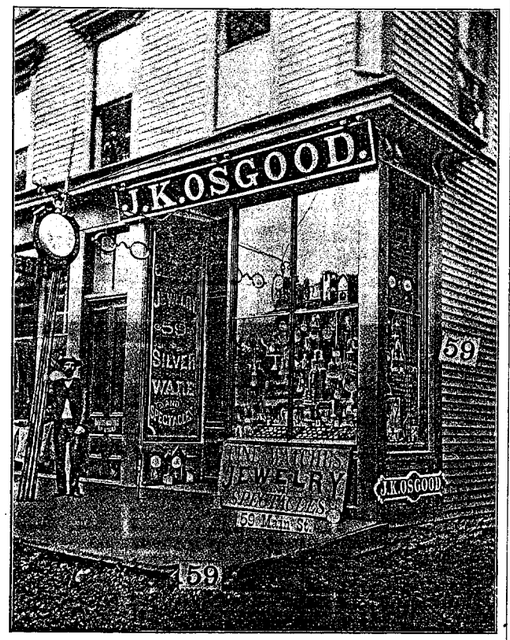
portion the average is three and one-tenth degrees per hundred feet. The total curvature is about 726 degrees, or 54 1-2 degrees per mile of the whole distance.'

A comparison of the above shows that the Fort Fairfield branch has the greatest percentage of curved line and the Brownville-Houlton section the least, and yet while the Houlton-



J. K. OSGOOD'S JEWELRY STORE, MAIN ST.

Caribou section has a considerably greater percentage of curved line than the Brownville-Houlton section; it also has a much smaller amount of curvature per mile and a less average curve per hundred feet. The latter is due to a greater diversity of the physical features of the Brownville-Houlton section, as it contains some of the roughest and also some of the smoothest country on the line.

The country through which this line runs is for the first five miles or so in cleared farming lands, or outlying wood lots, but from this to Stacyville, nearly 50 miles is through wilderness unbroken except by lakes, and without roads other than those used for log hauling and transportation of supplies to lumber camps, with the single exception of the road along the East Branch of the Penobscot, running from Medway to Stacyville. From Stacyville to Houlton the aggregate of cleared land through which the line was run was at the time less than ten miles, but roads are crossed frequently, and farming settlements are found all along on both sides. A rather greater proportion of cleared land is found north of Houlton, but it is rather surprising to one who is accustomed to traveling by the stage road to see so little of the fields from the railroad.

The first growth on the ridges and dry land is nearly all birch, maple and hemlock with occasional spruce and pine, and if the soil be quite rocky, white birch is likely to predominate largely. In low, moist ground, there are spruce, cedar and

at Stacyville, Sherman, Crystal, Island Falls, Oakfield, Smyrna, Houlton, Bridgewater, Blaine and Westfield, the cutting of hard wood for fruit boxes at Stacyville, and for ship timber at Crystal, and the production of telegraph poles, fence posts, railroad ties and all ordinary kinds of lumber and tan bark at nearly every station on the line, to say nothing of shingles, hay, potatoes, starch, &c., &c.

The development of the agricultural resources of course produces a large proportion of the business of the line and is perhaps to be credited with a greater portion of indirect business than some others. The capacity of Aroostook County soil to produce abundantly is proverbial, and has been written about and talked about for many years, and yet has probably not been overstated. It is hard for most farmers to realize that any soil can be inexhaustible, but probably that of Aroostook comes as near to it as possible. Its basis is a calcareous rock, which in almost every field is so near the surface that the disintegrating action of the frost and moisture are forever at work upon it, and the distributing agencies of cultivation are spreading this fertilizer to parts which are not naturally supplied, so that the exhaustion which comes by the production of crops is being replenished by these natural means from a sure supply. This does not, of course, permit heavy farming without the use of fertilizers, but it is a pretty good foundation for a farm after all.

The soil being kept in a favorable condition by the lime from the disintegrated rock, is quicker to respond when fertilizers are applied, than soil that lacks this important element, and the crops are larger than could be produced in other sections of the State even if an equal amount of fertilizer were used.

