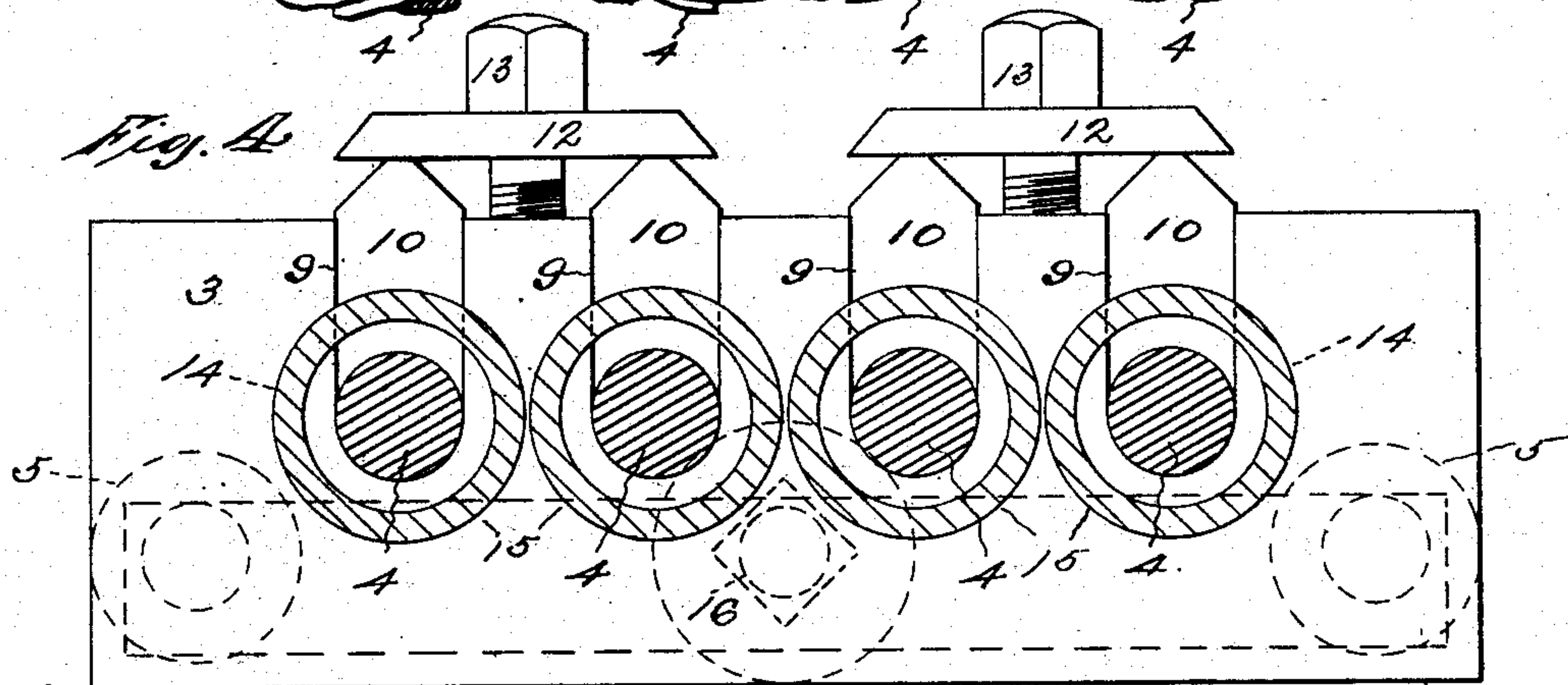
