### A DOUBLE-DECK CAR FOR RAPID TRANSIT.

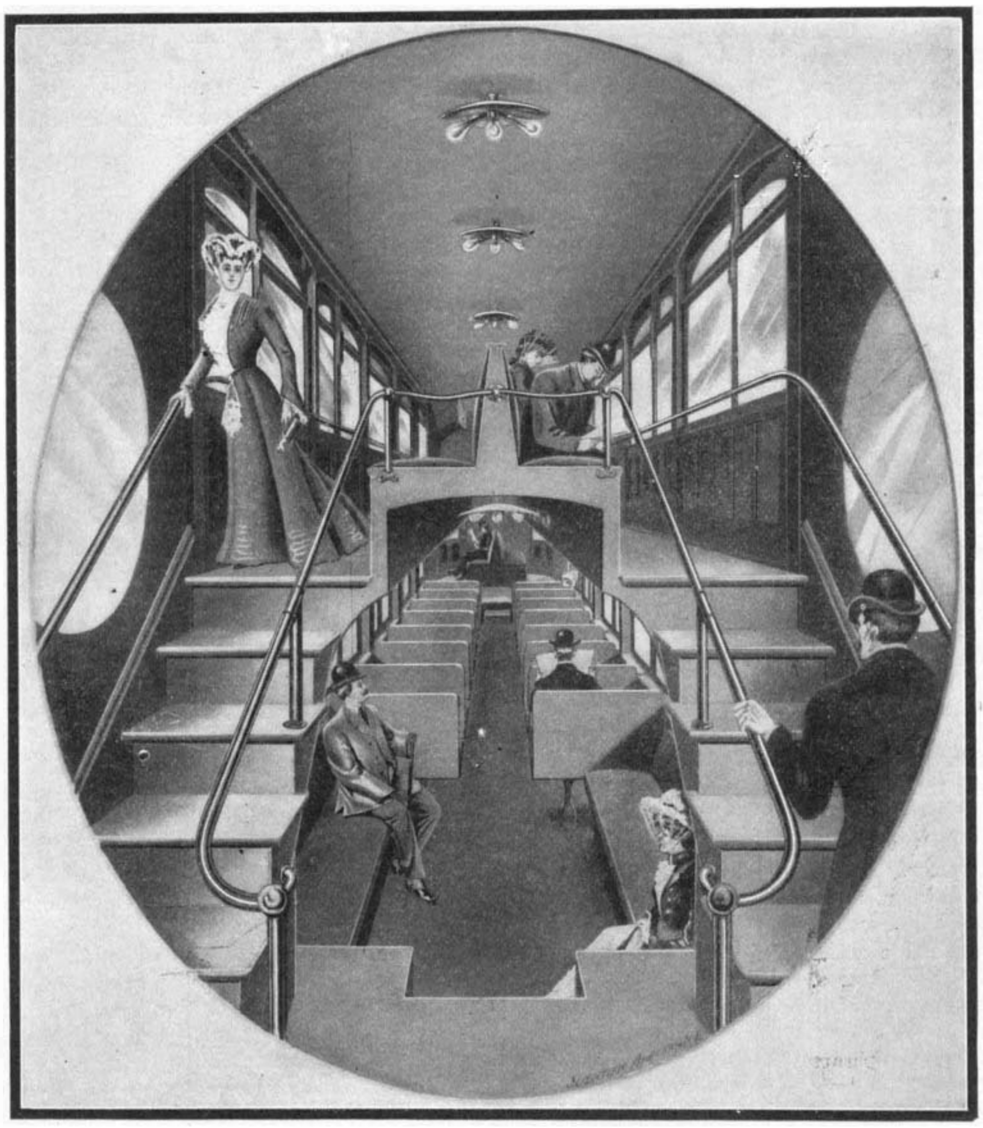
Although the double-deck car is practically unknown in this country, it is very extensively used in Europe. In a recent examination of the question of double-deck cars made for the Merchants' Association of New York, by John P. Fox, it was stated that of the 6,660 electrical cars of Great Britain and Ireland, ninety per cent are double-deck and ten per cent single-deck, while of the 3,517 new cars in cities having a hundred or more cars in use, ninety-four per cent are double-deck. The report of Mr. Fox was made after he had carried out an exhaustive investigation of the subject during a visit to Great Britain and the European cities where the double-deck car is most extensively used, and it contains expressions of opinion from managers and superintendents of the various traction companies in Europe, as to the relative advantages of cars of the single and of the double-deck type. According to the statement of the General Manager of the Liverpool Corporation Tramways, it was thought desirable, when electric traction was introduced in Liverpool in 1888, to follow the American practice of using single-deck cars. Subsequently, on introducing double-deck cars the average time consumed per passenger in getting on and off worked out at 1.9 seconds; whereas in a large American city, where the operation of the cars is similar to that in Liverpool, the length of stop per passenger averaged 2.8 seconds on an open, twelve-seated car.