Farming becomes profitable therefore in Aroostook County, and that

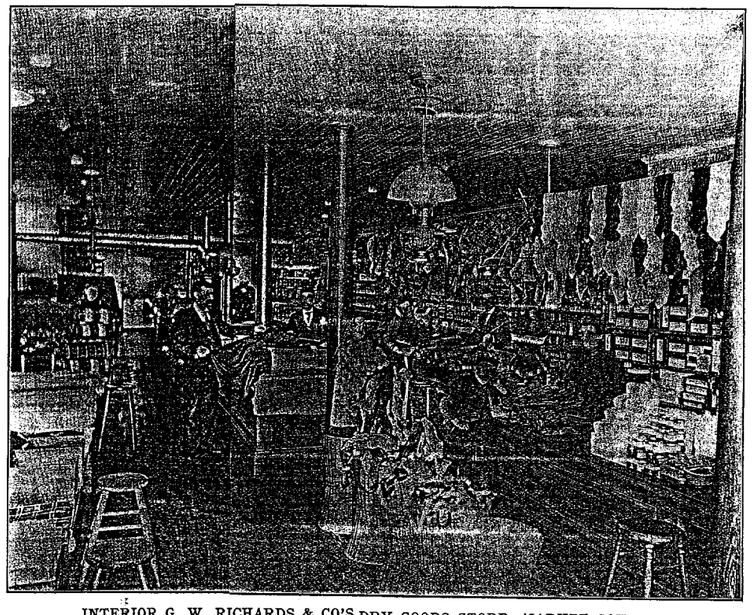
freight stations. At Schoodic, West Seboois, Norcross, Grindstone, Stacyville. Sherman and Crystal are combination passenger and freight stations and at the last two are private warehouses and stock yards. At Island Falls there are separate passenger and freight buildings, stock yard and private warehouses. At Oakfield, Smyrna, New Limerick and Cary's Mills are combination passenger and freight stations with private warehouses. At Houlton there is a large passenger and large freight station, several large private warehouses and a stock yard. At Littleton there is a combination passenger and freight station with private ware house. At Monticello and Bridgewater there are separate passenger and freight buildings and private warehouses. At Robinson's Mills a combination passenger and freight station and private warehouses. At Mars Hill and Blaine separate passenger and freight houses and private warehouses. At Fort Fairfield Junction there is a combined passenger and freight station and private warehouse, and at Easton separate passenger and freight and private warehouses. At Presque Isle, Caribou and Fort Fairfield are large passenger and freight stations and several private warehouses at each place.

Besides sidings at each of these stations there are also sidings at intermediate points such as Drummond's, Ingalls', Stewart's, Perkins', Lincoln's, Millinockett, Buswell's, Summit, Molunkus, Belvidere, Gilpatrick's, Dyer Brook, Spofford's, Timoney's, and granite quarry, south of Houlton, and Wiley road, Sharp's, Harvey's, Milliken's, Church's, Westfield, Maysville and Maplegrove, north of Houlton. At the last three there will probably be stations erected.

Tanks of 60,000 gallons capacity each are located at Brownville, West Seboois, Millinockett, Grindstone, Sherman, Oakfield, Houlton, Bridgewater, Fort Fairfield Junction, Presque Isle, Caribou and Fort Fairfield. All these are supplied by steam pumps except that at

INTERIOR J. C. HARRIGAN'S GROCERY STORE, COURT ST.

Before leaving the subject entirely it may be well to glance back to the time, four years or so ago, when the surveys were being made from Brownville to Houlton, to look into the methods of surveyors' work. The principles are quite simple after the engineer has fixed in his mind the proper thing to be done, or in other words the route which he wants to survey. This he has probably done by going over the ground quickly but carefully noting its characteristics and determining where the trial or preliminary lines had better be run. This is done by first setting up a transit at the starting point, and giving a course for the axemen and chainmen to proceed on. The former cuts out all bushes and trees that would interrupt the sight of the transitman, and the chainmen follow, measuring and driving a stake each 100 feet. The chief of the party determines the length of the courses and the angles. He also varies frequently visited the camps and his



