or otherwise spoiled matches. The carrier being set in motion is charged with splints in the following manner: The splints fall from an oscillating hopper upon a horizontal iron table bearing 110 parallel grooves. The splints lodge in these grooves from which they are driven by plungers, at each stroke of the machine, into the 110 grooves of a traveling table or charger, which moves to and fro between the fixed table and a vertical portion of the endless carrier. As the charger approaches the carrier a blade rises behind it and prevents the splints from being driven backward. The splints, being a little longer than the charger, project in front of it and are forced into the 110 holes of one row of the carrier plate, where they remain firmly attached when the charger retreats. The force required for this operation is so great that an iron plate is pressed automatically on the splints from above to prevent bending and breaking.

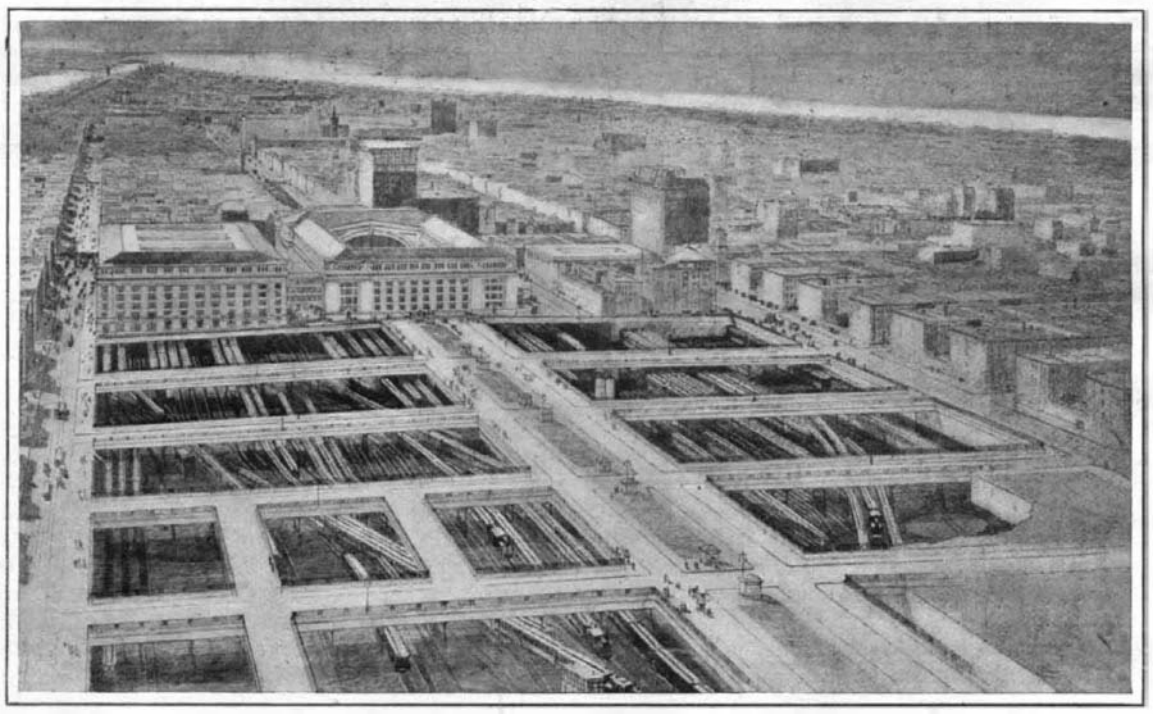
As the carrier travels onward the free ends of the splints with which each plate bristles are dipped successively into a paraffine and a sulphur bath after which they receive their coat of phosphorus from a rotating cylinder which dips in a vessel of the composition. Then they travel a long distance, for the purpose of drying, and finally reach the discharging and boxing station. Here they are expelled from the holes in the carrier plate by minute plungers so controlled by springs that they follow the plate in its motion as nicely as a human hand could do and perform their functions without shock or jar. The matches fall, in groups of five, into little receptacles whence they are pushed by pistons into the boxes, which are mechanically opened to receive them and similarly closed when full. The machine, therefore, does everything, even boxing, human hands merely feeding it with the raw material and removing the finished product. One such machine attended by three girls, turns out about 50,000 boxes, each containing 50 matches, in ten hours—an output which would require the labor of twenty persons in the old method of manufacture.

