at the exchange—an improvement which does away with individual batteries and magneto-calls.

On the left of each of the two sections is seen an apparatus called a decimal indicator, which serves to identify the subscribers. It consists of a number of superposed circles of contact pieces. Each subscriber's wire is connected with one of these contact pieces.

In the axis of the column of circles is a rotating spindle carrying contact brushes which transmit the subscriber's calls to the other parts of the apparatus. As soon as the call is made the brushes stop, the number is transmitted and the brushes resume their rotation. The sole function of the decimal indicator is to call the other parts of the apparatus into action as they are required. This ideal telephone girl instantly transmits every order and at once turns to her other patrons, all of whom she visits every three seconds in search of fresh commands. Meanwhile, what becomes of the call—that is to say, the number of the subscriber called up?

By various stages it is transmitted to the auxiliary organs of the section, which is composed of exactly similar divisions whose number depends on the volume of communication. Each of these divisions consists of five cylinders, *C C C C C*, alike in appearance but unlike in function.

The topmost cylinder, called the primary connector, represents the plug of the calling subscriber which the operator inserts in the switchboard. It receives the number from the decimal indicator, the division starter (the single cylinder at the lower left), and the controller of the decimal distributor (the circle of contacts on the same axis with the indicator). The units of the number are received in the interior of the primary connector, the tens by the distributor placed above it.

The cylinder immediately under the primary connector is the secondary connector which receives in like manner the number of the subscriber called up, and corresponds with that subscriber's plug in the ordinary system.

In short, the primary connector attends to the caller and the secondary connector to the person called, while the connection between the two instruments puts the two persons into communication.

The third cylinder is the signal transmitter which sends back to the caller electrical impulses which cause a pointer on a dial attached to his instrument to indicate the number called up.

Below this is the interconnector which indicates the hundreds and thousands and therefore the section (of 100) to which the person called up belongs. The interconnector always stands at 00 if the number of subscribers is less than 100. The lowermost cylinder is a rotary commutator, which controls the relays that stop and start various parts of the mechanism at the proper moments.

In the apparatus shown in the illustration each of the two sections contains five of these vertical divisions, each of which is composed of five cylinders. Five divisions usually suffice for 99 subscribers. If the communications are very numerous one or more supplementary divisions may be added without disarranging the section.

The subscriber's instrument contains, in addition to the usual transmitter, receiver, and call bells, an indicator with four disks, for units, tens, hundreds, and thousands. By depressing the handle of each disk to the proper degree the desired number is caused to appear, as shown in the illustration. Then a quarter turn of the handle below sends the call and causes the pointer surrounded by a circle of metal buttons, which is shown just above the handle, to move from the position of communication to the next, or calling button. After from one to four seconds the pointer is seen to move over all the other buttons, making a complete revolution and returning to the position of communication. During this movement the number called for has been transmitted to the exchange. The pointer is controlled by the signal transmitter at the exchange, as has already been stated.

Having thus sent his call the subscriber takes down his receiver, applies it to his ear and presses a button which rings the bell of the person called up. The sound of the bell is heard in the caller's receiver and indicates that the communication is established. Failure to hear the bell indicates that the line is not free. In this case the receiver is hung up and the call is repeated a few minutes later. The whole operation is very simple.

Subscribers' instruments of this character suffice for all cases in which the exchange serves fewer than 10,000 subscribers. If there are more than 10,000 lines the subscriber's instrument has an additional lever which indicates the particular exchange (of 10,000 subscribers) to which the person called belongs, and puts at the caller's disposal an auxiliary wire connecting the two exchanges.

