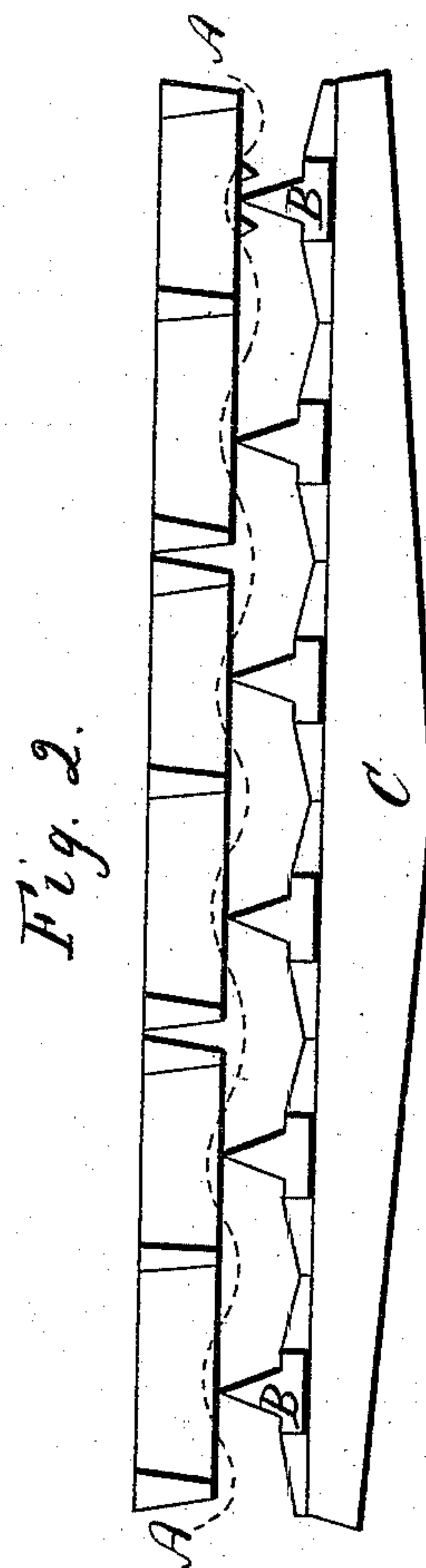
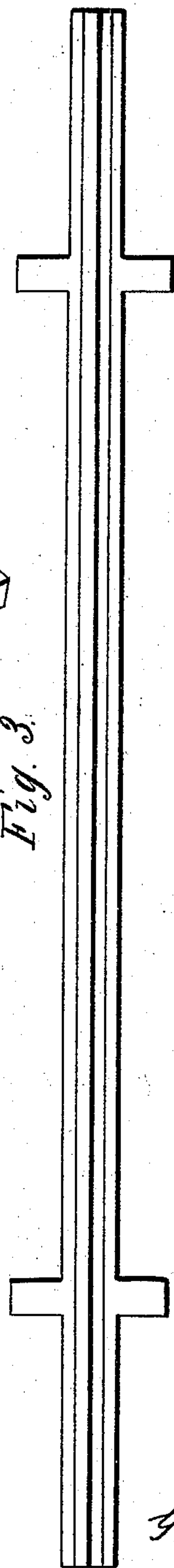
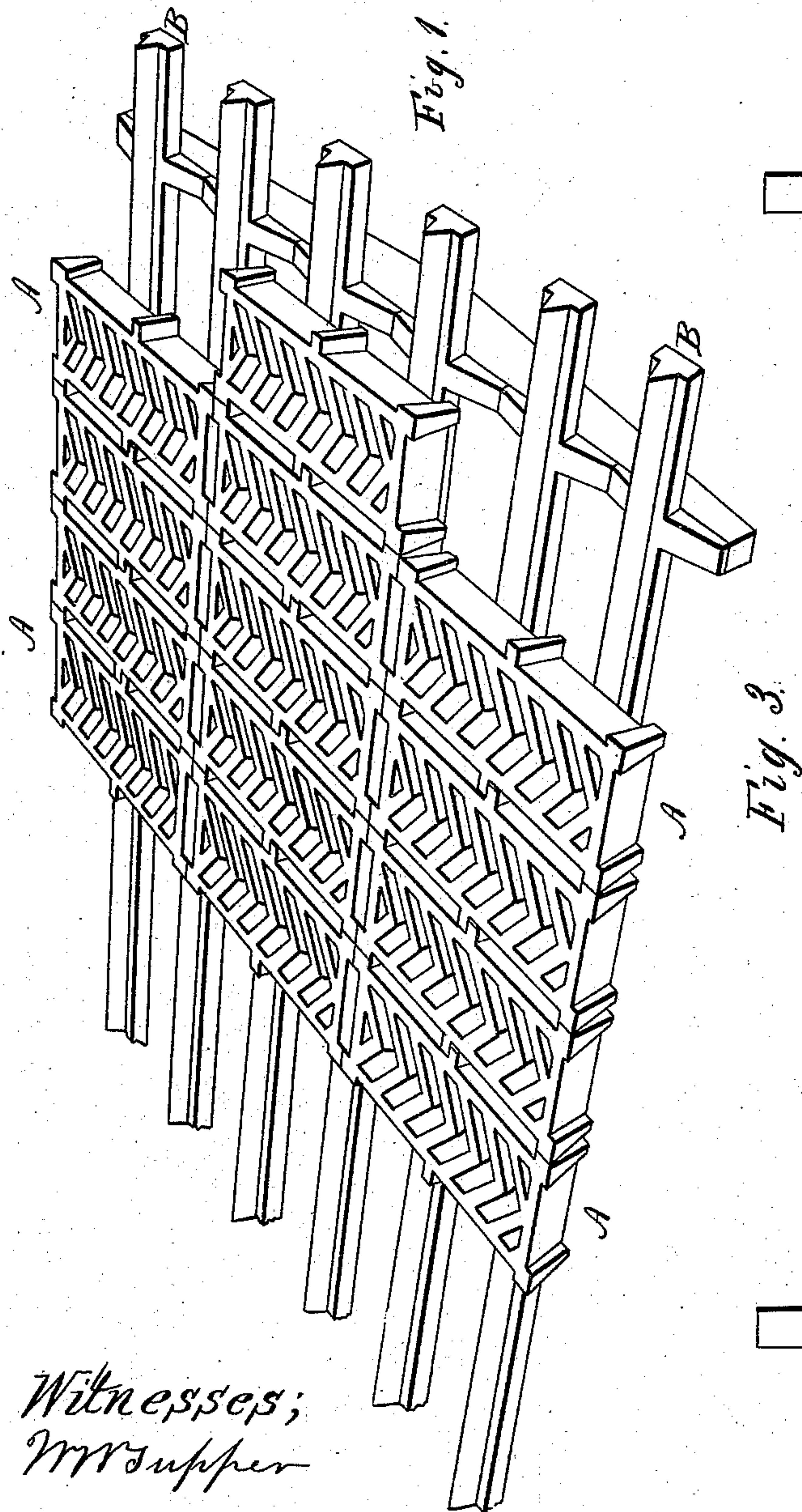


