No. 677,472. Patented July 2, 1901.

T. F. ROWLAND.

PLATE METAL ARCH.

(Application filed Feb. 3, 1900.)

(No Model.) 2 Sheets—Sheet 1.

Fig. 1

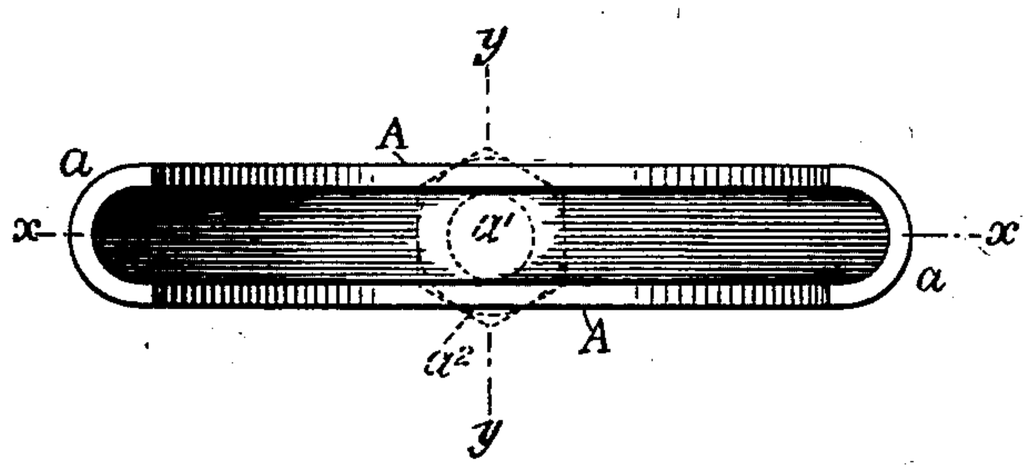


Fig. 2

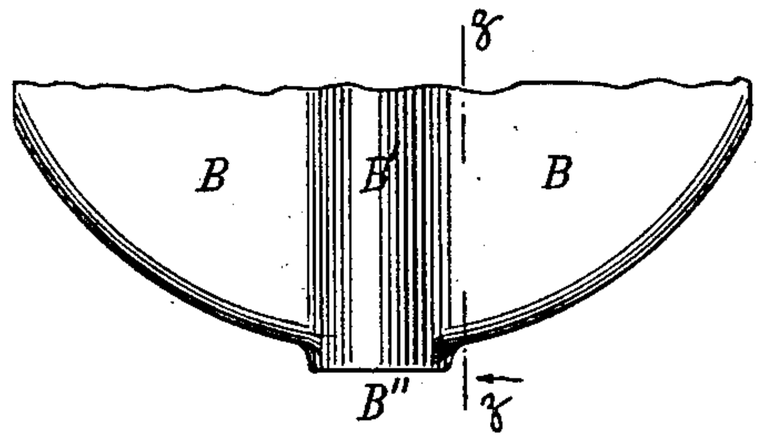


Fig. 3

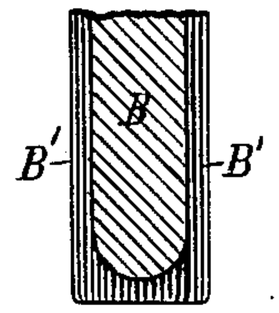


Fig. 4

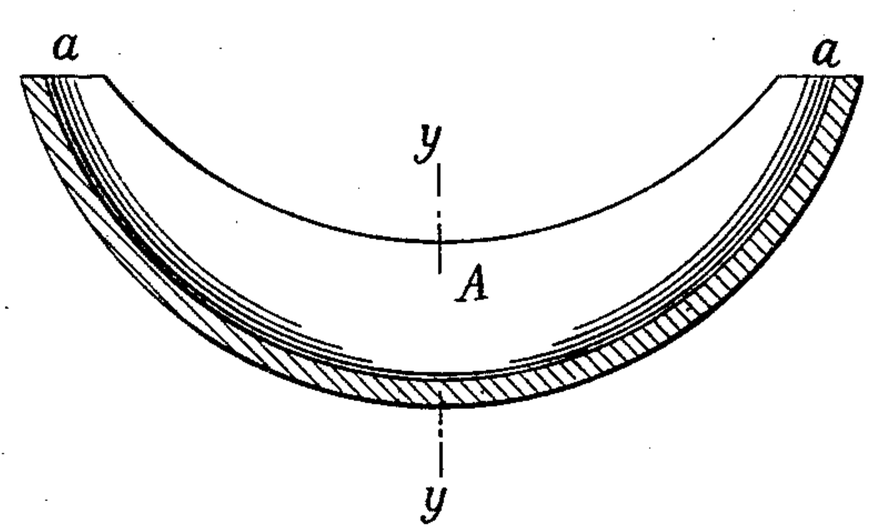


Fig. 5

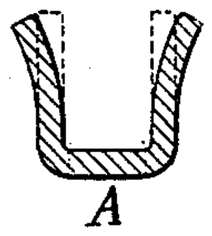


Fig. 6