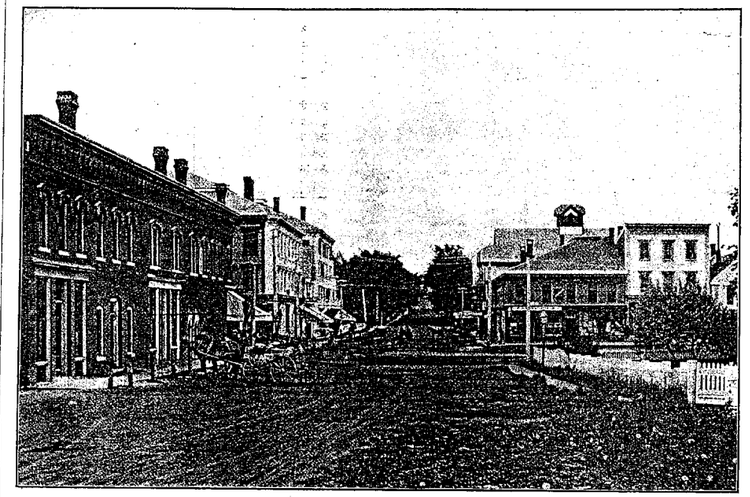
INTERIOR G. W. RICHARDS & CO'S DRY GOODS STORE, MARKET SQUARE.

vey party. A good commissary and cook are very important men, and they can usually keep things running quite smoothly, and allow the Engineers to devote their time solely to the details of their work.

The work in forest country is very greatly facilitated in many ways by the logging and tote roads which abound, but it needs a guide perfectly familiar with them to make the most of them.

Not infrequently, too, it is found that the roads laid out by lumbermen are as nearly as possible in the place where the railroad ought to be. This is not strange, for it is as sure as the attraction of gravitation that where heavy loads are to be hauled the result will be the shortest and easiest road. The latter means the road that is all slightly down hill. Logs are very seldom hauled up hill. Thus in crossing the country from river to river you will in the woods usually find a "main hauling road" running up the valley of a tributary and if it does not meet directly a road on the summit which leads down to the next river, there is almost certain to be branches from the main roads that will connect one with the other.

A very active interest was taken in the progress and details of the surveys by all the members of the Company and especially by the Manager, Mr. Cram, and the President, Mr. Burleigh. The latter gentleman fre-



COURT STREET, LOOKING SOUTH FROM WATER STREET.

Section 7 was under the charge of C. F. K. Dibblee in '92, and Section 3 in '93. Section 8 was in charge of E. H. Drury in '92 and '93. This includes the masonry of the Fish stream, West Branch of Meduxnekeag, Dyer Brook and the East Branch of Mattawamkeag, and the long wooden trestle in Dyer Brook.

Section 9 was in charge of H. Hilliard. It includes the 8 feet arch culvert at Smyrna, and the masonry of Rugged brook in same town. It was built in 1892. Mr. H. also had charge of Section 4 in 1893, which included the masonry of West Branch of Penobscot and the 8 feet arch culvert at Grant brook. In this he was assisted by J. C. Boyd as masonry inspector. In 1894 he had charge of the trestling at 2nd crossing of the Meduxnekeag, Johnson brook and Monticello.

Section 10 was built under C. E. F. Stetson, in '92 and '93. His work included the masonry of 1st crossing of Meduxnekeag, Philpot stream and Titcomb lake bridges. He also had charge of Sections 11 and 12 in 1894. Section 5 was in charge of R. H. Cushing in 1893. His work included the masonry of the East Branch of Penobscot, and Schoodic bridges with a number of smaller ones. He had charge of Section 13 in 1894.

Section 6 was in charge of C. L. B. Miles in 1893 and Section 18 the Fort Fairfield branch in 1894.

SUB-CONTRACTORS OF B. & A. R. R. GRADING.

Fisher & Crandall of Oakfield.
Mr. Bowden, Brewer, Me.
Smith & Steeves, Salisbury, N. B.
McQueen, Stewart & Co., New Brunswick.
John O'Hara, Orono, Me.
Joseph McLaughlin, Cedar Rapids, Iowa.
W. O. Johnson & Sons, Cedar Rapids, Iowa.
A. E. Trites, Salisbury, N. B.
Duffy Brothers, Bangor, Me.
J. A. Wheaton, Salisbury, N. B.
McPhail Brothers, Perth, N. B.
Malcolm & Ross, Edmundston, N. B.
Nelson Heddeen & Co., Ellsworth, Me.
Partridge & Chisholm, New Brunswick.
C. W. Mullen, Oldtown, Me.
W. H. Maxwell, St. Stephen, N. B.
John E. Stewart, Andover, N. B.
Wiley & Libby, Patten, Me.
Whalen & Gallagher, Houlton, Me.
Barney Doohan, Houlton, Me.

MASONRY SUB-CONTRACTORS.

McDonald & Merrill, Bangor, Me.
McKelleher, Bangor, Me.
Joseph McVey, St. Stephen, N. B.
Joseph McLaughlin, Cedar Rapids, Iowa.