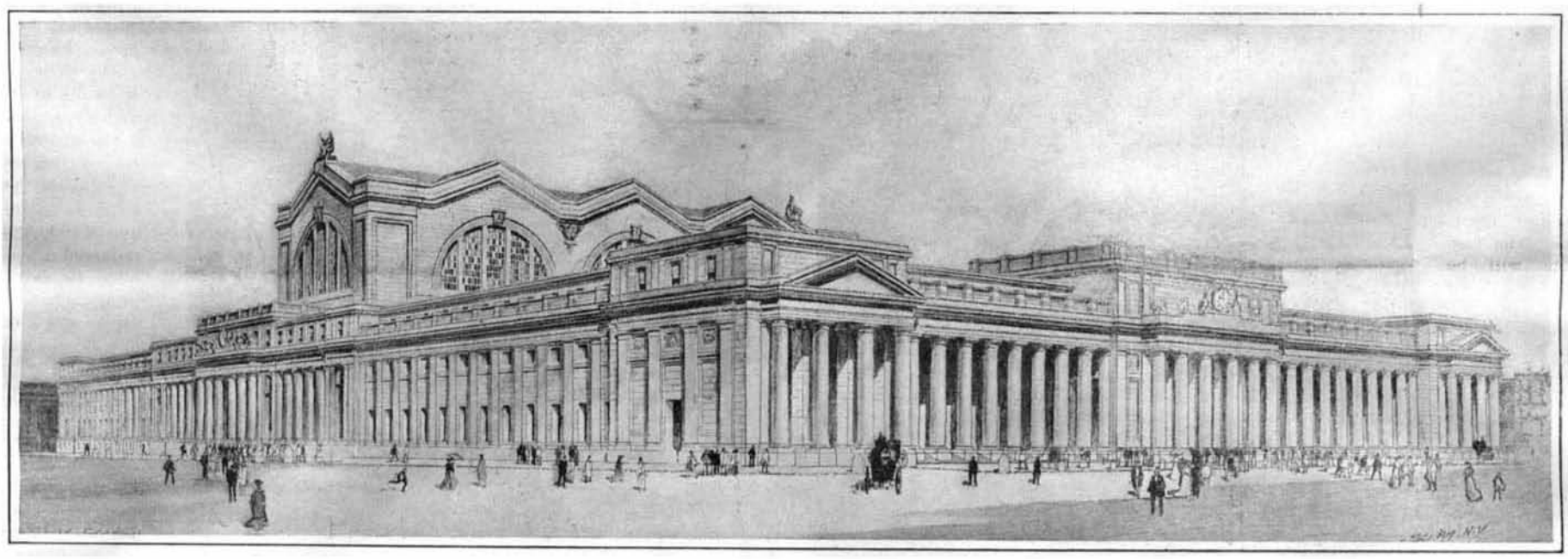
The caller is thus switched temporarily to the other exchange at which all the operations described above are performed, his own exchange serving merely to put his wire in connection with the other exchange.

Thus a subscriber of exchange K, wishing to talk to a subscriber of exchange W, turns his supplementary lever to the letter W, and is immediately connected with one of the wires running from K to W (unless all such wires are in use). Then, when he has indicated his number—which, in this case, is the number of the inter-exchange wire which has been assigned to him—the remaining steps in the transmission are made by four cylinders of exchange W, precisely as if the call had come from a subscriber of that exchange.

It may happen that the apparatus of the exchange is overwhelmed with demands. In that case the calls are stored up and are transmitted, without the necessity of repeating them, as the divisions become free. This delay will be avoided if the apparatus comprises a sufficient number of divisions. It has already been stated that a section can be extended, by adding one or more divisions, as links are added to a chain, but it is preferable to install, at the outset, a sufficient number of vertical divisions to meet all probable demands.

If a division becomes out of order it can be cut out and repaired without interrupting the service of the section, for the decimal indicator selects available divisions and passes over the others. In ordinary service, too, this intelligent and silent foreman judiciously distributes the work among his subordinates, giving a fair share to each.

