. In the case of the magnetizing intensity employed, the load is in fact practically proportional to the speed, so that the intensity of the current may be regarded as constant. This is further demonstrated by the author's measurements.

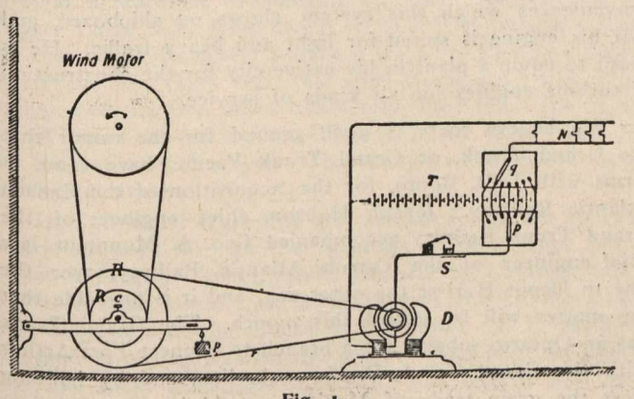
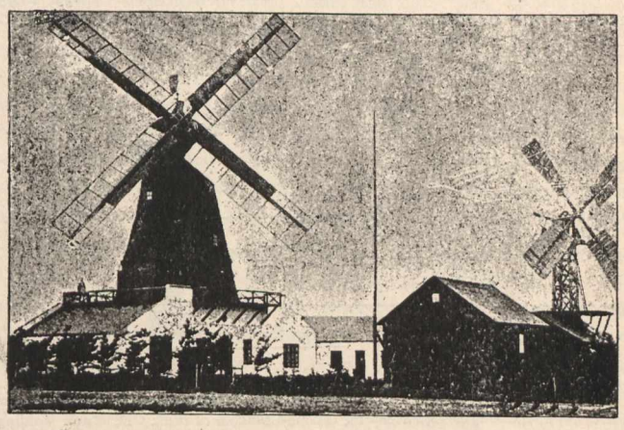


Fig. 1.

The current from the dynamo is used to charge an accumulator battery represented diagrammatically in Fig. 1. The cut-out switch F is closed, provided the current intensity be not inferior to its normal constant value. The dynamo D, therefore, works at a variable speed. In the case of the wind being so strong as to absorb part of the energy by the friction of the belt, the system will work in the following way: Assuming the accumulator battery to be nearly discharged and the crank of the cell controller to be adjusted for the total charge of the battery, the dynamo will run at a speed so high as to be quite sufficient to charge the battery with the normal current of a dynamo (e.g., 50 amp.). As the charge increases, the dynamo will automatically increase its speed and load so as to make the changing current constant. The cell-controller will have to be resorted to in charging in exceptional cases only—if, for instance, the charging and discharge of the battery takes place at the same time.

The electrical regulating device is situated in the interruptor S, being mainly an ordinary minimum current interruptor, disconnecting the dynamo as soon as the current decreases below the normal number of amperes. This arrangement is necessary to prevent the accumulator battery



from being discharged through the dynamo when the strength of the wind is small. The interruptor, however, will automatically insert the current as soon as the wind again assumes a greater strength. To attain this result, the current interruptor is provided with a tension regulator, inserting the current as soon as the speed of the dynamo has sufficiently increased. In the case of variable strengths of the wind, the plant may thus accumulate any amount of wind available, the interruptor opening and closing the connections continually. On the switchboard there are in addition two ammeters and one voltmeter.

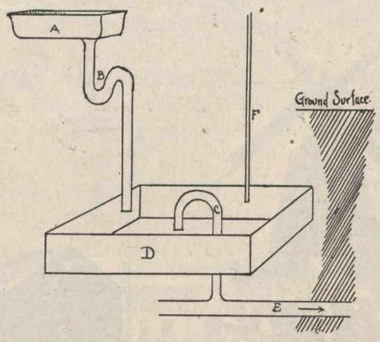
A small electricity works arranged in accordance with the foregoing principle has, as above mentioned, been in operation in Askov since the beginning of last autumn, supplying the inhabitants of the neighboring communities with electric current. The constant normal current supplied by this installation is 60 amps. at tension of 220 volts. As a reserve, however, in cases of several days' calm weather, a petroleum motor had to be installed. The plant has so far given every satisfaction, requiring no superintendence worth speaking of. The man in charge of the machine was away for whole days, so that there was no supervision except in the morning and the evening. The capacity of the accumulator battery is sufficient to supply the maximum amount of energy required during 48 hours. As regards the economical side of the question: The first cost at Askov has been about 16,000 Kr. (a Kroner is about 1s. 1d.), out of which 3,000 Kr. are set aside for the cost of petroleum motor. The electric current is supplied to consumers at the same price as in Copenhagen. The receipts for energy sold work out at about 2,800 Kr., and the expenses at about 800 Kr. per year. There will thus remain 2,000 Kr. for the amortization of the plant, which is more than sufficient with a capital of 16,000 Kr. The price of energy could, therefore, be further diminished. In the case of small electricity works intended for the use of a limited number of houses, the petroleum motor may be

replaced by a horse-driven contrivance. Moreover, in the case of the proprietor of the works being his own consumer, the consumption of current may be regulated according to the actual intensity of the wind; in the case of calm weather, there will, for instance, have to be no threshing done, etc. The first cost will thus be considerably diminished; according to Prof. Latour's calculation, a plant suitable for a farm would be installed at a cost of 3,000 to 4,000 Kr.

A CHEAP AUTOMATIC SEWAGE SYSTEM.

By J. A. Macdonald, Student Member C.S.C.E.

The system here illustrated is one particularly adapted to sink draining in rural and suburban homes. It is also well suited to the needs of cheese factories and creameries, where large quantities of slops accumulate daily, and must be hygienically disposed of. Its simplicity and cheapness, requiring no expensive valves for flushing, makes it more desirable in many cases than the septic tank. It is suitable for heavy clay soils, where the septic tank system might not be able to absorb the sewage. It is probably the parent of the septic system, as it has been in use for twenty-five years. W. P. Sissons, of Union Springs, N.Y., has used it for that time with satisfaction. Cleaning is necessary only once in four or five years.



A, Sink. B, Gooseneck pipe leading to tank out of reach of frost. C, Siphon inside of tank, the longer leg extending through bottom of tank. D, Tank holding 100 to 1,000 gal. as required, of plank or brick, and water-tight, may be placed in cellar for domestic purposes. E, covered drain leading from siphon underground to any convenient outlet. F, Ventilating pipe leading from tank to some height, say to house roof. Note, Crook of siphon should not reach quite to top of tank.

The action is entirely automatic. When the tank fills up to the top of the siphon, the siphon empties the tank to within a few inches of the bottom. As solids sink to the bottom and soapy and greasy matter float on the top, the siphon draws off nearly clear water, its mouth being below the surface and a few inches from the bottom. Gases arising from the tank are prevented from coming into the house by the "water seal" of the gooseneck. The ventilation pipe carries off gases and lets air out or in when the tank is filling or emptying. Occasional scalding of the sink with boiling water renders the sink and pipe above the gooseneck free from taint, and cleaning out the tank once in four or five years is found to be by no means a disagreeable job.

Hermanville, P.E.I.

RAILWAY NOTES.

Work on the new railway connecting Elmvale and Midland will be commenced shortly.

The G.T.R. has bought $8,000 worth of property in Waterloo, to be used for extra yard room.

The Railway Commission has approved the plans for the C.P.R. extension from Guelph to Goderich.

A test shaft at Detroit has been examined, and it is reported that a railroad tunnel under the Detroit river is perfectly feasible.

The J. C. Risteen Company, of Fredericton, have gone into the manufacturing of canvas canoes, and it is said that the prospects are that a large business will be done in this line.

The time has expired for the acceptance of Stratford's franchise by the Radial Railway Company, and the scheme has evidently been abandoned.

A by-law granting a $4,000 bonus to the Guelph and Goderich Railway was carried at Elmira. A similar by-law for $7,000 in Woolwich township was defeated.

There are prospects of the C.P.R. being extended to Elmore, Assa., this year. An engineer has been looking over the ground between Lyleton and that place.

Tenders for the purchase of the Quebec Southern Railway system will be received up to August 3rd, by L. A. Audette, Registrar of the Exchequer Court at Ottawa.

A premature explosion of dynamite on the C.P.R. Sudbury-Toronto line, now building, killed seven men, one of whom was the walking boss, H. Poole, of Wakefield, Que.

The Grand Trunk is about to lay a third track from Toronto to Hamilton, to be used for freight purposes only. It will be necessary to expropriate right of way in some places.

By the end of the year the Montreal Street Railway will have placed in service one hundred new cars. The company will also spend a large amount in relaying its tracks with heavy steel rails.

The property of the Guelph Biscuit and Confectionery Company has been bought by the C.P.R., and will be cleared for yard accommodation. The company has options on other property in the neighborhood.

The Hamilton, Grimsby and Beamsville Electric Railway may at last be extended to St. Catharines. Negotiations are being carried on for the use of the proposed high level bridge to enter St. Catharines.

It is expected that the C.P.R. will make a new issue of common stock shortly. Those close to the directors say that the amount will be $20,000,000, the whole of which will be needed for extensions and equipment.

The C.P.R. now holds about $400,000 worth of property in Montreal, just east of Viger Station, and as soon as permission to close certain streets is obtained, the company will extend its yard to provide better shipping facilities.

It is stated that negotiations are in progress for the purchase of the Tillsonburg, Lake Erie and Pacific, by the C.P.R. As soon as the line is in the hands of the C.P.R. it will be overhauled, and equipped with new rolling stock.

The Grand Trunk has bought 200 acres of land at Mimico, and will establish a freight yard there to relieve the Toronto yard. The land is just west of Mimico Station, and tracks are to be extended on both sides of the main line to form a distributing centre for freight. The plans call for a roundhouse also. Details have not yet been arranged. It is said that this yard will be used for east-bound freight and Little York for west-bound.

James Wilkinson, of Birmingham, Ala., is said to have obtained a patent on a turbine as the motive power for a railroad engine. The inventor claims that he can make use of his turbine for railroading with all the economies and conveniences which this system shows on shipboard, and that his engine is suited for light and heavy traffic. He is about to equip a plant in his native city for the construction of turbine engines for all kinds of service.

We believe there is good ground for the rumor that the Grand Trunk, or Grand Trunk Pacific, have come to terms with J. R. Booth, for the acquisition of the Canada Atlantic Railway. Joseph Hobson, chief engineer of the Grand Trunk Railway accompanied Geo. A. Mountain, late chief engineer of the Canada Atlantic Railway, over the line to Depot Harbor the other day, and it is probable that the matter will be settled this month. The Grand Trunk has an Ontario subsidy for a branch to connect Port Arthur with the Grand Trunk Pacific main line, and by building west the grain trade of Manitoba could be tapped before the main line of the Grand Trunk Pacific is completed. There has been a contest between the Canadian Northern and the Grand Trunk for the possession of the Canada Atlantic Railway.

A Greenwood, B.C., paper says: Mr. J. W. Stewart has been awarded the contract for the construction of the extension of the Great Northern Railway, from Morrissey to Fernie. The work will be rushed, as the Great Northern is anxious to secure connection with the coke ovens at Fernie.

Hamilton has won its case against the Hamilton Street Railway Co. in the matter of the city's percentage of railway earnings. Judge Meredith has held that "gross receipts" in the agreement of 1892 included traffic receipts not yet earned, such as receipts from sale of passenger tickets still outstanding.

The Hamilton Radial Electric Railway Company expects to have the Oakville extension graded and in shape to receive the ties and rails by October 1st, and to have the railway completed and cars running before the end of October. The Radial will make connections at Oakville with the Mimico Electric Railway, which is also expected to reach that town this fall.

A storage battery was recently installed in Port Arthur in connection with the railway. The plant cost $6,000, and was supplied by the Gould Storage Battery company, of New York, in competition with other works. The building in which the plant is located is said to be the most complete of its character in the continent.

Arthur Koppel, manufacturer of Industrial, Narrow and Standard Gauge Railway Materials, of 66-68 Broad Street, New York, has an exhibit of track switches, turntables, cars of various styles, etc., at the St. Louis Fair. His exhibit will be found in the Building of Mining and Metallurgy, Block 20, Assignment 10, and visitors will receive a cordial welcome.

Application will be made at the next session of the Legislature to allow the St. Catharines, Pelham and Welland Electric Railway Companies to extend the line from the present terminus at Pelham, through the townships of Pelham and Wainfleet in Welland, and Gainsborough in Lincoln, and Moulton in Haldimand County, to a point within the town of Dunnville.

The case of the Preston & Berlin Railway Company against the Grand Trunk Railway Company for a perpetual injunction to restrain the latter from trespassing on or crossing the P. & B. tracks on Caroline Street, Waterloo, has been settled out of court, the G.T.R. admitting that they had no right to cross the P. & B. tracks without an order from the Railway Commission. The case will come up before the Railway Commission in the near future.

The Grand Valley Company have decided to erect a new power house for their radial line running from Galt to St. George. The site chosen is between Paris and Blue Lake, two miles out of Paris. It is likely that the new power house will be the main one for the whole system. The plans call for a building seventy-one feet by forty-seven. The contract has been let to Messrs. P. D. Secord & Son. The power house will be completed as soon as the lines to Galt and St. George are in working order.

General Manager H. W. Gays of the New York and Ottawa Railway, says that the experts who were engaged to make a report as to changing the road from Ottawa to Tupper Lake, N.Y., from steam to electricity, estimate that the cost would be nearly a million dollars. This is a large outlay and Mr. Gays says that even if the road was fully equipped electrically, unless there was three times the number of trains run on the line than there are now, steam is the cheaper motive power. The change will therefore not be made at present.

The Montreal Terminal bill asking for power to run electric railways through the counties of Hochelaga, Maisonneuve, Jacques Cartier, Laval, Terrebonne, L'Assomption, Montcalm, and Joliette has been thrown out by the Railway Committee of the House of Commons. J. P. Mullarkey, made a strong plea on the prospect and said the company had spent $1,400,000 on a line to Joliette, and was prepared to go on. It was the only line that gave a two and one half cent passenger rate in Montreal. The application for a charter for the Canadian Traction Power Company, behind which are the same capitalists, was withdrawn. This company proposed to run a line up the Ottawa valley.

It is stated that an arrangement has been made for the permanent operation of the New Brunswick Coal and Railway Co.'s line on a firmer basis than heretofore. W. J. Hunter, now with the Intercolonial at Moncton, will become superintendent of the first-named road.

The Great Northern Railway of Canada failed to meet the interest on its bonds due on July 1st. It is said in explanation that negotiations are pending for the amalgamation of this line with the Chateauguay and Northern Railway and the reorganization of the company's business, involving the paying off of the present floating debt and outstanding bonds and the issue of new first mortgage bonds. By the amalgamation the Great Northern would secure entrance to Montreal, and the plan provides for the building of two or three connections, one of which is from Garneau Junction to Quebec, a distance of seventy-five miles. As soon as physical connection is made between the Great Northern and the Canadian Northern, it is said that a general amalgamation will occur.

The Canadian Pacific Railway will build this summer at its shops in Perth, one hundred stock, and eighty-five flat cars of 60,000 pounds capacity, and twenty-five refrigerator cars. The stock cars will be thirty-six feet long, eight feet, eight inches wide, and seven feet one and one quarter inches high, inside measurements. The flat cars will be thirty-six feet eight inches long, eight feet ten inches wide over frame and four feet two inches high from rails to top floor. The refrigerator cars will be thirty-eight feet eight inches long, and eight feet eleven inches wide over frames. The special equipment for all includes M. C. B. axles, Simplex bolsters and patent side bearings, Simplex brave beams, Westinghouse air brakes, Tower couplers, Miner draft rigging, dust guards, journal boxes and lids and roller side-bearing trucks.

The Canadian Electric Traction Company has awarded a contract to Bruce, Peebles & Co., of Edinburgh, for ten motor cars, with a speed of thirty miles an hour on the level, and fifteen miles an hour on grades of one in twenty-five. Each car will have a capacity for fifty passengers, and is to be capable of hauling either freight or a passenger trailer in addition. The motor equipments will be of two hundred and fifty horse power each. The power house equipment will have a capacity of 1,000 horse power. The value of the contract is £42,250. Power will be transmitted at 10,000 volts, and 25 frequency, and will be transformed to 1,000 volts for the motor cars. The use of the Ganz system, which is the polyphase system to be adopted, the manufacturers claim, will show a saving of thirty per cent. both in first cost, and operating costs, when compared with a single phase or a continuous current equipment. The line will run from London, through St. Thomas to Port Stanley, a distance of thirty miles. As soon as this section is completed, the remaining portion from London to Hamilton, will be electrified on the same system, making, in all, a distance of 160 miles.

MARINE NEWS.

A motor boat association is being formed to include in its membership all owners of motor boats from Kingston to Ogdensburg.

The lightship Anticosti, No. 15, built by the Polson Iron Co. for Dominion Government service, has left for her station at Anticosti Island.

The steamer Edna was damaged by fire at Parry Sound on July 13th, to the extent of about $1,000. She belonged to the Parry Sound yachting fleet.

The steamer Jubilee, running on Lake Temiskaming, Ont. ran into the wharf at Haileybury, Ont., recently, and sank during the night, and a number of her passengers had narrow escapes.

On July 13th, the steamer Lunenburg, from Ingonish, C.B., for North Sydney, struck on the rocks near Cranberry Head. Attempts to float the steamer were unsuccessful, and it is likely the hull will be abandoned. Passengers were landed, and the cargo is being removed.

The steamer Gauss, recently purchased by the Dominion Government for service in the Arctic seas, has been renamed the Arctic, and is being refitted and equipped for her work at Quebec.

A new steamer named the Elgin L. Lewis, for the freight and passenger trade on Lake Simcoe, has been launched at Orillia, Ont. She will have accommodation for 125 passengers.

It is reported that H. Calderwood, manager of the Collingwood Ship Building Co., has resigned. Jas. Smith, mechanical superintendent, and F. Johnston are also reported to have resigned.

The Ottawa River Navigation Co.'s steamer Empress has been put on her run to Grenville, Ont., after having been re-engined, and her passenger accommodations rearranged and improved.

Announcement from Vancouver, B.C., has been made that a new turbine steamer is to be built for the British Columbia-Australian service. She will be one of the fastest steamers on the Pacific.

On July 12th, the steamer Athenian collided with the Verex in the St. Lawrence, opposite St. Laurent, striking her above her engine and cutting her almost in two, from the keelson to the bulwarks.

The steamer Mary Hough, recently brought out from Liverpool, Eng., by Bowring Bros., Ltd., St. Johns, N.F., for the west coast run, ran on the rocks and has become a total loss. The steamer Restigouche, owned by the North American Transportation Co., has been chartered for the service.

The Dominion Atlantic Railway has placed one of its steamers, the Prince Arthur, on a route from Halifax, N.S., to New York, and the Red Cross Line, which heretofore has not had any competition, has cut the rate to $15 single and $25 return.