RECONSTRUCTING A GREAT CITY RAILROAD TERMINAL.

In a comparison of the problem presented by the construction of the two great railroad terminals which are now being built in this city, one for the Pennsylvania Company and the other for the New York Central, it must be admitted that the New York Central terminal presents the greater difficulties, for whereas the Pennsylvania Railroad station is being built *de novo*, and on a stretch of ground bought for the purpose, and free from any complications save those directly incidental to the construction of the station itself, the New York Central terminal problem is greatly complicated by the fact that the whole of the traffic of two large trunk railroads has to be provided for, and kept in movement, as far as possible without any delay or confusion of its schedule, right upon the very ground where the new station and the complicated yard is being built. The problem would be perplexing enough, in all conscience, did it consist merely in the pulling down of the old and the erection of the new buildings in the presence of the traffic; but as a matter of fact, the difficulties are enormously increased by the fact that the whole surface, both of the station yard and train shed, has to be excavated to a least depth of 15 feet to accommodate the express traffic of the road, and that 25 feet below this level as thus depressed, yet another yard and station must be excavated for the accommodation of the local service. At the present writing the westerly third of this excavation is completed, and the suburban service of the New York Central Railroad is being operated from a temporary terminal station built in this completed portion.

Nor are the difficulties of reconstruction at all assisted by the fact that simultaneously with all this excavation and tearing down and building up, a radical change is being carried out in the methods of traction employed, the steam trains being abolished and an elaborate and costly system of electric traction installed. Moreover, as though this were not sufficient, the company have put upon their engineers the burden also of instituting an entirely new system of signaling suitable to the electrified road.

Apart from the fact that there may be in the long run some slight financial gain from the change of motive power, and that there will be an immediate gain in convenience of operation, the immediate motive for this costly work was the desire to render safe and comfortable the operation of trains through the Park Avenue tunnel, and to abolish the smoke and steam, the noise and odors, incidental to the use of steam locomotives in the terminal yard. There is no doubt whatever that all of these objects will be secured; and by way of illustrating how completely the smoke and steam nuisance will be abated, we present two illustrations which show in a very dramatic way how great will be the improvement. Both illustrations are taken from a point of view near the intersection of Fiftieth Street and Park Avenue. One of them portrays a scene which may be witnessed at any time in the present yard when the condition of the atmosphere is favorable to a slow dissipation of the steam and smoke. The other view represents the conditions as they will appear in the year 1909, when the new yard and station shall have been built, and Park Avenue with the intersecting streets from Fiftieth to Forty-fifth Street have been built above the yard and restored to the use of the city. When this work has been completed there will be a complete absence of steam and smoke, and the loud exhaust of the steam locomotives will give place to the quiet hum of the big electric motors and the multiple-unit trains.



