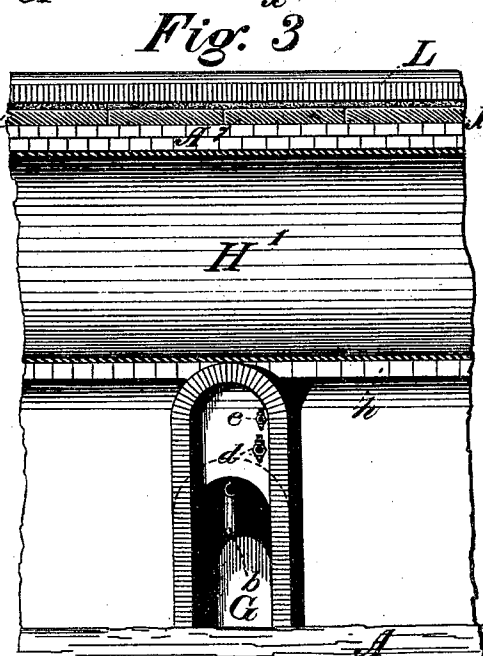
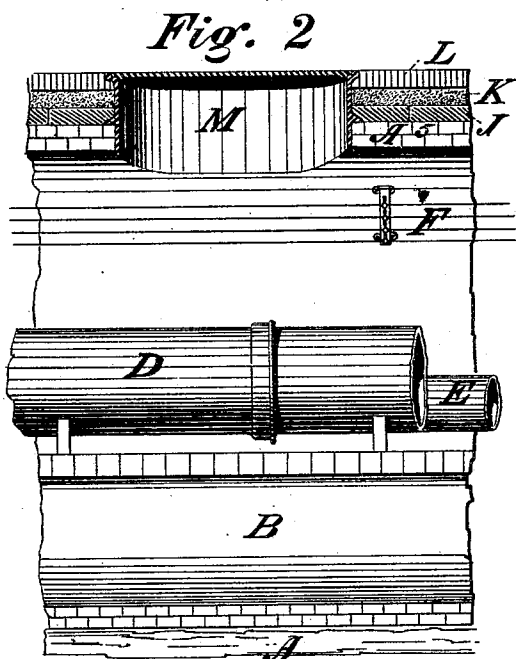
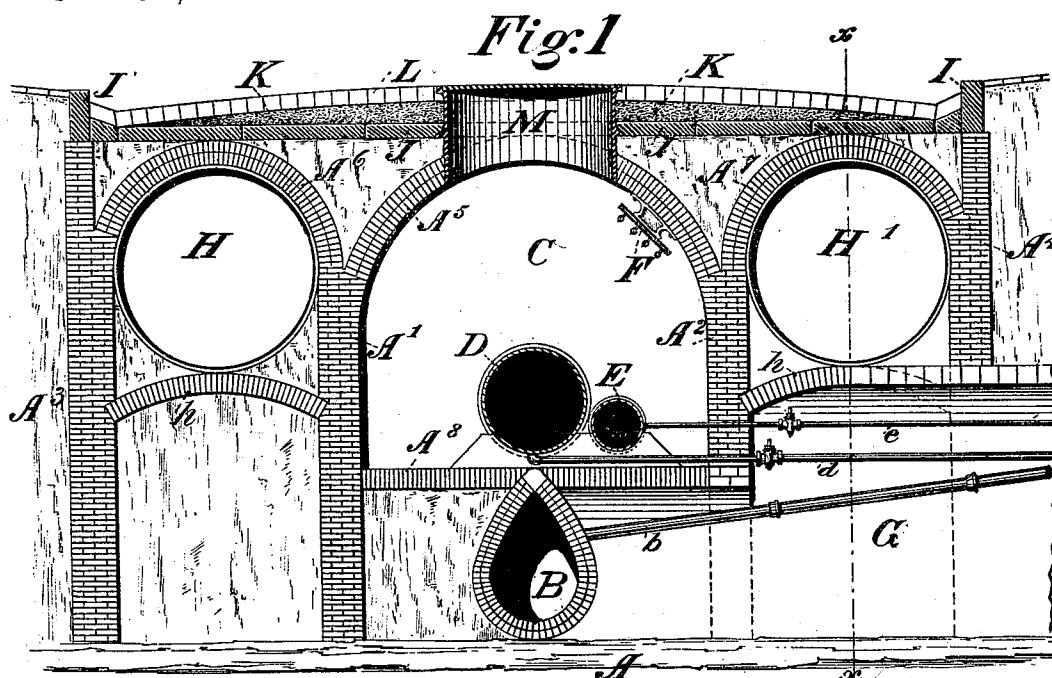


M. A. BURNHAM.
SUBSTRUCTURE OF STREETS.

No. 179,159.

Patented June 27, 1876.



Witnesses:

John E. Gearing

Geo. D. Collier

Inventor:

Manly A. Burnham

by J. Morden Bell
att'y.

UNITED STATES PATENT OFFICE.

MANLY A. BURNHAM, OF NEW YORK, N. Y.

IMPROVEMENT IN SUBSTRUCTURE OF STREETS.

Specification forming part of Letters Patent No. **179,159**, dated June 27, 1876; application filed June 12, 1876.

To all whom it may concern:

Be it known that I, MANLY A. BURNHAM, of the city, county, and State of New York, have invented certain new and useful Improvements in the Construction of Streets, of which the following is a specification:

My invention is designed to provide a permanent structure which shall afford facilities for the application and use of gas and water mains, telegraph-wires, pneumatic transit-tubes, &c., and will enable all necessary repairs, changes, or connections to the same to be made without necessitating the tearing up or removal of any portion of the pavement, as well as to furnish improved facilities for sewage. To this end my improvements consist in a novel combination of a pavement and a supporting-substructure and its adjuncts, all as hereinafter fully set forth.

