THE RAPID TRANSIT TUNNEL.

Work on some sections of the Rapid Transit tunnel is so advanced that it is now possible to get a good idea of the appearance of the inside of the tunnel as it will look when completed. The accompanying photographs were taken on Broadway at 135th Street, at the point where the long viaduct, by which the tracks will be carried across the Manhattan Valley, intersects the northern slope. The subway at this point has been built in an open excavation, and our illustrations were taken when the steel bents had been placed in position and before they had been walled in with a covering of concrete.

The whole of the subway and tunnel construction is to be of absolutely waterproof construction, and some description of this waterproofing and of the concrete filling will be of interest. The floor consists of a layer of concrete which varies in thickness, being 8 inches upon rock, and thicker when it is laid upon a loose or moist formation. Above the 8 inches of concrete is spread a layer of waterproof material, which is put down in the following manner: After the 8 inches of concrete has been carefully smoothed off, a layer of hot asphalt is spread upon it, and upon this is rolled down a sheeting of felt. Then follows another layer of asphalt and felt, the layers varying from two to six, according to the dampness and general characteristics of the surrounding material. Above the waterproofing is another layer of concrete, in which are laid the tracks and the stone or concrete footings for the columns and I-beams which support the roof and sides of the tunnel. The steel framework, as shown in the engraving, is made up of transverse bents, consisting of built-up columns, spaced 5 feet apart longitudinally and 12 feet 6 inches apart measured in the direction of the tunnel. The top member of each bent is a heavy I-beam. The wall posts also consist of I-beams, and angle iron knee-braces are riveted at the upper angles formed by the junction of the center and side columns with the roof to give lateral stiffness to the whole framework. The spaces between the I-beams of both the wall and the roof are filled in with concrete, which is smoothed off flush with the outer flanges of the metal. Immediately upon the flanges and the outer surfaces of the concrete filling as thus finished off is placed a complete layer of asphalt and felt waterproofing similar to that used in the floor as above described. After the felt has been put in place an outer layer of concrete whose thickness is determined by the nature of the excavation is carefully rammed in place. The subway as thus finished is inclosed in a waterproof envelope, which extends entirely around it.

The two interior views of the subway which we present are taken at the point where the masonry viaduct which forms the abutment of the steel viaduct across Manhattan Valley commences. This viaduct, which will be located about a thousand feet east of the Riverside Drive viaduct, will consist generally of plate girders carried upon braced towers, except across Manhattan Street, which will be spanned by a single elliptical arch of handsome design.

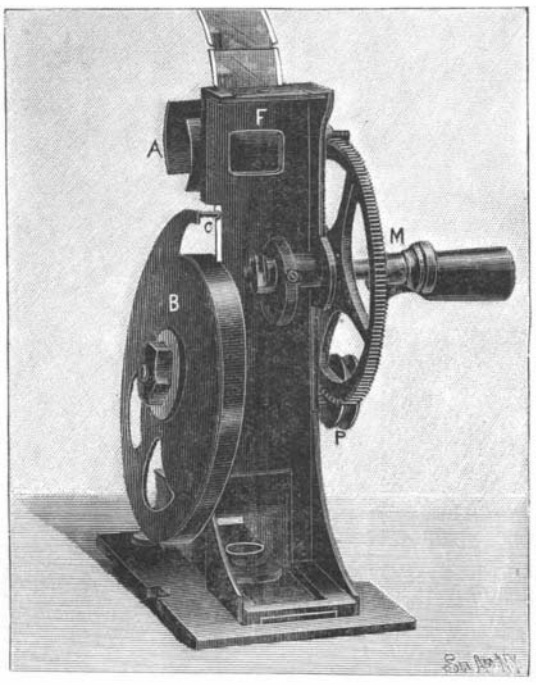


Fig. 1.—THE MIROGRAPH ACTUATING AND OBTURATING MECHANISM.