As showing the great increase in capacity secured by double-decking, it was mentioned in the report that some of the Liverpool single-deck American cars had stairs and an upper deck added, and were used on trial before the double-deck car was adopted as the exclusive type for service. These cars were used on Saturdays, Sundays, and holidays, and at other times when cars of large accommodation would be required. The seating capacity was increased from forty to one hundred by the addition of sixty seats on the upper deck. The total weight of the car was only 31,360 pounds, and the two 35-horse-power motors already installed on the cars proved sufficient for the work. The largest closed cars in New York are the convertible Third Avenue cars with cross seats, which are about the same length as the Liverpool converted American car; but they weigh 3,600 pounds more, and seat only forty-eight per cent as many passengers.

As our readers are aware, the Scientific American has for several years advocated the introduction of the double-deck car as one of the most efficient means for reducing congestion of surface railway travel in New York city. We had no idea, however, that the facts in favor of this type were as convincing as the Merchants' Association report has shown them to be; and we have yet to see any good argument advanced against the introduction of the type upon New York lines, or at least upon the Broadway line, the most congested of them all. The elevated railroad structure at the Thirty-third Street crossing might have to be raised slightly to provide sufficient clearance; but this could be done without any interruption of the traffic.

The double-deck car of which we herewith present an interior view was designed by James L. Getaz, Knoxville, Tenn., and is presented as being an interesting study of this problem. The car, as shown, is of larger capacity than would be used within the interior lines of city traffic, being more adapted for interurban service. It has a width over all of 8 feet 10 inches, a height from the top of the rail to the roof of the car of 15 feet. The length over all is 53 feet 2 inches. The car is vestibuled, and an entirely separate cab is provided at the front end for the motorman. To keep down the height of the car and provide good head room on both decks, the floor of the lower deck is lowered between the two trucks, access to this lower central portion being had by a couple of steps at each end. Access to the upper deck is by way of two stairways as shown, one on each side of the car, and the movement of passengers is facilitated by arranging the seats on the upper deck back to back, longitudinally down the center of the car. The side walls of the car are braced together by carrying the floor of the upper deck upon forged steel rockers, which are bent upward at the center into an inverted U, to provide increased head room for the center aisle of the lower deck, an arrangement which gives over a foot of extra head room, and assists in keeping down the total height of the car. These steel rockers are attached by stout knees to the side posts, and materially stiffen the whole structure.

This particular car is of the completely inclosed type—suitable for winter travel. For summer travel it can be built with open sides, as is done on the cars in European cities. The question of stability has been carefully considered, and the lowering of the lower deck between the trucks, coupled with the weight of the motors which would be necessary with a car of this size, has kept the center of gravity at a safe height above the tracks.

