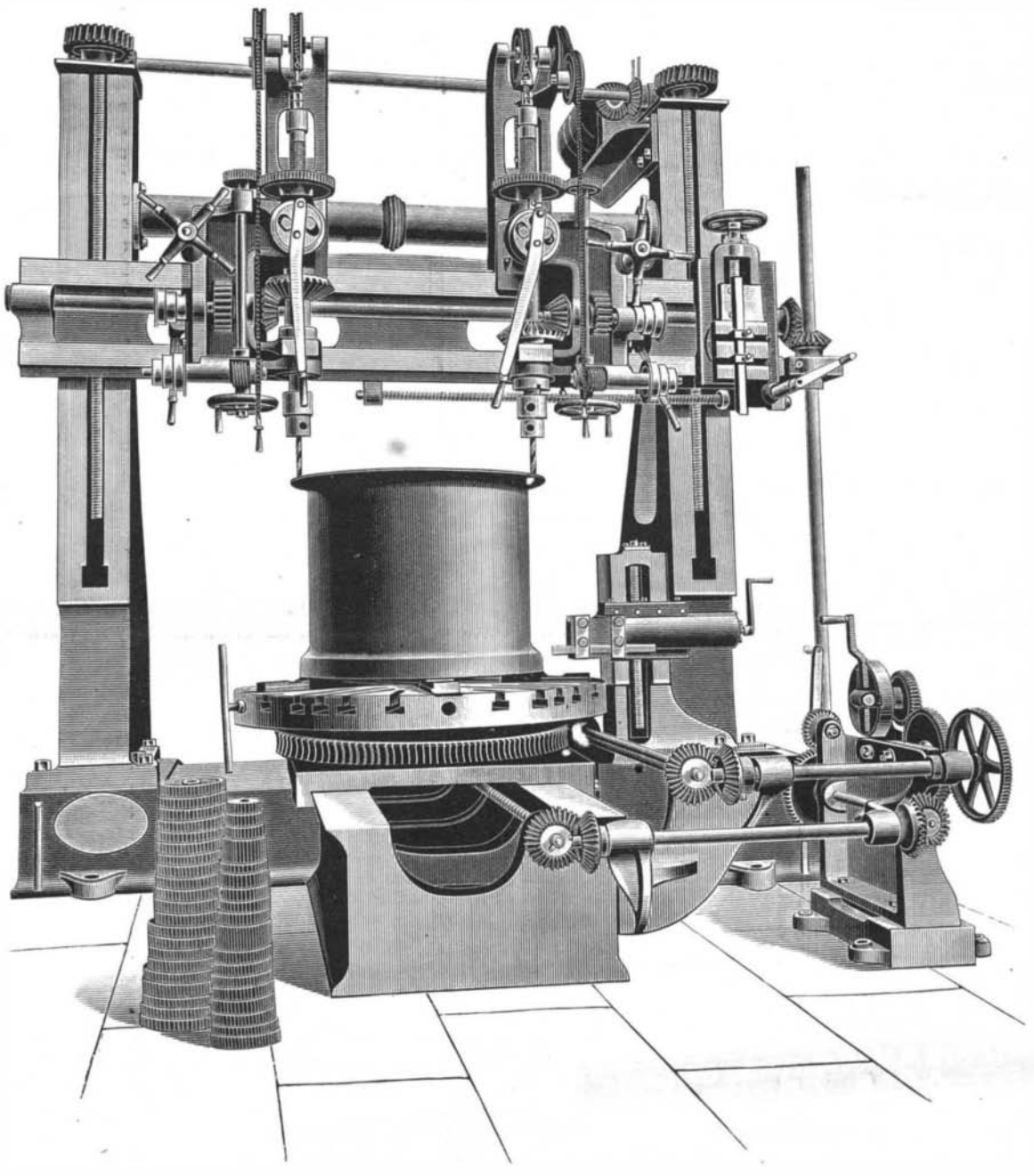
BOILER-END TURNING, BORING, AND DRILLING MACHINE.