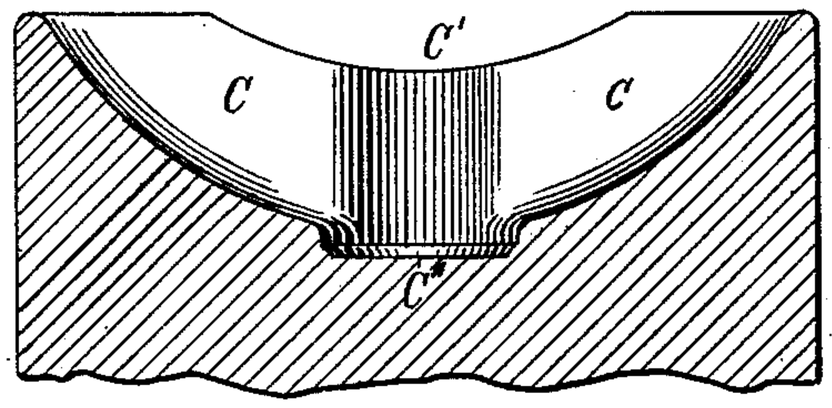
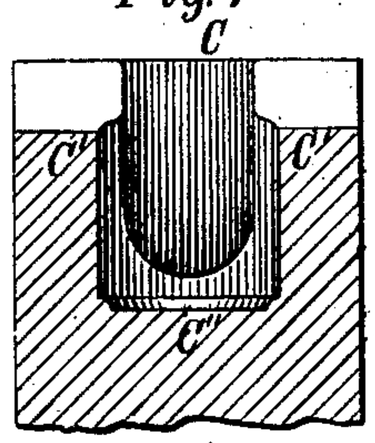


Fig. 7



Witnesses:
Raphael Netter
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Thomas F. Rowland, Inventor
by Frederick S. Duncan Atty

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

No. 677,472.

Patented July 2, 1901.

T. F. ROWLAND.

PLATE METAL ARCH.

(Application filed Feb. 3, 1900.)

(No Model.)