Most of the masonry was built by C. P. Treat direct.

Timber trestles and temporary bridges by Simmons & Burpee, Fredericton, N. B.

Stations south of Houlton, and also Littleton and Monticello, by E. T. Hartwell, Oldtown, Me.

Houlton station and buildings by C. A. Swett, Houlton, Me.

Buildings north of Monticello by M. C. Foster & Son, Waterville, Me.

CONSULTING ENGINEER BANGOR AND AROOSTOOK RAILWAY.

Job Abbott, of New York City, Consulting Engineer for the Bangor and Aroostook Railway and Aroostook Construction Company, was born at Andover, Mass., Aug. 23d, 1845; graduated in the English Department, Phillips Academy, Andover, in 1861, and in the Lawrence Scientific School at Harvard College, in 1864.

His first work after leaving school in that position until 1880, when he was elected President and C. E. of the Toronto Bridge Co., Toronto, Ontario, and erected the large bridge works at that point, which were the pioneer works in iron bridge building in Canada. In 1883 he was elected President and C. E. of the Dominion Bridge Co., Limited, of Montreal, P. Q., which absorbed the Toronto Bridge Co. and erected at Lachine, near Montreal, one of the largest, and most completely equipped bridge establishments in the country, embracing many novel features in the use of gas as boiler fuel, distribution of steam to small motors distributed through the works instead of driving from one central plant, and system of overhead roof truss railways for handling material, which has since been incorporated into nearly all the leading bridge shops in this country.

Most of the large bridges erected in Canada during the past ten years have been built at these Lachine works, notably the St. John cantilever bridge, at St. John, N. B.,; St. John river Railway bridge at Fredericton, N. B.; bridge across the Grand Narrows, Cape Breton, together with all the bridging and trestling on the Cape Breton R'y; the Canadian Pacific Railway bridge over the St. Lawrence river at Lachine, P. Q.; the Canada Atlantic Railway bridge over the St. Lawrence river at Coteau, P. Q., and the Canadian Pacific bridge at Sault Ste Marie, Mich.

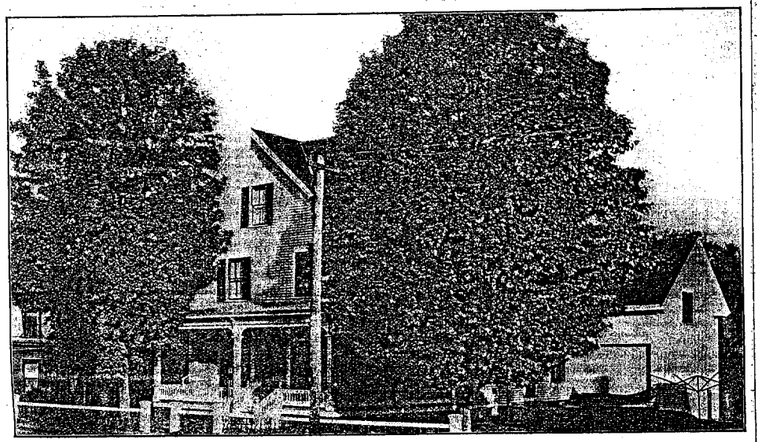
In the fall of 1888 Mr. Abbott was appointed Chief Engineer of the Wheeling Bridge & Terminal R'y, retaining his position as Pres. and C. E. of the Dominion Bridge Co. till June, 1890, when he disposed of all his Canadian interests, and during the years 1889–91 had active charge of the construction of the Ohio river bridge with the 525 foot double track channel span and of three double track tunnels from 700 to 2,500 feet in length and a large amount of other bridge, trestle and masonry work with buildings and equipment representing the expenditure of over $3,000,000.

During the winter of 1891–2 Mr. Abbott met Mr. Cram in connection with the negotiations by the management of the Wheeling Terminal System for securing Mr. Cram's services

the aggregate of cleared land through which the line was run was at the time less than ten miles, but roads are crossed frequently, and farming settlements are found all along on both sides. A rather greater proportion of cleared land is found north of Houlton, but it is rather surprising to one who is accustomed to traveling by the stage road to see so little of the fields from the railroad.

The first growth on the ridges and dry land is nearly all birch, maple and hemlock with occasional spruce and pine, and if the soil be quite rocky, white birch is likely to predominate largely. In low, moist ground, there are spruce, cedar and hackmatack as is usual.

