(No Model.)

2 Sheets—Sheet 1.

L. F. BECKWITH.

CONDUIT FOR STEAM PIPES.

No. 294,354. Patented Mar. 4, 1884.

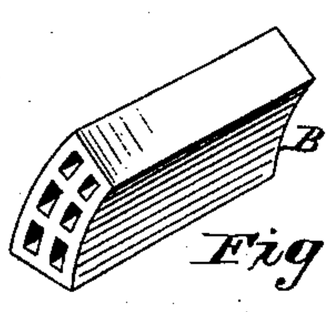


Figure 1a

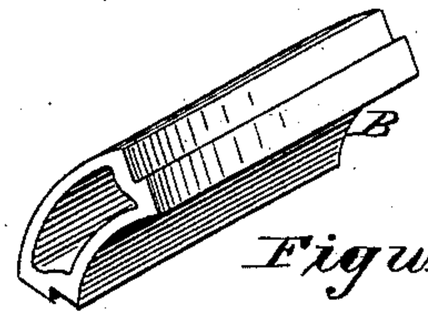


Figure 2a

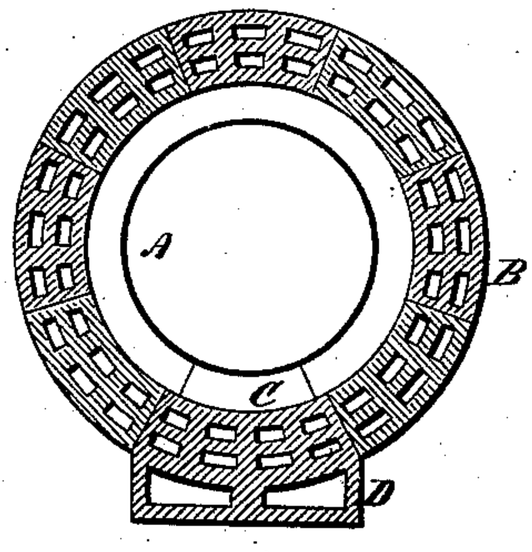


Figure 1.

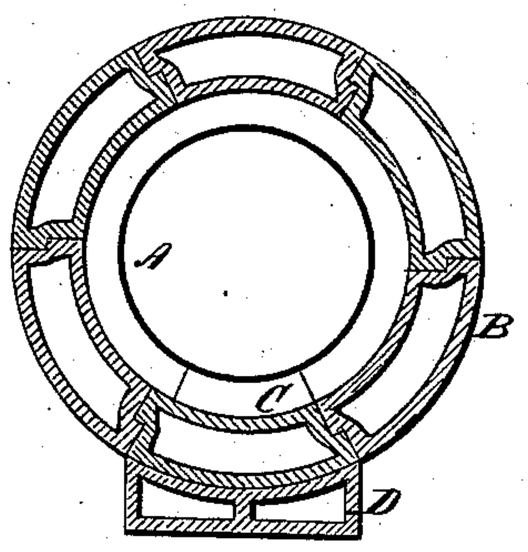


Figure 2.

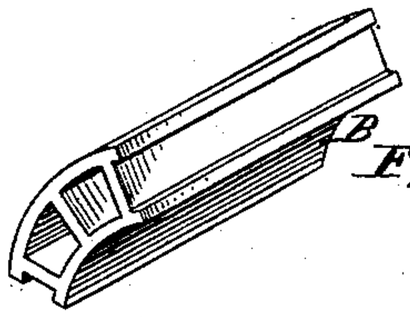


Figure 3a

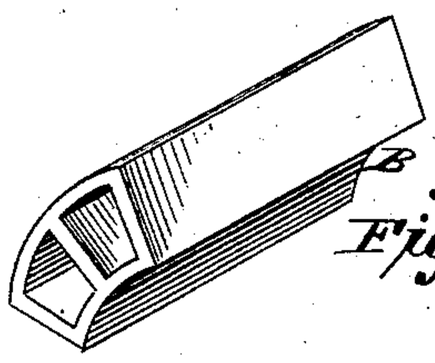


Figure 4a

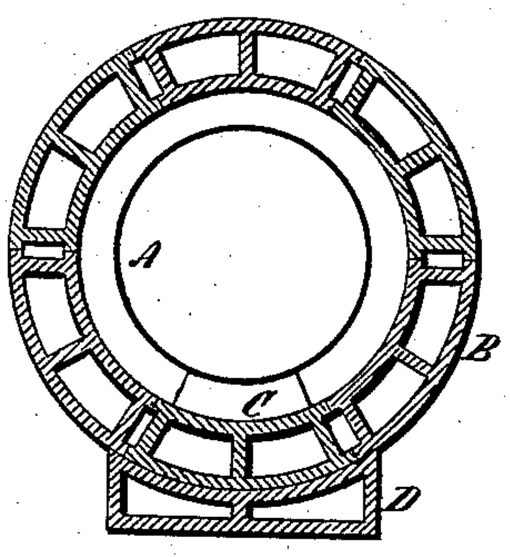


Figure 3.

