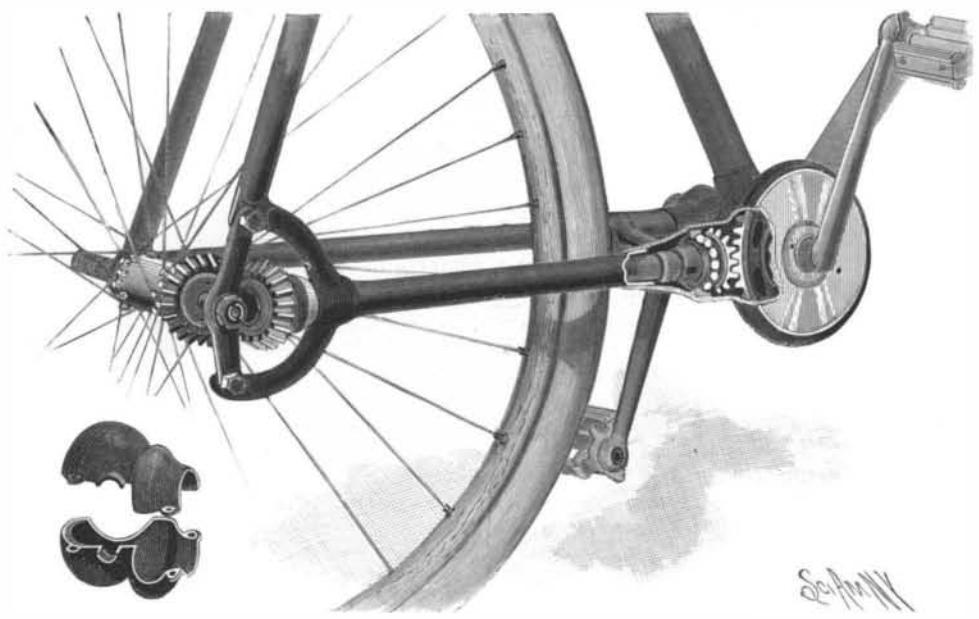
THE COLUMBIA CHAINLESS BICYCLE.

It has been known for many months to those wheelmen who take an interest in the development of the bicycle that the oldest bicycle manufacturing firm in the United States was intending to commit itself to the chainless type of bicycle as its standard model for the year 1898. In the accompanying cuts we are enabled to present to our readers the mechanical details of the driving gear of the Columbia chainless bicycle and of the ingenious machine which has been specially designed for cutting the epicycloidal teeth of the bevel gears.

The intense interest of the riding public in the question of a chainless bicycle and the unquestioned trouble and expense that several leading manufacturers, both in Europe and America, have gone to in the endeavor to build a satisfactory wheel of this type presuppose that there is more or less dissatisfaction with the chain-driven wheel. This is due to the difficulty of keeping the chain clean and to the rapid wear (known as "stretching") which takes place on the chain when it is put to continuous hard work. The stretching results in an alteration of the pitch line and a consequent increase of friction in running. Moreover, there is a measure of objection to the lubricated chain, due to the soiling of the clothes, and, in the case of lady riders, the catching and tearing of the costume.

On the other hand, the chainless wheel is free from these objections. The driving gear is inclosed and is as fully protected from the entrance of foreign substances as the bearings themselves. Hence both the gear and the rider are protected, the one from grit and mud, the other from oil, graphite or other more or less greasy lubricants. Moreover, on the score of appearance, the chainless wheel would naturally, on account of its compact parts, have everything in its favor. The only point upon which both the manufacturer and the public were doubtful was the possibility, first, of cutting bevel gears that would run with the smoothness and silence absolutely necessary for a bicycle; and secondly, whether these gears could be mounted in so light a construction as the frame of a bicycle with sufficient rigidity to insure their being kept in perfect alignment under the strain of daily service.