With the system now in use a break occurring in a subscriber's wire is not detected until an attempt is made to communicate, and then hours or even days may elapse before the wire is repaired. With the Lorimer system, on the contrary, any defect in a circuit is instantly indicated at the exchange by the ringing of a bell and the flashing of two lamps corresponding to the section and division to which the damaged wire is attached. Linemen are at once sent out and the break may be repaired before the subscriber has had occasion to know of its existence.



The façades extend 430 feet north and south and 780 feet east and west.

THE PENNSYLVANIA RAILROAD STATION, NEW YORK, AS SEEN FROM THE SOUTHEAST.

PENNSYLVANIA RAILROAD'S TERMINAL STATION, NEW YORK CITY.

The excavation for the new Pennsylvania terminal station has a total width of about 500 feet and an extreme length of slightly over 2,000 feet. Roughly, it includes four large city blocks, with some additional space which has been included for the accommodation of a power plant and the tunnel approaches to the station. The site is bounded by Seventh Avenue on the east, Ninth Avenue on the west, and on the north and south respectively by Thirty-third and Thirty-first Streets. The whole of this area will be covered at the lower level by the station tracks. At the easterly end, the tracks will converge from twenty-one to four, and they will extend beneath New York city, two of the tracks below Thirty-second and two below Thirty-first Street, ultimately passing under the East River to Long Island City. At the westerly end, the tracks will converge to two tracks, which will pass beneath the North River in two separate steel-and-concrete tubes.

From what has been said above, it will be seen that the site of the station and yard is bisected by two important thoroughfares, namely, Eighth Avenue and Thirty-second Street. Eighth Avenue divides the site into two equal portions, the westerly half constituting the station yard, while the easterly half constitutes the station proper; and here it is that the imposing structure which forms the subject of our front page engravings will be erected. It will have a frontage on the avenues of 430 feet, and on the streets of 780 feet, the sides of the building forming a perfect parallelogram. Below the surface of the street, and within the area covered by the building, the station will be divided into three levels, on the lowest of which will be the tracks at a depth of 40 feet below street grade.

The question of the architectural treatment of a building of this magnitude, and to be used for this special purpose, was one that called for the most careful consideration, and New York city is to be congratulated on the fact that the Pennsylvania Railroad Company were willing to forego the opportunity to erect a huge office building above the station site, and preferred to memorialize their final entrance into New York city by the erection of a magnificent and purely classic structure, commensurate with the importance of the company and the dignity of the great city in which it has at length found a fitting terminal.

The architectural design of the entire exterior is a Doric colonnade 35 feet in height, surmounted by a low attic, the total height of the elevation being 60 feet. In the center of the building, however, in order to accommodate the great waiting room, the roof of the structure reaches a height of 150 feet, and the line of the building is also pleasingly broken at the corner of Eighth Avenue and Thirty-third Street, where there is an elevation of four stories for the accommodation of the offices. The unusual extent of the building in area and its general type are suggestive of the great baths of ancient Rome; in fact, the architects of the building, McKim, Meade & White, took the baths of Caracalla, which are still magnificent in their ruins, as the inspiration of this architectural plan. The dignity and beauty of the building are enhanced by the contrast of the lofty "skyscraper" buildings of the vicinity; and when the structure is completed, the eye will turn with a sense of relief from the exaggerated perpendicular lines of the modern office building to the long, low perspective of this station, relieved at its mid-length by the lofty walls and roof of the waiting room. The exterior construction is to be of pink Milford granite, similar to the building stone of the Boston Public Library and the University Club in New York. This is a particularly effective structural stone, and its soft shades of color are decidedly pleasing to the eye.