The Polson Iron Works Co., Toronto, proposes starting the construction of motor boats, and is acting as agent for the Thorneycroft firm of London, Eng. A sample motor boat making twenty miles an hour has been brought out by F. B. Polson, who has just returned from England.

A. Spence, of the Gainsworth Dock Company, which owns shipbuilding yards on both the Forth and Clyde, and is one of the largest shipbuilding firms in Scotland, has been looking at the proposed site for steel shipbuilding at Dartmouth Cove, N.S., and considers it excellent.

The Richelieu & Ontario Co. steamer Carolina ran on a reef in Ha-Ha Bay on July 15th, sustaining some injury in the bow, but was able later to proceed to Levis under her own steam. The Carolina ran aground last year, and was almost entirely rebuilt after that accident.

A deputation waited on the Prime Minister on July 14th to urge the building of the Ottawa and Georgian Bay Canal. Sir Wilfrid gave the deputation assurances that he was in favor of the Government building the canal, and that the matter would receive immediate and serious consideration.

In competition with all the important shipbuilding companies on the Pacific coast, the Victoria Machinery Depot has made a successful tender for repairing to be done on the Algoa, a Pacific mail liner, which struck on Point Bonilla, off the California coast. The liner is 455 feet long, and of 7,000 tonnage. Repairs are to be made to the bottom, which is badly damaged, and also to the machinery.

The steel barge Haddington was launched at the John Bertram shipyards recently. The Haddington is intended for carrying grain and package freight between Fort William and Montreal, and is of canal size. Her dimensions are 254 feet long, 42 feet beam, and 18 feet deep. She is fitted with two Scotch return tubular boilers ten feet in diameter and 11 feet long. Her engines are of the triple expansion type, with cylinders of 15 inches, 25 inches and 42 inches diameter respectively, and 30-inch stroke. On the deck will be six three-ton deck cranes for handling freight. The capacity of the steamer is 75,000 bushels of wheat, and its total cost is $130,000.

The charter of the Montreal, Ottawa & Georgian Bay Navigation Co. has been extended for two years.

Steamer Hibernian, before reported ashore near Codroy, was floated on the 8th by the Merritt & Chapman Wrecking Company. The vessel will probably be dry docked at St. Johns, Newfoundland.

The Department of Marine and Fisheries, Ottawa, is asking tenders for the construction of two wooden lighthouse towers to be erected at Point Edward, in Sydney Harbor. These towers are to be equipped with range lights. The work of construction will likely begin about the first of August.

In 1902 D. O'Connor placed a small steamer on Lake Temagami, seventy-two miles north of North Bay, Ont., for freight and passenger trade. The increasing trade of the district, due to settlement and tourist travel, has necessitated the addition of a second steamer. This is an 85-foot boat, and was purchased at Kingston.

Capt. C. T. Knowlton, with crew has sailed to England to bring over the new Government steamer Canada, recently launched at Vickers Sons & Maxim's Yard, Barrow. The Canada will take the place of the Acadia, as flagship of the fishery protection service. She is two hundred feet long, and is armed with four pom-pom guns.

Owing to the claims for salvage brought against the Allan line steamer Austria, which was damaged in the recent fire at Boston, the work of temporary repairs has been held in abeyance, and it is possible that the vessel may be sold at that port. One claim placed the value of the craft at $100,000, and the cargo in her at the time at $200,000.

A new type of boat is about to make its appearance at Hamilton. The craft is a torpedo-stern speed launch, thirty feet long and less than five feet beam. She will be fitted with a twenty-one horse power gasoline engine, and is expected to develop a speed of seventeen miles an hour. She is being built by Mr. Turner, of the Smart-Turner company.

A Tacoma, Wash., despatch says that Capt. Finch, manager of the Neptune Salvage Co., has located the wreck of the Canadian steamship Islander, which sank in Alaska water in August three years ago. He expects to raise the Islander and recover the treasure boxes and valuables aboard her, which are estimated at from $400,000 to $700,000. The vessel was located by using a big steel diving cage, invented by Capt. W. W. Smith, of Milwaukee.

A Victoria paper says: "Capt. Newcombe, of the Government steamer Kestrel, reports a remarkable performance of the new propeller lately fitted to his ship. After three months' experience of its work, he claims a total absence of vibration and a knot per hour increase of speed, with the same revolutions of steam pressure. This is equivalent to an increase of thirty per cent. in engine power. The new propeller is a two-ton bronze casting, and was designed for the Kestrel by James K. Rebbeck, consulting engineer, and cast by Alex. Stewart at the Albion Iron Works, in this city.

The steamer North Star of the Mutual Transit Company, arrived at Port Arthur from Cleveland on July 6th, and discharged 400 tons of freight at the C.N.R. dock for shipment to the Northwest. This is the first break of the American lines into the carrying of freight to the Canadian head of the lakes. The company have contracts for the hauling of a large amount of freight from Cleveland, Buffalo and other American ports to Port Arthur and Fort William for shipment west. There are seven steamers in the fleet, and each of these will call en route to Duluth.

The new White Star liner Baltic has made her maiden trip from Liverpool to New York and return. On her return trip she demonstrated that she is some years ahead of the facilities of the port of New York. Her draught when loaded to her full limit is 36 feet 6 in., while the port's limit is 30 feet, except at high water, when vessels drawing 32 feet may enter or leave the harbor. When the Baltic is loaded to the draught limit of New York harbor she is still 4,500 tons below her full capacity; that is, she has about an average tramp steamer's capacity for which she has no employment.

MACHINE SHOP NOTES FROM THE STATES.

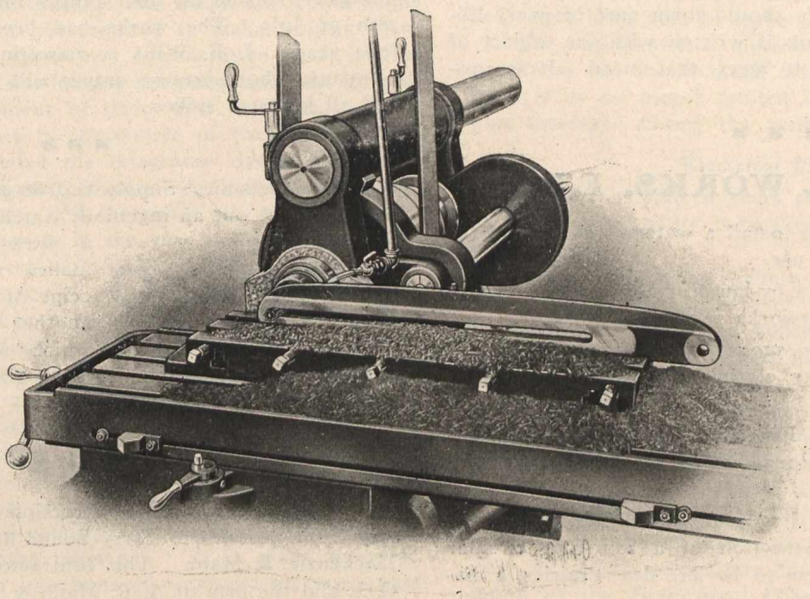
By Chas. S. Gingrich, M.E.

VI.

Automobile Manufacture.

There is probably no branch of the mechanical industries that is as busy at the present time, as the automobile manufacturers. Although this business is comparatively new, and the process of duplication of parts has not yet been carried out as thoroughly by any means, as in the bicycle business, it is nevertheless surprising to note the system that prevails in the manufacture of these machines, even in factories where no permanent model has yet been decided upon.

Standard automatic machines are largely employed on small parts, and wherever metal is to be surfaced off of



castings, large or small, this is done by machines and methods adapted for doing it in the quickest possible manner. A notable example of this is shown in the accompanying illustration, which shows the engine frame of a well-known automobile manufactured in Ohio, mounted on the table of a Cincinnati geared-feed miller, in process of being finished. The surface is about 10 inches wide, and is being finished at one cut with a 10½-inch diameter face-mill which is feeding .3 inches for every turn of the cutter, with a resulting table travel of 5¼-inches per minute. The actual time required for taking the cut is a little over four minutes, and the operator requires about 10 minutes for chucking and handling the pieces, at which rate one engine frame is easily finished every fifteen minutes.

Several years ago it would not have been considered practicable to do work in this manner, and a shaper or small planer would have been used instead, and of course, the time for finishing the job would have been at least double the time that is required by the method mentioned above.

(Continued on page 240.)

LITERARY NOTICES.

The Naval Pocket Book, 1904; 16mo.; pp. 972. Edited by Sir Wm. Laird Clowes. London: W. Thacker & Co., 2 Creed Lane, E.C.; 7s. 6d. net.

This publication, which is now in its ninth year, is designed to give technical information about the navies of the world. Special interest attaches to this number, as with it Sir Wm. Clowes resumes active editorship. The book contains a complete list of the ships of the navies of the world, giving the displacement, armament, protection, engines, coal capacity, etc.; an index of ships by name, and plans of over a hundred ships of all navies. Allan H. Burgoyne, F.R.G.S., contributes a chapter on the history of the submarine, and full particulars of the submarine fleets of the world are also given. Another chapter is devoted to a full description of the various types of torpedoes in use. A detailed list of the dry docks of the world is supplied. Miscellaneous tables, trial-trip tables, etc., make up the complement of information in this small but copious book.

Up-to-date Tables of Weights, Measures and Coinage. Alfred J. Martin, Fellow of Surveyors' Institution, England. London: T. Fisher Unwin, 1904; 16mo., pp. 250.

This little book goes very thoroughly into the matter of weights, measures and coinage as now existing in the Empire. Information as to present units and their relations is full and complete, but the main purpose of the book is the advocacy of the adoption of the metric system. The book contains a historical sketch of advances made along this line in various parts of the Empire within recent years, coming down to the introduction into the Imperial Parliament of the Metric System Bill of 1904. The author does not advise a sudden change, but rather an adjustment of the system at present in use to a scientific basis. "Advocates of the metric system should remember that all British reforms come by evolution, not revolution. Britishers prefer being led to being driven. Tell them that their cumbrous system will be adjusted, and they will listen; but tell them it will be bundled out, and a foreign one take its place, and they will turn a deaf ear." A large part of the book is devoted to an exposition of a simple, practical, and yet accurate adjustment of the present system to the metric system. A method of decimalization of British coinage is also explained. Reforms of a practical nature in time, mariners' compass, etc., are advocated. A mass of useful information for office and workshop is also contained in the book. A 50-page supplement accompanies the book, containing a guide to simple arithmetic, and showing how decimals may be taught at a very early age.

International Fire Prevention Congress, London, 1903. Report of Proceedings by J. H. Woolson, E.M., Adjunct Professor Mechanical Engineering, Columbia University. New York: Martin B. Brown Co., 1904.; 12mo., pp. 250.

Prof. Woolson was the official representative of New York City to the Fire Prevention Congress at London last July, and his report is published by the city authorities. It is said to be the only report issued in America containing a complete digest of the proceedings, so far as construction and protection are concerned. The book contains twenty-one papers presented to the congress by eminent authorities from all parts of the world on various phases of the problem of fire prevention. Diagrams and views of the British

Fire Prevention Committee's testing station are included in the book. Engineers, architects and others should find much useful information in this book.

The Iron Age Directory, 1904: A classified index of goods manufactured by advertisers in the Iron Age. New York: David Williams Co.; pp. 300; 25 cents.

This handbook should prove very useful to buyers of all kinds of materials and products connected with the iron business. The list is an index to the makers of over 5,000 different tools, machines and products. As the list is classified under the names of products, all the makers of any particular tool may be found at a glance.

Easy Lessons; or, the Stepping-stone to Architecture. By Thomas Mitchell; 12mo., pp. 100; 50 cents. New York: Industrial Publication Co.

This book is an elementary treatise on architecture in the form of question and answer. It treats of architecture from its earliest beginnings to modern times, but necessarily in a rather cursory way. The ground is taken that a knowledge of architecture should form part of every liberal education, and the book is written with the object of supplying the information to meet that need. It is profusely illustrated.

MUNICIPAL WORKS, ETC.

Thamesville is about to install a waterworks system for fire protection and private use.

Kincardine has carried a by-law to raise $4,500 to extend the electric light and waterworks systems.

Picton has voted down money by-laws to erect municipal buildings, and to buy electric light and waterworks plants.

C. F. Gildersleeve, of Kingston, has secured the contract to extend the sewage system in St. Catharines. His tender was $31,232.

Montreal city council has granted to Theo. Leclaire, the contract for the construction of a four-foot circular sewer from the sewage farm to Riviere des Prairies, a distance of about sixteen hundred yards.

The municipality of Bordeaux, near Montreal, has passed a by-law to borrow $25,000 for a waterworks and sewage system for the village, which is situated on the Back river at Sault au Recollet rapids.

Almonte town council has decided to commence on August 1st, the development of electric light power. The electric light committee will proceed with the construction of a cement bulkhead and side dam.

After having been cut off for three months, the electric current has been turned on the power motors in Orillia. The power is derived from an auxiliary steam plant which the council has installed at a cost of $10,000. Work on the repair of the broken dam at the Ragged Rapids has been commenced under the superintendence of D. C. Clark, of Trenton, and is expected to be completed early this fall. Meantime, the auxiliary steam plant supplies the town with light as well as with power.

Kingston is to acquire the plant of the Kingston Light, Heat and Power Co. on August 1st on the following terms: The city takes over the plant, subject to the debentures, $99,975, which mature in 1917, with interest from August 1, 1904, and shall pay the company the balance of the $170,373 named in the by-law. The company pays taxes on plant to August 1, 1904, and costs of all appeals against the award. The city also pays $3,857 for additions made to the plant since 1901, the time the arbitration was had. The city gives the railway company power at $2 a day for each car for six months, and after that at a rate to be agreed upon. J. M. Campbell has been appointed supervising engineer of the plant.

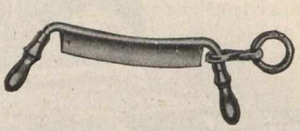
The Crow's Nest Pass Coal Company recently ordered from the Robb Engineering Company two 175 horse-power Robb-Mumford boilers for their mines at Fernie, B.C., in addition to three of the same style installed last year.

H. A. Kribs, chief engineer of the R. Forbes Co. woolen mills in Hespeler, was badly scalded through the bursting of the engine feed-pipe on July 25th, and died of gangrene on the 28th. Deceased leaves a wife and two adopted children. Four years ago his brother-in-law was killed in the same factory.

The Lindsay, Bobcaygeon and Pontypool Railway, just completed, has been taken over by the C.P.R. under perpetual lease, and will be opened for traffic on August 1st. The line is thirty-eight miles long. It leaves Burketon Station, on the C.P.R. main line, and runs north-east through Lindsay to Bobcaygeon.

—The Iron and Steel Company of Canada, Limited, of Belleville, successors to the Abbott-Mitchell Iron & Steel Company, started up their railing mills at Belleville on the 18th of July. The works had been closed for three or four years. J. F. Wills is managing director of the new company, whose present output will be in bar iron, washers and all kinds of spikes.

The Mechanics' Supply Co., 80-90 St. Paul Street, Quebec, have got out an ingenious watch charm in the shape of a draw-knife, which will be mailed to any address on receipt of thirty cents. This is another of the series, among which are a monkey-wrench, hammer, machinists' clamp, etc. Each of these souvenirs has had a large sale.



—Contracts for the construction of the James Bay Railway from Toronto to Parry Sound have been let by Messrs. Mackenzie & Mann. The contractors are Angus Sinclair, C.E., and the firm of A. R. Mann & Archie Mackenzie. Mr. Sinclair, who has the construction of the Parry Sound end of the line, has just finished the construction of one hundred miles of work for Mackenzie & Mann, including grading and masonry, in Nova Scotia. Messrs. A. B. Mann and Archie Mackenzie have been engaged on several contracts for the Canadian Northern in Manitoba and the West. The contracts made stipulate that the work shall be completed in September, 1905. The contract for the line from Parry Sound to Sudbury will probably be let shortly.

—J. V. Welch, operating the New Ontario gold mine, four and a half miles east of Fort Frances, has found free milling gold far in excess of his expectations. It is said that other minerals, including platinum, are to be found on the property.

—At Panama the highest mast in the world for wireless telegraphy is being erected by the De Forest Company. This company claims that wireless communication with the Orient will soon be established through a chain of stations at Seattle, Cape Flattery, Dutch Harbor, Kamchatka, Japan and Wei-Hai-Wei.

W. J. Webb, for the past six years engineer and superintendent of the Lawlor Building, corner of King and Yonge Streets, Toronto, has accepted a position as superintendent of Winnipeg's new eleven-storey sky-scraper, the Union Bank Building. Mr. Webb will be missed in engineering circles in Toronto, as he has occupied many executive positions in both the Canadian and Ontario Associations of Stationary Engineers. He reports at Winnipeg on the 15th of August.

THE STATISTICS OF CANADIAN PROGRESS IN ELECTRICAL APPLICATIONS.

By Geo. Johnson, Dominion Statistician.

The 24th of May will be the sixtieth anniversary of the sending of the first Morse message over a telegraph wire.

There are now 1,764 private and government cables with a length of 204,527 nautical miles.

On the land there are 1,025,700 miles of line and 3,978,500 miles of wire. These represent an outlay of capital equal to 500 million dollars. Add the outlay for cables and there is a total outlay of 850 million dollars to provide the means for transmitting wire messages by sea and by land.

Over head and under seas there is a daily transmission of one million four hundred thousand telegrams and 36,000 cable messages; the totals being 478,330,000 land messages and 13,140,000 cables in the year 1903.

This is the minimum, for in South Africa (for instance), there are thousands of miles of line which are in the hands of companies that are not required to make returns. Another fact has to be taken into consideration and that is that these figures do not include the telegrams sent by railways in the management of their own business. These number many millions in the course of the year. Thus Russia, in 1902, included the telegrams despatched hither and thither over that vast country in connection with the running of her railways, and the result was a total of 101,639,542 telegrams, whereas in the year before (1901), when railway telegrams were not included, the messages sent numbered only 20,000,000.

A third fact must be kept in mind. In Canada the press messages are not included in the number reported. Everyone knows the important part the newspaper telegraph service plays in such a country as Canada. Divided by ten to represent an ordinary message the millions of words of the "flimsy" of the press would far exceed the other messages sent and delivered in the course of the month or year and representing the business, the social and the other activities of the country. No estimate can be made of the number of these messages. It is plain, however, that at least a million four hundred thousand messages pass to and fro every day of the three hundred and sixty-five days of the year. All this from the one or two telegrams which passed on the 24th May, 1844, when the Morse system turned the plaything of science into an instrument of practical, everyday use.

The countries which most use the telegraphic mode of communication are the British Empire, the United States, Germany, France, Austria-Hungary.

The British Empire has 218,000 miles of line, nearly one million miles of wire, and sends and receives 127,000,000 messages.

Great Britain despatches and receives 92,471,000 messages or 222 per 100 of her population. Her daughters follow her illustrious example. Australia even goes beyond her, sending 223 messages per each one hundred, while New Zealand, that wonderful sister under the southern cross, goes far beyond mother, sisters, cousins, aunts or anybody else, topping the list with 610 telegrams per one hundred of her population. Canada does not make a good second, her record being only 101 messages per one hundred of her population. The African possessions of the British Empire, notwithstanding the fact that only a comparatively small proportion of the messages actually sent, are included in the available statistics exceed in the per head number, the record of Canada.