The industries already developed and being developed along the line, and which give business to it, are the slate quarries at Brownville, the cutting of logs between Brownville and Norcross which previously could only

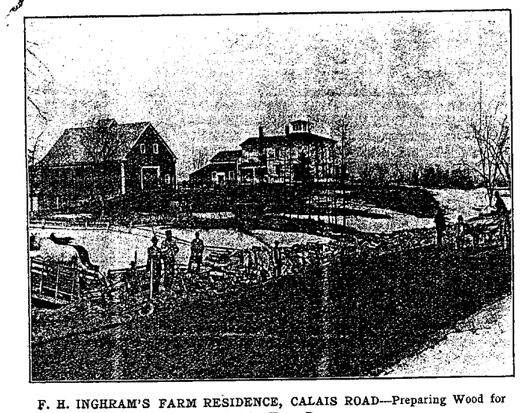


DR. HARRY L. PUTNAM'S RESIDENCE, MILITARY STREET.

be taken out, if at all, by very tedious water courses.

The cutting of spool wood for spool bar mills, and the manufacture of spool bars, between Schoodic and Norcross, the manufacture of last blocks, villages, and by the rapid increase in proper valuations yearly.

We now leave the road itself and glance at the appliances for the accommodation of business. At Brownville there are separate passenger and



F. H. INGHRAM'S FARM RESIDENCE, CALAIS ROAD—Preparing Wood for Market by Horse Power.

exhaustion which comes by the production of crops is being replenished by these natural means from a sure supply. This does not, of course, permit heavy farming without the use of fertilizers, but it is a pretty good foundation for a farm after all.

The soil being kept in a favorable condition by the lime from the disintegrated rock, is quicker to respond when fertilizers are applied, than soil that lacks this important element, and the crops are larger than could be produced in other sections of the State even if an equal amount of fertilizer were used.

Farming becomes profitable therefore in Aroostook County, and that section is to-day in a more satisfactory condition than any other farming section of New England.

That this is true may be seen by the evident thrift and comfort enjoyed by the farmers and the prosperity of the traders of the towns and will probably be stations erected.

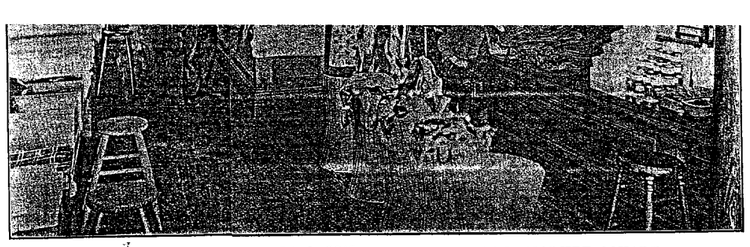
Tanks of 60,000 gallons capacity each are located at Brownville, West Seboois, Millinockett, Grindstone, Sherman, Oakfield, Houlton, Bridgewater, Fort Fairfield Junction, Presque Isle, Caribou and Fort Fairfield. All these are supplied by steam pumps except that at Caribou, which is fed from the town stand pipe.

There is a six stall engine house at Houlton, one of same size at Caribou, and a two stall house at Fort Fairfield and at each of the three places there is a 60 feet steel turn-table. There are coal sheds at Aroostook Junction, Houlton and Fort Fairfield Junction, each with a capacity of about 2,500 tons.

There are also several other smaller buildings in connection with the maintenance of track and for the accommodation of the workmen.

The sixteen new locomotives are as follows: Nos. 9, 10, 11 and 12 are eight wheel engines with 18x24 inch cylinders and 60 inch driving wheels. Nos. 13, 14 and 15 are also eight wheel engines with 16x24 inch cylinders and 68 1-2 inch driving wheels. No. 16 is an eight wheel engine with 16x24 inch cylinders and 60 inch driving wheel. Nos. 17, 18, 19 and 20 are ten wheel engines with 19x26 inch cylinders and 60 inch driving wheels. 21 and 22 are eight wheel engines with 68 1-2 inch driving wheels. 23 and 24 are ten wheel engines with 18x24 inch cylinders and 66 inch driving wheels. These were all built by the Manchester Locomotive Works, of New Hampshire.

For the B. & A. R. R. there have been purchased about 25 new passenger and combination cars, more than 600 new freight cars in addition to the stock of the B. & P. R. R.; four snow plows and four flange cars.