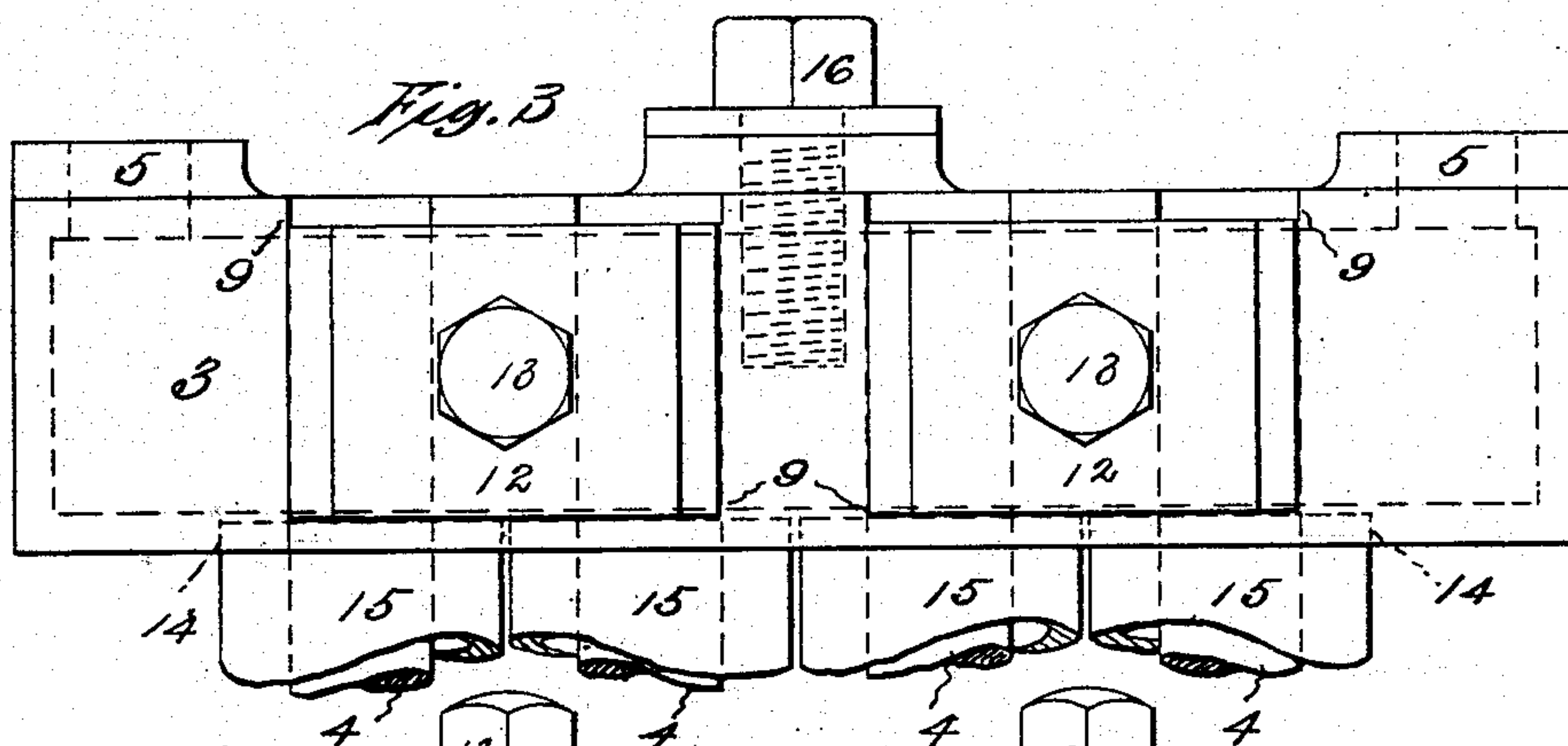
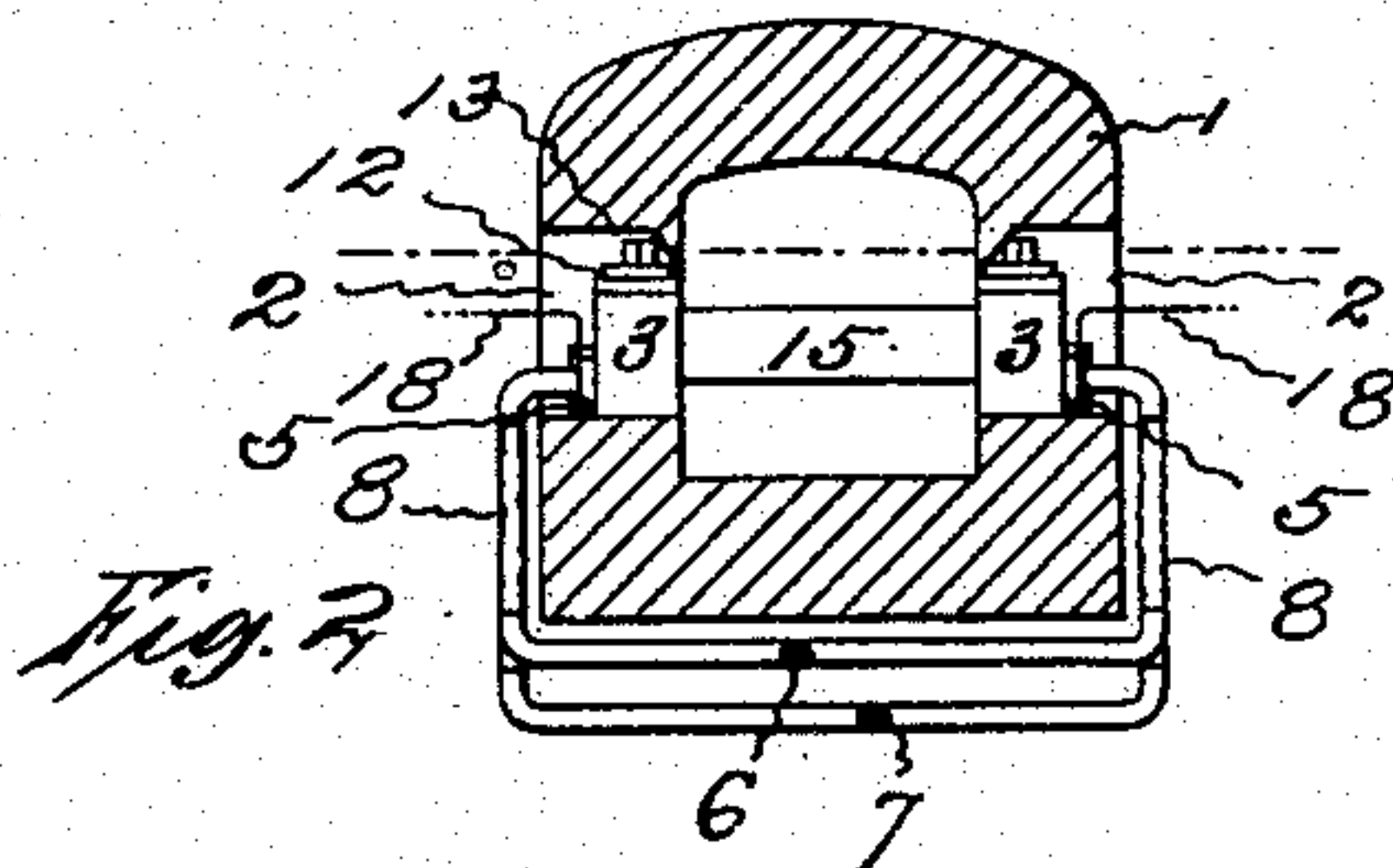