Of outside nations, Belgium holds the record, her telegraphic messages numbering 207 per one hundred of her population. Argentina comes next with 146 messages per one hundred of her population. The United States does better than Canada, having 120 messages per each one hundred of her population. France slightly exceeds the United States with 121. Germany is considerably below the other principal countries, having a record of 80 messages for each one hundred of the population. In the matter of miles of wire, Canada somewhat exceeds the United States. If the latter had as many miles as the Dominion in proportion to population, it would have over 200,000 miles more than it has.

The table being Appendix "A," gives as complete a list as I have been able to make up.

The employment of electricity, that subtle fluid of whose properties we know much without knowing anything of itself is by no means limited to the circulation of telegraphic messages among the nations of the world.

Electrical Propulsion.

It is about sixteen years since the scientific practicability of propulsion by means of electricity was proved beyond dispute.

In the United States there are to-day about eleven hundred street railway systems,* the motive power of which is electricity. There are 25,800 miles of track, the capitalization is $1,630,000,000, and the funded debt $1,275,000,000; the earnings were over $240,000,000 last year. Our neighbors have made great progress. They have 322 miles of electric railway to each million of the population of continental United States. These carried 5,000,000,000 persons or about 65 times the population, and about eight times as many as the steam-driven railways. Canadians have no cause to feel inferiority. Our electric railways carried last year 167,704,000 passengers or about thirty times the population of the Dominion. When it is recollected that the urban population of the United States forms over 37 per cent. of the whole, while Canada's town population is only 26 per cent., it is evident that our electric railways come out well in a comparison and give promise of doing better in the future, as Canada's urban population, following the continent's trend, increases its proportion. Our electric railways carried, like those of the United States, about eight times as many passengers as our steam railways carried.

I believe that Hamilton claims the honor of being one of the first cities in Canada to adopt electricity as the motive power of street railways, the Hamilton Street Railway Company having been equipped with electricity in 1892, the Ottawa Electric Railway Company beginning its career in July, 1891. Our development is, therefore, all within eleven or twelve years. That of the United States began in 1898.

Electric Railway Statistics of Canada.

The following table gives particulars of electric railway companies during the years ended December 31st, 1901-1903:

	1903.	1902.	1901.
Total number of railways sending returns	46	44	43
" miles of track, single	454.75	421.39	376.35
" miles of track, double	192.54	188.09	179.10
" motor cars	2,053	1,895	1,853
" trailers	298	326	302
" snow-sweepers and ploughs	109	97	85
" miles run	39,721,153	36,711,130	34,547,975
" passengers carried	167,703,958	145,609,993	132,885,258
" employees	7,439	5,427	5,443
Total amount of capital paid up	$29,838,326	$25,961,254	$24,734,040
" bonded debts	$17,013,758	$15,794,408	$14,166,225
" gross earnings	$ 7,777,324	$ 6,865,907	$ 6,283,666
" gross expenses	$ 5,018,779	$ 4,140,490	$ 3,699,283

*In 1900 the United States Census Returns for 1899 gave 871 street railways, chiefly electric.

Mileage in Each Province in 1903.

	Single Track.	Double Track.
Ontario	273.14	87.64
Quebec	96.09	82.57
British Columbia	41.75	6.25
New Brunswick	10.06	2.50
Nova Scotia	23.71	1.58
Manitoba	10.00	12.00
Total	454.75	192.54

The following table gives the number of employees, passengers and others killed and injured on electric railways in Canada for the year ended June 30th, 1903, also totals for 1902:

Causes.	Employees. Killed.	Employees. Injured.	Passengers. Killed.	Passengers. Injured.	Others. Killed.	Others. Injured.	Total. Killed.	Total. Injured.
Falling off trains	2	18	..	71	..	..	2	89
Jumping off trains	..	..	5	318	..	2	5	320
Struck by engine or cars	1	..	3	42	8	117	12	159
Head out of window	..	..	..	3	..	..	..	3
Coupling cars	..	6	..	..	..	..	..	6
Collisions	2	24	1	34	..	26	3	84
Walking on track	..	1	..	18	13	57	13	76
Other causes	2	13	1	18	1	10	4	41
Total, 1903	7	62	10	504	22	212	39	778
" 1902	2	30	8	413	22	120	32	563

In the Statistical Office we began to obtain returns in 1898. The following is the return for that year:

Number companies sending returns	35
Total number miles of track	635
Number of cars	1,379
" " trailers	382
" " snow-sweepers, ploughs	69
" " miles run	28,547,908
" " passengers carried	94,616,344
" " employees	4,004
Total amount capital paid up	$18,309,876
Bonded debt	10,454,452

I think that there was some misunderstanding about the miles of track. Otherwise the return for 1898 appears to me to be fairly correct. In 1900 the return gave 688 miles. In 1901 we asked for the miles of track, single and double, in order to eliminate the apparent confusion, and obtained as the result answers which aggregated 555½ miles. The latest return gives a total of 647.29 miles, showing an increase of 92 miles since the new century came in.

Telephones.

The summer of 1904 is the 30th anniversary of the invention of the telephone. In 1874, Mr. Graham Bell, then on a visit to his parents, who lived in Brantford, made some laboratory experiments which proved that speech could be transmitted by wire. Two years later, August, 1876, the first transmission of speech over a telegraph wire took place in Brantford. In 1877 the telephone went into commercial use, this city of Hamilton being the first to establish it. From that beginning the use of the telephone has been constantly on the increase. The first returns the Statistical Office secured showed that in 1893 Canada's equipment was 44,000 miles of wire; 33,500 instruments, by means of which 72,500,000 messages were sent in the year. In the ten years since the number of instruments has increased to 81,500 and of messages to 253,970,000, an increase of 144 per cent. in instruments and of 250 per cent. in number of messages—instruments 1 ½ times more; messages 2 1-2 times more.

Taking the population of the last census there is in Canada one telephone instrument to every 65 persons.

By provinces:

Ontario,	one telephone to every	....	57.9	persons.
Quebec,	" " "	....	63.8	"
Nova Scotia,	" " "	....	99.4	"
New Brunswick,	" "	....	85.3	"
P. E. Island,	" "	....	215.0	"
Manitoba,	" "	....	51.5	"
N. W. Territories,	" "	....	251.3	"
British Columbia,	" "	....	33.4	"

According to our list there were the first of this year 56 companies in Canada, divided by provinces as follows:

Twenty in Quebec, eleven in Ontario, seven in New Brunswick, six in Nova Scotia, one in P. E. Island, two in Manitoba, three in the Northwest Territories, one of these being in the Yukon, and six in British Columbia—the Bell Telephone Co. being counted three times, one in Quebec, one in Ontario, and one in Manitoba. Actually there are fifty-three, and we obtained this year returns from all but seven.

Some of them are, I believe, under the control of the Bell Telephone Company and their returns are included in that Company's returns.

(Just here I may note with satisfaction that all responded to our request with promptitude and showed sympathy with our efforts to procure the statistics published in the Year Book of Canada.)

Our neighbors to the south in 1900 showed a per capita of one telephone in 40, while in some places, such as San Francisco, it had reached one in twelve (U. S. Census Bulletin). The latest statistics indicate a per capita of one in thirty-eight. This rate of progress is exceeded by Denmark, in which country, according to Mr. F. Dagger in the Canadian Engineer, the per capita is one in every fourteen. Canada has not used the telephone to the same extent, but we appear to be making great strides forward, and British Columbia has come within measurable distance of the greatest of telephone-using peoples, the people of Stockholm, in which city there is one telephone in every eight persons.

The Dominion began to construct telephone lines with a commercial end in view, in 1877, as already stated. As far as our somewhat incomplete statistics show, fourteen telephone companies now in operation began distributing "hellos" in the decade 1880-1889; fourteen in 1890-1899 and thirteen in the present decade. Of the remainder we have no record.

The usefulness of the telephone in business in rural communities is well illustrated by the practice in the great fruit growing valley of Nova Scotia. The steamer of Halifax has loaded up with all she purposes carrying of other articles. She is to sail on Saturday afternoon for Liverpool. Her agent telephones to Kentville and Wolfville on Thursday that there is space left for say 2,000 barrels of apples. Kentville and Wolfville telephone to the sub-agents of the London (Eng.) fruit dealers, "How many barrels can you send to Halifax?" These sub-agents jump into their gigs and in an hour have arranged with the orchardists as to the number of barrels to be delivered on Friday evening at each station along the railway. Then they telephone the result to head stations. Cars are provided in accordance. The fruit is shipped to Halifax Friday night, put on board the steamer the next morning and off goes the steamer, the fruit having been exposed to high temperature hardly at all, the orchardists having had ample time to get their barrels repacked, the railway full opportunity to supply the necessary cars and the steamer being able to take on board the freight without exposing it to the influence of adverse conditions of weather on the wharf.

The number of telephone messages per annum for different countries is:

France	187,002,352
Germany	766,226,337
Great Britain and Ireland	723,246,368

Austria-Hungary	147,543,138
Denmark	59,210,855
Belgium	38,753,367
Switzerland	26,670,381
Netherlands	31,460,979
Norway	1,723,347
United States	3,002,000,000

Electric Light, Heat and Power Companies in Canada.

The equipment of these with which Canada has provided herself is of comparatively recent date.

There is no mention made of electricity in the census records of 1881.

In the census of 1891 the following information is given, 1901 being given for comparison:

	Manufacture of Electrical Appliances, Electric Supplies.		Electric Light.	
	1891.	1901.	1891.	1901.
No. establishments*	13	25	23	58
Capital	$1,520,000	$5,267,397	$3,185,257	$11,891,025
No. hands	408	1,922	630	899
Wages	$ 158,500	$ 846,618	$ 237,348	$ 451,047
Output	801,752	3,032,252	845,134	2,008,017

*Establishments having five hands and over.

In addition, the census of 1891 gave as follows:

Electrical Appliances and Supplies.

(Establishments Having Under Five Employees.)

No. establishments	10
Capital	$43,813
No. hands	17
Wages	$14,615
Output	$63,100

In the census of 1901 no provision was made for the collection of statistics of establishments having under five hands, so that for purposes of comparison, we must take the development which has occurred in establishments having more than five hands.

These show an increase in the ten years, as follows:

Establishments (Electrical Appliances and Supplies.)

Capital	—increase	in	ten	years—246	per cent.
Hands employed	"	"	"	346	"
Wages paid	"	"	"	434	"
Output	"	"	"	278	"

The statistics of electric light, heat and power plants having five hands have been given before. In addition to these, there were, in 1891, fifty-seven establishments having fewer than five hands, with a capital of $928,514; employees, 133, receiving in wages $60,336, and having an output of $309,015 of finished products.

The total equipment of Canada then of 1891 in light, heat and power establishments was:

Establishments	80
Employees	763
Capital	$4,113,771
Wages	$ 158,500 $ 846,618 $ 237,348 $ 451,047
Output	$1,154,149

Comparing these totals with those of 1901, which include only establishments having five hands, the evidence is strong that there has been a marvellous increase in the development of electric light, heat and power applications in Canada.

The Statistical Office has been able to secure a fairly complete return of the electric light companies for 1903, so that we can give data which enable us to ascertain the extent of the development in twelve years with a successful approach to accuracy.

The first point necessary for a comparison of the equipment of electric light works possessed by Canada is the number of establishments.

By provinces these were in:

Provinces	1891.	1903.
British Columbia	2	17
Manitoba	2	7
New Brunswick	7	13
Nova Scotia	7	22
Ontario	48	199
P. E. Island	2	3
Quebec	9	49
Territories	2	6
Total	80	316

This is a marvellous development in twelve years. It shows how fully Ontario has entered into the spirit of the age and what a full equipment of the great force of modern times she has provided for herself.

In the 316 establishments of 1903 there were 1,786 hands compared with 762 hands in 1891. There was a capital of over $20,000,000 invested against $3,200,000 in 1891.

Another result of our enquiry was that in the Province of Ontario about 100 of the plants were found to be using coal or wood, about 60 using water-power and 35 steam and water, remainder not stating the particulars. In Quebec six establishments used coal or wood; 38 utilized the water-power of the province, and seven combined water-power and steam-power. In New Brunswick 11 obtained power from coal or wood and 2 from water. In Nova Scotia 16 used coal and 6 water. In Prince Edward Island, 2 coal and 1 water. In Manitoba, 5 coal and 2 steam and water. In the Territories, 4 coal and 1 water and steam. In British Columbia, 8 coal or wood, 8 water and 1 water and steam.

Except in the Province of Quebec the majority of the plants use coal or coal and wood. Sometimes sawdust is utilized.

Electric Lighting in Canada.

An analysis of the statistics of electric lights prepared by me for the Year Book for 1903 shows that in 1903 there were 324 electric plants* in the Dominion with 14,780 arc lights and 1,212,861 incandescent lights. Taking the arc as equal to ten incandescent lights the country had on the 30th June last 1,360,661 lights in use. This is an increase of 236,865 lights in twelve months, or over 21 per cent. Where there were five lights in 1902 there were 6 in 1903. The growth since 1898 has been: Establishments, 1903, 324; increase 65. Arc lights, 14,780; increase, 4,391. Incandescents, 1,212,861; increase, 749,246, showing an increase of 42 per cent. in the number of arc lights and of 161.6 per cent. in the incandescents.

Of the provinces Ontario is far away the chief employer of the electric light. This province had 203 of the 324 plants in use in the Dominion. It has considerably more than one-half the total number of arc lights, and 47 in each hundred of the incandescents. Thirty-four municipalities in the province supply themselves with electric lighting.

The Province of Quebec has 53 plants, 3,853 arc lights and 409,503 incandescents. It is, therefore, behind Ontario by 4,571 arcs and 158,990 incandescents. It has made, however, greater proportionate gain since 1898 than Ontario, the gain in arcs being: Ontario, 36.2 per cent.; Quebec, 47.6 per cent.; and in incandescents, Ontario 138.6 per cent., and Quebec 212.3 per cent. During the period 1898-1903 the number of plants in Quebec increased by 13.

The largest single plant in the Dominion is that of Toronto, with its 170,000 lamps; arcs being taken as each equal to 10 incandescents. The next largest is that of the Lachine Rapids Hydraulic and Land Company, Montreal, 158,503. The third in size is the Ottawa Electric Company, with 111,927 lights.

The other provinces have made considerable progress. To the west, Manitoba has increased in 1898-1903 its arc lights from 162 to 375, and its incandescents from 13,800 to 31,905.

The North-West Territories have not increased as rapidly as the other parts of the Dominion, their arcs num-

*Some of these are absorbed by others but made their returns to the Department of Internal Revenue separately and are therefore given here separately. In the previous tables they are dealt with under the return of the absorbing companies.

bering 29, an increase of 4 in the period named, and their incandescents numbering 6,677, an increase of 1,997.

British Columbia shows the largest proportionate increase of any of the divisions of Canada, its increase of arcs being 377 or 82 per cent., and of incandescents 74,297, or 257 per cent. In 1898 British Columbia and Nova Scotia had almost the same number, British Columbia having 7 more arcs and 169 more incandescents; yet Nova Scotia has increased the number of its incandescents by 32,140, or 11.16 per cent. The three Maritime Provinces had in 1898, 951 arc lights and 46,977 incandescents, and in 1903 they had 1,267 arcs and 93,120 incandescents, an increase of thirty-three and one-third per cent. for arcs, and of over 98 per cent. for incandescents.

The imports of the country as well as the increased manufactured output of our own establishments attest the vigorous development of electricity as the harnessed servant of humanity. Of electric arc lights and carbon, and carbon points we imported during the past fourteen years an average of $35,000 worth a year, and the last two years' average was $76,200. Of electric light apparatus and batteries we imported in fourteen years an annual average of $407,000, and the last two years the average was $1,090,050. Of electric motors and meters in fourteen years we imported $151,700 a year. The average of the last two years is $378,300.

It appears to me that the outlook for Canada is one that shows the country going forward by leaps and bounds in its application of electricity. Electricity will drive the carriages on the King's highway as well as those on the iron way. It will do our ploughing, our sowing and our reaping. It will make trolley parks an important part of the national equipment for recreation. If it does not help us into this life, it will help some (no one of this Association of course) out of it—by order of justice. It will do the nation's smelting and welding. It will supply from peat bogs fuel for Ontario and Quebec. In the form of the "wireless" it will make travel by sea along our coasts and estuaries as safe as travel about the streets of our towns. It will make our hats, cook our dinners and warm our toes. It will become so tamed to our service that it will with the message present a photo of the speaker, and cut out in one town a cheque on a bank written hundreds of miles away, and do it so well that the original will be destroyed and the transmitted cheque remain the only existing original. We already have twelve messages over the one wire. How many more who can say? We have in use a telegraph-telephone system by which our railways can employ the same wire for both simultaneously. Our surgeons use it to minister to mind and body diseased. Our warriors use it in the form of the wireless to transmit orders from the right to the left of an army in extended order and thus are able to set thousands moving as one at the same instant over miles of distance.

In fact the electrical engineer is dealing with a force whose uses have become and promise to become even more in the future than in the past, so varied that more than any profession a man has to be a hustler all the time or he will become a way-back even while he is positive he is well to the front. The up-to-date man of to-day is rear-guard to-morrow if he is not always on the alert, so rapid are the movements, so numerous the applications of the electrical forces.

Department Agriculture, Ottawa, May 16th, 1904.