In our last issue we gave the detailed construction of a chainless machine in which the distortion of the machine was provided for by the interposition of a double jointed shaft for transmitting the motion from one pair of gears to the other. The chainless machine which is herewith shown relies upon the great strength of the material and the special design and rigidity of the frame for keeping the gears in alignment. Smoothness of running is secured by the great care and special tools used in cutting the gears. The lines of the Columbia chainless are similar to those of the latest Columbias of this year. They have a head of medium height and a drop crank hanger. The most apparent change is in the lower right rear fork and stay, which do not intersect at the hub, but are connected by a semi circular arm, which serves to support the lower right stay, in which is carried the countershaft which transfers the motion from the crank axle driving gear to the gear on the rear hub. The end of the rear axle is held in a swinging arm which is bolted to the ends of the semicircular bridge aforementioned. The driving wheel is attached to the front axle in the position occupied by the sprocket in the chain-driven wheel, and this wheel and the adjacent gear wheel on the countershaft are completely inclosed in the crank hanger, which has its right rear fork lug sufficiently enlarged to take the countershaft gear. The tube of the rear right fork is brazed into this lug and into the semicircular bridge before mentioned, and this arrangement, combined with the bracing effect of the swinging arm, presents an exceptionally rigid support for the countershaft and is well calculated to hold the crank axle, the countershaft and the rear hub in their proper relative alignment. The countershaft turns in two sets of ball bearings, one at each end, which are located immediately to the rear of each bevel gear. The bearings of the crank hanger and the rear hub are of the usual Columbia type.



THE DRIVING GEAR OF THE COLUMBIA CHAINLESS BICYCLE.

The confidence of the Pope Manufacturing Company in the possibilities of the chainless wheel was based largely upon the excellent performance of the old League chainless, which made its appearance in Hartford some four years ago. The failure of this wheel as a commercial venture was not due to the driving mechanism, but to the secondary features of weight, great width of tread and ungainly appearance. The smooth running of the gear and its endurance were remarkable, and a local rider is credited with having made on one of them sixty consecutive centuries in sixty consecutive days. The Pope Manufacturing Company secured possession of the patents.

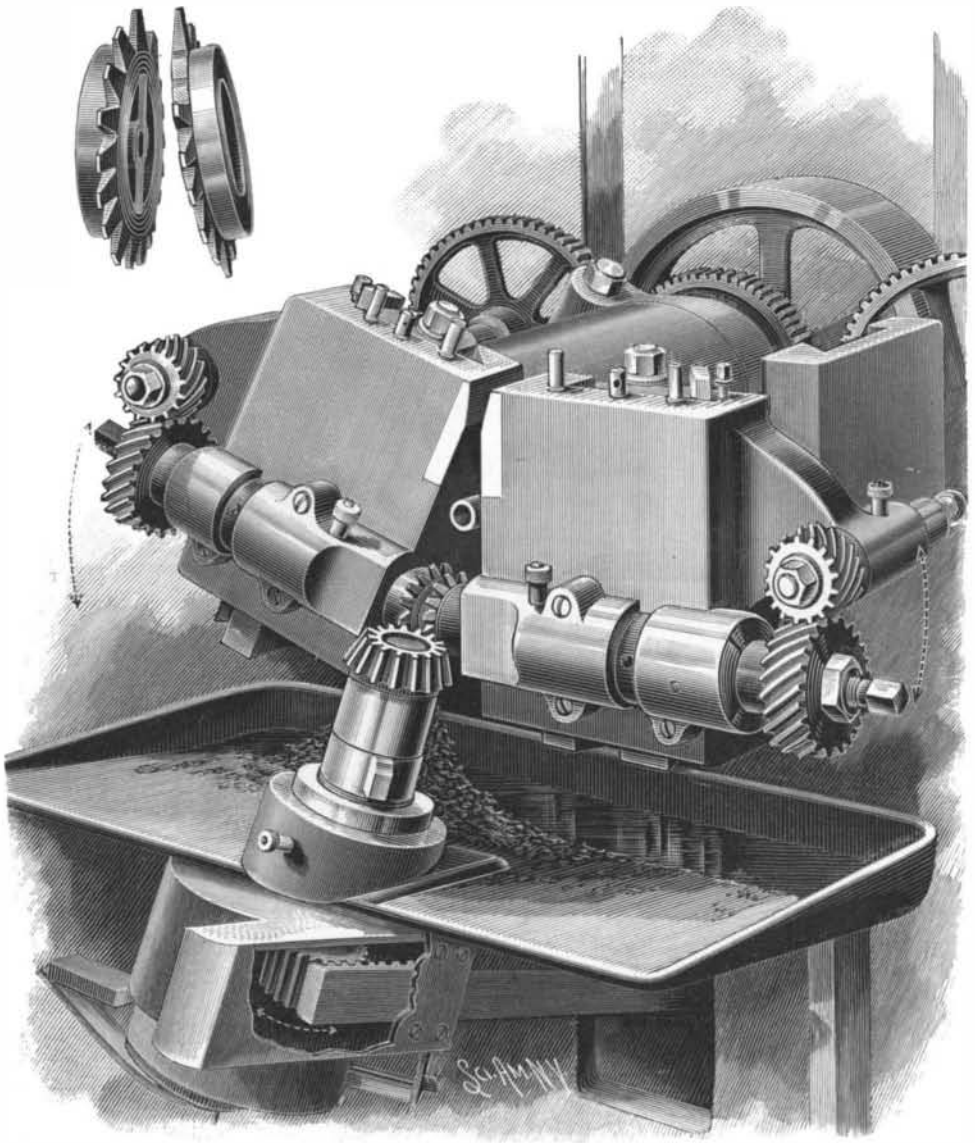
They have built many successive models of which the one now put upon the market has given complete satisfaction. We have spoken of the necessity of rigid framing and perfect alignment, but of even greater importance is the necessity of cutting bevel gears that should be mechanically accurate if they are to work with the perfect silence and smoothness that characterize a first-class bicycle. The difficulty in cutting bevel gears in a machine arises from the fact that the teeth for their full depth have to be evenly tapered throughout their length. The old machine-cut teeth were tapered at the point but not at the root, and it was only after a certain amount of wear that really good results were obtained in a new set of bevel gears.