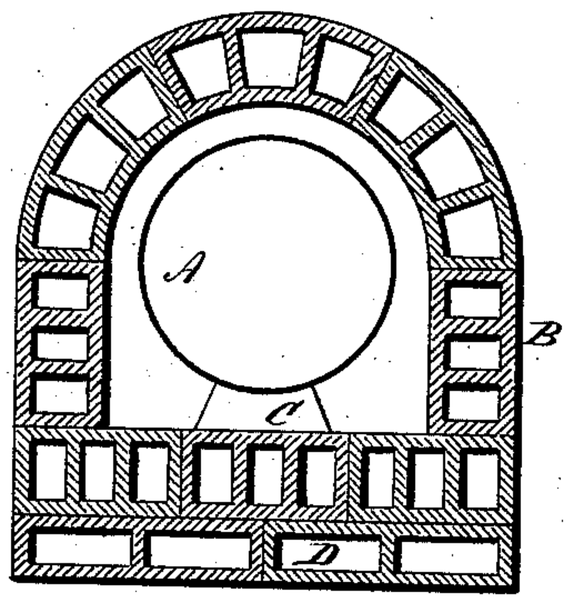


Figure 4.

Witnesses:
Philip Mauro
C. J. Hedrick

Inventor:
Leonard F. Beckwith by
A. Pollok his attorney

(No Model.)

2 Sheets—Sheet 2.

L. F. BECKWITH.

CONDUIT FOR STEAM PIPES.

No. 294,354. Patented Mar. 4, 1884.

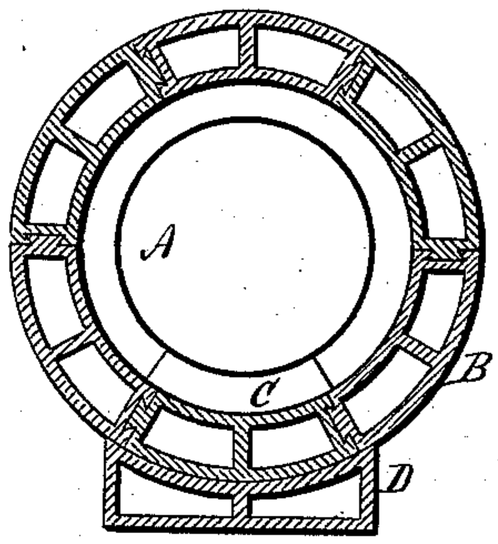


Figure 5.