In the accompanying drawings, Figure 1 is a vertical transverse section of a street embodying my improvements; Fig. 2, a vertical longitudinal central section of a portion of the same; and Fig. 3, a similar side section at the line *xx* of Fig. 1.

To carry out the object of my invention, I first provide a substantial foundation, A, for the structure, which foundation may be either a natural bed of rock or any suitable masonry-work, and must be located a sufficient distance below the desired roadway level to admit of the location of a sewer, B, immediately above it, the upper line of which sewer shall be at or below low-water mark, in order that the action of tide-water may be exerted in the most desirable manner to remove impurities. I propose to use a sewer of the section shown in Fig. 1, as being best calculated for strength and facility of construction, to wit, of egg-shaped section, having its greatest transverse diameter at the base, and terminating at top in a Gothic, equilateral, or lancet arch. The foundation A should extend at least from outside to outside of the curbing, the sides adjacent to the houses being meant by the outsides, and it may with advantage be extended from the house or front line on one side of the street to that on the other. Upon this foundation I erect two or more substantial walls, extending longitudinally along the street. In this instance I have shown two central walls, A¹ A², and two side walls, A³ A⁴,

being the form of construction preferred by me for streets of ordinary width, but for very narrow streets two only might be employed. A central arch, A⁵, is sprung across the tops of the walls A A¹, and similar side arches, A⁶ A⁷, unite the side walls A³ A⁴ with the central walls A A¹. The outside crown-lines of the arches should be at or near the level of the bottom of the curbing. A graded flooring, A⁸, is built across the space between the two central walls at or near the top line of the sewer B. The space included between the walls A A¹, arch A⁵, and flooring A⁸ forms a main tunnel, C, in which may be laid the water-main D, gas-main E, and telegraph-wires F, the latter being supported on suitable brackets or standards, and which is, moreover, of sufficient capacity not only to allow easy passage for the workmen engaged in the construction or repair of the gas, water, and telegraph lines, but also to afford, as in cases of riot or insurrection, a passage-way by means of which large bodies of troops may be safely and expeditiously marched to and massed in any desired quarter of a city. The main tunnel C should be provided with proper drains, leading into the sewer B, and with suitable man-holes to allow access thereto. Ventilators should be provided, sufficient in number and capacity to maintain a supply of pure air in the tunnel, which may be readily, if desired, lighted with gas. An archway, G, of sufficient size to allow free passage and working-space for a man, leads from the cellar of each house to the side wall of the main tunnel, and is prolonged, with a lower crown, to the side of the sewer B. Within these archways are placed the water-supply pipes *d*, gas-supply pipes *e*, and drain or sewage pipes *b* of the different houses, connecting respectively with the gas and water mains and sewer, and it will be obvious that they are readily accessible at any time for examination and repair. Pneumatic transit-tubes H H', one or more, may be laid in the spaces at the sides of the main tunnel, being supported upon arches *h*, or girders, if preferred, and access to the tubes is had by suitable doorways in the basements of the buildings selected as stations.

The substructure above described forms a firm and substantial support for the pavement J K L, which is laid upon it. The pavement

shown need not be here specifically described, as it is not herein claimed. Any desired form of pavement may be used, but I prefer one which is water-proof and of a permanent character. A macadamized pavement of broken stone, similarly set, may be substituted for the blocks, if preferred.

Man-hole rings M are placed at proper intervals to afford access to the main tunnel, and are provided with upper and lower flanges to hold them firmly in position. The man-hole rings are of oval form, and are set with their greater diameter in the direction of the length of the street, being made of sufficient size to allow the largest sizes of water-mains ordinarily used to be introduced through them.

The sidewalks may be laid down in any manner deemed most desirable.

From the above construction and combination of the subway and pavement I am enabled to provide a receptacle for the gas and water mains which, being accessible through the man-hole rings, allows all necessary connections and repairs to be made without breaking up or disturbing the pavement, accomplishing a result not heretofore accomplished within my knowledge, to wit, the use of a literally permanent pavement, while the solidity of the supporting structure enables me to use one or more pneumatic transit-tubes without in the least degree impairing the solidity of the buildings on either side. The advantage of accessibility afforded by the arched passages for the house-connections is, moreover, obvious; and, further, the relative arrangement of the sewer and tunnel is of great importance in

carrying out a thoroughly-practical system of sewage.

I am aware that a subway or tunnel for gas and water pipes, &c., has been long known, the same having been proposed as long ago as 1822, in the English Patent of one John Williams, and sundry Letters Patent having been subsequently granted in the United States and Great Britain for modifications of the same plan. I do not, therefore, broadly claim such a device, as it, *per se*, forms no part of my invention.

I claim as new and desire to secure by Letters Patent—

1. The combination, in a street or roadway, of a foundation, a sewer resting thereon, and two or more vertical walls, arched at top and supporting the curbing and pavement of the wagon-way, substantially as set forth.

2. The combination, in a street or roadway, of a foundation, vertical walls supporting the pavement of the wagon-way, and pneumatic transit-tubes resting upon arches or girders supported on the vertical walls, substantially as set forth.

3. The combination, in a street or roadway, of a foundation, a sewer resting thereon, vertical walls supporting the pavement of the wagon-way and inclosing a central tunnel, and archways connecting the basements of houses with the central tunnel and sewer, substantially as set forth.

MANLY A. BURNHAM.

Witnesses:

J. SNOWDEN BELL,
CHAS. W. SCHUELLERMANN.