The illustration represents a special tool constructed by Rushworth & Company, Sowerby Bridge, England, for turning, boring, and drilling. The machine will admit a job 8 feet 2 inches in height, while the height from the top of chuck to the under side of the spindles when the cross slide is in the top position is 6 feet 4 inches. The main bed and the two uprights or standards are very strong and massive, being of box section, with box bars, etc. The cross slide is arranged to rise and fall by worm gearing worked from belt-driven pulleys at the top of the right hand standard in the illustration. On this cross slide are two heads for drilling, arranged to rise and fall by power by worm gear, as shown on the illustration, to move by rack and pinion and by hand wheel, etc. The spindles are of steel, 3 inches diameter and 10 inches range, and are perfectly balanced, so that when the nuts, which are of gun metal, in two parts, are released by the lever in front, the spindles return quickly. The minimum distance from center to center of holes which can be bored is 10½ inches. The drills can be run separately or together, a steel clutch being arranged on each head carrying the drills, and worked by levers, as shown. On the same cross slide is arranged a tool box or turning rest for turning the edge of the flanged flue or the top. There is also a turning rest at the bottom, so that the top and bottom can be turned at the same time. The chuck which grips the flues is 5 feet in diameter, with five jaws, all connected with steel bevel wheels, so that the flue ring always remains concentric. The largest diameter the jaws will grip is 4 feet 9 inches, the smallest 2 feet. On the under side of this chuck is a worm wheel for driving the chuck for turning, and for dividing or pitching out the holes from 20 to 140 by the dividing arrangement shown on the side. The dividing handle, the handle for moving the chuck longitudinally, and the handle for the turning rest are close together, so that the workman has not to move. The strong slide which carries the chuck is arranged to move through the uprights by a screw having a range of 6 feet, 3 feet on each side of drills, so that tube holes in the portable boiler fire boxes can be bored in any part.

The miter and bevel gear are all of steel. The driving mechanism is all at the back on the right hand side of the machine, out of the way of the working. The weight is 17 tons. For the above and for our engraving we are indebted to *Engineering*.



IMPROVED MACHINE FOR BORING, TURNING, AND DRILLING.

Surgery in China.

In the *China Medical Missionary Journal*, published in Shanghai, Dr. J. C. Thomson has a very interesting article on surgery in China. Referring to the great fortitude of the Chinaman under surgical operations, Dr. Thomson says that even now it is frequently put to the test in circumstances where surgeons in isolated situations are compelled to undertake operations unaided, or where otherwise the employment of chloroform is contraindicated, and in the minor operations of surgery. When so tested the Chinaman will endure without flinching a degree of pain that, to the more highly-developed nervous system of the westerner would be well-nigh impossible. His experience also goes to confirm the general testimony regarding the remarkable recuperative power of the Chinese after surgical injuries. The reasons he suggests are the simpler feeding habits of the Chinese, the rare occurrence of albuminuria or glycosuria, and their equable mental constitution. With reference to the Chinese surgeons who have already been trained by the medical missionaries, Dr. Thomson says his observation of these men leads him to the conviction that the Chinese are fitted to take at least a respectable place as surgeons, and that a time is coming when Chinese surgery will give favorable results.

Erratic Blocks.

In a recent number of the *Fortnightly*, Dr. Alfred R. Wallace, writing on the ice age and its works, says: "The enormous block near St. Petersburg, and the mass of Swedish red granite found at Furstenwalde, southeast of Berlin, are given as instances of erratic blocks. The erratic blocks from the higher Alps, which are found on the flanks of the Jura Mountains, are also shown to point conclusively to the former existence of glaciers stretching down the Rhone Valley as far as the Jura. The distribution of erratics in North America is next considered, and the crowning example of bowlder transportation is said to be afforded by 'the blocks of light gray gneiss discovered by Prof. Hitchcock on the summit of Mount Washington, over 6,000 feet above sea level, and identified with Bethlehem gneiss, whose nearest outcrop is at Jefferson, several miles to the northwest, and 3,000 or 4,000 feet lower than Mount Washington.'" After giving instances in Great Britain and Scandinavia of bowlders carried above their source, Dr. Wallace says: "We thus find clear and absolute demonstration of glacier ice moving up hill and dragging with it rocks from lower levels to elevations varying from 200 to 2,700 feet above their origin. In Switzerland we have proof of the same general fact in the terminal moraine of the northern branch of the Rhone glacier being about 200 feet higher than the Lake of Geneva, with very much higher intervening ground. As it is universally admitted that the glacier of the Rhone did extend to beyond Soleure, all the *a priori* objections to the various cases of rocks carried much higher than their origin, in America, the British Isles, and Scandinavia, fall to the ground. We must either deny the existence of the ice sheet in the great Swiss valley, and find some other means of accounting for the traveled blocks on the Jura between Geneva and Soleure, or admit that the lower strata of a great glacier *can* travel up hill and over hill and valley, and that the ice sheets of the British Isles, of Scandinavia and of North America merely exhibit the very same characteristics as those of Switzerland, but sometimes on a larger scale. We may not yet be able to explain fully how it thus moves, or what slope of the upper surface is required in order that the bottom of the ice may move up a given ascent, but the fact of such motion cannot any longer be denied."