*G. L. Smith,*  
*Furnace Grate.*  
*N<sup>o</sup> 48,455. Patented June 27, 1865.*



*Witnesses;*  
*Mrs. Supper*

*R. F. Smith*

*Inventor;*  
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# UNITED STATES PATENT OFFICE.

GEORGE L. SMITH, OF BROOKLYN, NEW YORK.

## IMPROVEMENT IN GRATES FOR STEAM-BOILER FURNACES.

Specification forming part of Letters Patent No. 43,455, dated June 27, 1865.

*To all whom it may concern:*

Be it known that I, GEORGE L. SMITH, of Brooklyn, in the county of Kings and State of New York, have invented certain new and useful Improvements in Grates for Steam-Boilers and other purposes; and I do hereby declare that the following is a full and exact description of the same, reference being had to the accompanying drawings, and to the letters of reference marked thereon, in which—

Figure 1 is a perspective view of the sectional grates lying upon the truss-supporters. Fig. 2 is an end view of the same, as seen at the furnace-door; and Fig. 3 is a plan view of one of the truss-supporters.

The objects of my invention are, first, to lessen the wear and destruction of grates employed in steam-boiler furnaces and other positions where great heat is used; and, second, to effect a saving of fuel by increasing the heating capacity of such furnaces with a given amount of fuel.