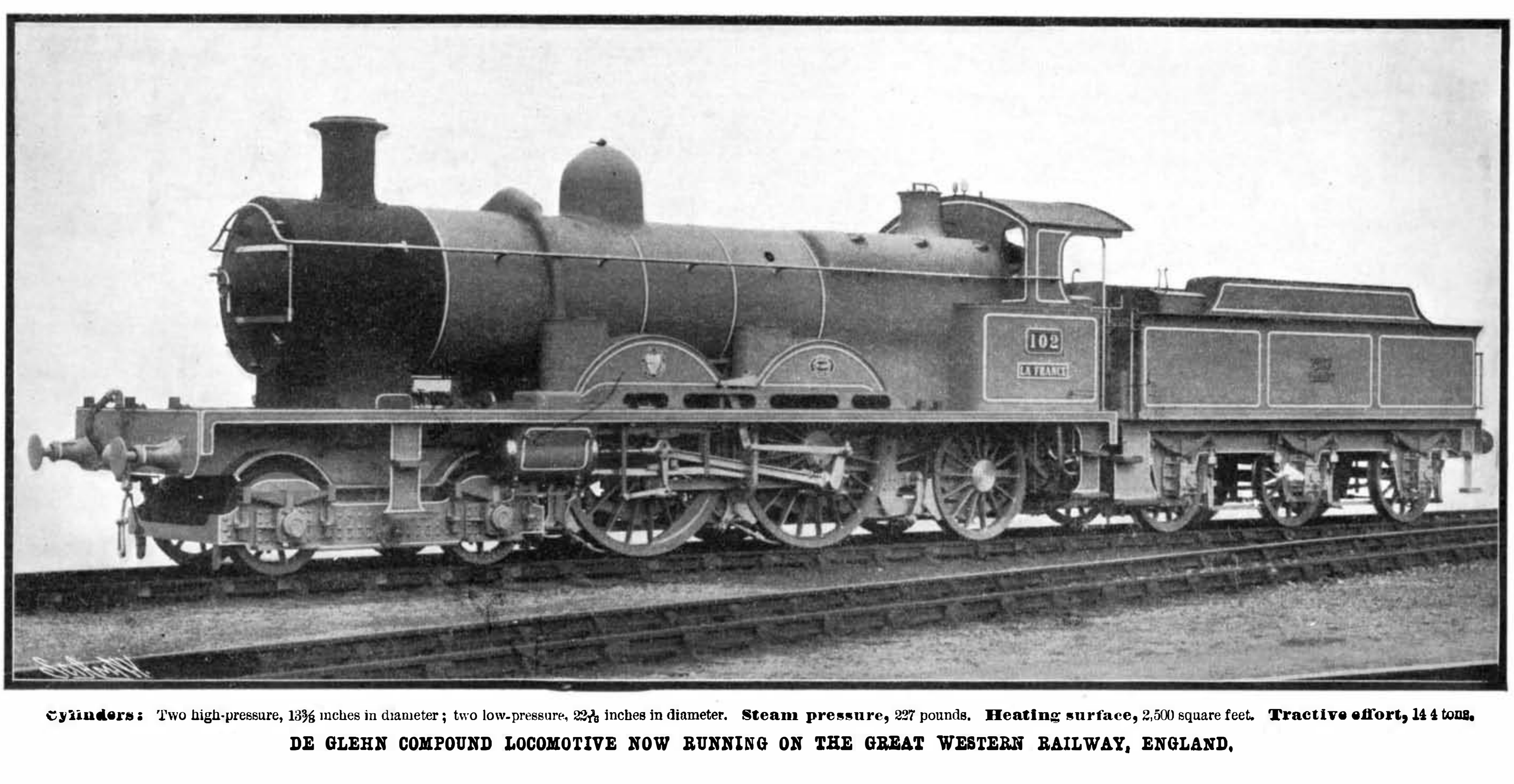


Width over all, 8 feet 10 inches. Height from top of rail to top of roof, 15 feet. Length over all, 53 feet 2 inches.

INTERIOR VIEW OF A DOUBLE-DECK CAR.

### DE GLEHN COMPOUND FOR THE GREAT WESTERN RAILWAY, ENGLAND.

The French compound locomotive for express service, mention of which was made some time ago in this journal, has been delivered, and is now giving good results on the Great Western Railway, England. The compound locomotive as such has been the subject of experiment and of a great deal of practical service on English roads for many years; but it is doubtful if any of the English-designed and built compound engines have given results as good as those secured with the De Glehn engines, which are used on several French roads for hauling fast passenger trains. The success of the French type is not due so much to any one particular feature, as to the fact that the designer has studied the question of compounding the locomotive from every standpoint, giving the most careful attention to details; and their high economy and large high-speed hauling capacity are due to the perfect balance and proportion of parts, producing a general, all-round excellence in the engine hitherto unattained. Particular attention was paid to the proportioning of the cylinders, and the ratio of high to low-pressure cylinders is widely different from that adopted on the Webb com-