American Pineapples.

According to a recent article in the *Youth's Companion*, a group of five small keys lying off the extreme southern point of Florida is now the principal pineapple producing district of the world. Less than seven hundred acres altogether are here devoted to the cultivation of this fruit, but from this area 4,500,000 pineapples have been shipped to New York in a single year. The plant is propagated from suckers or slips, and 10,000 may be planted to the acre, two-thirds of which will bear fruit, so that if a dollar a dozen could be realized, the crop would be a lucrative one. The most common variety is the Scarlet or Spanish, the one ordinarily seen in the North, on account of its good shipping qualities. Next in abundance is the Sugar-loaf, a sweeter fruit, but more delicate, and, therefore, more difficult to handle. Egyptian Queen, a large juicy fruit, is harder still to transport, and best of all is the Puerto Rico, a fruit weighing ten pounds, but so mellow that it is rarely seen more than two hundred miles from the place where it is grown. A field of pineapples, raised from slips, will bear for five years, though after the second year the yield steadily decreases. A field planted with suckers only yields for two years. After this the land seems exhausted, and its strength must be renewed with fertilizers, and by growing other crops, while plantations of pineapples are made in another field. The fruit which is allowed to ripen in the field is altogether superior in melting quality, rich flavor and wholesomeness to the hard, sour and indigestible specimens which must be picked while they are solid and green, so that they can endure a journey to Northern cities.

An Electrical Fog Signal.

An electrical method of fog signaling has been invented by an electrician in the employ of the Great Northern Railway Company. A wire is laid by means of a pipe from the signal box to the various signals, at which points brushes composed of copper wire project some four or five inches above the side of the rail nearest the signal. To the foot plate of the engine a similar brush is fixed, connecting with an indicator and bell on the engine. If the signal be at danger, the two brushes coming in contact has the effect of ringing the bell, and indicating to the driver by means of a miniature signal fixed on his engine that the line is not clear. The arrangement can be switched off in fine weather. The process, which is in working order at Wood Green, has proved so satisfactory that the company have decided to fit up the suburban lines, and eventually the whole of their system.

The Largest Range Light in the World.

The Lighthouse Board will shortly begin the construction of the largest range light in the world on the present site of the Waackaack Beacon, just east of Sandy Hook. The lens, which was on exhibition at the Columbian Exposition, is six feet high and three feet in diameter. The lens cost $12,000, and is of the best French make. When placed on exhibition a small light was put behind it, but the rays were so powerful that it had to be removed and shown without a light. The light from the new beacon will be equal to that of a search light. The light is a very important one, as it is used by mariners entering the main ship channel after rounding Sandy Hook bound in.

Chloralamid.

In an address by Prof. Penzoldt, of Erlangen, delivered before the German Scientists' Congress at Nuremberg recently, on "The Influence of Drugs on Digestion," the speaker stated that "chloralamid was one of the few narcotic drugs which accelerated digestion, and in a pronounced degree."

Professor Lanier's Process of Photographing upon the Wood Block.