Countries.	Year.	Miles of line.	Miles of wire.	No. of messages.	No. of offices.	No of messages per head of population
Great Britain	1903	49,450	480,400	92,471,000	12,129	2.22
Australia.	1902	45,343	121,818	8,431,372	3,102	2.23
New Zealand	1902	7,749	22,672	4,713,351	1,103	6.10
India and other Asian Poss.*	1902	57,495	190,887	6,749,372	2,006	.02
African Possessions	1902	17,885	38,832	7,555,500		1.08
Canada	1903	36,780	96,728	5,313,800	3.004	
Newfoundland and B. W. Indies	1902	3,308	15,187	1,654,000	300	.92
Gibraltar and Malta.	1902	67		33,500		.15
Total British Empire.		218,077	966,524	126,921,895	21,644	
Abyssinia	1902	1,056	3,168	158,400		
Austria-Hungary	1902	39,372	198,303	31,554,715	9,228	.69
Argentina.	1902	29,397	58,656	7,000,000	520	1.46
Belgium	1902	4,047	21,874	14,252,100	1,372	2.07
Bolivia	1902	2,465	8,625	1,075,000	68	.47
Bosnia.	1902	1,803	4,873	427,452	134	.25
Brazil.	1900	14,710	27,720	1,505,042	1,003	.10
Chili.	1902	11,060	68,710	4,879,719	608	1.57
China.	1902	14,000	49,000	3 430,000	250	.01
Colombia	1898	8,600	25,800	600,000	448	.15
Congo Free State.	1902	888	3,108	62,160	40	
Costa Rica	1902	840	2,940	284,532	68	.92
Cuba.	1902	2,300	3,450	430,125	153	.27
Denmark	1902	2,385	8,855	2,409,365	169	.98
Ecuador.	1902	1,242	4,347	434,470	60	.31
France.		90,592	340,180	47,280,070	13,527	1.21
Colonies and Dependencies:						
Algeria.	1901	6,520	18,240	2,369,456	539	.50
Tunis.	1901	2,420	5,500	978,000	122	.51
Other Possessions.		10,700	32,100	1,605,000	300	.40
Germany.	1902	83,526	309,644	45,216,963	25,621	.80
Greece.	1901	3,830	5,590	1,205,095	241	.50
Guatamala.	1901	3,490	10,470	929,619	157	.59
Honduras.	1902	2,825	8,475	618,000	168	1.05
Italy.	1901	28,472	107,810	11,682,366	6,078	.36
Japan.	1903	x16,128	78,710	18,073,407	2,197	.38
Korea.	1902	2,170	6.510	325,500	325	.06
Luxemburg.	1902	656	1,390	87,300	196	.37
Mexico.	1901	43,675		2,665,998	377	.19
Montenegro.	1902	343	427	29,590	21	.13
Netherlands.	1903	4,010	16,158	5.728,222	761	1.08

Countries.	Year.	Miles of wire. Miles of line.		No. of messages.	No. of offices.	No. of messages per head of population.
Colonies, East Indies	1901	7,518	22,554	729,316	389	.02
Nicaragua	1901	2,440	7,320	140,640	119	.28
Paraguay	1901	500	1,500	97,044	75	.15
Persia	1901	5,480	8,270	16,540	112.00	2-10
Peru	1903	3,220		152,808	48	.03
Portugal	1902	5,301	11,688	4,054,230	461	.73
Portugal—Colonies of	1903	2,368	7,104	142,080	80	.01
Rumania	1902	4,350	8,780	2,318,683	1,866	.12
Russia	1902	106,417	325,978	*101,639,542		.15
Salvador	1902	1,920	5,760	715,084	135	.71
Santi Domingo	1902	430	1,290	40,000	65	.07
Servia	1902	2,300	4,925	1,092,527	145	.44
Siam	1902	2,900	7,700	154,000	360	.02
Spain	1901	20,170	47,470	4,627,713	1,534	.25
Sweden	1901	10,077	31,695	2,813,830	2,175	.55
Norway	1902	9,978	53,813	2,278,639	974	1.01
Switzerland	1902	5,556	23,765	3,273,784	2,137	.99
Turkey	1902	25,100	39,800	4,976,070	907	.21
Egypt	1903	2,562	10,868	x1,617,946	544	.16
United States	1903	196,115	1,029,983	91,391,443	23,567	1.20
Hawaii	1903	250	750	37,500	40	.24
Porto Rico	1903	470	1,410	70,400	70	.07
Philippine Islands	1903	720	2,160	43,200	42	.00 1-2
Uruguay	1901	4,604	13,812	397,493	101	.04
Total Foreign Countries		854,268	3,099,028	430,118,178	100,697	
Grand Total		1,072,345	4,065,552	557,040,073	122,341	

*Including Railway Telegrams numbering 91,639,542.

xNot including State Telegrams.

*The statistics for Africa are very incomplete, many thousands of miles of line being in hands of companies not making returns.

xSubmarine cable 2,130 miles in addition.

MECHANICAL WOOD PULP.*

By Stanislas Gagne, B.A., Sc.

(Continued from last issue.)

Screening.

Where the pulp falls from the grinders enough water is added to it to render it fluid, and on its way to the reservoirs it passes over perforated plates which retain the chips and splinters that have passed through unground. It is again diluted here and is pumped up into the individual screens or into a long distributing trough above the screens. In Canada, only two types of screens are used, viz., the rotary or centrifugal and the vibrating, the former type being the newest and not so commonly used as the latter. Although they work differently, as will be seen later, their object is the same, viz., to separate the well ground from the badly ground pulp. Some mills separate their pulp into several classes, according to degree of fineness, but the majority make use of only one size of screen holes or slits, all the material not passing through these being entirely rejected; but it is a self-evident matter that it would be economical to use all the product of the grinders if a market could be found for it. We will confine our remarks to but one screen or separation, and describe some of the methods by which it is accomplished.

Vibrating Screens.

Figure 24 is a view of a vibrating screen. It consists of, first, a wooden box at the bottom of which are the screen plates; below these plates is a diaphragm which is made to vibrate up and down by means of a shoe and cam. The pulp held in suspension in water is admitted over these plates by pipe and tap from the long trough containing the stock, and a downward movement of the diaphragm draws or sucks the material through the slits in the plates; the next upward movement blows the slivers and other coarse material out of these slits; the two actions constituting a vibration. Figure 26 represents the diaphragm and connections. The box receiving the stock over the plates is usually made of wood and so hinged that it may be lifted over the rest of the machine. The frame containing the plates is also hinged and permits of being raised for examination and cleaning. The screen plates are made of brass about 12 by 40 inches in size, and 3/8 to 1-3-inch in thickness, with slits or holes 2 to 3 inches long and from .008 to .020 inch wide, according to the nature of the stock to be screened and the fineness of the product required. The connection of the diaphragm to the sides of the box is usually made by India rubber of suitable elasticity and strength. The knockers or shoes transmitting the vibrations from the cam are usually of wood and are protected by cast iron and bolted casings to prevent them from splitting. The cam is rigidly fixed to the shaft and is made of steel; it is so arranged as to give 1, 2, 3 or 4 throws each revolution, according to the speed of the shaft and to the rate desired by the manufacturer. These cams are so arranged on the shaft that the strain on the driving belt is uniform throughout each revolution. One or two springs are placed around or near the shoe so that it is always kept in contact with the cam, shock and noise being thus avoided. The capacity of such a screen containing 10 to 12 plates on four cams varies with the speed, the size of the slits and the quality of the stock. With No. 8 to 10 slits, ordinary well ground pulp and at a rate of 400 to 600 vibrations per minute, it is from two to three tons per day; and with No. 10 to 16 slits from four to six tons. The box over the plates is sometimes divided up, so that all desirable material passes through, the coarse being left over. This waste is put into a box or receiver of any kind and dumped into the river or elsewhere, according to the location of the mill. The screens are often arranged in a row, as was seen in Fig. 10, above the wet machines, and either separate or forming a continuous trough. They are provided with an additional box to receive the screened stock, which may also be made continuous throughout the whole

*The above paper won the first prize given by the publishers of the Canadian Engineer for the best student's paper presented to the Canadian Society of Civil Engineers for 1903, the judges being members of the Society.

row. Either this last method is adopted or a long second trough is added, into which all the screens discharge, and from which all the wet machines take their supply. This permits the cutting off of any screen for cleaning or repairs without stopping the wet machine connected with it. When the plates have been used for some time, and especially when resinous balsam is used, they become clogged and must be cleaned. This is usually done with a jet of steam, or, if much gummed, with a piece of felt dipped in coal oil.

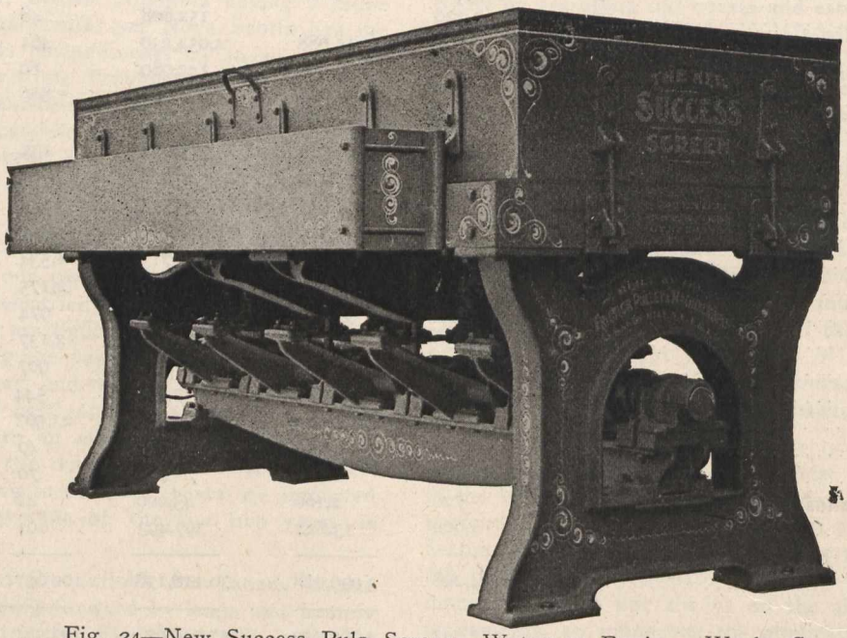


Fig. 24—New Success Pulp Screen.—Waterous Engine Works Co.

Centrifugal Screens.

Figure 28 is a cut of the Baker & Shevlin centrifugal screen, and Figure 35 illustrates the principle on which it works. As seen in this last figure, it consists of an outer cylinder or casing A, of a cylindrical rolled brass plate B, perforated with small round holes, of vanes V, of a cylinder C, perforated at different plates with large holes, and of a tube and vertical shaft S on which the vanes are fastened. The pulp is admitted from pipe F, to which it has been pumped, and falls inside of cylinder C; the vanes, revolving at high speed, act as a centrifugal pump (thence its name), causing the pulp to flow radially; it then passes through the large holes in C, which serve to distribute it evenly and is forced against the screen cylinder B, where the desirable part i.e., that of a certain size and below it, passes through and falls in H, and the undesirable part, i.e., the coarse chips and splinters, remains inside and falls in K; the good pulp passes from H into the distributing trough above the wet machines, while the remainder passes from K into a wasting tank or a dumping place. The holes in B are round, and therefore quite different from those in the plates of the vibrating type, and, moreover, in this case the fibres must pass through them more or less end first. However, the screening action seems to depend, to a certain extent, on a coating as thick as the distance from the end of the vanes to the cylinder B will permit, which consists of coarse material collecting against the inside of the plate B, through which coating the pulp must

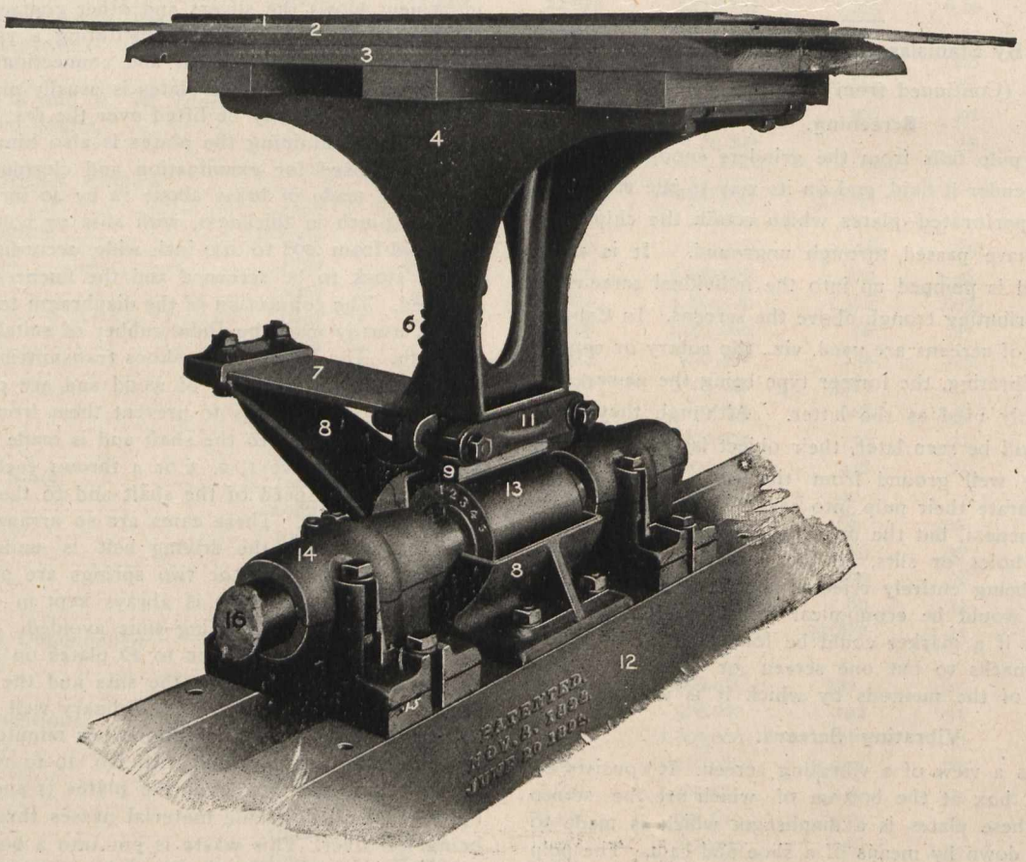


Fig. 26—Success Screen Diaphragm and Connections.

pass before reaching the holes in the plate. Therefore the screening action of this type is more obscure, i.e., not so well defined nor so easily conceived as in the case of the vibrating type, and hence can be judged by results only. Some claim that one of these centrifugal screens will do the work of as many as ten of the vibrating type, that it requires much less power and largely reduces the waste. On the contrary,

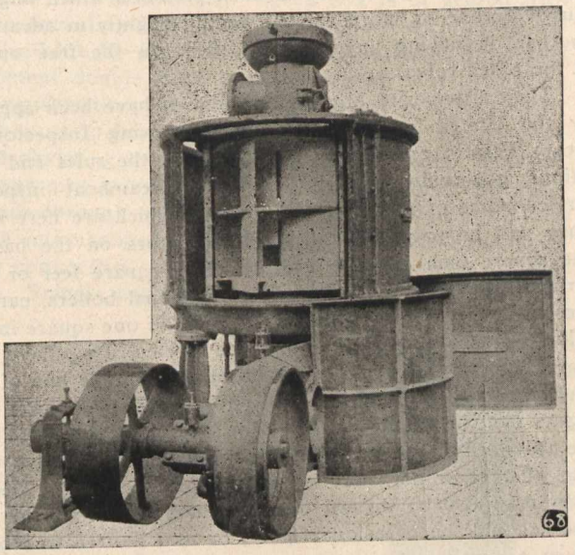


Fig. 28—Centrifugal Screen.

others would not use them because, as they say, they injure the felting power of the pulp, which they render mealy or short by breaking the long fibres in roughly forcing them through a mass of chips and splinters. This is but one of the many differences of opinion between manufacturers in the pulp industry.

The Moore Rotary Screen.

This screen is gaining favor with many Canadian manufacturers and deserves mention here. Its appearance as shown by Figure 30 and Figure 31, represents a vertical section through it. The whole screen stands about 9½ ft. high and,

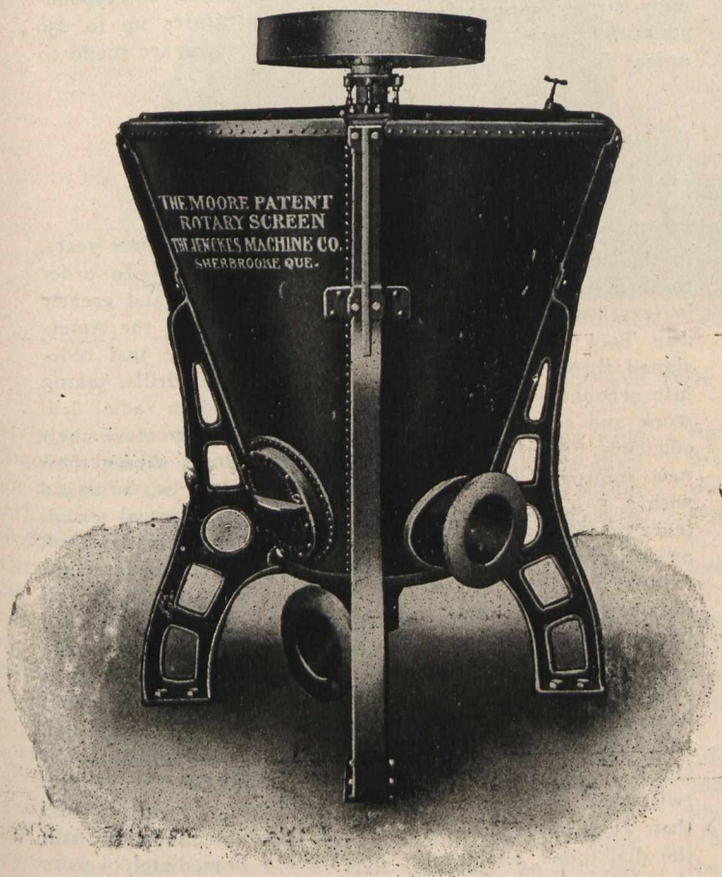
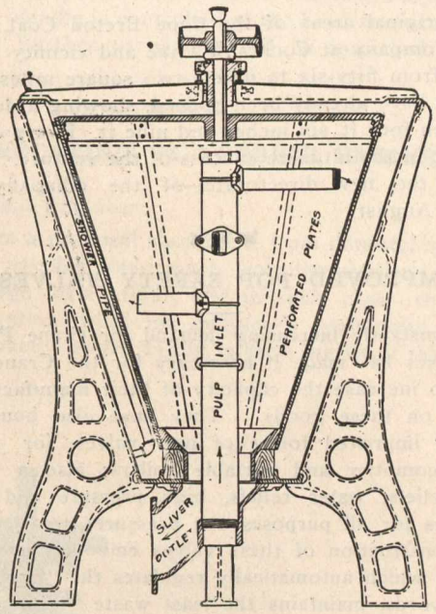


Fig. 30—Moore Rotary Screen of Jenckes Machine Co.

with the exception of the wood step, which steadies the bottom end of the revolving plates and supports part of its weight, is made entirely of metal. The screen plates are of brass, made in sections, perforated with holes 85-1000 of an inch in diameter (smaller or larger at the option of the purchaser), and are secured to the steel frame by brass screws.



THE MOORE ROTARY SCREEN

Fig. 31—Section of Moore Rotary Screen.

The stock enters the screen at the bottom by means of a 6-in. pipe rising straight up at the centre of the screen, and is discharged against the screen plates by means of four or more smaller pipes which radiate from the centre pipe in different directions. Unlike the Baker & Shevlin screen, the screen

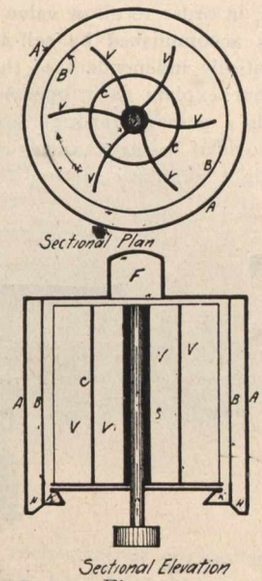


Fig. 35.

plates, and not the centre pipes and vanes, revolve in this machine and usually at the rate of 60 to 70 R.P.M. This produces a centrifugal force, which, together with the force with which the stock is discharged through the radial pipes, carries the desirable pulp through the holes, while the coarser material remains inside and gradually falls down to the sliver outlet. The outside of the plates is kept constantly clean by means of a brass shower pipe; a larger capacity being then afforded. The screened stock comes out through the pipe, shown at the side in Figure 31, and the slivers by the elbow at the bottom. The plates are driven by a pulley on the top of the machine and are carried by a roller bearing of hardened tool steel which contains 14 one-inch steel balls. Like the Baker & Shevlin screen, the screening is done through round holes, and most of what has been said regarding it

may apply to the Moore screen. The manufacturers claim an output of five tons of pulp per 24 hours with an expenditure of three horse-power. Most of the screens have a capacity of 20 to 25 tons per 24 hours..