Figure 5ª

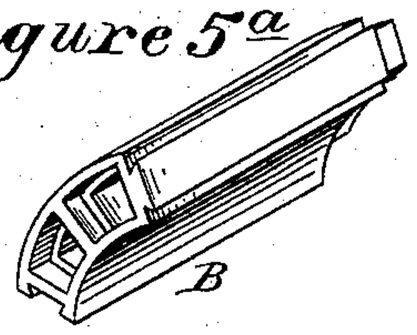
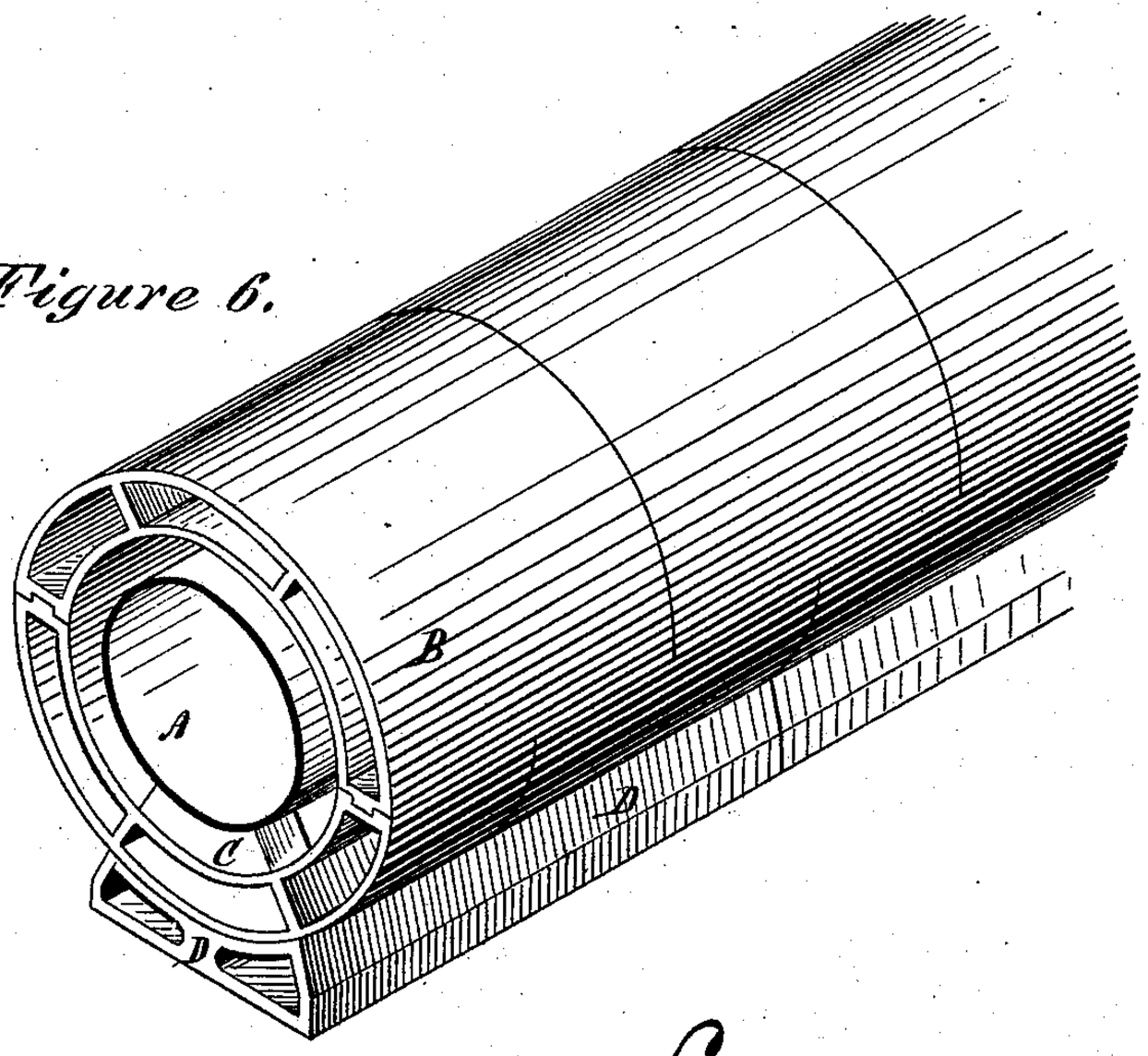


Figure 6.



Witnesses:
Philip E. Mauro
C. J. Hedrick

Inventor:
Leonard F. Beckwith
by A. Pollok
his attorneys

UNITED STATES PATENT OFFICE.

LEONARD F. BECKWITH, OF NEW YORK, N. Y., ASSIGNOR TO THE FIRE PROOF BUILDING COMPANY OF NEW JERSEY.

CONDUIT FOR STEAM-PIPES.

SPECIFICATION forming part of Letters Patent No. 294,354, dated March 4, 1884.

Application filed May 31, 1883. (No model.)

To all whom it may concern:

Be it known that I, LEONARD F. BECKWITH, of the city, county, and State of New York, have invented a new and useful Improvement in Conduits for Steam-Pipes, which is fully set forth in following specification.