2 Sheets—Sheet 2.

Fig. 8

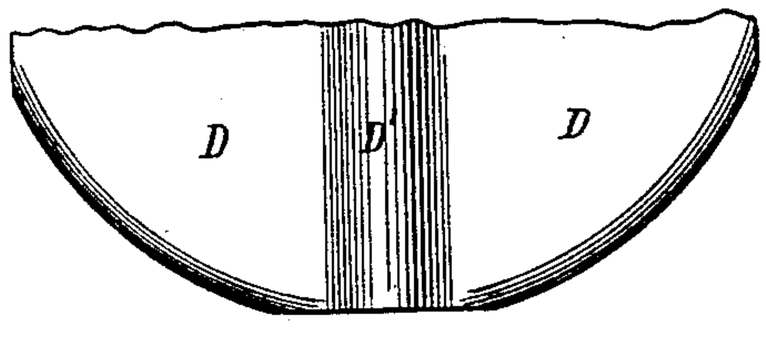


Fig. 9

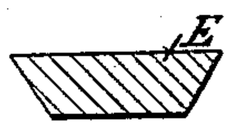


Fig. 10

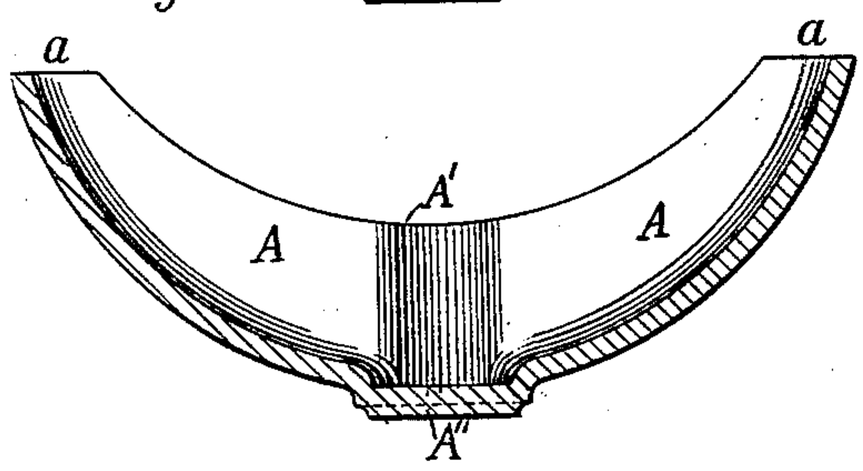


Fig. 11

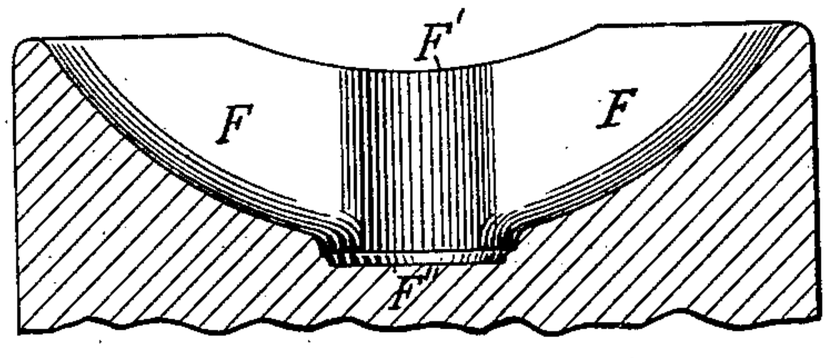


Fig. 12

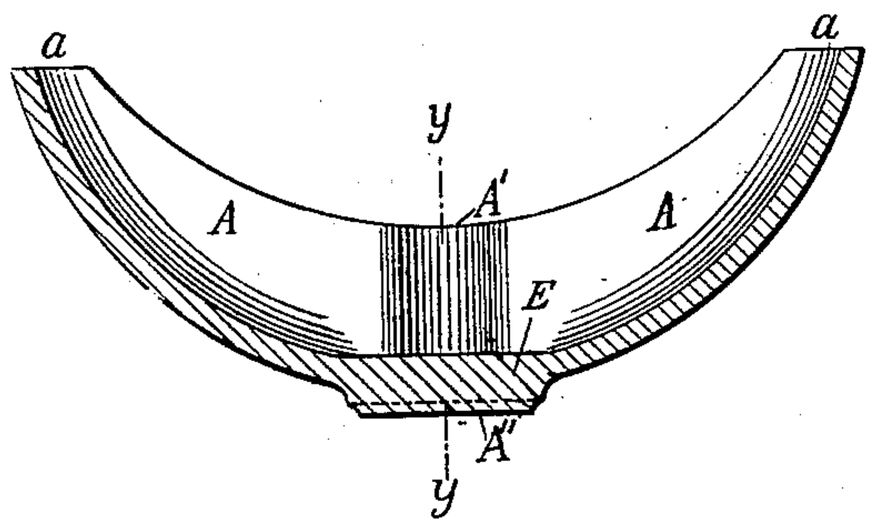


Fig. 13

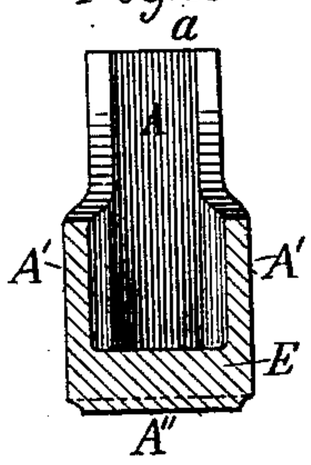
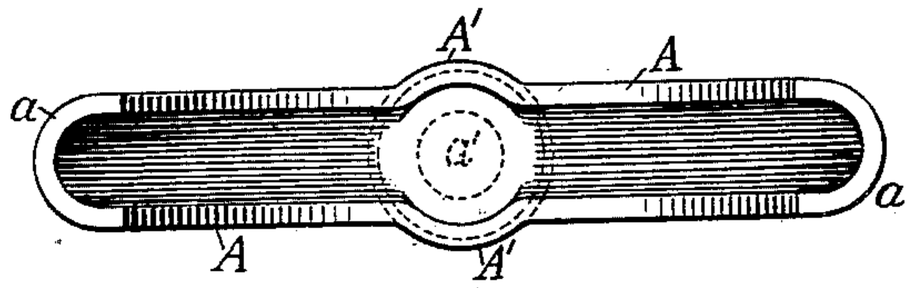


Fig. 14



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UNITED STATES PATENT OFFICE.

THOMAS FITCH ROWLAND, OF NEW YORK, N. Y.

PLATE-METAL ARCH.

SPECIFICATION forming part of Letters Patent No. 677,472, dated July 2, 1901.

Application filed February 3, 1900. Serial No. 3,873. (No model.)

To all whom it may concern:

Be it known that I, THOMAS FITCH ROWLAND, a citizen of the United States, residing at 329 Madison avenue, in the borough of Manhattan, in the city of New York, county of New York, and State of New York, have invented a certain new and useful Improvement in Plate-Metal Arches, of which the following is a specification.

My invention relates to improvements whereby a certain plate-metal arch now offered on the market as a guard or bridge for use with the manhole-covers of boilers is altered, strengthened, and rendered satisfactory for all purposes; and it consists in the features of construction hereinafter described. My invention is equally applicable, however, to plate-metal arches when used for other purposes.

The plate-metal arch or manhole-guard in connection with which I will describe and illustrate my invention consists of a sheet of pressed steel arched both longitudinally and laterally, the longitudinal arch, however, being the longer. Thus the guard or bridge forms a main longitudinal arch, and at every cross-section the walls of the guard also form an arch. At the crown of the arch a hole is cut, through which passes the bolt by which the manhole-cover is held to the inner side of the boiler-shell. The guard rests upon its ends on the boiler-shell, the top of the arch being opposite the manhole and