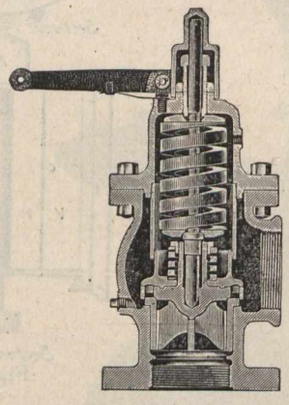
(To be continued.)

The original areas of the Cape Breton Coal, Iron and Railway Company at Cockran's Lake and vicinity have been increased from fifty-six to ninety-two square miles, and several seams have already been opened, showing a depth varying between four ft. six inches and nine ft. Every confidence is now felt in the ultimate success of the venture. It is proable that the new directorate of the company will be formed in August.

IMPROVED POP SAFETY VALVES.

The constantly increasing demand for Crane Patent Pop Safety Valves has made it necessary for the Crane Co., of Chicago, to increase the capacity of their manufacturing departments on these goods. They have also bought out a number of improved forms of pop valves for stationary, marine, locomotive and portable boilers; also a variety of cylinder reliefs, water reliefs, high pressure and hydraulic relief valves for all purposes and pressures.

The construction of these valves embodies a self-adjusting feature which automatically regulates the "Pop" of valve. In other words, maintains the least waste of steam between the opening and closing points, an improvement which will be readily appreciated, as there is no necessity of readjusting to regulate the "Pop" on changes in the set pressure. The valve is described by the manufacturers as follows: In all Pop Safety Valves, it is necessary to have a "Pop" or huddling chamber into which the steam expands when main valve opens, thereby creating an additional lifting force proportionate to this increased area and greater than the force of spring, thus holding the valve open until pressure is relieved. Means must also be provided to relieve this "Pop" chamber of pressure, in order to allow valve to close promptly and easily. This is accomplished by self-adjusting auxiliary valve and spring, entirely independent of the main valve and spring, and to further explain their operation, the steam in "Pop" chamber finds a passage through holes or ports into an annular space provided in the auxiliary valve or disc, and by reason of the light auxiliary spring, this pressure lifts



the auxiliary valve and allows the steam in "Pop" chamber to gradually escape, thus permitting a greater range in setting pressures with the least waste of steam, and at the same time supplying a cushion or balancing medium, thereby preventing any chattering or hammering and affording the easiest possible action in closing. This feature is embodied in no other make of valve, and unlike other Pop Valves, in changing set pressures within reasonable limits of the spring capacity, nothing further is to be done but simply turn down or out (for a higher or lower pressure), on the screw pressure plug at top of valve.

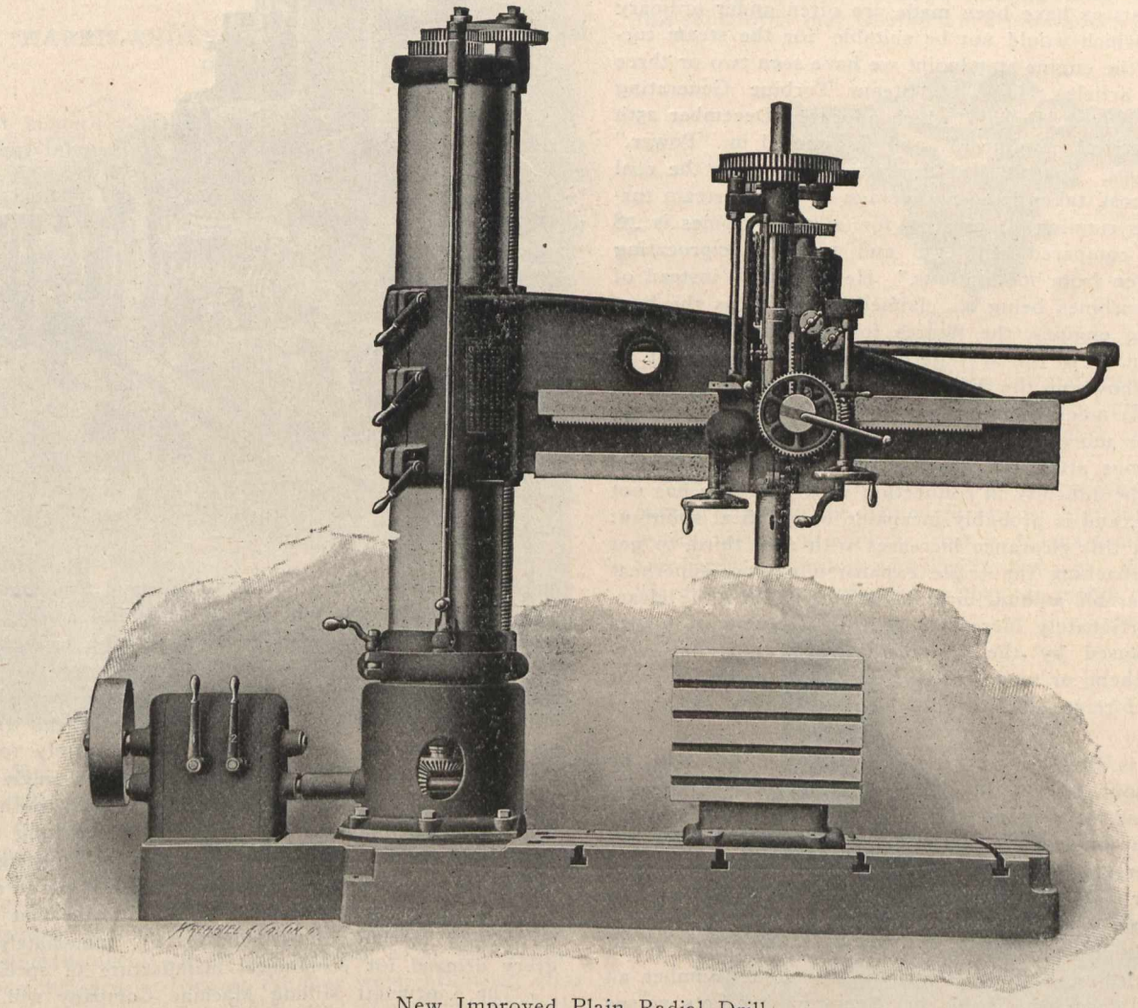
Their encased spring valves are constructed with a casing or chamber enclosing both springs, protecting them against the action of the steam, particularly high pressure, which, blowing with great force and velocity throughout all parts of valve before reaching the atmosphere, would otherwise have a tendency to disarrange the springs and other parts operating in connection therewith. This form of valve is also particularly useful, in fact, necessary where a number of valves may be connected to one main exhaust or discharge pipe. The encased spring chamber, extending over a greater portion of the top surface of main valve, prevents any retarding action of the steam due to back pressure, which might be caused by one or more valves opening slightly in advance of another, in having any material effect on the free opening of the other valves.

Their Composite Marine Pop Valves have been approved by the United States Board of Supervising Inspectors of Steam Vessels, and comply fully with all the rules and regulations governing the United States steamboat inspection service, some of the most important of which are here noted. They will be passed by all local inspectors on the basis of one square inch of valve area to three square feet of grate surface, and on water tube, coil or sectional boilers, carrying pressure exceeding 175 lbs., on the basis of one square inch of valve area to six square feet of grate service. They have bevel seats at an angle of 45 degrees from their centre line of axis. The seats are made of composition or with solid nickel bushing as may be required. The cam lever is capable of lifting the valve off its seat one-eighth the diameter of valve opening, whether or not there is pressure on the boiler. The cam lever may also be thrown over far enough to lock the valve open should the occasion require, or it is desired to blow off all or a portion of the steam from boiler through the safety valve. The cap is made with handles or cross-bars and fastened to the stem by a key pin. The stem in turn is securely attached to the main or wing valve and having a square section operating in a square socket or recess in the main valve, affords means of turning the valve on its seat, thereby removing any incrustation or saline matter that may accumulate. Self-adjusting "Pop" regulator, which automatically controls and maintains a minimum waste of steam between the opening and closing points, as more fully explained above. Encased springs made of the best steel and with self-adjusting spring discs. Valves can be taken apart without removal from boiler and without disturbing the outlet pipe. All parts have been carefully designed and strongly proportioned, and when fitted and adjusted with correspondingly strong springs, are suitable for pressures up to 250 pounds. Special valves for higher pressures are made to order.

IMPROVED PLAIN RADIAL DRILLS.

Radical changes have taken place, in the past few years, in the standard of construction of radial drills. In order to keep fully abreast of the changed conditions and greatly increased duties now confronting the radial drill, the American Tool Works Company of Cincinnati, have just redesigned throughout, their entire line of radial drills, taking into account every condition influencing modern radial drill work and every point which would tend to increase their efficiency. In the accompanying illustration is shown their new improved plain radial drill, which can be furnished with 4, 5, 6, and 7-foot arms. A feature of unusual excellence on this new drill is the feeding mechanism in the head, an entirely new and original construction. It provides eight distinct rates of feed to the spindle. These feeds are all obtained by the simple turning of a dial shown on the feed box, until the desired feed, indexed thereon, comes opposite a fixed pointer. This method is an extremely simple one, as it requires no reference to index plates and subsequent handling of levers. The feeds operate through a friction, which permits a drill being crowded to its limit without strain to the feed works. A plate is provided, indicating twist drill sizes, from ½-inch to 3½-inches inclusive, and their respective proper feeds, and this, in connection with the dial index, enables the operator to immediately secure the proper feed for the twist drill he is using. This involves no guess work, saves a great deal of time, and insures the

drill being used to its full capacity. Feeds can be automatically tripped at any position of spindle by adjustable trip dog and pointer, acting on the worm clutch. Depth graduations are on the spindle and all depths can be read from zero. Two or more dogs can be supplied, making it possible to counter-bore any number of holes without resetting. The trip acts automatically at full depth of spindle, preventing breakage of feed mechanism. Speed box is of geared friction type providing four changes of speed, each being instantly available by use of the two levers shown. Frictions are of patent double band type, employing very few parts in their construction, which can thus be made of such large proportions as to be free from slippage under the severest cuts, and obviating the use of loose delicate parts. A motor of any type may be readily attached at any time, connection being made through chain, gear or belt. The speed box can be easily interchanged with a cone by simply breaking a coupling connection on the lower driving shaft of the machine. Spindle has sixteen changes of speed, all immediately available without stopping the machine. This wide range of spindle speeds, combined with the exceptional driving power of the machine, renders the drill equally efficient with either ordinary or high speed twist drills. Column is of double tubular type. The outer column is practically integral with the inner column, which extends the entire height and has full bearing for outer column, at both top and bottom. This gives the equivalent of a double column, affording exceptional rigidity. Arm is of parabolic beam and tube section, giving the greatest resistance to bending and tortional strain. Its design leaves the lower line parallel with the base, and thus permits work being operated upon in close proximity to the column without the necessity of an extreme reach of spindle. Arm is raised and lowered rapidly by a double thread coarse pitch screw hung on ball bearings, and controlled instantly by a convenient lever. Back gears are located on the head, thus bringing the greatest speed reduction direct to spindle. They may be engaged or disengaged without shock or jar while the machine is in operation Spindle is counterbalanced and has frictiona' quick advance and return. Tapping mechanism is carried on the head, between the back gears and speed box, thus giving to the frictions, already very powerful, the benefit of the back gear ratio, making unusually heavy tapping operations possible, and also permitting taps to be backed out at an accelerated speed. The lever for starting, stopping or reversing the spindle is controlled at the head from the front of machine. Further particulars will be furnished by the makers.



New Improved Plain Radial Drill.

* * *

RECIPROCATING VS. TURBINE ENGINES.

Editor Canadian Engineer:

Sir,—From a practical standpoint I am doubtful whether turbines will receive very much consideration at present, except for large installations, and in such cases the principal consideration, from the engineer's standpoint, is the question of space. So far as the relative merits of the steam turbine and ordinary reciprocating engine is concerned, a great deal may be said on both sides, but, as a matter of fact, we have not seen anything yet which would show conclusively that the turbine has any great advantage over the reciprocating engine. In fact, several serious disadvantages have been shown up.

First. The turbine requires, to give good economy, a high pressure of steam, a certain amount of super-heating, and a very complete vacuum. These are not always obtainable in the ordinary power plant, and it is difficult and expensive to maintain them in any plant.

Second. It is necessary in the steam turbine to have a certain amount of clearance between the blades or buckets and the case in order to prevent them striking and tearing the blades out. This clearance must be as small as possible, otherwise there will be serious leakage, but the expansion of the blades will vary in proportion to the temperature or super-heating of the steam, so that for a high temperature it is necessary to have more clearance than for a low temperature Now, if the turbine is made with the proper clear-

ance for a low temperature the blades will strike if a higher temperature is used, and if the clearance is made sufficient for the high temperature there will be leakage when the low temperature is used.

Third. The very high speeds necessary for the turbine is an objection, where direct current dynamos are used with commutators, causing wear and serious trouble.

Fourth. The turbine is not suitable where the load is very variable, as for elevator service or small tramway plants.

Fifth. The humming noise is objectionable in office buildings, hotels, etc.

In regard to the discussion that has appeared in the papers, a great deal has been said with regard to the steam turbine, because it is new and novel, and all the statements and nearly all the tests we have seen are made under theoretical conditions, showing the best results of the turbine, but none showing the results under ordinary conditions, whereas very little has been said by steam men in regard to the comparative methods of the reciprocating engines, and such tests as have been made are often under ordinary conditions, which would not be suitable for the steam turbine. From the engine standpoint we have seen two or three very good articles. One is "Steam Turbine Generating Plants," by Alfred Morkam, which appeared December 25th in the "Electrical Engineer," and is quoted in "Power," February, 1904. In this Mr. Morkam states that "the coal and works cost, taken from an average of all the steam turbine stations running at present, for steam turbines is .78 and .16 as compared with .738 and 1.4 for reciprocating engines, taken from 160 stations." He says that instead of the steam turbines being, as claimed, as good as the best reciprocating engines, the figures for the turbine stations are not even up to the average of the good and bad of all sorts. He shows up the difficulty of securing high vacuums, which add so much to the steam turbine economy, and that, although for more than twenty years the turbine has had the continuous attention of some of the best mechanical engineers, the difficulty in connection with clearance has not been solved, and is probably incapable of practical solution; second, that this clearance increases with use; third, to get results approaching the triple expansion engine, superheat of a considerable amount must be employed, and the clearance proportionately increased; fourth, stripping of blades may be caused by the superheat overheating or over-expanding them, or may also be brought about by water or any small foreign substance at the very high peripheral speed.

There is also a good article in "Power" for April by J. A. Seymour, of the MacKintosh & Seymour Company, showing that the average of several M. & S. engines under full load shows from 12.29 to 12.69 pounds of steam per electric horse power, as compared with 13.17 and 13.78 pounds for Westinghouse turbine, and at half load the engines show from 12.21 and 12.93 pounds electrical horse-power per hour as compared with 15.1 and 15.9 for the Westinghouse turbine. There is also in the same number an article by I. William Chubb on "Reciprocating Sets versus Turbo-Generators," in which he states that among engineers in Great Britain the relative advantages of steam turbines and reciprocating engines have been the matters most discussed in connection with power house plant, and it has been admitted that unless they are condensing and of sizes developing more than 200 h.p. steam turbines have no advantage over ordinary reciprocating engines. He gives a large number of tests, which show practically the same economy for each type.

My own opinion is that, although the turbines are being at present very much talked of and advertised, a little time will show up their weaknesses even more than at present, with the result that except in very large installations, where the conditions can be just right for the turbine, and where space is a chief requirement, they will not make very much headway. Yours truly, R. E. C.

* * *

Ritchie, Hearn & Co., Ltd., of the Brantford Soap Works, have sold their present quarters and are now looking for a new location. They hope to remain in Brantford.

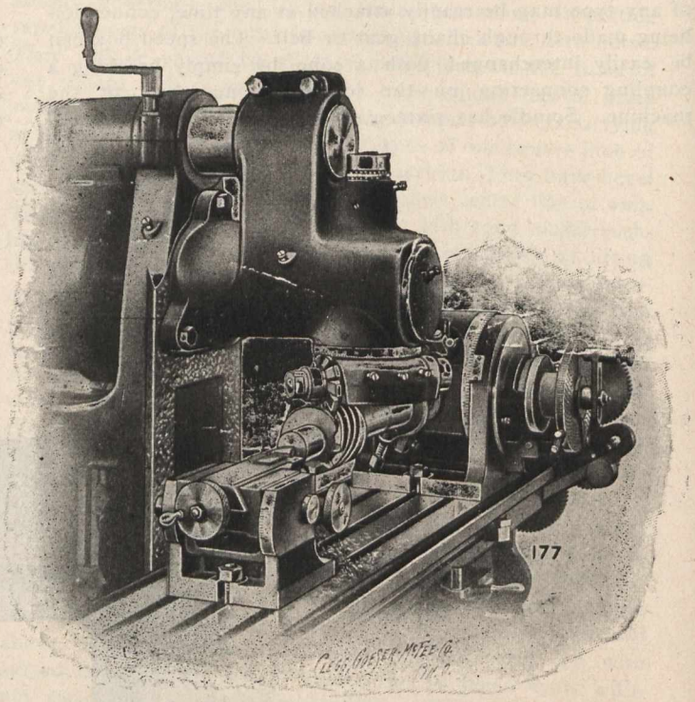
MACHINE SHOP NOTES FROM THE STATES.

By Chas. S. Gingrich, M.E.

VII.

Gas Engine Manufacture.

Nearly all gas engines employ in their valve mechanism at least one pair of helical, or as they are commonly called, "spiral" gears. The space which they occupy is usually limited, and the speed ratio between them is such as to require gears of an angle considerably greater than 45 degrees, and since the ordinary Universal Miller will not swing more than 45 degrees, it has always been quite a problem to rig up a suitable machine for cutting these gears. It was, therefore,



quite interesting to find a No. 3 Universal Cincinnati Miller performing this work with a brand new attachment, which is quite massive in its construction and strong enough to pull any cut within the power of the main belt of the machine. This particular job is shown in illustration herewith, and although the gear shown is of small diameter, the writer was shown steel gears of three pitch, approximately 10-in. diameter, which were milled with this outfit at a single cut and at a very good rate, leaving an entirely smooth tooth surface. This same machine was also employed for cutting the spur gears used on the same engine, and also for finishing a large number of the small parts which are usually done on a shaper.

This is another illustration of the activity that is going on among machine tools builders to immediately supply every demand for economical manufacture of special parts.