The difficulties, inconveniences, and expense attending the wear and destruction of the grate-bars of boiler and other furnaces are well known to all practical engineers, and various modes have been tried to overcome these objections, but with little success. It is an admitted fact that the main cause of the difficulties mentioned is due to the unequal expansion due to the grate-surface being intensely heated on its upper part, while the under part thereof is kept comparatively cool by the passing air required to support combustion. The effect is that the top surface of the grates, being expanded by heat, must either "crown up," warp sidewise, or do both. Experience has proved that the grates thus bent out of shape never resume their original form when cooled, and are by each subsequent heating impaired in quality, so that they soon become valueless for the purpose intended. To overcome these difficulties grate-bars of various shapes and forms have been tried, including, among others, irregular shapes, serpentine lock-bars, and bars of great weight of metal with deep trusses cast upon their under side; but with all these, as with the common form of grate-bar, it is found that not only does the difficulty above named increase with the increased weight of metal

used in the grate-bar, but that the spaces for air-openings between the bars are decreased in some and increased, of course, in others, so that a sufficient supply of air to support combustion is not afforded in the one case, while in the other case the expanded openings cause a serious waste of fuel. When the grates are expanded so that the air space or opening, as above stated, is decreased in capacity, the result uniformly is that the face of the bar is burned by the intense heat, causing the clinker from the coal to amalgamate with it, effectually checking the passage of air between the grates so situated, causing their rapid destruction.

All the difficulties and objections above named I claim to have overcome by my improvement, the nature of which consists in so constructing a grate for furnaces as to insure greater strength and durability with less weight of metal, which I effect by constructing my entire grate-surface of a series of small shallow sections, A, of such size and form (being about the proportions shown in the drawings) as that each when heated will expand alike in all its parts. These sections are supported by a series of truss-bars, B, and so placed that each and every section A is supported by and balanced upon two of the supports or truss-bars B—that is, that the part of every section which overhangs the two truss-bars upon which it is placed and supported shall equal the weight of the part of the section between the two truss-bars, so that the section cannot sag down or break or alter its shape, as would be, and is, the case with ordinary grate-bars and sectional grates of other form supported at their ends, when highly heated.

I construct the trusses or supports B in such manner, on the top surface thereof, that the heat of the grate-sections is not transmitted to them, thus insuring, with little weight of metal, a sufficient strength of truss to support the sections and the weight of fuel upon them, and also an unobstructed passage through the openings of the sections for the air upward and the ashes and clinkers downward. These trusses B are placed upon the ordinary grate-bar bearer, C, as shown in Figs. 1 and 2; and it should be understood that the truss or bag-



brace supports are constructed separate from both the grated sections and the bearers. It is by this that one of the most important results is attained. In other words, although the trusses rest upon the bearers, and the grated sections upon trusses, each of these is free from the others, so far as positive bind between one another is concerned. Therefore any one of the three destructive parts making up the grate—to wit, grated sections, truss-supports, and bearers—can accommodate itself to the expansion and contraction or to any change in the relation of any portion of the bearing-surface of one piece with any portion of the bearing-surface of another piece occurring from any cause. By having the grated surface made up throughout its area of small narrow sections which are subdivided by transverse divisions any part of the grated surface may be readily removed, and that, too, without disturbing the bars or trusses, as they (the bars) are independent structures from the grated surface. This facility of removal of any section renders the repair of the grate a very simple and cheap operation, as a new section, or any number of sections, may be substituted in a short time for the destroyed sections.

I will here state that my invention differs from all grates heretofore used, first, in dividing a grate formed of one large piece, or a grate formed of two or four pieces, into a series of small sections, upon the system described and represented; second, in supporting each of these small sections upon discon-

nected trusses upon the plan described and shown; third, in making the trusses a separate structure from the grated sections, while the sections rest upon them; fourth, in combining the principles of the sectional grated surface, longitudinal A-edged trusses, and freedom in each part to expand independent of another part.

The advantages of my improvement over all other grates in use I claim to be, first, economy in cost by combining great strength with lessened weight; second, economy of fuel with increased heat; third, security against the possibility of sagging or breaking down of the grate-sections; fourth, greater durability of the grate.

Having thus described the object, nature, and advantages of my improvement, what I claim as my invention, and desire to secure by Letters Patent, is—

1. Trusses or supports for a grated surface, made free from the grated surface and from the transverse bearers, substantially as and for the purposes set forth.

2. So arranging the sections and the trusses or supports of a sectional grate that each section will be supported and balanced substantially in the manner described.

GEO. L. SMITH.

Witnesses:

ROBT. F. SMITH,  
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