This excellent process was described in its earlier form in *Photographic Work* for June 17 of 1892, but since then Professor Lanier has considerably improved the method, and he has instructed many operators, so that the method is in use by several of the large wood engraving establishments of the Continent. He publishes details in the *Correspondenz*, and says that instead of the zinc white previously recommended, he has made experiments with white lead and barytes white (sulphate of barium), but for most uses he still prefers the zinc white, especially if the firm and solid kind can be obtained. It must be admitted that white lead is better than zinc white in the matter of covering power, but such emulsions as are prepared to contain it are less sensitive than those made with the zinc, this being, perhaps, an indication that the white lead reacts with the nitrate of silver. Barytes white, on the other hand, though of less covering power than the lead compound, has no reaction with the silver compounds. Excellent results are obtained with the following formula:

A.	Gelatine solution, 1 to 20	5 cubic cents.
	Barytes white	6 grammes.
	Chloride of ammonium solution, 1 to 10	1·5 cubic cents.
B.	Citric acid solution, 1 to 2	3 cubic cents.
	Alcohol	2 " "
	Nitrate of silver solution, 1 to 5	6 to 8 " "

The two solutions are mixed in a small mortar, B being added drop by drop. Another preparation containing albumen and zinc white, and one which adheres well to the block, is made up as follows:

Four stock solutions are made thus:

A.—Gelatine, 1 gramme in warm water..... 30 cubic cents.
B.—Chloride of ammonium, 10 grammes in water.....100 c. c.
C.—Nitrate of silver, 10 grammes in water..... 50 grammes.
D.—Citric acid, 10 grammes in water..... 20 c. c.

The following are ground together in a mortar:

Zinc white	6 grammes.
B	1·5 cubic cents.
A	2 " "
Albumen	4 " "

We now mix in a test tube:

C	7 to 8 cubic cents.
D	3 " "

This argentic solution is added drop by drop to the contents of the mortar, the whole being well mixed during each addition. The wood block is now coated with a thin rubber solution made by dissolving:

India rubber	3 grammes.
In chloroform	100 cubic cents.

This requires dilution with several times its volume of benzole before use. The rubber film being dry, and the edges of the block rubbed with fat to prevent the absorption of water, all is ready for the application of the sensitive coating, which operation must be done in a dully lighted place. A hog hair brush is used to apply the emulsion in the first place, when it is spread with a flat camel's hair brush (or the cheap substitute commonly sold), after which the coating—which should be but thin—is smoothed with a badger softening brush. The coating soon dries, and the blocks may be kept for several days. The printing may occupy from seven to thirty minutes. After exposure, a solution of chloride of sodium is flowed over the film to convert the silver nitrate into chloride. To fix, the exposed surface is turned downward in a flat dish containing a little hyposulphite of soda, the block being rested on small pieces of glass—about five minutes being required. In the same way (by turning down) it is immersed in a saturated solution of chrome alum, and then washed in several waters. When dry, it may once more be flowed with the dilute rubber solution. For line subjects an emulsion less rich in silver is to be preferred.

Macassar Oil.

BY ROBERT GLENK.

The true macassar oil, prepared from the seeds of Schleichera Trijuga, *Willd.*, one of the East Indian Sapindaceæ, has a great reputation in its native country as a stimulating application to promote the growth of the hair and also as a remedy in skin diseases, especially eczema.

It is obtained either by expression or by boiling the bruised seeds in water and skimming off the oil which rises to the surface.

It has in former years been imported into this country; latterly, however, a product under the name of macassar oil, but which in reality was mainly composed of cocoanut oil in which the blossoms of Ylang Ylang, Canaga odorata, or of the false Ylang Ylang, Michelia champaca, N. O. Magnoliaceæ, have been digested, began to make its appearance on the market and took the place of the former. Now, mostly domestic oils under the same name, suitably perfumed and frequently colored red with alkanet, have entirely replaced the natural product.

The writer recently received a small sample of the true macassar oil from Mirzapoor, Hindostan. At the ordinary temperature it is semi-solid, of a yellowish-white appearance, and has a weak odor of bitter almonds. It is said to contain hydrocyanic acid, and it is not unlikely that in the stimulating properties of this constituent the cause of the ascribed beneficial action of the oil may reside.