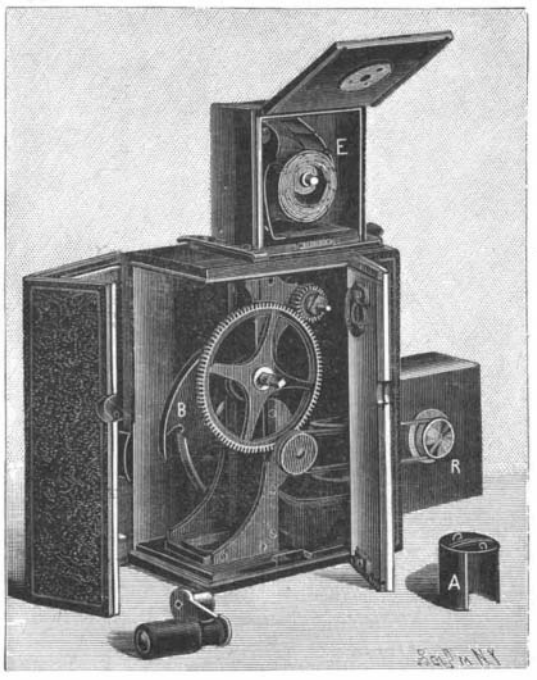
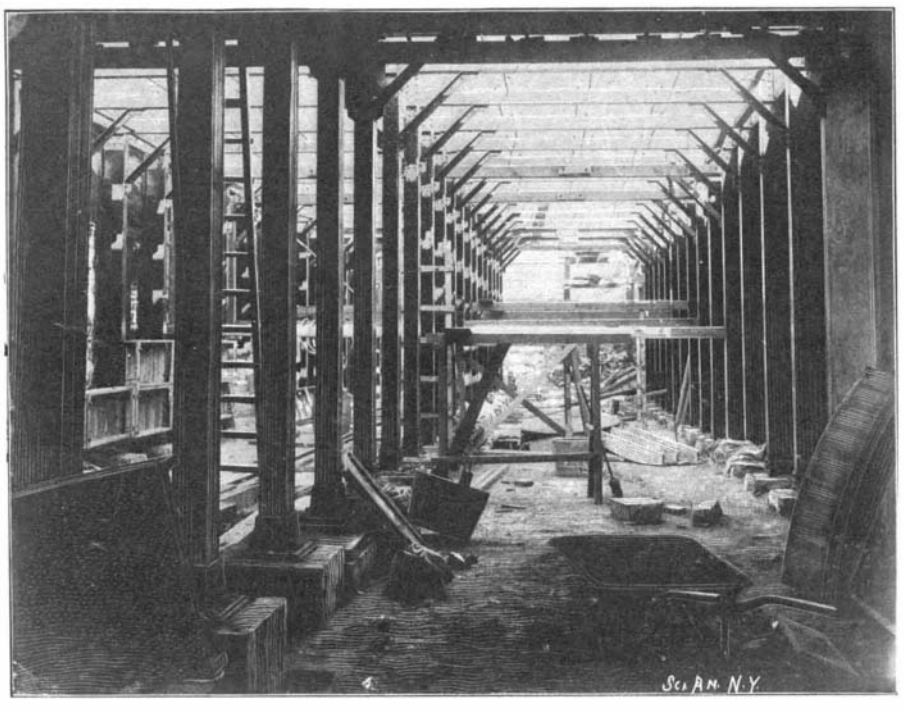


Fig. 2.—THE MIROGRAPH ARRANGED FOR TAKING A PHOTOGRAPHIC NEGATIVE.

The engineers and the majority of the contractors of the Rapid Transit Commission are to be congratulated upon the progress which is being made. With a few exceptions, such as the section along Forty-second Street, the work has been opened up from Duane Street to 181st Street on every mile of the route, and for long stretches the excavation is practically continuous. In several sections the steelwork is in course of erection, and the concreting is keeping pace with it. The two deep shafts at 167th and 181st Streets are down to grade, and the drifts are being pushed forward. Steel is on the ground in sufficient quantities to keep the erecting gangs busy; and altogether the prospects of completing the tunnel on contract time are promising.