When steam is conducted to a distance in pipes above or below ground, there is a waste of steam, loss of pressure, and production of water arising from the condensation of the steam in the pipes. This condensation, other things being equal, is in proportion to the defective insulation of the iron pipe by reason of the deficiency of non-conducting substances around it, and the study of the best system of insulation becomes of the highest importance. In pipes underground, especially, constant dampness must be fought, in conjunction with the radiation from the steam-pipe. The latter is usually wrapped more or less effectively in asbestus cloth, porous gray paper, Manila paper, cow's-hair felt, chopped straw, and loamy earth, plaster, &c. One of the methods which has given the best results heretofore for non-conductibility has been to place the steam-pipe thus wrapped inside of a wooden pipe, made of hemlock, white pine, &c., logs, about two to four inches thick on the sides, and coated with tar or asphaltum on the outside to render them impervious to dampness. The joint between two sections of wooden pipe is usually a simple lap-joint asphalted. The ends of the wooden pipe are banded by iron rings, and the pipes are very strong and similar to those used in many cities for the water-supply. The pipe is then laid in the trench, which is drained under the pipe by drain-tiles set on heavy wooden planking. An attempt is made to obtain an air-space by a partial utilization of the space between the wrapped steam-pipe and the wooden pipe; but it is irregular and ineffective. The objections to the wooden pipe are its uncertainty and lack of durability under the peculiar conditions in which it is placed of being constantly heated inside and cooled and wetted outside, its liability to checking and cracking from these causes destroying its non-conductibility; and, finally, its expense when any large steam-pipes are to be covered, a twelve-inch pipe requiring a log fourteen to sixteen inches bore and about twenty-four inches outside diameter. Logs of this size are difficult to obtain in any quantity—such as a large city would use in street steam-heating, for example—and are expensive in any event. Built-up pipe of heavy wooden staves, banded with iron and asphalted, have been proposed, but are very defective and leaky. The iron pipe has also been laid in a conduit built of common brick, as well as in a wooden box filled in around the pipe with "mineral wool," lamp-black, powdered steatite or agalite, &c. The objection to these powdered substances as insulating filling is that with time they settle down into a more and more compact mass, becoming thus better conductors of heat and leaving an empty unfilled space above.

It is known that the conducting-power of terra-cotta or burned brick is only about one thirty-fourth part of that of iron, and also that when it is made of a porous body, and not vitrified like stoneware, its conductibility is only somewhat more than that of some woods, while it is even less than that of others. Moreover, the poor conductibilty of a layer of air not in motion is well known, it being from about one-third to one-fourth of that of pine wood, even when the latter is taken under the most favorable case for it of a transmission of heat perpendicular to the fibers. It is clear that a combination of these elements will give a pipe of average conductibility much less than solid wood, and far superior in strength, durability, and adaptability to the constantly-varying conditions of laying, &c.

It is proposed to substitute for the wooden pipe, wooden box, conduit of solid brick, &c., for incasing and insulating pipes under ground, a pipe consisting of hollow bricks or blocks of burned clay, porous terra-cotta, light floating brick, cement, concrete, or artificial stone, or other suitable material containing a non-conducting air space or spaces in each brick, and curved, so as to be easily adjusted to forming the circumference, which may consist of two or more bricks. The number and shape of the tubular air-spaces may be varied indefinitely. Of the materials named for the construction of the casing, porous terra-cotta is preferred, for several reasons, to wit: it is much lighter than ordinary brick, and is a much better non-

conductor of heat, and more impervious to moisture. It is, moreover, not liable to cracking under the action of heat and moisture, as is the case with solid or hollow brick. These properties render it pre-eminently suitable for the purposes of this invention, and, so far as I am aware, the use of porous terra-cotta for a non-conducting and water-proof casing has never been suggested previous to my invention. While therefore I do not strictly limit myself thereto, I do make herein special claim to the use of porous terra-cotta for this purpose.

The material known as "porous terra-cotta" consists of an intimate mixture of clay with combustible material of vegetable origin, which in burning is destroyed, leaving cavities, which give the brick a porous body like the texture of pumice-stone. The organic substances used in admixture with the clay are sawdust, peat, coal, straw, chopped straw, tan-bark, flax, and the like in a state of fine division. Porous terra-cotta with fine cavities is far superior to that with large cavities. Owing to the assistance given in burning by the combustible materials mixed with the clay, the amount of fuel required to burn a kiln of porous terra-cotta is less than that required for burning hollow brick.

Various examples of pipe constructed in accordance with the invention are shown in the accompanying drawings, in which—

Figures 1, 2, 3, 4, and 5 are transverse vertical sections, showing different constructions. Figs. 1ª, 2ª, 3ª, 4ª, and 5ª are perspective views each of a hollow brick of the form used in the conduits shown in Figs. 1, 2, 3, 4, and 5, respectively; and Fig. 6, a perspective view of the conduit shown in Fig. 5.

