J. SCOTT.

EXPANSION JOINT.

APPLICATION FILED AUG. 9, 1910.

987,098.

Patented Mar. 14, 1911.

2 SHEETS—SHEET 1.

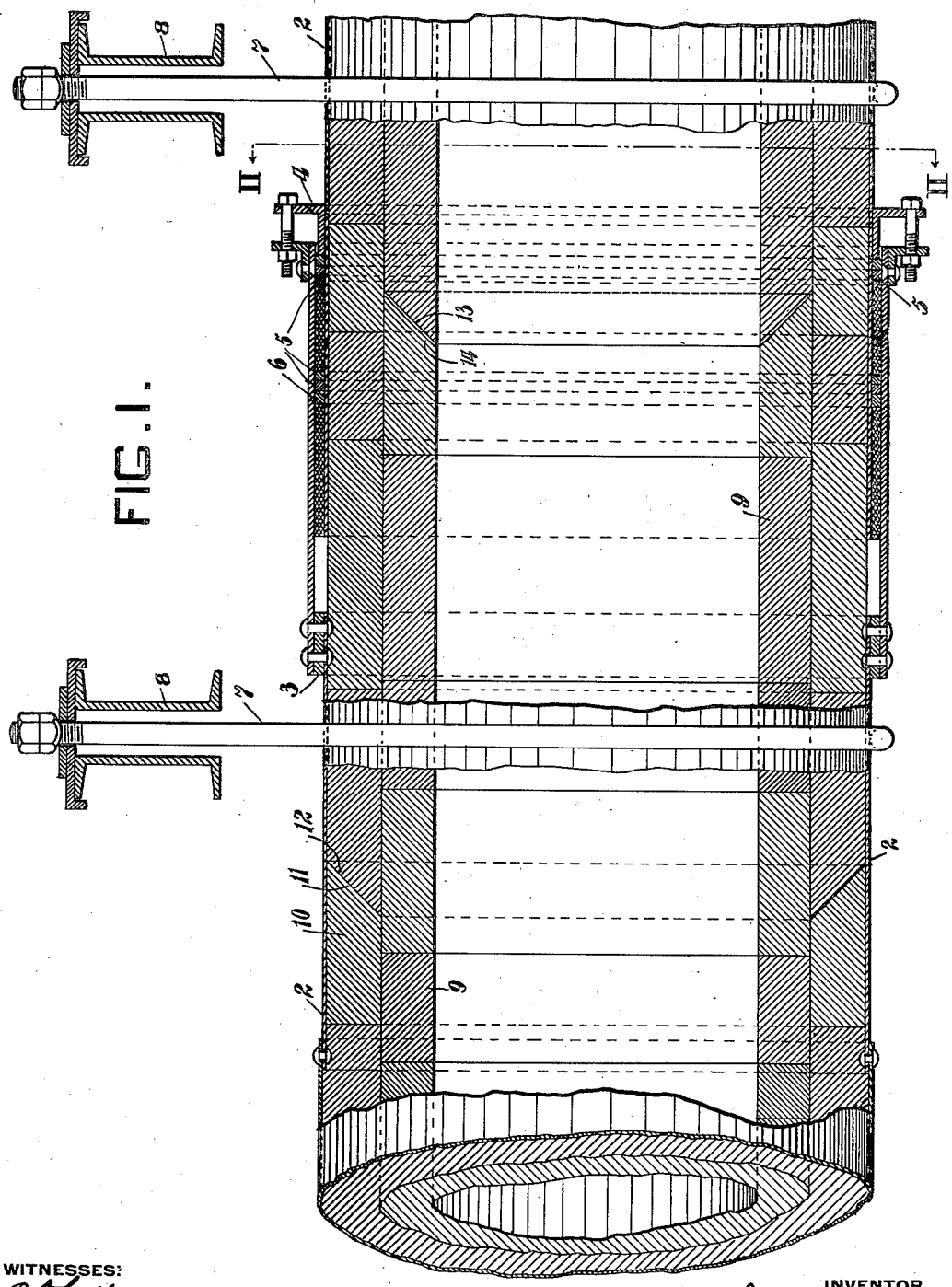

FIG. 1.

WITNESSES:

R. D. Little

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2 SHEETS—SHEET 2.