INTERIOR G. W. RICHARDS & CO'S DRY GOODS STORE, MARKET SQUARE.

the length of the courses and the angles to be turned. The leveller, with a levelling instrument and staff, takes a sight at each stake and records in his field book the actual elevation of the ground above an arbitrary plane, which is usually, when obtainable, the sea level, although for his purpose it may be any other. When the level notes are platted on profile paper, they form the most important information which is acquired by the party, if any of it can be considered the most important. When the transit notes are also platted the two plats along with the side notes taken sometimes by the transit or level men, or, much better still, by an engineer detailed for that duty alone and designated the "Topographer," the "chief" has all the information before him that is necessary to determine the location which he will make. After the whole route has been gone over with preliminary survey, the location according to the determinations as above found is made. In this way obstacles found in the preliminary may be avoided, and unnecessary curvature or angles eliminated and what is of still greater importance, the grades can be established to the best rates the country affords.

The practice, however, brings in a good many features that may seem entirely unnecessary but nevertheless these are usually found inseparable from the work. It involves in addition to the responsibility for good work, long tramps at morning and evening to and from work, not over good roads where four miles an hour is a comfortable gait, but through woods and swamps, over windfalls or under them, and at best following the line cut the previous day or two, or some tote or logging road; sleeping under canvas or nothing, occasionally going without a midday lunch when the cookee fails to find the party; frequently when the weather is hot and dry, going for hours without water, sometimes suffering from fires, always worrying lest you may; and if the weather be wet, undergoing a reversal of these hardships along with slow progress in work. Sometimes on a moving day, the party will fail to make connection with camp. As a preventive it is a good plan for the cook to blow a dinner horn at intervals about the time the party may be expected, to guide them to the new camping ground.

Should any or all of the above never happen to a party, yet it is in summer pretty sure to enjoy or otherwise, the persistent sociabilities of myriads of flies and mosquitoes.

Notwithstanding these, there is no real hardship except in very rare conditions and you can seldom find a healthier or happier crew than a surquently visited the camps and his knowledge of the country and of surveying enabled him to direct to good advantage many of the movements of the parties. They were also aided very much by Job Abbott, Esq., of New York, Consulting Engineer, who assisted in placing contracts for work of different kinds, and arranged many of the details of the financial part of the work, and had direct charge of the plans for steel bridge work as well as its construction and erection.

The engineers employed in the surveys were Moses Burpee, Chief Engineer, with parties in charge of C. E. F. Stetson with C. F. K. Dibblee transitman, and Bert. Fletcher and George Thompson, levellers; F. H. Butler with Frank Hull, transitman, and Mark White, leveller; T. C. Burpee with C. L. B. Miles, transitman, and W. B. Goodwin, leveller. On Mr. Butler's being given charge of the office Mr. Warren Nickerson was placed in charge of his party. The surveys were begun June, 1891, and finished including the Van Buren line and the Ashland branch in February, 1892.

Construction was begun with C. P. Treat as Contractor, in June, 1892. His staff includes S. H. Doty, Engineer, J. A. Lane, Manager, Rob't Smith, Assistant Manager and H. C. Decker, Cashier.

The engineers employed on construction were T. C. Burpee, who in 1892 had charge of Section 1, at Brownville, and in '93 Section 2, with the masonry at Pleasant River and C. P. R'y crossing bridges and Mill brook viaduct, also re-running track center line and ballast grades in '93 and '94 and masonry of Aroostook and 2nd crossing Meduxnekeag bridges in the winter of '94–5.

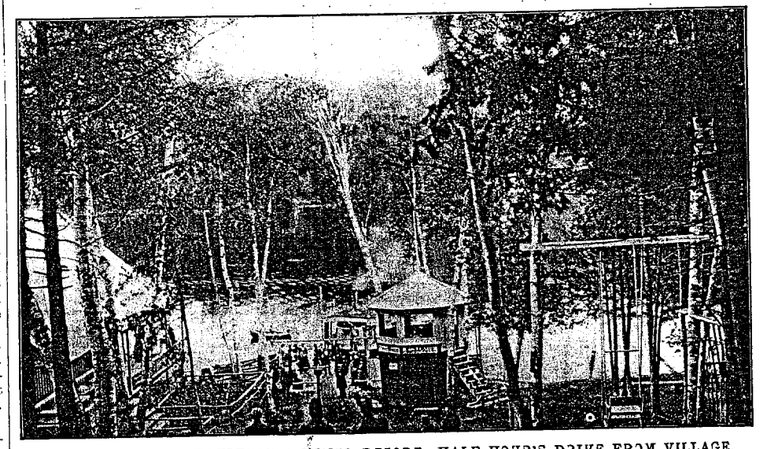
THE EDITOR'S NEPHEW AND NIECE—Children of Mr. and Mrs. A. B. Monson.