The Pope Manufacturing Company have had designed an ingenious machine with various compound motions by which it is possible to cut gears whose teeth shall have at every point a mathematically exact taper. So perfect is the result that when two such gears are run in contact, the friction is practically as small as after several months of wear. The gear cutter is also capable of giving the proper increase in the lateral diameter of the teeth from the face toward the axis and producing the epicycloidal curve which enables the surfaces to meet and separate as the gear rotates with a rolling instead of a sliding contact.

The accompanying illustration shows the gear cutting machine. The two cutters rotate in two rocking heads, which are set at the proper angle corresponding to the desired taper of the teeth, and the gear is fastened to the inclined arbor of the milling machine. The arbor, with the attached gear, has a slight oscillating movement, which serves in combination with the action of the revolving cutters to give the proper cycloidal curve to the teeth. This motion is secured by means of a rack and pinion located beneath the table. The two rocking heads which hold the cutters are rigidly attached to a common shaft, the center of which coincides with the apex of the gear cone. It is the combination of these two motions, namely, the rocking of the gear cutters and the oscillation of the gear, that produces the mathematically perfect cycloidal teeth of these bevel gears. In order to cover the whole length of the tooth, the cutters are given a vertical travel of the required length. The cutting face of the cutters is given a fifteen degree slope.

The stock is cut out of the gear blanks on one of the old type of gear cutters, and only the shaping and finishing are done on the new machine.

The machines are completely automatic. After the gear has been inserted the cutting of the teeth goes on automatically until the whole set has been completed.



MACHINE FOR CUTTING THE BEVEL GEARS.

The Cyrus W. Field Collection.

The National Museum at Washington has just received a collection which possesses extreme interest to electrical people, says The Electrical World. It comprises the private papers of Mr. Cyrus W. Field relative to the laying of the Atlantic cable, cable dispatches first sent, objects with which he worked out the idea of laying the cable, and many other things of interest pertaining to the project. The correspondence and autograph copies of telegrams sent by Mr. Field to the President of the United States and other prominent persons are included. The globe, constructed by a London manufacturer, on which Mr. Field traced the course for the cable to be laid from Newfoundland to Ireland, forms an interesting object of the collection. It is about a foot and a half in diameter, on a stand, with a magnetic compass beneath, and shows many signs of hard usage. The journal kept by Mr. Field, and notes of deep sea soundings set down by him and officers of the Great Eastern, by which the cable was laid, are part of the collection. Mr. Field's private library, with all the literature relating to the work of laying the cable, forms another part. There are also copies of medals presented to him by Congress and the French government, engrossed resolutions passed by bodies in this country and in Europe, a cane from the wood of the Great Eastern, etc. Among the relics are cases containing sections of the first Atlantic cable. The collection was the property of Mrs. Isabella Field Judson, of Dobbs Ferry, N. Y., who is a daughter of Mr. Field. The donation was secured by Professor Watkins from Mrs. Judson.

Notes and Recipes.