its cover. The cover-bolt extends from the cover up through the opening in the guard. The end of the bolt is threaded, and a heavy nut is fitted thereon. By turning the nut the manhole-cover is drawn up against the boiler-shell. The strain thus created is carried by the guard, which, being arched longitudinally and having walls which are also arched laterally, presents a desirable form of construction for carrying such strain. This device, however, contains one feature which constitutes a serious obstacle to its success and precludes it from meeting certain requirements of the art in which the device is used. At the crown of the arch and at the point where the entire strain is immediately applied the arch is weakened by cutting in its walls the bolt-hole, which necessarily is of considerable diameter, inasmuch as it is necessary to use as large a bolt as possible to withstand the heavy strain commonly put upon these manhole-covers.

In the manhole-guard above referred to as being offered upon the market the bolt-hole is of practically the same diameter as the width between the inner walls of the crown of the arch, thus very seriously weakening the arch at that point. The bolt-nut is necessarily of such size that its edges project beyond the sides of the arch. If the entire arch were broadened, so that a bolt-hole of the same diameter would occupy a relatively smaller part of the crown and a nut of the same size would not project over the edges of the arch, the arch would be too heavy and large for practical use.

The object of my invention is to strengthen the crown of the arch to enable it to withstand any strain which may be put upon it, and without broadening or enlarging the entire arch to provide a seat or bearing of suitable width for the bolt end, and to widen the crown of the arch so that a bolt-hole of suitable diameter may be used without weakening the arch. The means by which I accomplish this object are illustrated in the drawings which accompany and form part of this application.