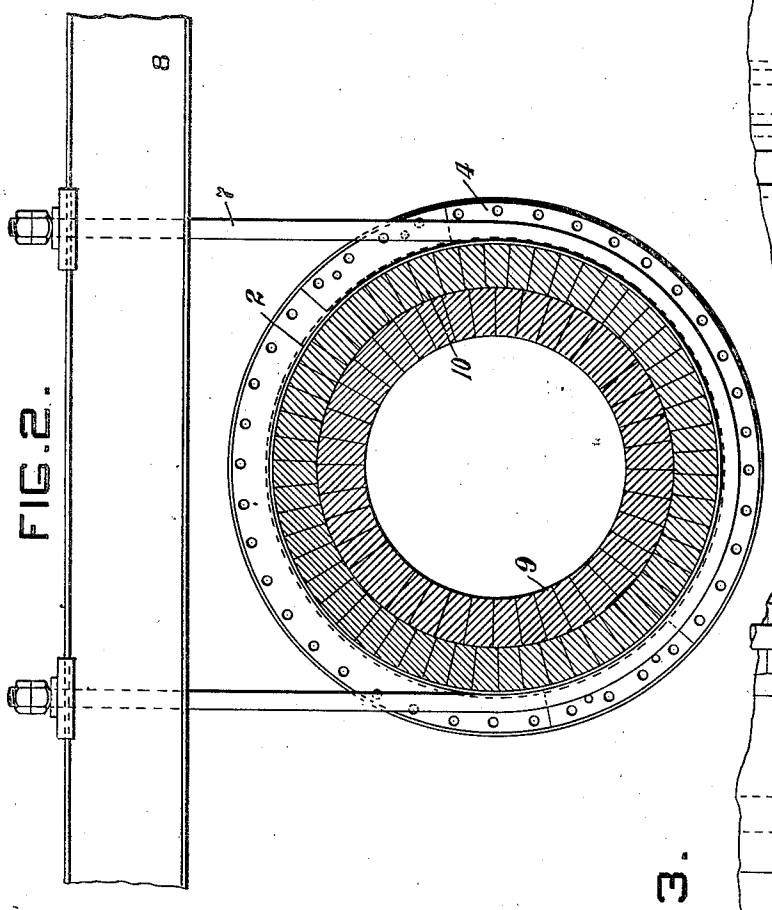

FIG. 2.

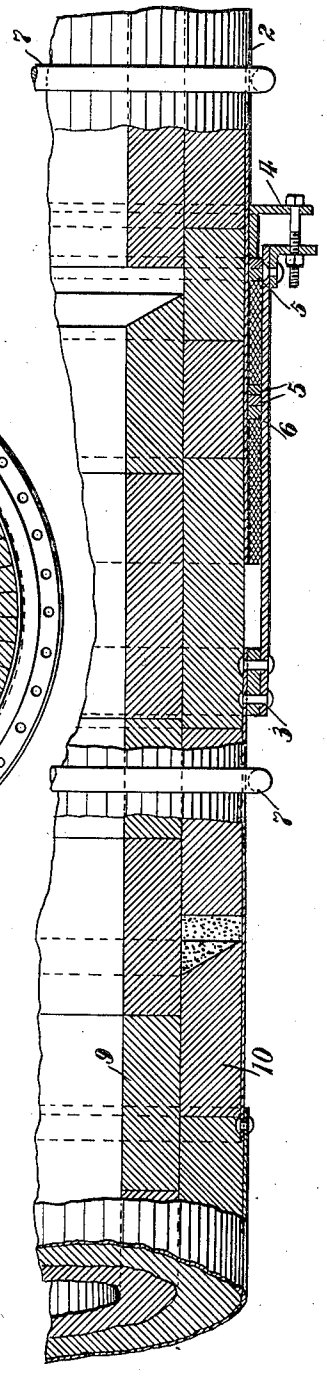

FIG. 3.

WITNESSES:

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UNITED STATES PATENT OFFICE.

JAMES SCOTT, OF PITTSBURG, PENNSYLVANIA.

EXPANSION-JOINT.

987,098. Specification of Letters Patent. Patented Mar. 14, 1911.

Application filed August 9, 1910. Serial No. 576,366.

To all whom it may concern:

Be it known that I, JAMES SCOTT, of Pittsburg, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Expansion-Joint, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming part of this specification.