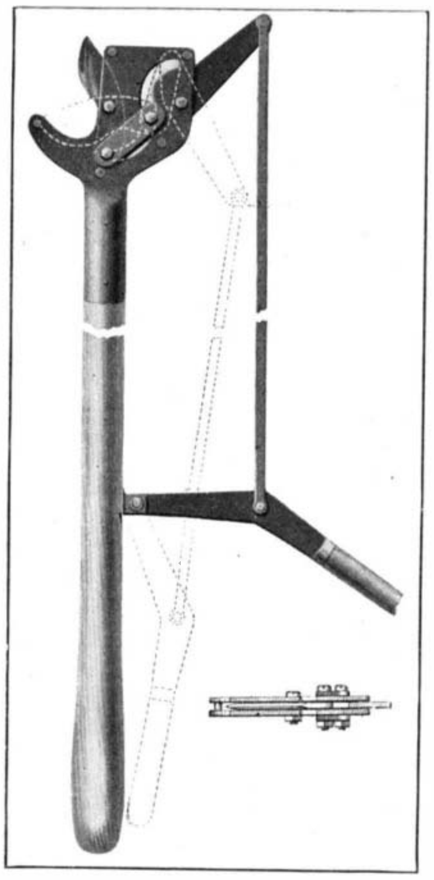



**Cylinders:** Two high-pressure, 13⅜ inches in diameter; two low-pressure, 22 1/16 inches in diameter. **Steam pressure,** 227 pounds. **Heating surface,** 2,500 square feet. **Tractive effort,** 14 4 tons.

DE GLEHN COMPOUND LOCOMOTIVE NOW RUNNING ON THE GREAT WESTERN RAILWAY, ENGLAND.

pounds, which are the best known of the English compound engines.

The "La France," as she is called, was built by the Societe Alsacienne de Constructions Mecaniques of Belfort, France. The firm is building a large number of the same type for the Chemin de Fer du Nord, on whose line between Calais and Paris some of the finest records of these engines have been made. The distance between these two cities, 184¾ miles, is covered in three hours and fifteen minutes, in which is included time for one stop for a change of engines.



NEW PRUNING SHEARS.

The Great Western compound was built and erected at Belfort, then dismantled and shipped to the Great Western Railway Company's shops at Swinden, where it was re-erected and put in service. The likeness between the English engine and those of the Chemin de Fer du Nord will be apparent at a glance to readers of the SCIENTIFIC AMERICAN, who are already familiar with the French engines from the illustrations which have appeared in this journal. In order to divide the total stresses, and keep down the size and weight and reciprocating parts, steam is expanded in four cylinders, two on the outside and two on the inside of the frames, the outer high-pressure cylinders, which are 13⅜ inches in diameter, being connected to the rear pair of driving wheels; and the two low-pressure cylinders, which are a fraction over 22 inches in diameter, being placed between the frames below the smokebox, and connecting to a pair of cranks formed in the axle of the forward driving wheels. Provision is made by means of a valve controlled from the cab, by which the engineer can at will admit high-pressure steam direct to the low-pressure cylinders, a three-way valve in the cab serving to operate auxiliary valves on the high-pressure cylinders, by which the exhaust steam from these cylinders may be turned directly into the blast pipe. When the engine is running compound, this exhaust passes through the auxiliary valves into the low-pressure cylinders. The valve gear is of the Walschaert type, and provision is made for independently controlling the distribution of steam to the high-pressure and low-pressure cylinders by the manipulation of the reversing gear, thus rendering possible a wide range of expansion to suit the conditions of service.

The boiler is of the Belpaire type, and is fitted with the Serve tubes, the total heating surface being about 2,500 square feet. Under a pressure of 227 pounds per square inch, the theoretical tractive effort of the engine is 28,814 pounds. The tender is of the regular English six-wheeled type, with a capacity of 3,000 gallons of water. It must be admitted that this engine is of very handsome contour and general appearance, the only exception being the external pipe that straddles the barrel of the boiler just forward of the steam dome. The performance of this locomotive will be studied with great interest by the locomotive engineers of Great Britain. It is true that they are already familiar with the splendid results obtained on French railroads; but at the same time it is realized that a true comparison with their own engines will only be possible when both the English and French type are running, as they will be on the Great Western Railroad, under exactly similar conditions of service.