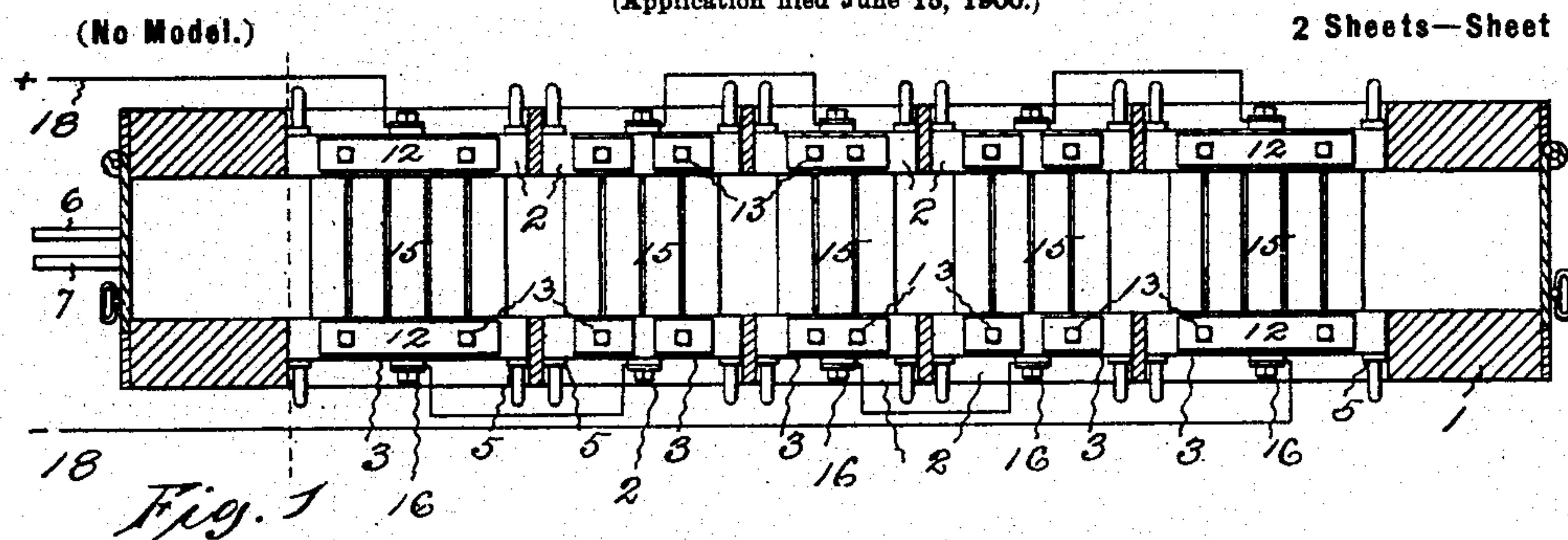