Waterproofing Leather.—A process for waterproofing leather has been patented in Germany. Dissolve beeswax in benzine to saturation and heat the solution in a water bath, then add about one-tenth of spermaceti in a melted state. For use warm the mass again in a water bath and apply warm with a brush or a pencil to the dry leather, which has likewise been suitably warmed.

New Mode of Manufacturing Collodion.—According to a patented process by Schlumberger, it consists in dissolving the guncotton in ethyl alcohol or methyl alcohol, to which a small quantity of one of the following substances is added: Levulose acetic acid, oxalic acid, citric acid, tartaric acid, lactic acid, hydrochloric acid, or their alkali salts or earth alkali salts or zinc salts soluble in alcohol, aldehydes of acetic acid and benzoic acid or their acetates, ether of alcohol, with the above named acids; picric acid and salicylic acid, nitro-benzine, chinoline, pyridine, urea, glycocol.

Fast Black Stamping Ink.—According to the Pharm. Zentrh. a fast black stamping color for linen, cotton and woolen fabrics is prepared as follows: Dissolve five parts of nitrate of silver in ten parts of spirits of salammoniac, and prepare another solution of five parts gum and seven parts soda in twelve parts water. Mix both solutions and heat carefully in a porcelain dish on the water bath until the liquid has become black. This will render the stamped signs visible at once, but the fastness will ensue in the fiber only during the drying. This argentic stamping color is absolutely fast to washing and likewise to light.

New Bismuth Blue.—If a chloride of bismuth solution is mixed with ferrocyanide of potassium, a yellow precipitate separates out, as reported by Fr. Faktor, in the Ph. Post, which receives a light green color on shaking or boiling. After the addition of a few drops of nitric acid or potassium chlorate, the color changes into dark green and later into dark blue. With this, vapors escape which betray hydrocyanic acid by the odor. In order to be certain that the bismuth blue is a product of the air oxidation, the color was produced in the absence of oxygen. The result was a green precipitate, which only changed its color when it came into contact with the air, taking on the blue color first on the surface and later more and more in the interior. As an oxidizing medium, chlorate potassium or nitric acid has been found valuable. The blue precipitate produced in this manner was filtered, washed with hydrochloric acid and dried at 100° C. The dried precipitate forms a powder which assumes a darker color on heating. Bismuth blue is insoluble in cold or boiling water, likewise in cold and diluted hydrochloric acid; in strong hydrochloric acid it dissolves with a green color. In cold sulphuric acid it is insoluble, but is soluble in the concentrated acid. Nitric acid does not dissolve it. Diluted potash or soda lye changes the blue color into green. Ammonia changes the color into green-blue, if boiled long. In a cold soda solution the color does not change. When boiled, bismuth blue passes into solution.—N. Erf. u. Erf.

Testing Vaseline.—According to the Pharm. Zeitung, proceed as follows: 2 grammes vaseline dissolved in 5 grammes chloroform and agitated diligently with 10 c. cm. water are not changed by a drop of phenolphtalein solution, and show a strong red color upon the addition of a drop of one-tenth normal potash lye; whereby, on the one hand, the absence of the alkali is proved, and on the other hand, absolute freedom from acid; 10 grammes vaseline are heated with 10 grammes water in a water bath one-quarter hour. After cooling, the decanted water, which reacts entirely neutral and gives no reaction on sulphuric acid with chloride of barium, is evaporated on a watch glass, whereupon only an imponderable residuum remains. Vaseline is made brown by sulphuric acid (98 per cent) in the water bath. If a weaker acid (73 per cent) is used, no influence is shown and the acid is only changed if the preparation is imperfectly purified (technical vaseline). The best way to proceed is as follows: 10 grammes vaseline are melted in a water bath and 50 drops of a 73 per cent sulphuric acid added. Now heat one-quarter hour in the water bath while stirring. In the case of pure vaseline the sulphuric acid is hardly changed. No dark ring forms where the two zones touch when the acid is allowed to settle, nor is the acid dyed brown. Five grammes vaseline are heated with 5 grammes carbonate of soda and 25 grammes water in the water bath one-half hour, while stirring. After cooling, the aqueous solution is decanted and supersaturated with diluted hydrochloric acid. The liquid remains clear, if neither resins nor fatty acids were present.