The main entrance to the station for foot passengers will be at the center of the Seventh Avenue façade and opposite the intersected end of Thirty-second Street. Once inside the building the passenger will

find himself in a noble arcade, 45 feet in width and 225 feet in length. On either side will be shops where will be displayed wares suitable to the needs of the traveler. At the further end of the arcade the intending traveler will pass the entrance to two large restaurants, one to the left, the other to the right, and will then find himself at the head of a broad flight of stairs leading down to the floor of the general waiting room. This vast hall, the largest of its kind in the world, will be 110 feet in width, 320 feet in length, and will have a clear height from floor to ceiling of 150 feet. Within its spacious walls will be located ticket offices, parcel rooms, telegraph and telephone offices, and baggage checking windows, all so disposed that a passenger may proceed from one to the other in their logical order. Adjoining the general waiting room on the west will be two subsidiary waiting rooms, corresponding in their relation to the main hall to the two restaurants. Each waiting room will measure 58 x 100 feet. One of these is reserved for men, the other for women, and each will be provided with every convenience for comfort. The entrances for carriages will be by way of pavilions located at the corners of Thirty-first and Thirty-third Streets and Seventh Avenue. The carriages will descend on a slight gradient until they reach the level of the station proper. Entrance will be had by the Thirty-first Street incline, and the carriages will leave by the Thirty-third Street ascent as an exit.

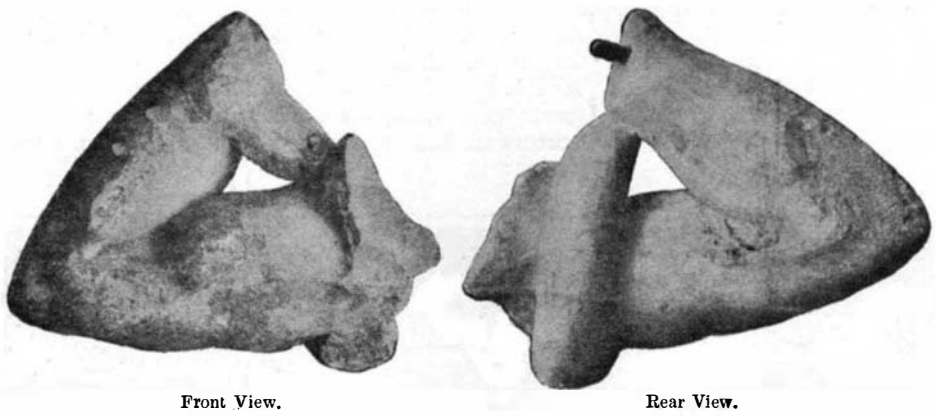
To the east of the general waiting room is the main baggage room with its 450 feet of frontage. The baggage will be delivered and taken away by a special subway, 30 feet wide, which will extend under and along the entire length of Thirty-first Street and Seventh and Eighth Avenues. From the baggage room trunks will be taken to the tracks below by motor trucks and elevators. Cabstands will also occupy this level.

The passenger, after securing his ticket, checking his baggage, etc., passes through between the smaller waiting room entrances onto the great station concourse, an iron-and-steel-covered area over 100 feet wide, which extends across the entire width of the building. Crossing the concourse he will be confronted by a series of gates, bearing signs announcing the destination and time of departure of the trains on the various platforms below at the track level. The concourse and the adjacent areas are open to the tracks, and together they form a great courtyard 340 feet in width by 210 feet broad, roofed in by a lofty trainshed of iron and glass similar in design to the famous trainsheds of the new stations in Frankfort and Dresden, Germany. In addition to the entrances to the concourse from the waiting room, there are also direct approaches from Thirty-first Street, Thirty-third Street, and Eighth Avenue.

Below the main concourse, and located between it and the tracks below, is a sub-concourse, 60 feet in width, which will be used for exit purposes only. From the sub-concourse staircases and inclines will lead to the streets and avenues and to future rapid transit stations under Seventh or Eighth Avenue. Direct connection may also be made, in due time, with the proposed subway station of the Hudson Company's subways running up Sixth Avenue from the North River tunnels of that company. The northern side of the station, paralleling Thirty-third Street, will be assigned to the suburban service of the Long Island Railroad.