My invention relates to the construction of pipes or mains used in handling or conveying gases, and more particularly relates to the construction of such pipes or mains having a lining of bricks or other refractory material which are used in conducting heated gases such as are heated or are burned in the hot blast stoves of a blast furnace plant.

One object of my invention is to provide a main lined with refractory material having novel means for preventing "creeping" or relative movement of the refractory lining within its metal shell and to prevent increase in the length of the lining and serious damage resulting from such increase in length.

Another object of this invention is to provide a lined main having an expansion joint in the metal shell of the main having means for maintaining a gas tight slip joint permitting relative longitudinal movement of the main caused by the alternate increase and decrease in the length of such gas mains by reason of the repeated heating and cooling to which the mains are subjected when in use, and to provide an expansion joint in the refractory lining permitting lengthwise movement of the one part of the lining relative to its adjoining portion corresponding to that of the incasing metal shell of the main.

A further object of my invention is to provide a refractory lining having expansion joints located at suitable intervals in its length and arranged to prevent permanent increase in the length of the lining and the resulting destructive crushing effect of such increase in length.

In conveying heated gases by means of such mains, for example, the hot blast from the hot blast stoves to the stack of a blast furnace, or the combustible gases led from the furnace stack in which they are generated to the hot blast stoves or other place of use, the main is alternately heated and cooled or one portion of the main is heated and another cooled. The expansion of the heated main causes considerable increase in its length over that of the main when cold, and sets up enormous strains in the structure. Heretofore in the construction of such mains, provision has sometimes been made for the expansion of the metal shell, the refractory lining being built up solidly within the shell. When such lined tubes or mains are in use the lining as well as the metal shell is expanded and increased in length by the heating effect of the gases passing through the main, and when the main becomes cooled and the lining is contracted, the joints in the bricks forming the lining become broken and adjoining ends of the bricks are separated to a slight extent, the movement of the metal shell being the cause of the separation of the bricks at the joints. The heated gases conducted in such mains usually contain a large amount of finely divided solid materials carried in suspension in the gases, this being particularly the case in the waste gases conducted away from the top of a blast furnace stack. When the gas main has been heated and then cooled so that the adjoining ends of the bricks are separated, the finely divided solid materials in the gases, which are constantly being deposited in the mains, enter and fill up these cracks. When the main is again heated the brick work will be again expanded to the same extent as before, and by reason of the filling of the cracks by the materials deposited from the gases, the brick work is permanently increased in length and is successively moved a greater distance at each heating and cooling of the gas main and lining. While the amount of such increase in length and movement is comparatively small at any one time, the result of long continued use is that the brick work is increased in length to such an extent as to ofttimes cause serious damage to the structure.

Referring to the drawings, Figure 1 is a longitudinal section of a pipe or main having an expansion joint for the metal shell located at suitable intervals in the length of the gas main and having a refractory lining constructed and arranged in accordance with my invention. Fig. 2 is a transverse section of the same on the line II—II of Fig. 1. Fig. 3 is a longitudinal section showing a

modification in the construction of the expansion joints in the refractory lining forming part of this apparatus.

In the drawings, 2 designates a cylindrical shell of a hot blast or gas main built up of metal joints in the usual manner. At intervals in the considerable length of such mains are expansion joints constructed and arranged in accordance with my invention, and which, as shown are formed by making the metal shell of the main in sections and providing on the end of one section an annular ring 3 of larger diameter than the shell 2, and on the adjacent end of the adjoining section of the main is a gland 4, which is arranged to compress and hold in position flocculent refractory materials placed in the annular space formed between the shell 2 and the ring 3. Also placed within the stuffing box formed by the ring 3 and shell 2 is a series of rings 5 formed of suitable packing material adapted to resist the action of heat and a metal ring 6 is also placed in this space to act as a separator and keep one section of the shell 2 concentric with the other section and with the ring 3. The main is preferably suspended by U bolts 7 from suitable overhead supports 8, this construction lending to free longitudinal movement of the main when expanding and contracting.

Within the metal shell 2 of the hot blast main is a refractory brick lining which as shown is formed of two annular rows or layers, 9 and 10. At intervals in the length of each row of bricks adjacent to the expansion joints formed in the metal shell of the main, the ends or edges 11 and 12, 13 and 14, of the bricks, are beveled. The beveled ends of the bricks in one row 9 are formed so as to overlap those of the row 10, this being clearly shown in Figs. 1 and 3.