The Cincinnati Milling Machine Company will, without doubt, be very glad to give information in regard to milling spiral gears and similar gas engine parts, as I understand that they maintain a special department for supplying such information and making estimates on milling work.

* * *

ENQUIRIES FOR CANADIAN TRADE.

Further information regarding the following may be had on application to the High Commissioner for Canada, Victoria Street, London, S.W.:

A firm interested in the export of brass and copper tubes and electro-deposited copper shells desire to communicate with agents at different trade centres in Canada.

An importer of mica wishes to correspond with persons in Canada who are in a position to export this mineral in considerable quantities, and with actual owners of mica properties.

A firm manufacturing feed water heaters, winch condensers, fans and air heaters for drying purposes, and other apparatus of a similar character, desire to get into communication with buyers in Canada.

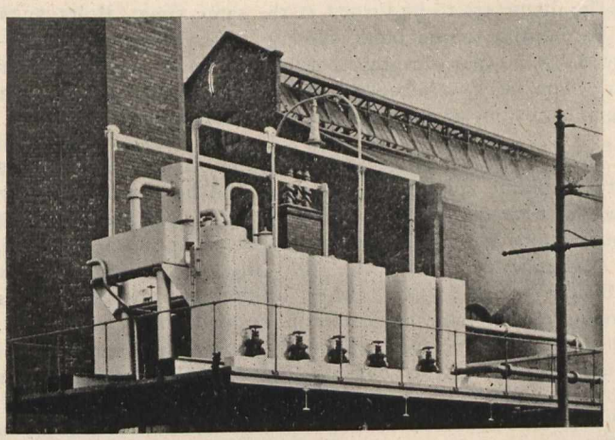
THE CANADIAN ENGINEER AT THE CANADIAN NATIONAL EXPOSITION.

The Canadian Engineer will have a Branch Office and Information Bureau in Machinery Hall, at the Canadian National Exposition, Toronto, August 29th to September 10th. Friends are cordially invited to make this stand their headquarters while in the city. Catalogues of advertisers, directories of the city and of exhibits, and other information of value to visitors may be secured from our Bureau of Information.

—At the annual meeting of the Canadian Electric Light Company, in Quebec, the following were elected to the board of directors: Rodolphe Audette, H. M. Price W. A. Marsh, Gasp. Lemoine, Chas. King, H. T. Machin, Jos. Paquet, Wm. Doyle, and R. Wilson-Smith, of Montreal.

THE "HARRIS-ANDERSON" PATENT FEED-WATER PURIFIER.

In modern power installations the importance of the complete removal of oil from the condensed steam that has to be used over again as feed-water is fully recognized by engineers who have any regard for the safe and economical working of their boilers, and efforts have for long been made, with varying success, to effect this much-desired result. Steam separators and mechanical filters, while they are a step in the right direction, have not of themselves been found to completely overcome the difficulty of extracting the finest particles of oil from the water. The "Harris-Anderson" Purifier, which is illustrated above, has successfully demonstrated that it affords a complete solution of the problem in a very simple and ingenious way, and working automatically it effects the removal of all oil, whether free or emulsified, and leaves the feed water brilliantly clear and in every way fit for boiler use. The removal of the free oil in feed-water can be more or less effected by many filtering devices: it is the extraction of the finely divided or emulsified particles, too small to be retained by any filtering medium, which has hitherto presented an insuperable difficulty. The difficulty has, however, been overcome at last by the "Harris-Anderson" system, which, speaking broadly, consists in the formation of a precipitate in the water, which envelops the particles of oil, rendering them capable of removal by filtration. The formation of this precipitate is effected by the addition to the water of minute quantities of two mutually interacting reagents, quite innocuous to the boiler plates or fittings. The reagents are supplied to the machine in a solid form, and in any convenient quantity, while the machine supplies them to the apparatus automatically. Thus, all need for weighing out, dissolving, and regulating the reagents on the part of an attendant, is dispensed with. The "Harris-Anderson" apparatus is now in constant use at a large number of power plants in Britain with excellent results obtained from an extended experience. Our illustration is taken from the installation now at work at the Electric Generating Station of the Cardiff Corporation, England, and is handling 10,000 gallons of feed per hour. John T. Webster, late Works Superintendent for the Bertram Engine Works Co., Ltd., Toronto, and formerly with the patentees of the "Harris-Anderson" system has lately returned from a trip to the Old Country as special representative for Canada for this apparatus.



IMPROVED PIPE DIE.

Threading pipes one inch and upwards by hand is perhaps as hard manual labor as a man can apply himself to. Tools that afford any relief from this exhausting labor are an undoubted boon to the workman, and effect a saving to his employer. The "Jardine" Patent Pipe Die, illustrated herewith, is an adjustable die, with adjustment to meet any variation in size of fittings. It is claimed that it works more easily and does better work than either the ordinary solid die or any of the well known opening dies. The reason of this superiority may be stated in a few words. The solid pipe die works easily at the start of the cut, but much harder when near the finish, as the whole length of the cutter is required to taper the thread, the further the die goes on the pipe the harder it works.

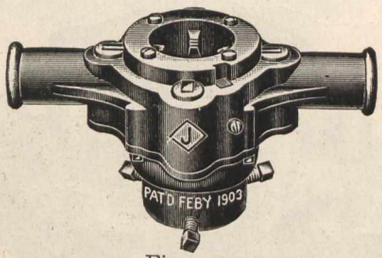


Fig. 1.

The opening cutter type of pipe die, of which there are a number made in the United States, is adjustable to size, but works just like a solid die, that is, it cuts easily at the start and harder as the die advances on the pipe. In working the "Jardine" die it is adjusted so that the mouth of the die cuts to the size of the point or smallest part of the thread. As the die advances on the pipe the cutters open out so as to taper the thread. The cutting is all done with the mouth of the die, and the further it goes on the pipe the easier it cuts, the die opening out as it advances, and the cut becoming lighter in consequence. The makers state that one man can

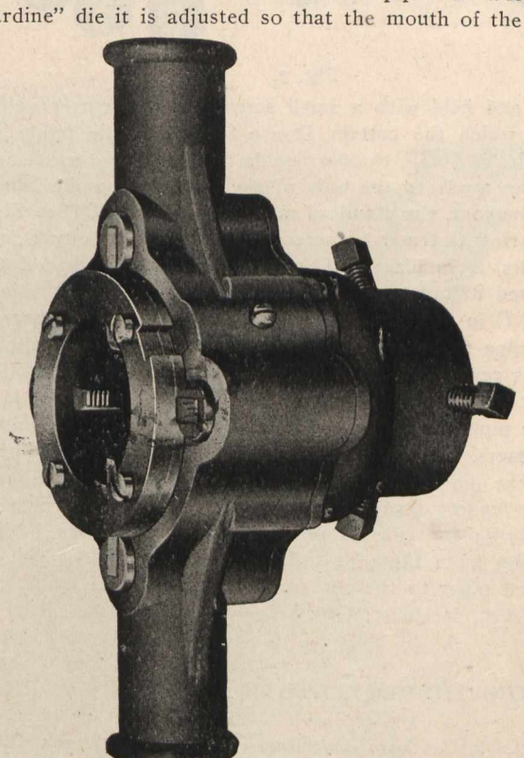


Fig. 2.

easily thread 2-in. pipe or two men 4-in. pipe at one cut. In testing the die, one man without assistance has repeatedly threaded a 4-in. pipe at one cut within five minutes. Fig. 1 shows the die in position to cut a thread. Fig. 2 shows the die in position to change the cutters. Fig. 3 is a section of the die in position to change the cutters.

A is the stock bored to admit the body B, and having the guide holes F for guide blocks E on cutters D. B, the body (carrying the cutters, or chasers D), is made to fit the stock A in which it slides freely up and down, but is prevented from turning by the key and key way shown in Figs. 1 and 2. A leading screw (Fig. 3) is cut on outside of body B, the same pitch as thread to be cut on pipe. C, the barrel, at lower end of which there are three set screws K by which it is fastened to the pipe to be cut. The upper part of the barrel has an annular groove, by means of which it is held in position in the stock A by the plate H. The stock A and the plate H revolve freely on barrel C. The inside of the barrel C is threaded to fit the leading screw on the body B, so that when the stock A carrying the body B revolves on the barrel C, the leading screw draws the body B into the barrel C. D, the four cutters or chasers are let into the guide

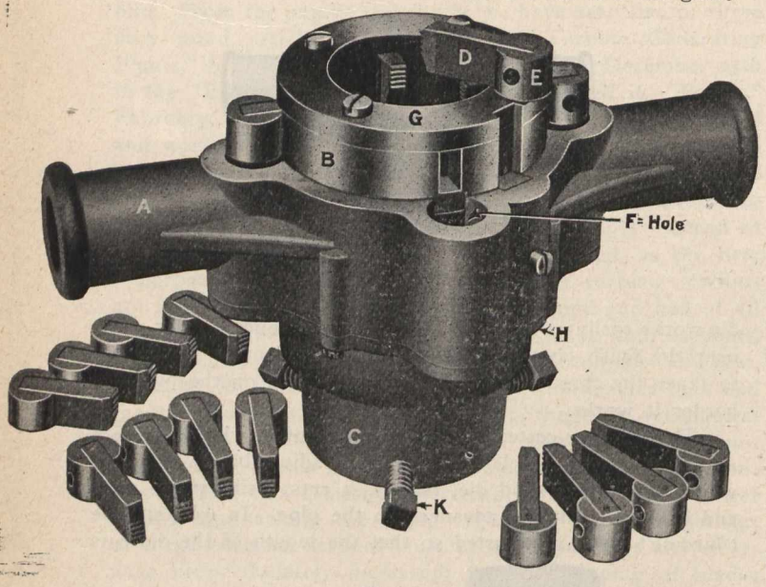


Fig. 3.

blocks E and held with a small screw. E, the cutter guide blocks in which the cutters D are fastened, slide freely in the guide holes F. F, the four guide holes in the stock A are bored at an angle to the axis of the stock, the angle being ⅜-in. to the foot, the standard tape for pipe thread (See Fig. 3.) G, a ring fastened by screws to the top of body B, to hold cutters D in place. H, a plate bored to fit barrel C, and fastened to bottom of stock A by screws, thus holding the barrel C in position. K, the screws to fasten the barrel C to the pipe to be cut. When the cutters are in place, the barrel C is revolved till the body B, carrying the chasers D, is brought to the position shown in Fig. 1. The die is then put on the pipe, the end of the pipe in contact with the mouth of the chasers, the three set screws K are tightened on the pipe and the die revolved to cut the pipe. As the die revolves, the leading screw draws the body B with the chasers D downwards; the chasers following the guide holes F recede radially from the pipe as they advance axially, giving the required taper to the thread. The die is made by A. B. Jardine & Co., Hespeler, Ont.

HEXAGON TURRET LATHES FOR BAR WORK.

The two lathes here described represent two sizes of a type of lathe which is extensively used in the leading workshops in England for the production of such articles as can be made from solid steel bars. They are made by Alfred Herbert, Ltd., of Coventry. They will deal with a very large proportion of work which is usually done upon engine lathes, and at a very large increase of output with consequent economy, the savings being not 10 or 20 per cent., but in many cases as high as 100 per cent., and instances are by no means wanting in which an intelligent operator produces regularly more than four times the amount of work previously turned out by a man of equal skill upon an ordinary engine lathe. The lathes are designed to take full advantage of the recent improvements in steel for cutting tools, thus securing an extra source of economy. High-speed steel-cutters are furnished with every lathe, and the speed and feed tables are calculated on the assumption that high-speed tools only will be employed. The object of the designers has been to produce a standard machine with a standard set of tools suitable for doing any ordinary bar work without requiring an expensive outfit of tools and cutters, and special tools are only supplied where the work is of quite an unusual nature. The smaller of the two machines will deal with work made from bars up to 2 inches in diameter, 30 inches long, and the large machine has a range up to 4½ inches diameter, 42 inches long. Larger diameters of work can, of course, be dealt with when made from forgings, and longer pieces can be produced by doing the work at two operations, reversing it end for end. Another size of machine admits work up to 2½ inches diameter. For such work as piston rods, air pump rods, armature spindles, etc., in which there is a long, plain portion in the centre, with the ends reduced, very considerable savings can be effected with this lathe. Bright drawn bars are used, which are not machined on the plain central portion, but are subsequently finished with this part by grinding. One end is first machined, the work is then reversed, the part machined at the first operation being supported in a steady bush, fitted into the lathe spindle, and the second end finished. For repetition work having a number of diameters on the one piece special box tools are used, enabling all the diameters to be turned at the same time. Bolts, such as locomotive frame bolts, having taper shanks, are produced by a taper turning tool having an adjustable taper bar. The lathes are made either belt driven, as shown in the illustration, or with special motor-driven headstocks.

The No. 2 machine, which is illustrated by Fig. 2, has fifteen spindle speeds, five of which can be obtained at any time without shifting the belt upon the cone pulley. The chuck holds bars full diameter of the hole in the spindle, is opened and closed while the lathe is running, and has sufficient range to grip either bright bars or black bars having considerable variation in diameter and roundness. The chuck is operated by an ingenious arrangement of toggle levers, giving considerably more power with less effort to the workman than on chucks hitherto constructed. The bar is supported at the rear end of the spindle by a universal chuck operated by a hand wheel. The bed has flat sides, and the saddle bearing is of unusual length. The hexagon turret is of broad dimensions, and affords every facility for fixing the large tools, which are used on this type of lathe. The automatic feed to the saddle has three changes by means of a lever, and the automatic stops, which are used for disengaging the feed, are carried upon a hexagon bar along the front of the bed, this so as to rotate with the turret. The gearing is contained in a casing which can be clearly seen in the illustration at the right-hand end of the bed. The advantage of this form of stop motion is that the stops are always in sight, and can easily be adjusted by the workman. The patent turning tools will take any required reduction at one cut, and have been designed to do away with some of the disadvantages of turret lathe tools as commonly made. Their construction can be seen by the illustration, and it will be seen that the cutter holder, which is made from a solid block of steel, can be adjusted with the same facility as a slide rest, being moved along its slide by a knurled knob shown at the top of the holder. The cutter is not an end-cutting, but a side-cutting tool, and moves in a straight line to or from the centre of the work, thus requiring no special adjustment for varying diameters. This is a feature not possessed by any swinging type of tool holder. The complete set of tools consists of three patent turning tools as above described, one cutting off and forming tool holder, one triple tool holder carrying an adjustable stop for the stock, an end rounding tool, and a centring tool, and a self-opening die head which has some novel features. The dies of this die head are produced by milling, and will cut clean threads

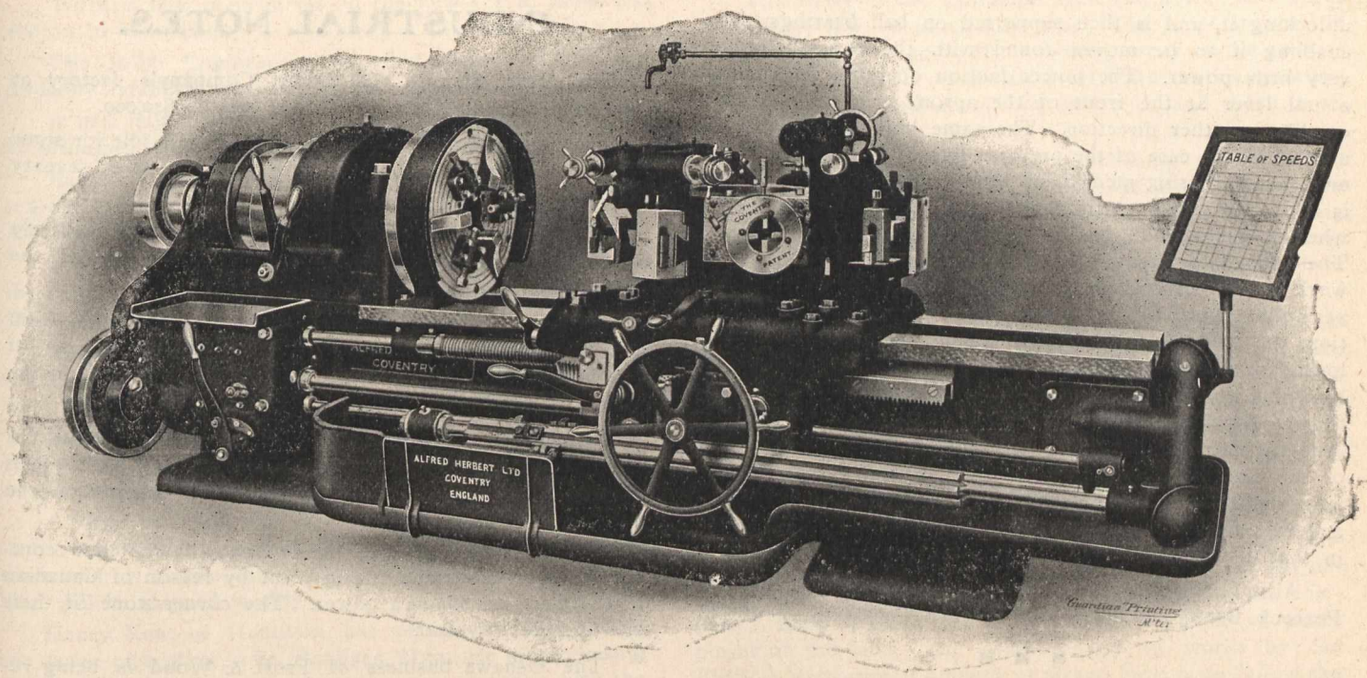


Fig. 2.

of accurate pitch. The special feature of the die head itself is that it is so designed that the stresses produced during the work do not tend to bell mouth the dies, as in the case with most other die heads. The dies bed right along their ends, and any pressure upon them, therefore, tends to bed them more and more firmly in position, and thus to produce parallel threads even on short threads. Another point on this die head which will be appreciated by users is that all the adjustments and changes which are required during the progress of the work, are made without the use of screwdrivers or spanners, suitable handles being provided for each adjustment.