A. H. EDDY.  
ELECTRICAL HEATING FURNACE.

(Application filed June 15, 1900.)

2 Sheets—Sheet 1.



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No. 677,070.

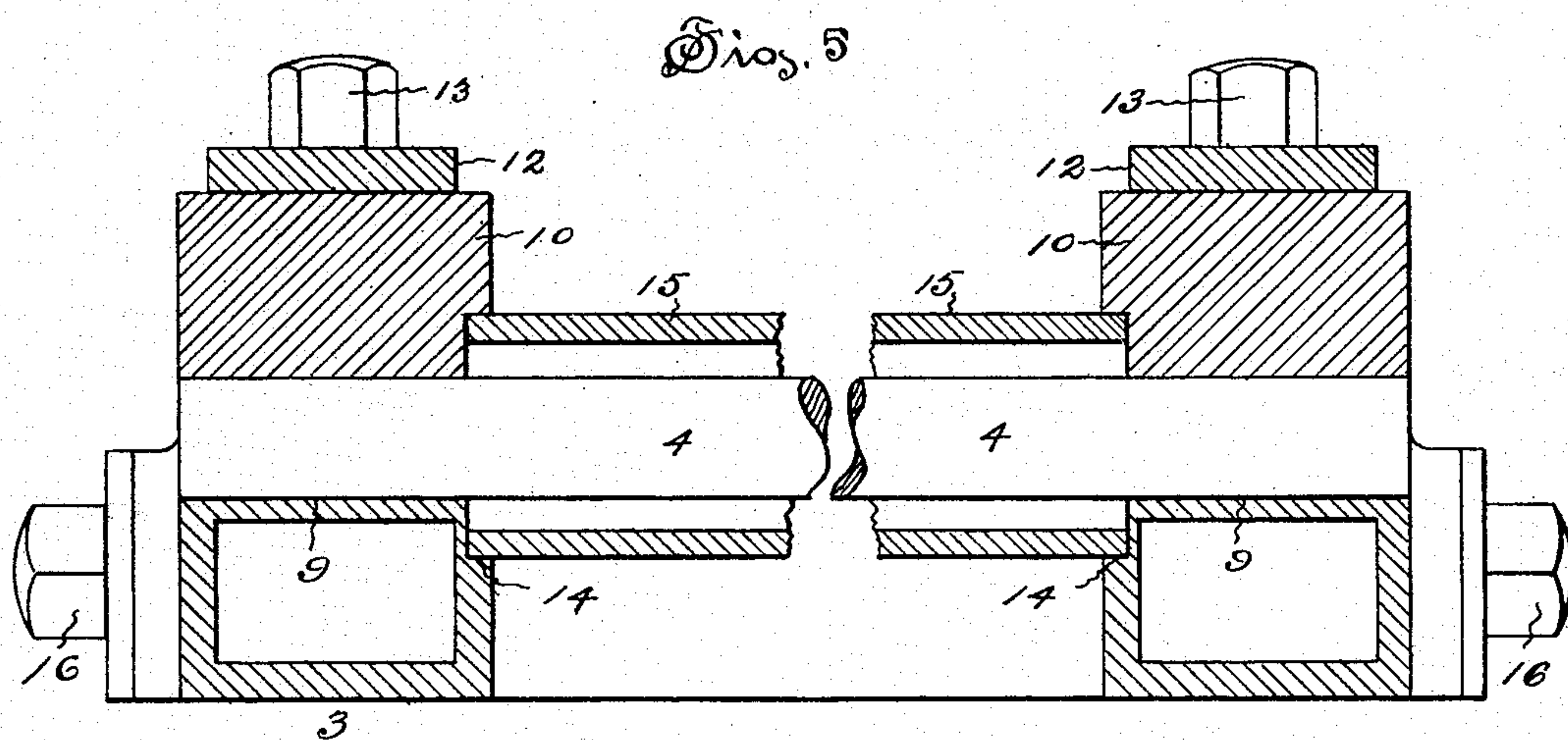
Patented June 25, 1901.