It has a mildly acrid taste, probably due to partial rancidity, and an acid reaction to litmus paper. It is completely liquefied at 82° F. (28° C.) and congeals near 50° F. (10° C.). The oil is readily saponified by sodium hydrate even at a low temperature, the soap being white and hard. With nitrous acid it assumes an orange-red color and becomes viscid, but does not seem to solidify. On adding 5 drops of the oil to 20 drops of concentrated sulphuric acid, it acquires a reddish-brown color. The oil is freely soluble in chloroform, ether, bisulphide of carbon, benzol, benzine, and the fixed and volatile oils, but only slightly soluble in alcohol. It has a specific gravity of 0·942.

An excellent formula for preparing a so-called macassar oil for the hair, and which has given great satisfaction to those who have used it, is the following:

Castor oil	16 f. oz.
Alcohol	3 f. oz.
Oil of nutmeg	30 m.
Oil of rosemary	10 m.
Oil of sweet marjoram	10 m.
Oil of neroli	10 m.
Oil of rose	20 m.
Tincture of musk	1 f. 3
Alkanet	sufficient to color.

—*Amer. Jour. of Pharmacy.*

Petroleum as Fuel.

On the Great Eastern Railway this fuel has been used in many of the engines for a considerable time, and the present extraordinary high price of coal is, we understand, leading to a considerable extension of the system. We note also that experiments in this direction are being made in some of the Lancashire cotton mills, on account of the difficulty of securing solid fuel, and hence a few words on the subject at the present juncture may not be out of place.

The question as to whether it is more economical to burn petroleum than coal turns entirely on the relative cost of the two fuels, coupled with the comparison of their respective evaporative values. For the purpose of firing steam boilers the use of the higher qualities of petroleum, such as that used for illuminating purposes, is altogether out of the question on the score of price, as the process of rectification to which the crude petroleum is subject very much enhances the cost. It should, therefore, be understood that in speaking of petroleum as a fuel it is really the residual or waste products from the mineral oil industry, as well as liquid hydrocarbons recovered from coal-fed blast furnaces, coke ovens, and gas producers, known as blast furnace oil, creosote, and common tar oils, that are referred to. One of the simplest methods of burning these refuse oils in steam boilers is that adopted by Messrs. Nobel at their well known oil works at Baku. It consists of a series of shallow trough burners, arranged in a series one above the other, thus exposing a large surface. As the oil trickles down it flows from one stage to the other, and is thus vaporized and completely consumed by the time it reaches the lower tier of troughs. With this system of trough burners, it is stated, a practical evaporation of 14½ pounds of water per pound of petroleum refuse has been obtained, as compared with an evaporation of 7 to 8 pounds of water per pound of coal under similar conditions. The more common and practical method of burning these oils, however, is to spray them into the furnace tube or combustion chamber with a jet of superheated steam by an injector, which draws in the air supply at the same time.* The oil is thus heated and broken up into fine spray and thoroughly vaporized in the furnace, where it is also mixed with the air which supplies the oxygen for combustion. It is essential for the complete combustion of this class of fuel that the furnace tube should be lined, to some extent, with fire clay or brickwork, to act as an accumulator of heat and maintain a constantly higher temperature, and to this end the fire bars are usually covered with a layer of fire brick and fuel kept in a state of incandescence. In connection with the spraying of petroleum it may be stated that experience has shown superheated steam to be much more efficient than wet steam. The point is one which is sometimes overlooked. The most extensive adoption of the use of petroleum in this country has been on the Great Eastern Railway, where, as we have already stated, it has been in operation for some considerable time. The fuel generally used in these locomotive boilers consists of a mixture of two parts of coal tar with one of green oil, just to thin it down. The cost of this mixture twelve months ago was given as about 25s. ($5.50) per ton; what the precise price is at this moment we cannot say, as quotations have been somewhat disturbed by the present state of the coal market. If we credit the evaporative duty of the liquid fuel referred to as being equivalent to double that of coal—which, we may remark, is an outside estimate—then a steam user cannot afford to use it so long as the price of coal is less than half that of the liquid fuel. This is a basis of comparison that is invariable, and which any steam user can apply for himself, to meet the circumstances of his own particular case.—*The Practical Engineer.*

* For illustrations of petroleum spray injectors as used at the Columbian Exposition, see SCIENTIFIC AMERICAN of July 8, 1893.