The No. 5 machine, which is illustrated in Figure 5. is very similar in its leading features. It has, however, a number of variations, which are necessitated by its large size. Instead of the chuck used on the smaller lathe, an exceptionally heavy 3 jaw chuck is used, having screwed dogs in between the jaws for obtaining an extra grip upon the bars when doing the heavy work. It has been found in practice that no universal chucks made will stand against the heavy cuts which are frequently taken on big bars, but the chuck in question with the addition of the independent dogs, is found to be perfectly satisfactory. In use, the bar is centred by the jaws, and then firmly gripped by the dogs, which actually do most of the holding, after the bar is once set. The turret is heavy, and in order that it shall rotate easy an arrangement is provided by which it is raised up from its seat by the same lever as is used for

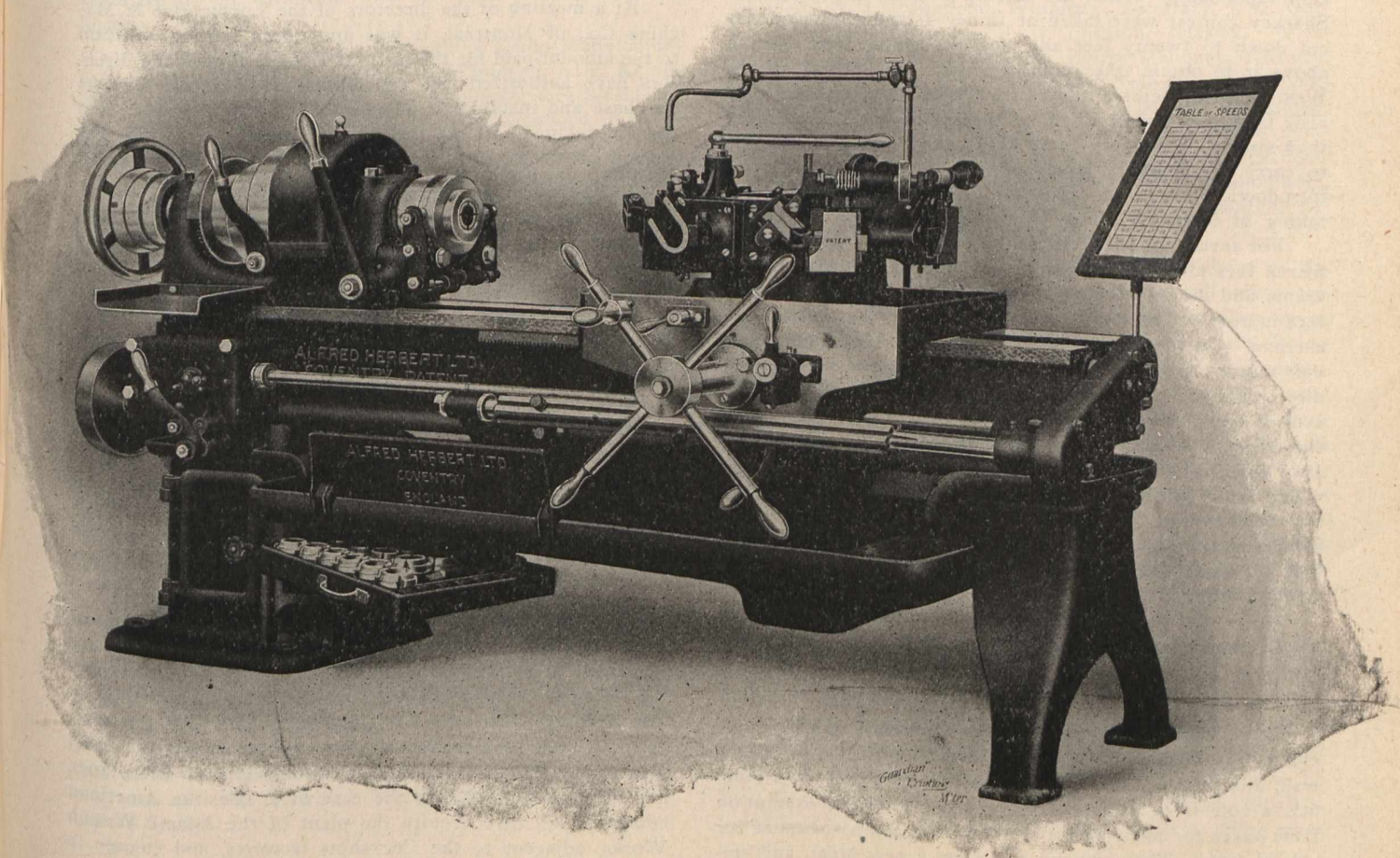


Fig. 5.

unlocking it, and is then supported on ball bearings, thus enabling it to be moved round with the expenditure of very little power. The power motion operated by a horizontal lever at the front of the apron, moves the saddle quickly in either direction. The same kind of stop bar is used as in the case of the previous lathe. The saddle, however, has a chasing mechanism by means of a leader, which is used for screw cutting, and also for guiding the dies when a cut of cuts has to be taken on the same piece. The difficulty with a die head on such work, is to start the work at the correct point. The leader accomplishes this perfectly. The various motions, viz., the quick power motion, the feed motion, and the chasing gear, are all interlocked so it is impossible to have two motions in action at the same time. This lathe is a very highly specialized tool for the heavier kinds of bar work, and is being extensively used by English engineers. Two of these lathes, and one of the smaller lathes have recently been ordered for the new shops of the Canadian Pacific Railway, at Montreal, and will doubtless be objects of much interest to engineers in that district.

Alfred Herbert, Ltd., are represented in Canada by Peacock Bros., engineers, Canada Life Building, Montreal.

AN ADVANCE IN BIOGRAPH PICTURES.

The Westinghouse Companies in the United States and Europe have united in representation at the St. Louis Fair. A unique feature of their exhibit is the moving pictures, shown in their own auditorium on the grounds. These pictures are interesting, both in subject and in the manner in which they were secured. Most of the pictures are interior views in various Westinghouse factories, and show the activity prevailing in the shops, the methods used, and the general appearance of the shops, and they will, no doubt, be greatly appreciated by those unable to visit the shops. Some are outdoor scenes, one film, six minutes long, showing employees coming in procession from the Westinghouse Electric and Manufacturing Co.

The secret of success in obtaining moving pictures of interiors is ascribed to the light of the Cooper-Hewitt mercury vapor lamp. When the moving pictures of the Jeffries-Sharkey contest were taken at Coney Island the ring was cut down to twenty feet and 400 arc lamps were strung above it to obtain the requisite light. In several of the Westinghouse pictures the entire length of a quarter mile aisle is shown, and it is stated that at no time were more than sixty-four mercury vapor tubes used. As it is possible to carry the mercury lamps in front of the camera, their introduction marks an advance, in making possible the taking of interior shifting or panoramic views.

For several of the pictures the camera was placed about fifteen feet above the ground, suspended from a travelling crane, and moved slowly down along the aisle about fifty feet in rear of the lamps, which were also suspended from a crane. On the crane with the lamps was mounted a 500-volt motor connected to a 27-kilowatt generator of 125 volts, direct current. The sixty-four lamp tubes were hung in sets of eight, in eight frames, each about five feet high, three feet wide and four inches deep, and fitted with resistance coils, each board taking 35 amperes at 110 volts, the whole set requiring from 30 to 40 kilowatts, or about one-fifth the energy consumed by the 400 arc lights. The camera shutter was very fast, taking 15 pictures per second, and the light had to be the nearest possible approach to clear sunlight to make successful pictures.

It is said that the Westinghouse pictures, when all shown successively, occupy over two hours in presentation.

The Canadian Colored Cotton Company recently purchased the woolen mills of the Cornwall Mfg. Co., in Cornwall, and propose operating another cotton mill. On Aug. 6th, a vote is to be taken on a by-law granting exemption from taxes for ten years, and a fixed $50,000 assessment for school taxes. The company will erect a new plant, and employ 150 hands with a minimum pay roll of $50,000 a year.

INDUSTRIAL NOTES.

The Metal Shingle and Siding Company's factory at Preston was recently burned with a loss of $40,000.

The Belleville rolling mills, which have lain idle for some years, were started up on July 19th with a staff of seventy men.

The T. Eaton Company, of Toronto, will immediately commence work in Winnipeg on what will be one of the largest retail blocks in Canada.

Hawkesbury has granted twenty years' exemption from taxes and a $5,000 bonus to the W. P. MacNeil Company, of New Glasgow, if they erect a foundry and iron plant in the town.

Winnipeg is introducing a "nickel-in-slot" machine for selling water. Five tokens are sold for a cent, each token setting free three gallons of water when inserted in the meter.

The Niagara Falls Milling Company is the first company to erect a manufacturing plant by reason of Canadian development of Niagara power. The corner-stone of their mill was recently laid.

The Oshawa business of Frost & Wood is being removed to Smith's Falls. Three years ago, the Company bought out the large plant and business of Coulthard, Scott Company at Oshawa, and at that time thought to have had it all located in Smith's Falls within a year or so.

A new company to be known as the Northern Iron and Steel Company, Limited, has been organized with authorized capital of $2,500,000, and will take over the Cramp Steel Co., the affairs of which have for some time been at a standstill. The new company is formed of the common stock holders of the Cramp Co.

At Windsor, the township council recently granted the Canadian Typograph Company ten years' exemption from taxes, provided the company erects a factory, employs twenty men and pays the tax rate on the same amount worth of machinery now owned by the company. The company has been ordered to vacate the premises it now occupies, and has had several offers from other cities.

At a meeting of the directors of the Locomotive & Machine Co., of Montreal, it was announced that in addition to the amount paid for the plant at Longue Pointe, the directors have authorized the expenditure of $300,000, for the purchase and installation of new tools, equipment, etc., and the enlargement of the buildings. Albert J. Pitkin was elected president, to succeed the late Samuel R. Callaway.

J. A. Jamieson, engineer and contractor, of Montreal, is preparing plans for the new elevator for the Dominion Government, to be built at Port Colborne, the Lake Erie entrance to the Welland Canal. The building will be of two million bushels storage capacity, with large unloading and loading capacity, and will be of fire-proof construction throughout, and built on the new piers which were built by the Government inside Port Colborne Harbor.

The Imperial Steel & Wire Company, of Collingwood, at the first meeting of shareholders announced that the buildings were nearing completion, and would be finished by the time the plant arrived, which is expected to be all on hand early in August. The officers elected were: President, J. A. Currie; first vice-president, B. S. Wood; second vice-president, W. J. Lindsay; third vice-president, W. Saddington; secretary-treasurer, D. Donald.

The International Harvester Company is making an effort to secure a location in Brantford, for manufacturing ploughs. It is said, that the company is desirous of securing the new Cockshutt factory, which was erected last year. The buildings alone are worth $300,000. It is said the Harvester people have made an offer of $800,000 for the local plant and a large warehouse at Winnipeg. No acceptance has been announced. In the case of a sale, the American company will also acquire the plant of the Adams Wagon Works, adjacent to the Cockshutt factories, and engage in the manufacture of wagons for the Manitoba trade.

Work is now in progress on the new C.P.R. hotel and station in Winnipeg.

The Robb Engineering Co., Ltd., Amherst, N.S., will probably establish a new boiler-making plant.

A new immigration hall to cost $200,000 will be erected at Winnipeg, close to the new C. P. R. station.

Barnett and Record have a contract for the erection of a grain drying plant for the C.N.R. elevator system at Port Arthur.

It is said that Niagara Falls capitalists are proposing the erection of a machine and foundry works at Chippewa, Ont.

The contract for the new town hall in Athens has been let to Messrs. Dillon & Orr, for $3,900, the building to be completed by October 15th.

Robert Noble, of Norval, is about to erect a grain elevator at Acton. It will be fitted with modern machinery. A gasolene engine will furnish power.

A large lime kiln will be built by a Winnipeg company at Stonewall, Man., having secured the quarries from Fullmore and Higginbotham. Thirty-four cars of stone and lime will be shipped weekly.

Henry New, of Hamilton, has offered to build a $60,000 sewer pipe plant in St. Boniface, Man. He is purchasing seven acres of land, but has not yet come to terms with the council as to exemptions.

W. J. Devlin has organized a company with a capital of $20,000 to erect a foundry and machine shop in North Bay, if the town will give exemption from taxes and free water for a period of ten to twenty years.

Foley Brothers will build a chair factory, 50 x 70 feet, in Fort William. They will employ twenty-five skilled workmen at the start, and they expect the present venture will be the beginning of a very large industry.

It is reported that $50,000 will be expended on changing the Carmelite Monastery at Falls View, Ont., into a palatial and up-to-date hotel, under the management of Mr. Gilmore, of Toronto. The plans are as yet not completed.

An American syndicate is proposing to spend $800,000 in the erection of a beet sugar factory, in the neighborhood of Calgary. Gustavus Theden, of Minneapolis, is the representative of the syndicate who has been investigating the locality.

At a meeting of the directors of the Kemp Manufacturing and Metal Company, Limited, of Winnipeg, A. E. Kemp, M.P., was elected president; W. A. Kemp, vice-president; and John A. E. Wildman and William Crawford, managing directors.

The management of the B. C. Marine Railway Company has taken over the Albion Iron Works, Victoria, for a couple of months, in order to run off some very heavy castings for the Western Fuel Company, Nanaimo. The Albion Works are in the hands of the receiver, and negotiations are pending for a sale. If the deal is carried out, the works will be improved and put on a business basis.

A contract will be executed shortly, under which Armstrong & Company, the English gun and ammunition manufacturers will establish and operate at, or near Ottawa, a cartridge factory with a capacity of 20,000,000 rounds annually, when operated night and day. The company will establish a cordite factory in connection with the cartridge factory. Provision is made in the contract for the establishment of factories of similar capacity in Manitoba and British Columbia whenever required by the Department of Militia.

The annual meeting of the Hudson's Bay Company was held recently in London. A dividend of thirty-five shillings per share was declared. The fur sales showed somewhat unsatisfactory results, there being a general decline in prices, largely due to the Russo-Japan war. During the year the company sold 180,000 acres of farm land, against 368,000 last year, but the actual revenue from sales this year exceeded that of last year. During the period reviewed, 120,000 immigrants arrived, of which nearly 50,000 were from the United States.

The strike at the Dominion Iron and Steel Co.'s works at Sydney, N.S., is practically over. The force at work in the mills has been gradually increased, many of the strikers going back to work. The first steel since the inauguration of the strike was turned out on July 15th, and work in all departments is being resumed.

The Pittsburg Coal Co. is establishing a distributing point for its western trade at Fort William. Thirty-five acres have been secured on No. 2 Island, and a coal handling plant will be erected with storage room for a million tons. A bridge to the mainland will be built, with accommodation for railroad, traffic, and electric car line.

William Buckhoff has been appointed managing director of the Portland Rolling Mills Company, N.B., in place of R. C. Elkin, resigned. Since the reorganization of the Maritime Nail Works, there have been some changes in the company, which is almost identical with that owning the rolling mills, and these changes have further resulted in the reorganization of the rolling mills management.

The Grand Falls Power Company, represented by Barton E. Kingman, of New York, has paid into the New Brunswick provincial treasury $10,000 on account of the deposit required by the Government as evidence of the company's bona fides in the proposed development of water power at the falls. The establishment of works by the Electric Manganese Company at Grand Falls is to follow the water power development.

The Soo industries have been reorganized under the Lake Superior Corporation, and are resuming operations. Cornelius Shields is general manager. C. D. Warren, president, will have control of the policy of the company, which policy will be conservative, only those departments of the plant being opened which can be made to pay. Mr. Warren states that the company has on hand all the old contracts and some new ones, which will be sufficient to operate the plant for years. The Helen Mine is being operated, and all the vessels of the Algoma Central SS. Co. have been placed in commission.

The annual convention of the National Association of Master Plumbers and Steam Fitters was held recently in Toronto. About one hundred delegates from all parts of the Dominion were present. R. Ross, of Toronto, was elected president. The other officers are as follows: Vice-president, A. J. Hammond, Winnipeg; Secretary, J. G. Gordon, Toronto; treasurer, F. G. Johnson, Ottawa. Vice-president for Provinces: Ontario, Henry Mahoney, Toronto; Quebec, W. J. R. Hughes, Montreal; New Brunswick, William Watson, Moncton; Manitoba, J. Mould, Winnipeg; British Columbia, J. Coughlin, Victoria. Legislative committee, F. Bonhomme, Montreal, chairman; apprentice committee, J. Harrison, Toronto, chairman; sanitary committee, William Clarke, Hamilton, chairman. The convention decided to meet at Winnipeg next year.

The Backus syndicate, of Minneapolis, is about to develop water power on Rainy River, which will mean the expenditure of millions of dollars and the building up of three great manufacturing towns, Fort Frances and Rainy River in Ontario, and International Falls in Minnesota. E. W. Backus, one of the chief promoters, says: "The company, which is practically organized, will construct a dam which will cost over half a million, and put up a pulp mill of 325 tons daily capacity, with a paper mill of like amount, and a 3,000-barrel flour mill. A sawmill has just been completed at a cost of $350,000, and timber limits have been secured in Ontario and Minnesota at a cost of $1,000,000 that will last for twenty-five years. The plant will turn out over 70,000,000 feet of lumber a year. Forty million feet will be cut this summer."

The C.P.R. is reported to be making many improvements in its elevator system at Fort William. A new handling house is being built in connection with Elevator E; Elevator A is being remodelled and made faster, the Barnett & Record Co. holding the contract; the power at D is to be more than doubled, and a new cleaning elevator is to be built in place of the present one at Port Arthur, which is being sold to the C.N.R. The company's coal-handling plant

at Fort William, erected last year, is also said to be proving too small, and plans are on foot to extend the docks and greatly increase the capacity of the plant. Pressure is said to be felt especially in regard to hard coal storage, the present 108,000 ton capacity being already too small.

FIRES OF THE MONTH.

The railway depot at Nipissing Junction, near North Bay, has been totally destroyed by fire. It was a joint station, owned by the C.P.R. and G.T.R., and valued at about $3,000.

A disastrous fire, entailing a loss of nearly $75,000, broke out on July 8th in the big dry kiln of the Canadian Pacific Lumber Company at Port Moody, B.C. The entire plant on the north side of the track was burned, as were also two store sheds, the dry kiln and a steamer in course of construction, valued at $6,000.

The explosion of an oil furnace in the hammer shop of the G.T.R. shops at Point St. Charles resulted in a fire that did considerable damage. The spring shop, the blacksmith shop, and the hammer shop of the railway, the centre frame of the blacksmith shop, which is over 100 ft. in length, were completely destroyed. The damage is estimated at $10,000.

On July 15th the plant of the Metal Shingle and Siding Company, of Preston, was totally destroyed, involving a loss of in the neighborhood of $40,000, which loss is pretty well covered by insurance. The metal which covered the burning building confined the fire, otherwise some of the adjoining structures might also have been burned. C. Dolph, manager of the company, will at once build a temporary factory and resume business.

The carriage factory of C. A. Graham & Co., Napanee, was destroyed by fire on July 6th. The loss on the contents is about $5,000 and on the building about $2,000, covered by insurance.

The sash factory of Mason & Edge, Montreal, was damaged by fire on July 8th to the extent of about $10,000.

A boiler explosion demolished Peters & Cairns' sawmill, near Haliburton, killing two men. The plant, valued at $8,000, is a complete wreck.

Jas. B. Atchison's saw and planing mills at Cornwall were burned on June 24th. The loss is estimated at $40,000, with no insurance. The mill was thoroughly up to date, and employed about forty men. On August 6th the town will vote on a by-law authorizing a loan, without interest, to Mr. Atchison to rebuild the factory.

The new mill of the Ontario Corundrum Co., situated about twelve miles from Combermere, was destroyed by fire at a loss of $20,000. It will be rebuilt.

FIRE PREVENTION.

Following is an extract from a circular issued by the British Fire Prevention Committee:

"The increasing loss of life and property owing to children playing with matches and with fire has induced the Executive of the British Fire Prevention Committee to attempt a remedy by impressing upon children the dangers involved thereby, and the Executive consider that warnings embodied in fables or stories, which are read at an age when children's minds are very susceptible to such impressions—fables being generally remembered throughout life—would also act as a deterrent against carelessness with matches and fire for the coming generation. With a view of furthering this end, the British Fire Prevention Committee are enabled through a generous donation from a Canadian member to offer the committee's gold medal and a purse of £20 for the best fable for children calculated to serve as a warning against the danger of playing with matches or fire. The competition for this prize is open to British subjects resident in any part of His Majesty's dominions.