A. H. EDDY.  
ELECTRICAL HEATING FURNACE.

(Application filed June 15, 1900.)

(No Model.)

2 Sheets—Sheet 2.



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# UNITED STATES PATENT OFFICE.

ARTHUR H. EDDY, OF WINDSOR, CONNECTICUT.

## ELECTRICAL HEATING-FURNACE.

SPECIFICATION forming part of Letters Patent No. 677,070, dated June 25, 1901.

Application filed June 15, 1900. Serial No. 20,401. (No model.)

*To all whom it may concern:*

Be it known that I, ARTHUR H. EDDY, a citizen of the United States, residing at Windsor, in the county of Hartford and State of Connecticut, have invented certain new and useful Improvements in Electrical Heating-Furnaces, of which the following is a specification.

This invention relates to those furnaces in which a high degree of heat is obtained by the flow of electrical current through high-resisting conductors.

The object of this invention is to provide a simple and efficient furnace of this nature which is particularly adapted for the purpose of fusing refractory substances, such as enamels, upon more or less refractory bodies, such as pieces of clay or metal, without heating the bodies enough to destroy their texture and without precipitating deleterious or discoloring matter upon the fused substances.

The invention resides in a furnace having terminal clamps connected with the electrical circuit and holding high-resisting electrical conductors that are enveloped in a refractory material which will prevent the disintegration of the conductors and prevent fluctuations of the temperature.

Figure 1 of the accompanying drawings shows a horizontal section of a furnace that embodies the invention. Fig. 2 shows a transverse section of such a furnace. Fig. 3 is a plan, on larger scale, of one of the clamps for holding the conductors and the refractory envelops for the conductors. Fig. 4 is a transverse section taken across the conductors and envelops, showing a side elevation of one of the clamps; and Fig. 5 is a cross-sectional view taken through the clamps and one of the high-resistance conductors and its refractory envelop.

The furnace 1 can be built any required size and any desired shape and the walls may be made of any suitable material. Placed in openings 2 in the opposite walls of the furnace shown are the clamps 3, which hold the ends of the high-resistance conductors 4, that extend across the interior of the furnace. These clamps may be made to hold any desired number of conductors, which preferably are carbon-rods, those shown being arranged for three, four, and five carbons. Any

desired number of pairs of clamps may be employed. The circuit-wires 18 are connected with the clamps, so that the current flows in parallel through the carbons held by each pair of clamps, which pairs of clamps are joined in series to better enable the heat to be graded. The body of each of these clamps is hollow and is provided at each end with a nipple 5, those nipples at one end being connected with a water-supply pipe 6 and those at the other end being connected with a drain-pipe 7. Any common means may be employed for forcing water through the clamps for the purpose of keeping them cool. Sections of rubber hose 8 are employed in the circulating system to properly insulate the clamps.

The clamp-bodies are provided with mortises 9, in each of which is a clamping-jaw 10. After the carbons 4 have been placed in the mortises beneath the jaws plates 12 are forced down by set-bolts 13 for causing the jaws to firmly clamp the carbons.