## NEW PRUNING SHEARS.

We show in the accompanying engraving an improved form of pruning shears which has recently been invented by Mr. Alfred S. Boyd, of Rockville, Ind. This shears belongs to the class adapted for trimming the surplus growth of shrubs and trees, and the improvement consists in a new construction which affords a very strong, light, compact, and easily operated shears that can be very cheaply manufactured. As illustrated, the shears consists of a cutter head secured to the end of a long handle or pole, and is operated by a lever conveniently secured near the opposite end of the pole. The cutter-head consists of two similar steel plates, which are shaped at one side to form a cutter jaw. A shear blade is mounted between these plates with its outer end projecting above the cutter jaw. At its inner end this blade is provided with a pin whose ends project through S-shaped slots formed in the plates. The pin is connected by two links to a pin similarly projecting through these slots and secured to a rock arm pivoted between the plates at the opposite ends of the cutter-head. This construction is shown in section in our detail view of the cutter-head. A rod connects the outer end of this arm with the operating lever at the lower end of the handle. By moving the operating lever outward the shears will be opened as shown by full lines in our illustration. The shearing blade may be made to close down between the edges of the stationary jaw, by swinging the operating handle inward to the position shown in dotted lines. It will be observed that this construction affords a compound leverage for actuation of the shear blades, which is very powerful, so that the shears may be worked with ease, and small limbs of trees or shrubbery be cut without excessive labor.

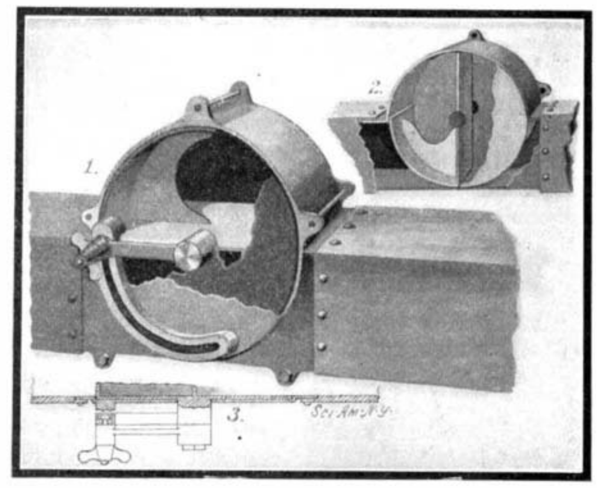
## Death of the Oldest American Clockmaker.

On March 5, there passed away, at his home, in Dorchester, Mass., Edward Howard, the veteran clockmaker of America. Mr. Howard was born at Hingham, Mass., in 1813. In partnership with David Porter Davis, he established the first clock factory in this country, and later built the American Waltham Watch Works, at Waltham. Besides clocks, Messrs. Howard & Davis manufactured scales, and some of the first of these that they made were sold to the government and to various banks in 1849, for weighing California gold. Steam fire engines were a third object of this firm's activity. Mr. Howard was an inventor of note, and his is one of the few instances of an inventor living to the age of ninety years, and reaping the full fruit of his labors. At the time of his death he had not engaged in active business for the past twelve years, or since the incorporation of the great clock company bearing his name.

The figure of a huge elk constructed out of beans is one of the peculiar exhibits at the World's Fair. The bean elk comes from Ventura County, California.

## AN IMPROVED GRAIN VALVE.

In designing a good grain valve, one is limited by certain requirements not met with in valves which are adapted to control the flow of fluids. The construction must be such that when the valve is being closed, it will not produce any shearing or crushing action on the grain, which would tend to break or smash the grains, and also the arrangement should be such that the grain can find no lodgment in any of the parts, and thereby choke the valve and prevent it from operating. These requirements are fulfilled in the valve which is illustrated herewith, and which is the invention of Mr. George J. Noth, of 913 West Fifth Street, Davenport, Iowa. The valve casing consists of a box, which fits at each end into the grain pipes or conduits, and whose upper wall is formed of a plate bent to the shape of a semi-cylinder. The side walls of the valve casing are outwardly offset, to receive two disks which form the side walls of the