A is the iron pipe inside, resting on small segmental pieces of burned clay C, set a few feet apart, which preserve a uniform air-space around it. The hollow bricks B are made of different shapes, thickness, number, and size, according to circumstances. The method of making the joints between the hollow bricks may be varied. For the joint in the cross-section of the pipe, Figs. 1, 4 show a plain joint; Figs. 2, 3, a broken joint; Figs. 5, 6, a tongue-and-groove joint. The joint between the bricks in the length of the pipe may be a plain joint, as in Figs. 1, 2, 3, 5, 6, or a lap-joint, as in Fig. 4. The principle of breaking all straight joints in the cross-section of the pipe and in the length of the pipe is preferable, as carrying out more thoroughly the object of making a more continuous protection against the passage of heat and perfection of adjustment in forming the pipe in place.

The bricks should preferably be from three to six inches across in thickness, as compared with two to four inches for wood, in order that the air-space may be a large one and more effective. The sides of the hollow brick should be about from one to two inches thick, according as the material used is burned clay or porous terra-cotta, and the bricks should be laid breaking joints, as in a wall, the joints being laid with cement. The bricks should preferably be about two feet long for rapid laying, with few joints. The bricks, after or before setting, should be covered on the outside with a coat of coal-tar, asphalt, or other suitable substance, as a preservative against humidity; or they may be glazed on the outside by any of the well-known methods used for sewer-pipe. The hollow brick invert, where used for drainage, should not be glazed or coated with water-proof covering.

The pipe of hollow bricks may be supported on a hollow-brick invert, D, laid in the bottom of the trench, and which is used for drainage, as in Figs. 4, 2, 3. In Fig. 1 the invert forms the lowest brick of the pipe. The pipe of hollow bricks may be made circular, square, egg-shaped, &c., in section. Any of the insulating substances mentioned—mineral wool, &c.—may be used around the iron pipe, if desired, between it and the hollow-brick pipe. By making the pipes in several pieces, as shown, with different methods of producing the joints in both directions, the resulting structure is peculiarly adapted for the special application of underground work.

The system above described has the advantage of being equally applicable to insulating large or small pipe, of being less expensive, of less average conductibility and more durable than wood, and of being of less conductibility than common brick conduits, capable of use where the latter are not. Finally, a pipe is obtained which can be built to suit any circumstances, to allow for branches, service-boxes, &c., and which, when made of hard-burned hollow brick or of porous terra-cotta, &c., consists of materials remarkable for their indestructibility. Further, owing to the terra-cotta pipe being air-tight, practically, the infiltration of gases from leaks in gas-pipes laid in streets will not occur, and thus the explosions which have happened will be prevented.

Instead of porous terra-cotta, any other suitable material—such as artificial stones of cement, lime, sand, &c., concretes of coal-tar, asphaltum, coke-dust, breeze, gravel, &c., light floating brick of infusorial or silicious earth and clay or other materials, all in combination with any system of conveying in metal pipes steam, hot air, gas, hot water, smoke, &c., to a distance underground—may be used, but not to the same advantage, the porous terra-cotta being, for the reasons above given, the preferred material, and being specifically claimed herein.

I claim—

1. A casing for underground metal pipes for conveying steam, hot water, hot air, gas, smoke, &c., composed of separate hollow pieces, made of porous terra-cotta, jointed together, substantially as described.

2. A casing for underground metal pipes for conveying steam, hot water, hot air, gas, smoke, &c., composed of separate hollow pieces,

made of porous terra-cotta, jointed together by broken joints or tongue-and-groove joints or lap-joints in cross-section, substantially as described.

3. A casing for underground metal pipes for conveying steam, hot water, hot air, gas, smoke, &c., composed of separate hollow pieces, made of porous terra-cotta, jointed together by broken joints or tongue-and-groove joints or lap-joints in horizontal section, substantially as described.

4. A casing for underground metal pipes for conveying steam, hot water, hot air, gas, smoke, &c., composed of separate hollow pieces, made of porous terra-cotta, jointed together by broken joints or tongue-and-groove joints or lap-joints in cross-section and in horizontal section, substantially as described.

5. A casing for underground metal pipes for conveying steam, hot water, hot air, gas, smoke, &c., composed of separate hollow pieces, made of burned clay or porous terra-cotta, jointed together, substantially as described, said casing and metal pipe being so combined as to form an air-space between the metal pipe and the casing, substantially as described.