The conditions can be obtained at the committee's offices, 1 Waterloo Place, London, S.W., upon application by letter only, enclosing a stamped addressed envelope."

Mr. Chas. E. Goad, who is the donor of the prize, is a citizen of Toronto. He is a well-known civil engineer, and the founder of the series of insurance surveys which have been in use in Canada for the past thirty years. In 1886 the system was extended to London and the British Isles, and since then to the West Indies, Egypt and South Africa, and recently to Turkey and the East. He was born and educated in London, Eng., and is an Associate in Arts of Oxford University. Devoting himself to engineering, he was engaged on the Northern Railway, 1869-1870; on the construction of the Toronto, Grey and Bruce Railway, 1870-1873, and on the Montreal Northern Col. Railway, from Montreal to Ottawa (now a portion of the C.P.R. system), 1873-1875. In 1876 he was appointed chief engineer of the Halifax and Cape Breton Railway. In 1881 he was admitted a member of the Amer. Soc. C.E., and is a member of the Can. Soc. C.E. Mr. Goad is also a Fellow of the Royal Historical Society, and a Life Fellow of the Imperial Institute. On the organization of the British Fire Prevention Committee, in 1897, he was chosen as a member of the Executive. "Insurance Society," which is now published as the "Insurance and Financial Chronicle," was founded by Mr. Goad in 1881.

Mr. Goad is now on his way home to Toronto from Turkey and Palestine, where he has been engaged on surveys instituted by the Turkish Government.

HOW TO MAKE HARD COPPER CASTINGS.

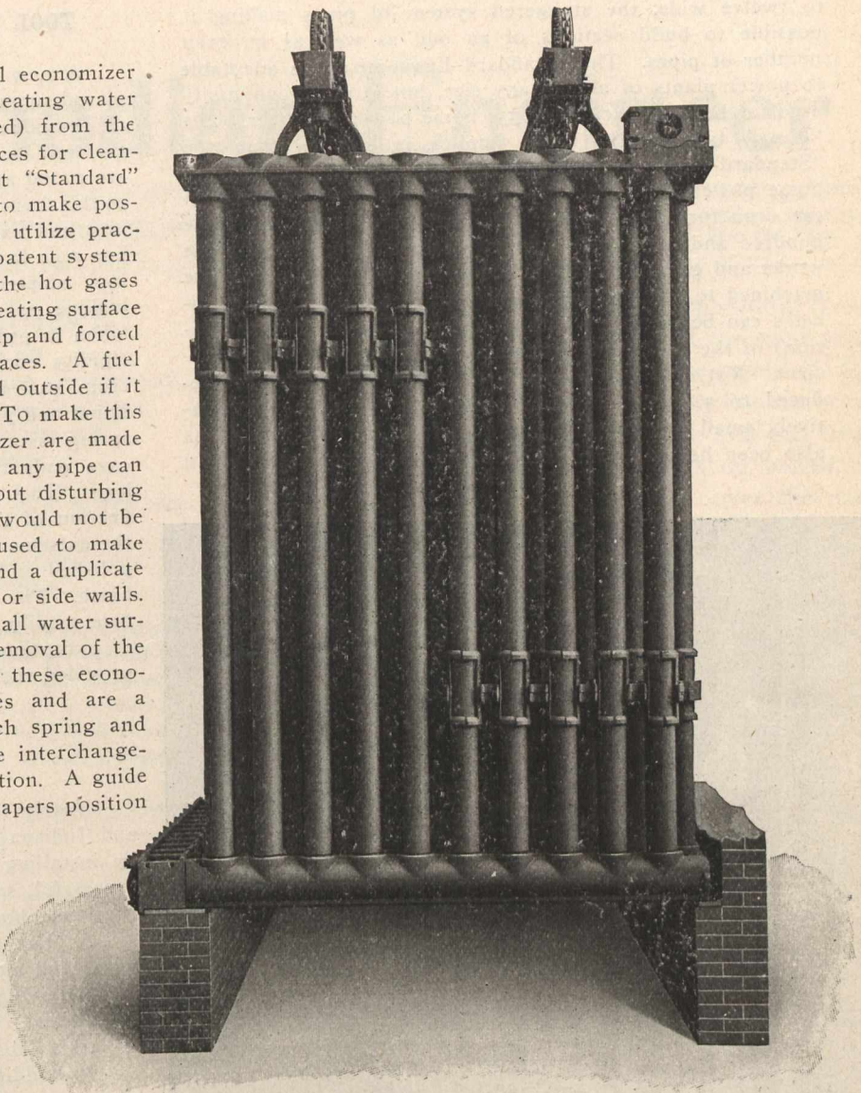
Pure copper, when it is melted and run in the moulds, is invariably porous or spongy. The reason for this phenomenon does not appear to be known, but the metal when in a molten state either absorbs or develops gases which cannot escape from the mass before it solidifies. For this reason copper castings, so called, are always alloys, although the introduced element is usually in a very small proportion. The following methods are recommended for small quantities: To every 25 lbs. of copper, heated to redness in a crucible, add 1½ lbs. potash or soda, 1 lb. alum, ¼ lb. of bone dust, and ¼ lb. of zinc or tin; melt, remove slag, cover with charcoal and run into ingots. This ensures a hard, dense, and tough metal. For small quantities, under 10 lbs., a graphite crucible with an asbestos cover should be used, and about 1-10th per cent. of pure sodium introduced into a cavity in a carbon rod and stirred into the metal, which is covered by a layer of common salt. Copper may be purified by stirring into it a mixture of 3 parts nitre and 2 parts argol. Phosphorus also is used to prevent porosity in copper. A reliable mixture for hammers, soldering-bits, etc., is copper, 100 lbs.; zinc, 1½ lbs.; stick phosphorus, 1½ inches.

The Quebec Steamship Co.'s new steamer Bermudian has been launched at Sunderland, Eng. The Bermudian is a twin screw steel steamer of 5,500 tons register, with speed of 16 knots. Her dimensions are: Length, 425 feet; beam, 50 feet; depth, 36 feet 6 in. She has accommodation for 240 saloon, 32 second-class and 48 third-class passengers. A large cold storage compartment is provided for carriage of green vegetables and meats. The steamer is to be delivered to the owners by November 1st, and will run in the Bermuda service.

—The Standard Tool Company, Cleveland, Ohio, are offering their bit stock drills and wood brace drills, sets 14-A and 13-B, containing drills, ⅛-inch to ⅜-inch by 32nds, in flat leatherette cases. These cases are very convenient to carry in the pocket. The drills fit in holes drilled for each size, which is plainly marked on the box, in gold, beneath the corresponding drill. These compact little cases will also be very useful in the tool chest as they take up but little room, and the drills can always be found clean and ready for use. Where economy in preserving drills is a consideration, these handy sets will appeal as well worth the cost, which is but a little over the price of the drills themselves.

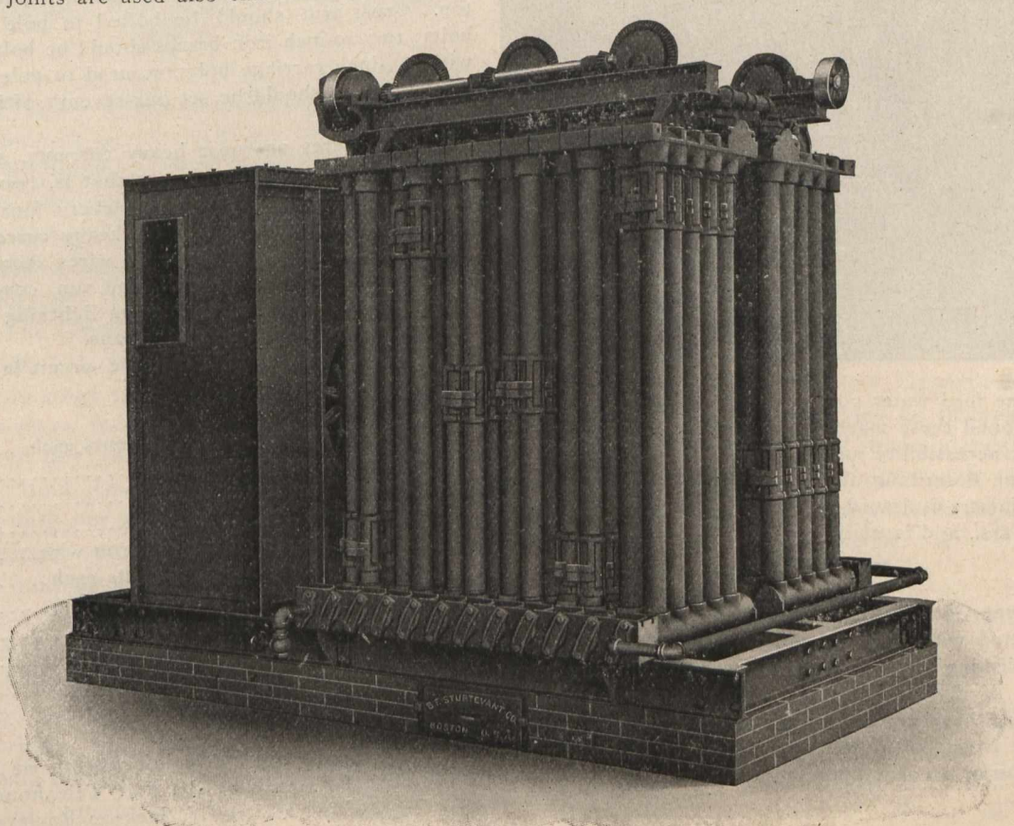
NEW FUEL ECONOMIZER.

The two most essential qualities of a fuel economizer are its ability to utilize most efficiently for heating water a maximum amount of heat (otherwise wasted) from the escaping gases, and the accessibility of all surfaces for cleaning, repairing and renewals. The Sturtevant "Standard" and "Pony" type economizers were designed to make possible these two requisites. These economizers utilize practically all the waste heat from the gases by a patent system of staggered pipes. This system compels all the hot gases to encircle the pipes, increasing the effective heating surface to a maximum. The gases are thus broken up and forced to give up their heat to the surrounding surfaces. A fuel economizer must be accessible both inside and outside if it is to be a valuable adjunct to a power plant. To make this possible the joints of the Sturtevant economizer are made taper metal to metal, and are so designed that any pipe can be taken out and a duplicate substituted without disturbing any other pipe, section or side walls. This would not be possible if packing, cement or rusting were used to make tight joints. Any header can be withdrawn and a duplicate replaced without disturbing any other section or side walls. There are no connection pipes to remove and all water surfaces are rendered accessible by the simple removal of the caps. The taper metal to metal joints make these economizers especially valuable for high pressures and are a marked improvement over gasket joints which spring and leak under such pressures. The scrapers are interchangeable and the driving mechanism positive in action. A guide plate for the scrapers is used to insure the scrapers position and prevents them from sticking and breaking. The driving pulley can be belted up parallel or perpendicular to the length of the economizer.

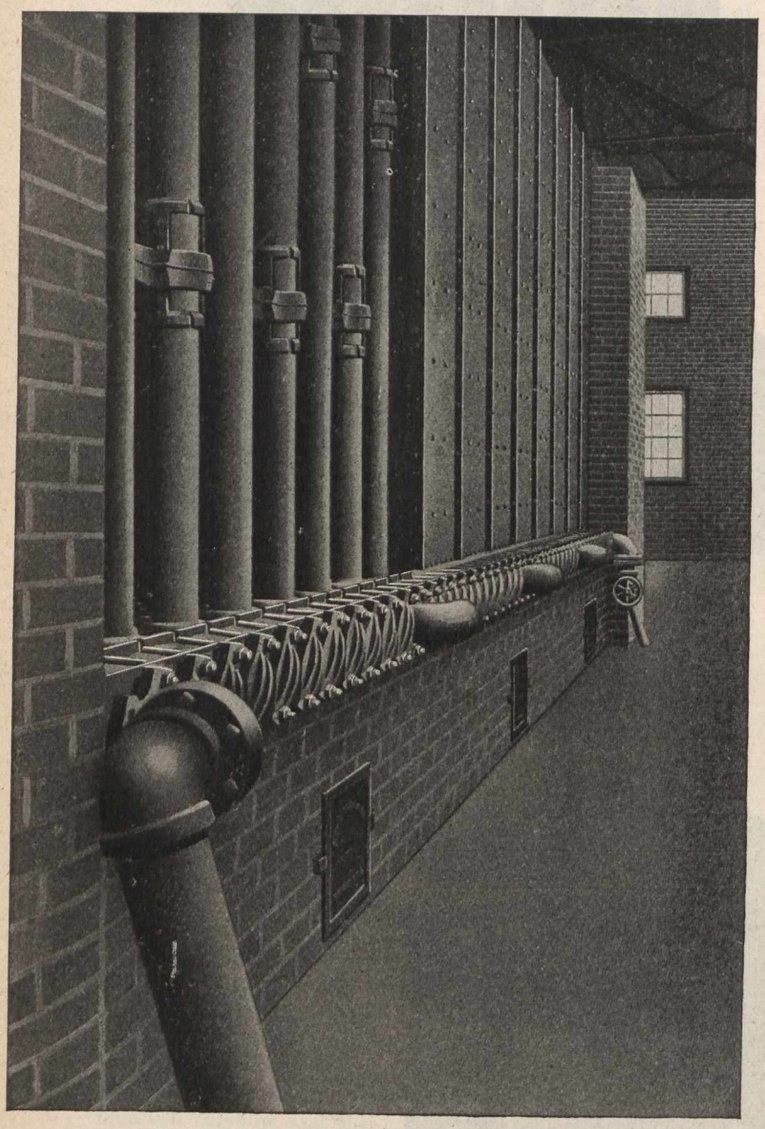


The Sturtevant economizers are not designed for forced circulation, but the connections are made in such a way that the flow of water is started in the right direction, and tends to keep the flow up and down the consecutive sections without making undue work for the pump. The foundations required for these economizers are comparatively simple. This is due to the fact that the machines are so constructed that the parts themselves contain the rigidity that would otherwise be required in the foundations. The fact that taper metal to metal joints are used also eliminates the necessity of building more rigid foundations, as there are no gaskets to loosen and leak if the foundations spring slightly.

Two general types of economizers are made by the B. F. Sturtevant Company, the "Standard" and "Pony". The "Standard" is built in sections containing pipes from four



to twelve wide, the staggered system of pipes making it possible to build sections of an odd as well as an even number of pipes. The "Standard Economizer" is adaptable to power plants of almost any size, but is more commonly used for boiler capacities of 350 horse power and over. The "Pony" type, as its name implies, is smaller than the "Standard" and is more adaptable to power plants of 350 horse power and less. All machines are made of the best cast iron for the purpose. All parts are tested to three hundred and fifty (350) pounds pressure before leaving the works and guaranteed to be sound and tight. All parts are machined to special gauges and kept in stock so that duplicates can be furnished without delay. The several installations of the Sturtevant economizers have proven highly efficient. Not only has it been proved that the gases are reduced to a remarkably low temperature with a comparatively small amount of heating surface, but the water has also been heated to an exceptionally high temperature. In



cases where the feed water contains foreign substances, the owners have found these machines to be especially valuable owing to their accessibility and ease of cleaning. An illustrated catalogue describing the Sturtevant "Standard" and "Pony" economizers is issued by the B. F. Sturtevant Co., Hyde Park, Mass., and is of interest to all steam users.

The Freeman, Hines Co., of London, manufacturers of drain pipes, fitted with a patent double seal joint, are desirous of establishing a Canadian branch. The company has a capital stock of £50,000, and if a branch were established in Canada would have a paid-up capital of £75,000. They would employ from 80 to 90 hands. Parker & Bickford, solicitors, Toronto, are handling the Canadian interests of the firm.

TOOL MAKERS' CALIPERS AND DIVIDERS.

A new line of calipers and dividers has recently been placed upon the market by the Brown & Sharpe Mfg. Co. of Providence, R.I. These show a radical departure from the well known lines of this class of tools, in that the legs are round and not flat, a feature that is readily appreciated, as this form adds materially to the stiffness and gives a neatness and finish that could not otherwise be obtained. This line new in design and intended to meet the demand for a tool adapted to the more delicate work required in tool making as well as to general use. Every care has been taken in proportioning the various parts to insure extreme rigidity combined with lightness and durability. The fulcrum stud is hardened, thus reducing the wear to a minimum and preventing the roughing up of the bearings. The spring is unusually stiff and of improved form with concave ends that fit into grooves milled in the ends of the legs. This construction insures rigidity, prevents side deflection of the legs and gives uniform pressure throughout the extreme movement. The legs are of steel, round, highly polished and every care is taken to have them uniform in finish. The measuring points come together evenly, a feature readily appreciated by every mechanic. The screw is of exceptionally fine pitch for accurate adjustment and is provided with a solid nut and hardened thrush washer.

RURAL TELEPHONES.

Nearly ten years ago the farming sections of Illinois and Indiana began fighting the Bell Telephone monopoly by installing co-operative lines. The plan has been quite successful, so much so that the Bell Company now offer rural telephones at very much reduced rates.

A plant of forty miles in Indiana, with good poles and wires and modern instruments, cost just what was received in dividends in three years, and a sinking fund is now being established. The cost of maintenance is said to be not five dollars a subscriber.

In building a rural telephone line, 25-foot poles, 5 inches at the top, should be placed 130 to 150 feet apart. Cedar poles are best, their life being 12 years. They should be well seasoned and peeled, and will last longer if cut in the fall. The tops of poles should be roofed. For cross-arm cut gain 7 inches from top, and 4¼ inches wide. If two cross-arms are to be put on, cut another gain 18 inches from top. Cross-arm should be bolted to pole with ½ x 7 lag bolts; two 20-inch iron braces should be bolted to cross-arm with 3½-inch carriage bolts, secured to pole with 3-inch lag screws. Pole should be set one-seventh of its length in the ground.

When wires are near heavy currents, such as car and light lines, use metallic circuit; that is, two wires for each line, and transpose the wires at every fourth pole. Never place wires within six feet of heavy currents. Solder all splices in the wire, and make tie wires about 9 inches long.

Secure telephone to wall, and run covered wire from telephone to outside wires, placing lightning fuse block near the 'phone, between line and 'phone.

The cost of one mile metallic circuit in Illinois is estimated as follows:

40 cedar poles, 25 feet, 80 cents each.....	$32 00
80 glass insulators.....	1 20
80 oak brackets.....	1 00
160 spikes	50
2 miles No. 12 galvanized iron wire.....	11 55
Digging forty holes, 15 cents each.....	6 00
Filling 40 holes, 15 cents each.....	6 00
Stringing two miles wire.....	4 00
Peaking poles and nailing brackets.....	1 50
	$63 75

(For part of the above information we are indebted to a neat circular issued by the Farr Telephone and Construction Supply Co., 118-120 W. Jackson Boulevard, Chicago.)