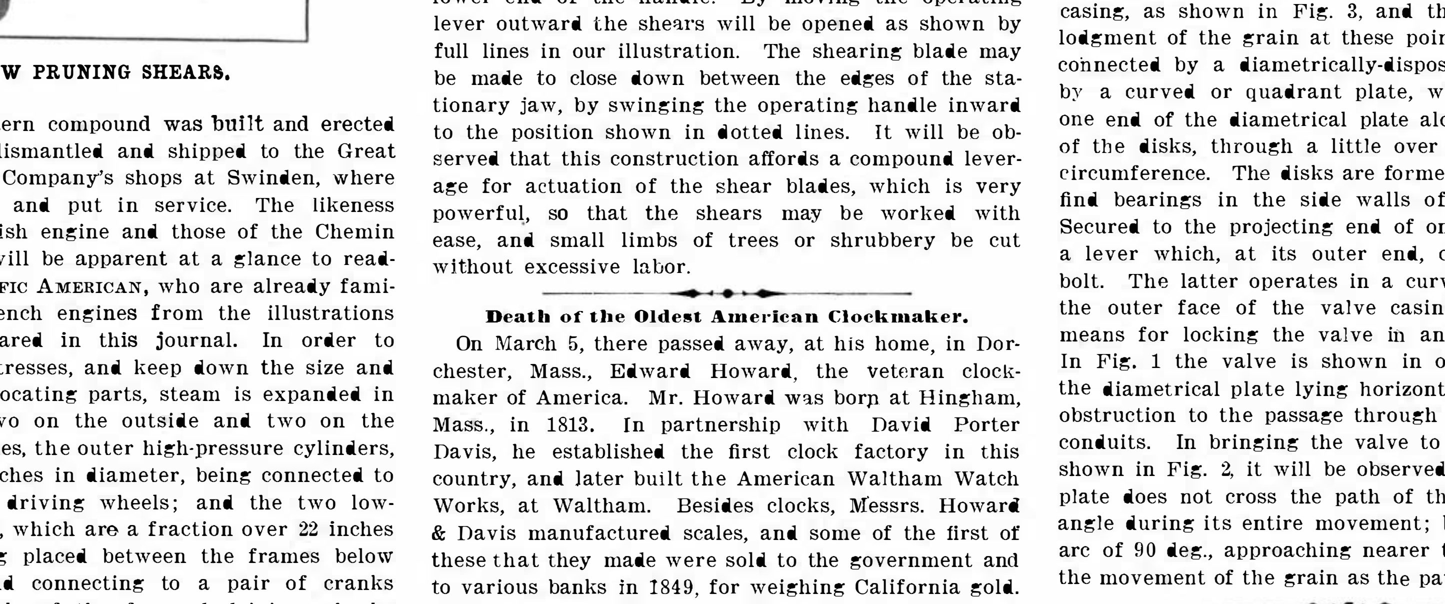


GRAIN VALVE.

valve proper. The purpose of this offset is to bring the surfaces of the disks flush with the walls of the casing, as shown in Fig. 3, and thus to prevent any lodgment of the grain at these points. The disks are connected by a diametrically-disposed plate, and also by a curved or quadrant plate, which extends from one end of the diametrical plate along the peripheries of the disks, through a little over a quarter of their circumference. The disks are formed with hubs, which find bearings in the side walls of the valve casing. Secured to the projecting end of one of these hubs is a lever which, at its outer end, carries a clamping bolt. The latter operates in a curved slot formed on the outer face of the valve casing, and provides a means for locking the valve in any desired position. In Fig. 1 the valve is shown in open position, with the diametrical plate lying horizontal, and offering no obstruction to the passage through the grain pipes or conduits. In bringing the valve to closed position, as shown in Fig. 2, it will be observed that the quadrant plate does not cross the path of the grain at a right angle during its entire movement; but it moves in an arc of 90 deg., approaching nearer to parallelism with the movement of the grain as the path is cut off.

## STEAM TURBINE OF 11,000 HORSE-POWER.

When once the Parsons steam turbine had been introduced into this country, its development in size and power was very rapid. It will be remembered that the rights for the manufacture of this type in the United States were secured by the Westinghouse Company, and the sizes which they first constructed, some four or five years ago, were of 600-horse-power nominal capacity, direct-connected to 400-kilowatt, polyphase generators. The advantages of the steam turbine in economy and convenience, as shown by the subsequent operation of these first machines, were so substantial and unvarying that the company has not hesitated to sign contracts for the construction of turbines of 7,500-horse-power nominal capacity. These great machines, of which several are under construction for different concerns, will have a continuous overload



11,000-HORSE-POWER TURBO-GENERATOR FOR THE PENNSYLVANIA RAILROAD TERMINAL TUNNEL.