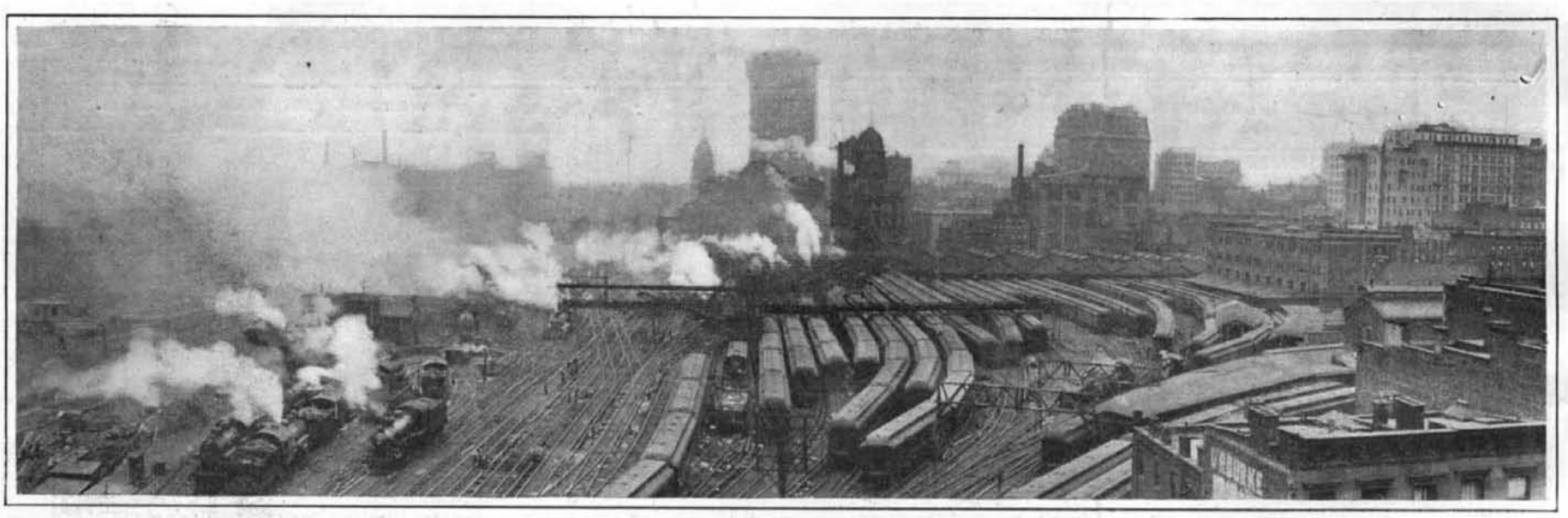
The new station and yard as they will appear from Fiftieth Street. The broad central roadway is Park Avenue, which will extend to the office and station building. To the left is the new Post Office. The open spaces will eventually be covered by buildings.

THE NEW GRAND CENTRAL TERMINAL, NEW YORK.

The southerly end of the depressed yard will be covered by the new Grand Central Station proper, whose southerly façade will stretch for 300 feet on 42d Street, and its westerly façade for 680 feet on Vanderbilt Avenue on the west. The building will also extend 625 feet on Forty-fifth Street, 400 feet on Lexington Avenue, 275 feet on Forty-fourth Street, and 260 feet on Depew Place. Of this great block of buildings, the southerly portion will include the station proper, and the northerly and larger half will be taken up by the offices of the company. In the view herewith given, the northerly façade of the office buildings lies to the right. The large building, of similar architectural treatment, to the left, is the new Post Office building, beneath which will extend a portion of the tracks of the upper express level.

The station building proper will include a ticket lobby 90 feet wide by 300 feet long, from which access will be had to a grand concourse 160 feet in width by 470 feet in length, the latter being covered by a vast domed roof, rising at its crown to a height of 150 feet above the floor. Beyond the concourse will be thirty-four stub tracks for passenger trains, with broad platforms, of an average width of 16 feet, between them. On the lower deck will be a separate station for suburban travel, which will be served by fifteen parallel tracks and a two-track loop.

Referring again to the view illustrating the completed station, it will be observed that between Fiftieth and Forty-fifth Streets, the squares which would normally be occupied by blocks of buildings are, for the present, being left vacant. There is no doubt, however, but that ultimately these enormously valuable areas will be covered by office or apartment structures; indeed, the railroad company, in laying out the tracks in the yard below, have been careful to make provision for suitable footings for the bases of the columns of the buildings which will ultimately be put in place when the increased value of this property warrants their erection. When that is done, the entire yard with its hundreds of entering and leaving trains, will be entirely shut out from view, and the noise of the traffic will be entirely eliminated.



The yard here shown will be lowered fifteen feet; below this will be the suburban tracks. The steam and smoke will disappear with the introduction of electric traction.

VIEW OF THE PRESENT GRAND CENTRAL STATION FROM THE NORTH.