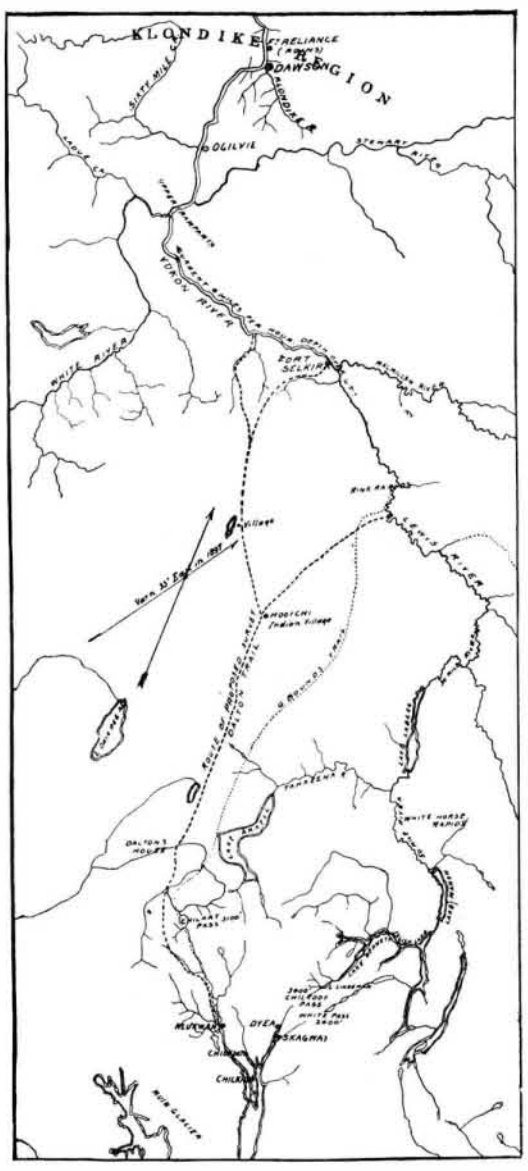
Dedication of the Yerkes Observatory.

The Yerkes Observatory at Williams Bay, Wis., was dedicated on October 21, when Mr. Yerkes gave to President W. R. Harper the keys of the building which contained the great telescope. The ceremonies covered two hours. Mr. Yerkes himself presented the gift, which is valued at $350,000. Prof. James E. Keeler made the speech which marked the opening of the dedication exercises. Seven hundred persons were present. Prof. Barnard announced, on October 20, that he had already discovered a third companion star to Vega with the great instrument. He found it because the Yerkes telescope was more searching than any other in the world.

SURVEYING FOR A RAILROAD TO THE YUKON VALLEY.

The most formidable and best equipped expedition, both in numbers and material, having for its object the exploration and development of the country at the headwaters of the Yukon River, sailed from Puget Sound on the 15th of the present month (October). The company originated in Boston and included men from San Francisco and Seattle, and is backed by a capital of $200,000, all paid. The expedition embarked in a large steamer, chartered for the occasion, and is composed of two divisions, one, comprising 45 men, including prospectors and others, for development and exploration; and another, composed of engineers and subordinates, for reconnoitering and preliminary survey of a railroad route from the mouth of Chilkat Inlet to Fort Selkirk, on the Yukon.

Fort Selkirk is the objective point of both divisions, where the headquarters will be permanently established. The surveying party will locate, as a starting point, at Klukwan, an Indian village of 300 inhabitants, at the head of Chilkat Inlet and mouth of Chilkat River. The equipment of the expedition is most complete, and includes 150 head of cattle, 200 horses, feed for stock and 200 tons of stores, and every known appliance for protection against the extreme cold of the region has been provided. The programme of the prospecting party after disembarking at Chilkat Inlet, where deep water navigation exists, is to follow the general route of the Dalton trail, as direct as possible, to Fort Selkirk, which will be reached, if the plans do not miscarry, early in January. Here headquarters will be established, and in the early spring prospecting parties will be sent out for a thorough exploration of the country. It is believed that gold will be found all over the Yukon Valley and in the beds of the various streams emptying into that river.



PROPOSED RAILWAY TO THE KLONDIKE.