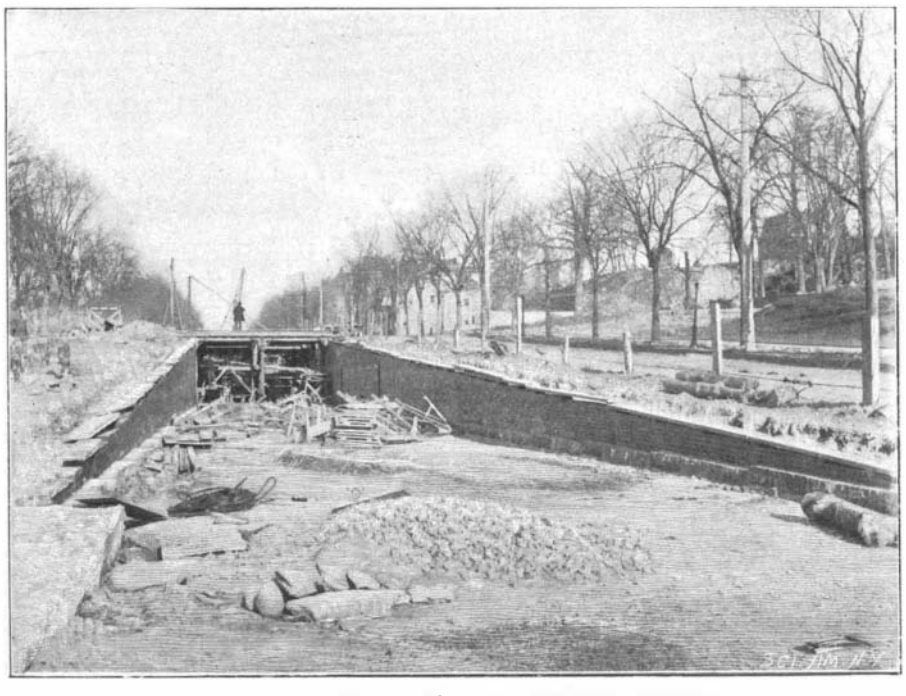


Interior View, Showing Steel Framing Before Concreting.

THE MIROGRAPH.

It would require a volume to set forth all the solutions that have been proposed for the problem of intermittently actuating the films of cinematographs. None of the devices invented, we think, is simpler than the "Mirograph" of MM. Reulos and Goudeau. The actuating mechanism, according to La Nature, consists of a disk, *B* (Fig. 1), the circumference of which is provided with a flange, *C*, at right angles with it. This disk is mounted on a central horizontal shaft driven by a crank, *M*. The flange, *C*, is not completely circular. For three-quarters of the circumference every point is equally distant from the shaft. After the three-quarter point the flange gradually approaches the center. From this arrangement it follows that the two ends do not meet, but are located on the same diameter, about 0.01 of a meter apart (Fig. 2). This is what constitutes the principle of the invention. The film is not perforated, but is provided with notches on each side at the level of the line of separation of the images, which notches are engaged by the flange, *C*, of the disk. The film will remain immovable as long as a notch is in engagement with the circular part, but when the eccentric part is brought into action a forward movement will result equal to 0.01 of a meter; that is to say, to the width of the image. The film having moved forward through this distance, the notch escapes the eccentric extremity, but the other extremity immediately engages the following notch. Then, as the disk continues to rotate, the film is intermittently fed along.

The rotary motion is not given directly to the disk, *B*, but through the medium of gearing connecting the crank and the disk-shaft (Fig. 2). The gearing comprises a spur-wheel engaging two pinions, the lowermost of which is keyed upon the shaft of the disk, *B*, and the uppermost of which carries the shutter. The shutter, *A* (Fig. 2), consists simply of a tube having cutaway portions situated opposite each other. The shutter is placed horizontally (Fig. 1) against the opening, *F*, behind which the film passes. In its revolution the shutter presents its closed and open part alternately. The size of the pinions is such that the open part of the shutter presents itself opposite the opening during the inoperative position of the



Approach to Subway, Showing Portal in Distance.

Portal of Subway at 135th Street.

PROGRESS OF THE NEW YORK RAPID TRANSIT TUNNEL.