Figures 1, 4, 5, 9, 10, 12, 13, and 14 are views of my improved plate-metal arch in various stages of construction. Figs. 2, 3, 6, 7, 8, and 11 are views of the dies which are used in making my device. Fig. 1 is a view from underneath of the sheet-metal blank from which my arch is constructed, which said blank is arched laterally and longitudinally in the manner above described. Fig. 2 is a side view of the male die of the first set of dies used in making my improved device. Fig. 3 is a cross-section of said die at the line $z\,z$ of Fig. 2. Fig. 4 is a longitudinal cross-section of the blank shown in Fig. 1, the cross-section being made along the lines $x\,x$ of Fig. 1. Fig. 5 is a view in cross-section at the line $y\,y$ of Fig. 1 of the walls of the arched blank shown in that figure, the walls of said blank being shown in Fig. 5 as forced out of their former position for the purpose hereinafter described. Fig. 6 is a view in longitudinal cross-section of the female die corresponding with the die shown

in Fig. 2. Fig. 7 is a side view, in cross-section, of the die shown in Fig. 6. Fig. 8 is a side view of the male die of the second set of dies used to make my plate-metal arch. Fig. 9 is a cross-section of the metal plug or plate which I use in making my device. Fig. 10 is a longitudinal cross-section of the blank after being treated with the dies shown in Figs. 2 and 6. Fig. 11 is a longitudinal cross-section of the female die corresponding to the die shown in Fig. 8. Fig. 12 is a longitudinal cross-section of my finished arch. Fig. 13 is a lateral cross-section of the same, taken at the line *y y* of Fig. 12. Fig. 14 is a view from underneath of my completed device.

Referring now to the figures in detail, A A are the walls of the laterally and longitudinally arched sheet-metal blank from which my device is made. *a a* represent the ends or feet of said arched blank. If a bolt-hole were cut in the crown of said blank, as is shown in dotted lines at *a'* in Fig. 1, the said blank would then be exactly the same as the manhole crab or bridge above referred to as being offered on the market. The position and relative size of the bolt-nut are shown in dotted lines at a^2.

B B represent the body of the male die, which fits exactly inside of the blank A A. At the middle of the walls of said die, however, are projections B' B', of greater width than the distance between the opposite walls of the blank A A and preferably curved in contour. At the middle of its lower part the said die B B is carried out into a projection B^2, which said projection has, preferably, a circular face. The metal blank A A is then heated until it becomes sufficiently plastic. The walls of said blank opposite the crown thereof are then by any suitable means slightly bent outward, as shown in cross-section in Fig. 5, so as to permit of the partial insertion therein of the projections B^2 and B' B' of the die B B. The blank A A is then placed in and upon the female die C C, the inner surface of which corresponds in contour in general with the outer surface of the blank A A and has side grooves C' C', corresponding with the projections B' B' of the male die, and a depression C^2, corresponding with the projection B^2 of the male die. The male die is then forced down and into the blank A A as it is held in the die C C, thus giving the blank the shape shown in cross-section in Fig. 10. The said blank will then have protruding and curved cheeks A' A' and a projecting shoulder with circular face A^2. In this way the crown of the blank A A has been widened and enlarged and has been given a flat surface broad enough to receive the bolt-nut and upon which it may have a firm seat. As, for the reasons above set forth, it is necessary, however, to strengthen the crown of the blank thus formed, I proceed as follows: E is a metal plate or plug fitting the inner side of the broadened crown of the blank A A. The plate E is then placed inside of the blank A A and against its projecting crown A^2. Heat is applied until the crown and sides of the blank and the plate are sufficiently plastic, and then the said blank and plate are placed inside of the female die F F, (shown in Fig. 11,) the inner contour of which corresponds to the outer contour of the blank, as shown in Fig. 10. The die D D is then inserted into the blank, and sufficient pressure is brought to bear upon said die to cause the welding and complete joinder of the plate E to the inner sides and crown of the blank A A.

Figs. 12 and 13 show the strengthening of the crown and walls of the blank A A resulting from the welding thereto of the plate E, and Fig. 13 also shows the protruding cheeks A' A'.

Fig. 14 is a view from underneath of the finished arch, showing the protruding and curved cheeks A' A' and showing in dotted lines the thickened, broadened, and projecting crown A^2. When the blank is in this condition, a bolt-hole, such as *a'*, as shown in dotted lines in Fig. 14, is drilled in the crown A^2, and the blank is then ready for use as a manhole-guard.

It is to be noticed that the crown of my improved plate-metal arch and its walls immediately adjacent said crown are materially strengthened and supported by the insertion and welding thereto of the plate E and that my improved arch is thus furnished with a broadened and flat crown, which forms a suitable seat for the bolt-nut, and that this strengthening and broadening makes possible the use of a bolt-hole and bolt of suitable diameter without endangering the stability of the arch and its crown.