6. A casing for underground metal pipes for conveying steam, hot water, hot air, gas, smoke, &c., composed of separate hollow pieces, made of burned clay or porous terra-cotta, jointed together by broken joints or tongue-and-groove joints or lap-joints in cross-section, substantially as described, said casing and metal pipe being so combined as to form an air-space between the metal pipe and the casing, substantially as described.

7. A casing for underground metal pipes for conveying steam, hot water, hot air, gas, smoke, &c., composed of separate hollow pieces, made of burned clay or porous terra-cotta, jointed together by broken joints or tongue-and-groove joints or lap-joints in horizontal section, substantially as described, said casing and metal pipe being so combined as to form an air-space between the metal pipe and the casing, substantially as described.

8. A casing for underground metal pipes for conveying steam, hot water, hot air, gas, smoke, &c., composed of separate hollow pieces, made of burned clay or porous terra-cotta, jointed together by broken joints or tongue-and-groove joints or lap-joints in cross-section and in horizontal section, substantially as described, said casing and metal pipe being so combined as to form an air-space between the metal pipe and the casing, substantially as described.

9. In combination with a casing for metal underground pipes, an invert for drainage, substantially as described.

10. A casing for underground metal pipes for conveying steam, hot water, hot air, gas, smoke, &c., composed of separate hollow pieces, made of burned clay or porous terra-cotta, jointed together, and having an invert for drainage, substantially as described.

11. A casing for underground metal pipes for conveying steam, hot water, hot air, gas, smoke, &c., composed of separate hollow pieces, made of burned clay or porous terra-cotta, jointed together by broken joints or tongue-and-groove joints or lap-joints in cross-section, and having an invert for drainage, substantially as described.

12. A casing for underground metal pipes for conveying steam, hot water, hot air, gas, smoke, &c., composed of separate hollow pieces, made of burned clay or porous terra-cotta, jointed together by broken joints or tongue-and-groove joints or lap-joints in horizontal section, and having an invert for drainage, substantially as described.

13. A casing for underground metal pipes for conveying steam, hot water, hot air, gas, smoke, &c., composed of separate hollow pieces, made of burned clay or porous terra-cotta, jointed together by broken joints or tongue-and-groove joints or lap-joints in cross-section and in horizontal section, and having an invert for drainage, substantially as described.

14. A casing for underground metal pipes for conveying steam, hot water, hot air, gas, smoke, &c., composed of separate hollow pieces, made of burned clay or porous terra-cotta, jointed together, substantially as described, said casing and metal pipe being so combined as to form an air-space between the metal pipe and the casing, and having an invert for drainage, substantially as described.

15. A casing for underground metal pipes for conveying steam, hot water, hot air, gas, smoke, &c., composed of separate hollow pieces, made of burned clay or porous terra-cotta, jointed together by broken joints or tongue-and-groove joints or lap-joints in cross-section, substantially as described, said casing and metal pipe being so combined as to form an air-space between the metal pipe and the casing, and having an invert for drainage, substantially as described.

16. A casing for underground metal pipes for conveying steam, hot water, hot air, gas, smoke, &c., composed of separate hollow pieces, made of burned clay or porous terra-cotta, jointed together by broken joints or tongue-and-groove joints or lap-joints in horizontal section, substantially as described, said casing and metal pipe being so combined as to form an air-space between the metal pipe and the casing, and having an invert for drainage, substantially as described.

17. A casing for underground metal pipes for conveying steam, hot water, hot air, gas, smoke, &c., composed of separate hollow pieces, made of burned clay or porous terra-cotta, jointed together by broken joints or tongue-and-groove joints or lap-joints in cross-section and in horizontal section, substantially as described, said casing and metal pipe being so combined as to form an air-space between the metal pipe and the casing, and having an invert for drainage, substantially as described.

18. A casing for underground metal pipes for conveying steam, hot water, hot air, gas,

smoke, &c., composed of separate hollow pieces or bricks, and having an interior filling or layer composed of non-conducting substance—such as mineral wool or plaster—or of non-conducting and water-repelling substance—such as lamp-black—substantially as described.

19. A casing for underground metal pipes for conveying steam, hot water, hot air, gas, smoke, &c., composed of separate hollow pieces or bricks of porous terra-cotta, having their surface covered with coal-tar, asphalt, silicate-paint, glazing, or other water-proof covering, substantially as described.

In testimony whereof I have signed this specification in the presence of two subscribing witnesses.

LEONARD F. BECKWITH.

Witnesses:

B. F. LEE,

JOHN MCCLURE.