1893. His work included the masonry of the East Branch of Penobscot, and Schoodic bridges with a number of smaller ones. He had charge of Section 13 in 1894.

Section 6 was in charge of C. L. B. Miles in 1893 and Section 18 the Fort Fairfield branch in 1894. He also revised the location north of Houlton in 1892.

Section 14 was in charge of J. C. Boyd in 1894. He also ran track centers and grades in the fall of same year.

Section 15 was in charge of Hugh Jardine in 1894. He also engineered



NICKERSON LAKE—HOULTON'S SUMMER RESORT—HALF HOUR'S DRIVE FROM VILLAGE.

the trestle work of the Aroostook bridge.

E. E. Greenwood had charge of Section 16 in 1894. In 1893 he was masonry inspector at East Branch of Mattawamkeag and some other bridges.

W. B. Goodwin had charge of Section 17 between Presque Isle and Caribou.

Geo. E. Thompson, who assisted Mr. Stetson through the season of '91, '92, '93 and '94, was in charge of ballast grades in fall of the latter year. Among the Junior assistants who have rendered valuable services are H. A. Frink, John D. Nelson, C. C. Gibbs, Frank Holmes, Willard Edgerly, P. C. Newbegin, C. Wetmore and Harry Dibblee.

Mr. W. Z. Earle has been Principal Assistant Engineer since April, 1893, and Mr. Butler has had the charge of the draughting room since fall of '91. Luther Gerrish, a man thoroughly competent, and who was perfectly familiar with the country traversed, acted as Guide in the work. He worked on the Short Line in Maine, on the Canadian Pacific, on the Northern Maine, as well as the B. & A., as Guide. He is spoken of in the highest terms by the engineers who were in the surveying party of the Bangor and Aroostook road.

Buildings north of Monticello by M. C. Foster & Son, Waterville, Me.

CONSULTING ENGINEER BANGOR AND AROOSTOOK RAILWAY.

Job Abbott, of New York City, Consulting Engineer for the Bangor and Aroostook Railway and Aroostook Construction Company, was born at Andover, Mass., Aug. 23d, 1845; graduated in the English Department, PhiHips Academy, Andover, in 1861, and in the Lawrence Scientific School at Harvard College, in 1864.

His first work after leaving school was in the drafting rooms of the Manchester Locomotive Works, the builders of the new locomotives on the B. & A. R'y, where he worked in the spring of 1864, going from there as Assistant Engineer on the Glencove branch of the Long Island R'y during the summer of 1864, and then as Assistant Engineer to John B. Jarvis, C. E., P. F. W. & C. R'y, where he was engaged until 1866.

He then opened an office at Canton, O., as Civil and Mining Engineer and Patent Expert, reading law and being admitted to the Ohio bar in 1869. In 1872 he was made Vice President and Chief Engineer of the Wrought Iron Bridge Co., of Canton, O., continuing

June, 1890, when he disposed of all his Canadian interests, and during the years 1889–91 had active charge of the construction of the Ohio river bridge with the 525 foot double track channel span and of three double track tunnels from 700 to 2,500 feet in length and a large amount of other bridge, trestle and masonry work with buildings and equipment representing the expenditure of over $3,000,000.

During the winter of 1891–2 Mr. Abbott met Mr. Cram in connection with the negotiations by the management of the Wheeling Terminal System for securing Mr. Cram's services as General Manager, having known Mr. Cram previously during his general managership of the New Brunswick R'y. Mr. Abbott became interested in looking into the B. & A. R'y scheme, and, being much impressed with its unique and valuable features both from a financial and railway standpoint, made his connection with the enterprise after finding it impossible to secure Mr. Cram's services for the Terminal System. The peculiar feature of the financial plan for building this road was that of subordinating all the interest of the promoters to that of the parties who should advance moneys for its con-

(CONTINUED ON PAGE 7.)

"BROWNIE" INNIS, THE DOG THAT GOES ON ERRANDS.