The third level, which will be at a depth below the surface of the street corresponding to the height of an ordinary four-story building, will be entirely covered below the station building with twenty-one parallel tracks and their respective platforms. Within the station area, covering 25 acres of ground space, there will be 16 miles of tracks. A trackage area of this amount will afford ample facilities for the easy movement by electric power of the many hundreds of trains per day that will use this station. Through trains from the West, after discharging passengers, will proceed at once to Long Island City, where the main train yard and terminals will be located, thus leaving the station tracks clear of any idle equipment. In like manner, the westbound through trains, which will be made up at the Long Island City terminal, will pass through the station, stopping only to take up their quota of passengers. The suburban service of the Long Island Railroad will be operated on the "shuttle" plan. The planning of the station, with its numerous entrances and exits independent of each other, and separating the incoming from the outgoing throng, was worked out to facilitate, in greatest measure, the prompt and uninterrupted movement of the traffic. The exposure of the building on all four of its sides to main arteries of street traffic gives the plan a flexibility which is rarely obtainable and also insures easy connections by underground subways with the future extensions of the city's rapid transit system.

Following this article on the station building, we shall, next week, illustrate the huge work of excavation, which has to be carried out before the station itself can be erected.



Front View. Rear View.

Fig. 1.—The Newly-Discovered Right Arm of Laocoön Showing Its Correct Position and That of the Serpent's Coils.

Fig. 2.—The Present Incorrect Restoration of the Laocoön Group.

Fig. 3.—A Correct Restoration of the Laocoön Group.

Fig. 4.—The New Reconstruction of the Laocoön Group From the Rear.

THE LAOCOÖN GROUP AS IT OUGHT TO BE.

THE LAOCOÖN GROUP AS IT OUGHT TO BE.

The famous Laocoön group was found in a vault in Rome in 1506. Pope Julius II. bought the statue and placed it in the Vatican. There it remained until Napoleon in 1796 bore it to Paris as a trophy. In 1815 the group was returned to the Vatican.

When the statue was unearthed the right arm of Laocoön and of the younger boy were missing, and likewise the right hand of the older boy. The group was restored by Giovanni Montorsoli. Even in his day some doubt was expressed as to the accuracy of his reconstruction. At the time of its exhibition in Paris Radel expressed the opinion that the right arm of Laocoön could not have been extended high in the air, but that it must have been bent toward the head. According to a recent issue of Umschau, a young German savant, Herr Ludwig Pollak, has been fortunate enough to discover a fragment of an arm which undoubtedly formed part of a replica of the Laocoön group and which has rendered it possible to determine the correct position of the original arm.

The arm, illustrated in Fig. 1, was found by Pollak in a small Roman "scalpellino" among a mass of marble statuary fragments. These fragments are commonly bought, refurbished, and sold. Pollak was informed that the arm had been discovered in the "via Labicana"; no further details were available. He saw that the fragment was the right arm of a Laocoön and bought it. The stone of which the arm is made is a coarse-grained Parian marble. In ancient times it had been broken in two places and repaired. The serpent was injured at the time of the last fracture; but its convolutions can still be traced. The body of the serpent has the smooth surface so characteristic of the restored group. In all probability the scales were painted. At the inner side of the upper arm three indentations are to be seen, which were evidently caused by the pick of some workman.

So different is this fragment from the Vatican group that it could not have belonged to it, but to an ancient replica about one-ninth smaller than the original. The arm was probably broken when the statue was removed from its pedestal in Rhodes and taken to Rome.

The newly-discovered arm renders it possible to correct the restoration. This Pollak has done, as shown in Figs. 3 and 4. The group gains considerably in artistic composition. The uplifted arm of the restoration has the declamatory effect of shallow pathos. By carrying the arm back of the head the suffering of Laocoön is made more intense.

Automobile Show and Carnival.

An open-air automobile show and series of tests of machines will be held at the Empire City race track the last three days of this week. Some of the interesting tests will be an obstacle race, a vibration test (made by carrying a pail of water), and a power test to see which machine will go the farthest through deep sand.