Ten skilled prospectors from California accompany the party and will head the divisions into which it will be divided in the early spring. Each man will be provided with all the implements, stores, etc., necessary for rapid and effective work, and the whole will be under the command of Capt. J. E. Smith, of San Francisco, a successful and experienced miner and prospector. The rank and file are men who are financially interested in its success and have each enlisted for a term of two years The entire plan is somewhat on the co-operative principle, each one sharing in the good fortune or otherwise of the undertaking in certain proportion. The distance from Chilkat Inlet to Fort Selkirk is estimated at 300 miles. The country has been traversed by Indians and white hunters for years, and from the best information available it is not thought that the impediments that are likely to be met will prove insurmountable.

The party making the reconnaissance for a practicable railway route will make its western headquarters at the head of Chilkat Inlet. It consists of Col. W. C. Alberger, of San Francisco, who ranks high as an engineer and in the military profession, as consulting engineer; Walter J. Fogelstrom, who achieved distinction in Peru and as an Arctic explorer, as chief engineer; and A. W. Blake and A. B. Shearer as assistants. In addition twenty chain and transit men besides workers constitute the party. A force of natives will also be engaged as packers. It is the purpose of the engineers to survey all the known passes affording entrance into the Yukon Valley. The general features of the Chilkat, Chilkoot, White and other less known passes are fairly well understood, but accurate detail is wanting.

It is the confident expectation of the party to discover a route into the Yukon Valley in every respect easier and more direct with less elevation than those now known. White explorers assert confidently that to the north of Chilkat Pass (and the Indians say the same) the range of mountains that skirt the whole western border of Alaska, from Mount St. Elias southward, sinks to a very low elevation, estimated at 2,000 feet, somewhere about this locality.

An explorer who traveled through this part of the country in the last few months mapped out a route crossing two low ranges which, in his opinion, offered a perfectly feasible route for a railroad. For a hundred miles along the Dalton trail the land is heavily timbered, and spruce with trunks three feet in diameter are numerous. The grade is nowhere abrupt, and as far as known offers only ordinary difficulties to the engineer.

Over the range and continuing through to Fort Selkirk the country is known to be level and easily traversed. In summer it is said to be not unlike any prairie country in appearance, abounding in succulent grasses and rich in luxuriant flora. The distance to Fort Selkirk is about 300 miles. Diversions from the Dalton trail are contemplated by the engineers, one from Hootchi, an Indian village about 100 miles from Fort Selkirk, to the Lewis River, down the Nordenskiold Valley, striking the Lewis above Five Finger Rapids at the head of navigation, and another route following the Selwyn River to its junction with the Yukon, 50 miles below Fort Selkirk, avoiding rapids that are dangerous at low water.

The engineers propose to reach Fort Selkirk as soon as possible, and believe that in three months' time they will be able to return with sufficient data to accurately determine the feasibility of a railroad to the Yukon. They will be provided with all the apparatus for observing the meteorological conditions of the region and gathering much other valuable information.

The Death of George M. Pullman.

Mr. George M. Pullman, the well known car manufacturer, died at his home in Chicago on October 19 of heart trouble. George Mortimer Pullman, who in the old and new world is honored for the invention of the sleeping car, which has greatly reduced the inevitable weariness and discomfort of railroad travel, was born in 1831 at Brocton, N. Y., where his father was a good mechanic. The boy received a common school education and at fourteen entered a country store, which he left at the age of seventeen to learn the trade of cabinet making. The widening of the Erie Canal soon afterward gave him the opportunity of securing the appointment of contractor for moving buildings along the canal. In 1859 he removed to Chicago and engaged in the raising of buildings, at which he was very successful. Not long afterward Mr. Pullman fitted up two cars belonging to the Chicago and Alton Railroad with sleeping berths. These cars were liked and admired, but Mr. Pullman did not push the manufacture of sleeping cars until 1863, and then he turned out his first regular sleeping car, which was named the "Pioneer." The car cost him $18,000. In 1867 the Pullman Palace Car Company was formed, with prominent railroads interested in it. Its original capital was $1,000,000, and is now increased to $36,000,000, so that to-day it is one of the most powerful corporations of its kind in the world. Mr. Pullman will always be remembered by the step that he took when he planned to build a city on the dreary prairie outside of Chicago. This was one of the most daring ventures which an American has ever undertaken. The city was built at an expense of $8,000,000 and has now 12,000 inhabitants, who are comfortably housed in sanitary houses, and there is not a saloon, jail or pauper in the territory. It has proved a wonderful financial success. Mr. Pullman was a typical American inventor, possessing, as he did, the acute perception of what the public needed, and he had an inventive mind which grasped everything that served his purpose.