In the body of the clamps, around each carbon-opening, is a socket 14, and supported by these sockets are the tubular envelops 15, which extend from clamp to clamp across the furnace and inclose the carbons. The sockets are made sufficiently large to permit the parts to expand and contract without breaking the tubes and still keep the ends of the tubes substantially sealed. These envelops are preferably formed of round porcelain tubes having a somewhat larger interior diameter than the diameter of the carbons, so that there will be an air-space between the carbons and the porcelains. The carbons and the porcelain tubes are circular in cross-section. Any other shape, however, could be employed. The tubular envelops may be formed of other refractory materials than porcelain.

The clamps are tapped on the outer face and provided with set-screws 16 for clamping the terminals of the circuit-wires.

Bricks, tile, china, or articles of a similar nature may be carried by any suitable means into this furnace adjacent to the refractory envelops of the conductors and subjected to the heat generated by the flow of electricity through the resisting conductors in such manner as to fuse any enamel or material of like



character which may have been applied to them either in a solid, powdered, pasty, or plastic condition. The heat emitted from the furnace is so intense and so directed that the enamel is fused without affecting the condition of the article to which the enamel is applied, the article not remaining in the furnace a sufficient length of time to become heated through. The clamps may be so arranged that the article as it passes through the furnace may be subjected to a gradually-increasing temperature and then to a gradually-decreasing temperature in order to effect the best results. Any common means may be employed for feeding the articles continuously through the furnace or for passing them in and withdrawing them at the same end.

The employment of the refractory envelopes prevents the disintegration of the carbons and the consequent precipitation upon the fused enamel of the ash which would result from disintegration, also the changes of conductivity that would follow a diminution of the cross-sectional area of the carbons. The envelopes also assist in maintaining an even degree of temperature, as they protect the carbons from the cooling effect of drafts of air and the consequent changes in the degree of their conductivity and heat-emitting capacity. By the employment of the refractory envelopes of this nature for the carbons the fused enamel is protected from the ashes of the disintegrating carbon, the heat is maintained uniformly, and the efficiency of the plant is increased. These envelopes are preferably formed of porcelain; but they may be made of some similar clay material, and these substances, while non-conductors under normal conditions, become fair conductors after being heated to a high degree. In this furnace after the desired temperature has been reached the carbons may be removed from the circuit, the envelopes then becoming the conductors, the voltage increased, and the amperes reduced, thereby favorably effecting the efficiency of the electrical apparatus. The envelopes having greater specific resistance than the interior conductors require a higher voltage to cause a proper flow of current; but by reason of this resistance a smaller amount of current will produce the desired temperature. Of course the watts are the same.

The operation of this furnace may be continued with the porcelain tubes alone, after they become sufficiently heated, by increasing the voltage of the current, so that should the carbons become dissipated or disintegrated or entirely removed the work would not be interrupted. It is even possible to dis-

pense with the carbon conductors, for by employing supplemental means for heating the porcelain non-conductors when starting up the plant they may be heated to such a degree that current of high voltage may be passed through them to keep them hot, and then the supplemental means for heating may be removed.

I claim as my invention--

1. In an electrical heating-furnace, the combination of high-resistance conductors, circuit-terminal clamps holding the ends of the conductors, refractory tubular envelopes entirely surrounding the conductors and held by and in electrical connection with the clamps; and an air-space between the conductors and the envelopes, substantially as specified.

2. In an electrical heating-furnace, the combination of high-resistance conductors, circuit-terminal clamps holding the ends of the conductors, refractory tubular envelopes entirely surrounding the conductors and held by and in electrical connection with the clamps, an air-space between the conductors and the envelopes, and means for keeping the clamps cool, substantially as specified.

3. An electrical heating-furnace having exterior walls, circuit-terminal clamps located in the walls, high-resistance conductors held by and in electrical connection with the clamps, refractory tubular envelopes which when cold are insulators but when in use become conductors, the tubular envelopes entirely surrounding but separated from the conductors, and held by and in electrical connection with the clamps, substantially as specified.

4. An electrical heating-furnace having exterior walls, hollow clamps connected with the circuit-wires, fluid-circulation pipes connected with the clamps for keeping the clamps cool, high-resistance conductors held by the clamps, tubular bodies which are good electrical non-conductors when cold and electrical conductors when heated to a high degree, entirely surrounding and separated from the high-resistance conductors, extending across the interior of the furnace, and held by and in electrical connection with the clamps, and means for raising the temperature of the conductors and tubular bodies and transforming the tubular bodies from non-conductors to conductors of electricity, substantially as specified.

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