Action of Light upon Dyed Colors.

The committee of the British Association of which Professor Hummel is secretary has undertaken a very laborious and tedious task, to determine by experiment the relative fastness to light of patterns of silk, cotton, and wool, dyed with 2 per cent of the artificial commercial coloring matters, and to the same depth with natural coloring matters. They were exposed in the country at Adel, five miles north of Leeds, in Mr. James A. Hirst's garden, the patterns being pinned on deal boards, covered with white calico, and fixed vertically in glazed wooden cases, the air, after being filtered through cotton wool, circulating freely. Every pattern was divided into six pieces. One of these was protected, the others exposed for different periods. The shortest "fading" period was about three weeks, May and June, 1892; at the end of the first period the standards were removed and new standards again exposed with the piece until fading to the same extent had resulted. The fourth and fifth series were exposed for a length of two or three fading periods, so that the fifth set might have an exposure of one year. This method was adopted in order to be able to expose in different years, as it is impossible to deal with a whole set simultaneously. The eosins and allied colors are the most fugitive; the methoxy group increases the fastness of the paler tint surviving after a few weeks. All basic reds, including magentas, are fugitive; the azo reds, and, more still, the secondary diazo compounds, are fast. Madder, cochineal, kermes, alizarin, and some chromotropes, 2 R and 2 B, belong to the exceedingly limited number of very fast reds; the Congo reds have not been tried yet.

Stereoscopic Photographs.

There is no limit to the vertical dimensions to which a stereoscopic pair of prints may be trimmed, should the subject demand it, such subject being a tall building, ravine, or other object of like nature. But, as regards lateral dimensions, the case is altogether different, and it is in this respect where so many blunders are made.

We take it for granted that every photographer at least desires that his friends shall be able to see and examine his binocular efforts without trouble or pain—nay, more, that they shall do so with such readiness as to be insensible of putting forth any effort in doing so; and the object of this brief article is to urge in bringing about such a state of matters, more especially as this is so easy of attainment.

The condition requisite for the average human eyes seeing the stereoscopic effect of a picture, and without any straining of the muscles of the eyes, is merely to see that the distance of an object *in the foreground* of one picture from the same object in the duplicate does not exceed three inches. It would still be better were this distance an eighth to a quarter of an inch less.

To those who possess slides of valuable or interesting subjects, whether portraits or landscapes, which resist their efforts in bringing them into coalescence, we would say steep them in tepid water, so as to loosen them from their mounts, and retrim them to the extent of taking a quarter of an inch, or thereabout, from the sides, finally remounting them.—*Br. Jour.*

Soluble Gold.

In the *Naturforscherversammlung* at Nuremberg, Dr. Schottlander described a curious colloidal form of gold, which was completely soluble in water with basic acetate of cerium. The solutions are a strong violet-red color, but when diluted, carmine-red. The intensity of the color is so great that a solution containing 1-500,000th of gold is still distinctly rose-red. Such solutions are obtained by precipitation of a dilute solution of a cerous salt mixed with gold by means of potash or soda lye and solution of the black precipitate formed in hot dilute acetic acid, or by boiling mixed solutions of cerous acetate, gold chloride, sodium hydrate in the proper proportions. From the red solution sodium acetate precipitates a violet-red precipitate which contains all the gold and some of the basic cerous acetate. On drying the precipitate, an amorphous, bronze-colored, glittering mass is obtained, which is soluble in water. This is somewhat akin to Carey Lea's soluble silver.—*Photo. Mittheil.; Am. Photographer.*

A FLAT car costs about $380, a flat bottom coal car $475, a gondola drop bottom $500, a double hopper bottom coal car $525, a double hopper bottom coke car $540, a box car $600, a stock car $550, a fruit car (ventilated) $700, and a refrigerator car $800. A four-wheeled caboose costs $550 and an eight-wheeled one $700. The prices given on the above cars include power brakes and vertical plane couplers. A 50 foot mail and baggage car costs $3,500, a second class coach $4,800, a first class coach $5,500, while a first class Pullman car costs $15,000.