In the construction shown in Fig. 3 but one of the adjoining ends of the bricks is beveled, and at the expansion joints formed in the brick work, the ends of the bricks are separated so as to form a space between the adjoining ends of these bricks. This space is preferably filled with asbestos wool, or similar flocculent refractory material.

In a gas main constructed in accordance with my invention, as shown in the drawings, the brick work and metal shell are alternately heated and cooled, and expand and contract in the usual manner. The expansion joints provided in the length of the metal shell permit of one section of the metal shell moving lengthwise freely, while at the same time the stuffing box and gland maintain a gas-tight joint. When the brick work is expanded and then contracted, the brick work will separate as before, but on account of the relatively short distance between the expansion joints, the brick work will separate only at points adjacent to the expansion joints in the metal shell. The beveled meeting edges of the joints formed in the refractory lining will separate and permit the entrance of finely divided solids deposited from the gases in the same manner as before. When the brick work is again expanded by heating, instead of having a permanent increase in the length of the brick work due to filling of the cracks formed in the joints, the deposited materials will be forced outwardly into the main by reason of the inclined surfaces in the joints, and in this way prevent creeping or gradual permanent increase in the length of the brick work.

The advantages of my invention will be apparent to those skilled in the art. From the above it will be readily seen that increase in the length of the lining is prevented and movement of the refractory lining relatively to the metal shell overcome. The possibility of damage by breakage of the main due to permanent increase in the length of the brick work is rendered impossible.

Modifications in the construction and arrangement of the parts may be made without departing from my invention, as defined in the claims.

The lining may be monolithic instead of being formed of bricks, as in the usual construction. In such cases, beveled joints are provided in the monolithic lining, at intervals in its length.

The employment of the stuffing box and gland on the metal shell of the gas mains renders expansion and contraction of the apparatus possible, while maintaining a gas-tight joint.

I claim:—

1. A gas main comprising a metal shell surrounding a refractory lining, said lining having a transverse joint separating the lining into a plurality of parts, the abutting end portion of at least one part being beveled.

2. A gas main comprising a metal shell surrounding a refractory lining, said lining having an overlapping transversely extending joint separating the lining into a plurality of parts, the abutting end portion of at least one part being beveled.

3. In a gas main having a metal shell surrounding a refractory lining, an expansion joint comprising means on the shell forming a slip connection between adjoining ends of two parts of said shell and a transverse joint adjacent to said slip joint separating the lining into a plurality of parts, the abutting end of at least one part of the lining being beveled.

4. In a gas main having a metal shell surrounding a refractory lining, an expansion joint comprising a stuffing box and gland on the shell forming a slip connection between

adjoining ends of two parts of said shell and a transverse joint adjacent to said slip joint separating the lining into a plurality of parts, the abutting end of at least one part of the lining being beveled.

5. In a gas main having a metal shell surrounding a refractory lining, an expansion joint comprising a stuffing box and gland on the shell forming a slip connection between adjoining ends of two parts of said shell and a transverse joint adjacent to said slip joint separating the lining into a plurality of parts, the abutting end of at least one part of the lining being beveled, and a packing of flocculent refractory material in the stuffing box portion of the joint.

6. In a gas main having a metal shell surrounding a refractory lining, an expansion joint comprising a stuffing box and gland on the shell forming a slip connection between adjoining ends of two parts of said shell and a transverse joint adjacent to said slip joint separating the lining into a plurality of parts, the abutting end of at least one part of the lining being beveled, and a packing of flocculent refractory materials held in place in the stuffing box by the gland.

7. In a gas main having a metal shell surrounding a refractory lining, an expansion joint comprising a stuffing box and gland on the shell forming a slip connection between adjoining ends of two parts of said shell and a transverse joint adjacent to said slip joint separating the lining into a plurality of parts, the abutting end of at least one part of the lining being beveled, and means in the stuffing box adapted to hold the end of the main within the stuffing box concentric with the adjoining end on which the stuffing box is mounted.

8. In a gas main a refractory lining divided transversely into a plurality of parts, the abutting ends of the lining at the joints being beveled.

In testimony whereof, I have hereunto set my hand.

JAMES SCOTT.

Witnesses:
R. D. LITTLE,
L. G. BROWER.