It is evident that, if desired, either the broadened crown or the protruding cheeks of my improved arch may be of a different shape than those shown in the drawings attached hereto without affecting my invention. I have shown, however, that shape of crown and cheeks which seems to me most desirable. It is also evident that the crown of my improved arch may be broadened, its cheeks protruded, and the metal plate integrally attached to its crown and walls in manners differing somewhat from that above described and that differently-shaped dies may be used and that less steps may be taken, if desired, in the process of making said arch. It is also evident that, if desired, the metal plate may be of different shape than that above described and illustrated and may be attached to the crown and walls of the crab in a different manner, provided always that it is attached integrally to said crown and walls so as to become part of and thus strengthen the same.

In some instances it may not be necessary to broaden the crown of the arch, and in such cases the sides of said arch need not be forced out into the protruding cheeks described and the crown need not be broadened, as above described; but broadening said crown and protruding said cheeks is so small an item of ex-

pense and the advantages of the broadened crown and protruding cheeks are so great and the necessity thereof is so general that it is thought that this form will be used in all cases, even in those few where a broadened crown is not absolutely essential. I have shown and described in this specification the best form of my arch, which contains the broadened crown and protruding cheeks and in which the strengthening plug or plate is applied to the crown and walls of the crab from underneath. By attaching the plate to the crown and walls from underneath greater strength is necessarily given to the crab than if a suitable plug or plate were integrally attached to the crown and walls from above.

Although I have described and illustrated my invention as applied to a manhole-guard, it is evident that it can be used with advantage in all cases where heavy strain is brought to bear upon the crown of metal plates which are arched longitudinally and laterally, in some of which cases bolt-holes may be required in the crown of said arched plates and in other of which cases they may not be required. I do not intend, therefore, to limit my invention to its use in connection with manhole-guards, nor do I intend to limit my invention to metal arches or bridges having the relative longitudinal and lateral contours shown in the drawings attached to this specification, as it is evident it is equally applicable to plate-metal arches or bridges of varying longitudinal and lateral contours.

Having thus described my invention, what I claim, and desire to secure by Letters Patent, is—

1. A metal plate arched longitudinally and laterally and having a strengthening-plate subsequently welded to the crown thereof and to the walls contiguous to said crown, substantially as and for the purposes above set forth.

2. A metal plate arched longitudinally and laterally, having its side walls protruded and its crown broadened, and having a strengthening-plate subsequently welded to the crown thereof and to the walls contiguous to said crown, substantially as and for the purposes above set forth.

3. A metal plate arched longitudinally and laterally, having its side walls protruded, and having a strengthening-plate subsequently welded to the under side of said crown and to the walls contiguous thereto, subtantially as and for the purposes above set forth.

4. The herein-described method of making an improved plate-metal arch which consists in arching a metal plate longitudinally and laterally and integrally attaching a strengthening-plate to the crown thereof and the walls immediately contiguous said crown, substantially as and for the purposes set forth.

5. The herein-described method of making an improved plate-metal arch which consists in arching a metal plate longitudinally and laterally broadening the crown of the arch and protruding the side walls adjacent the crown, and integrally attaching a strengthening-plate to said crown and the walls of the arch immediately contiguous thereto, substantially as and for the purposes set forth.

6. The herein-described method of making an improved plate-metal arch which consists in arching a metal plate longitudinally and laterally, and integrally attaching a strengthening-plate to the underside of the crown of said arch and to the walls of the arch immediately contiguous thereto, substantially as and for the purposes set forth.

7. A plate-metal arch formed of a metal plate arched longitudinally and transversely and having a welded strengthening-plate at its crown.

8. An arch formed of a metal plate arched longitudinally and transversely and having an interior welded strengthening-plate at its crown and the walls adjacent the same.

9. An arch formed of plate metal arched longitudinally and transversely, having its side walls protruding adjacent the crown and having a welded strengthening-strip at its crown.

10. An arch formed of plate metal arched longitudinally and transversely, having its side walls protruding adjacent the crown and having a welded strengthening-plate inside said crown and said adjacent side walls.

THOMAS FITCH ROWLAND.

Witnesses:

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JAMES M. CATLOW.