

No. 617,327.

Patented Jan. 10, 1899.

W. D. FORSYTH & E. T. BELL.

BOILER TUBE CLEANER.

(Application filed Dec. 4, 1897.)

(No Model.)

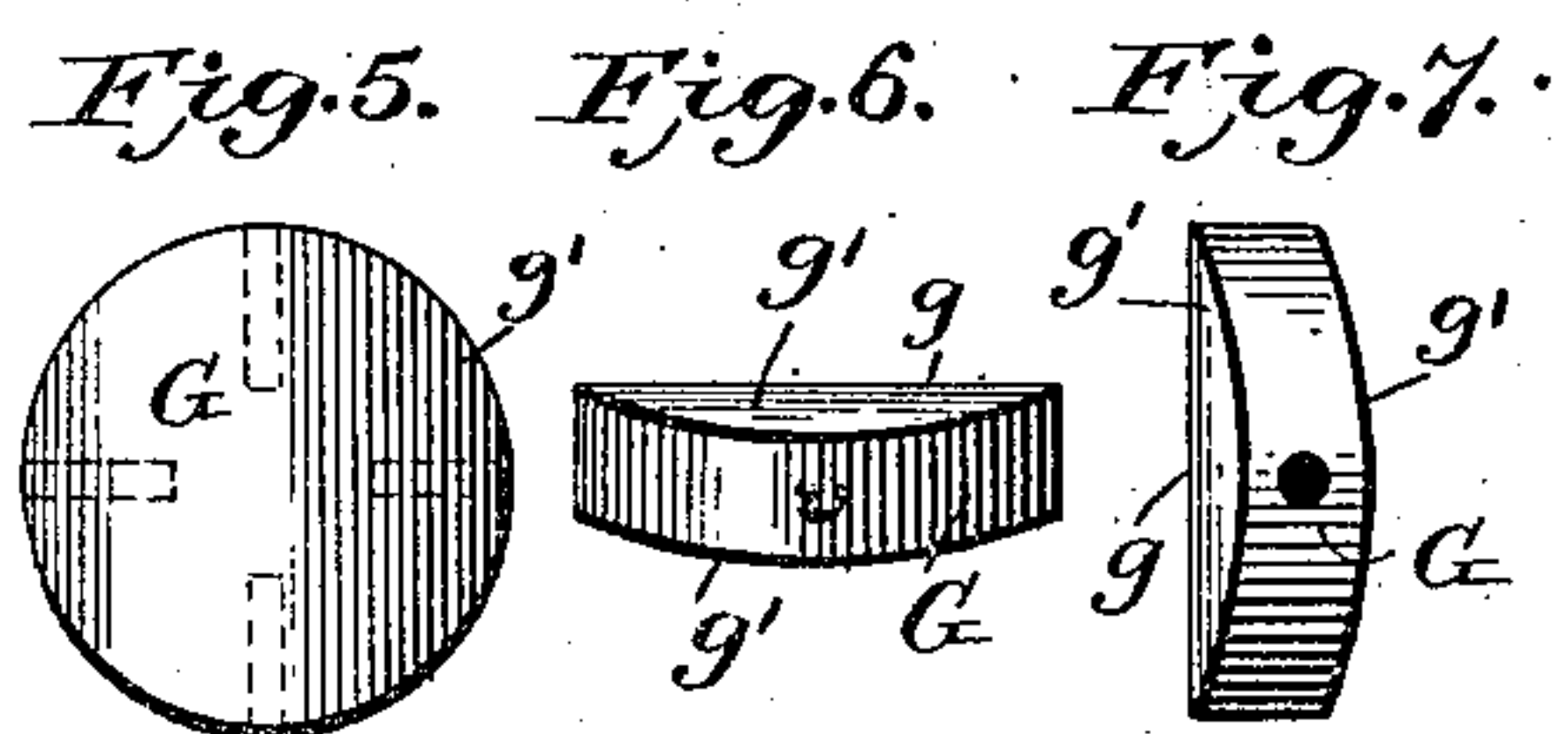
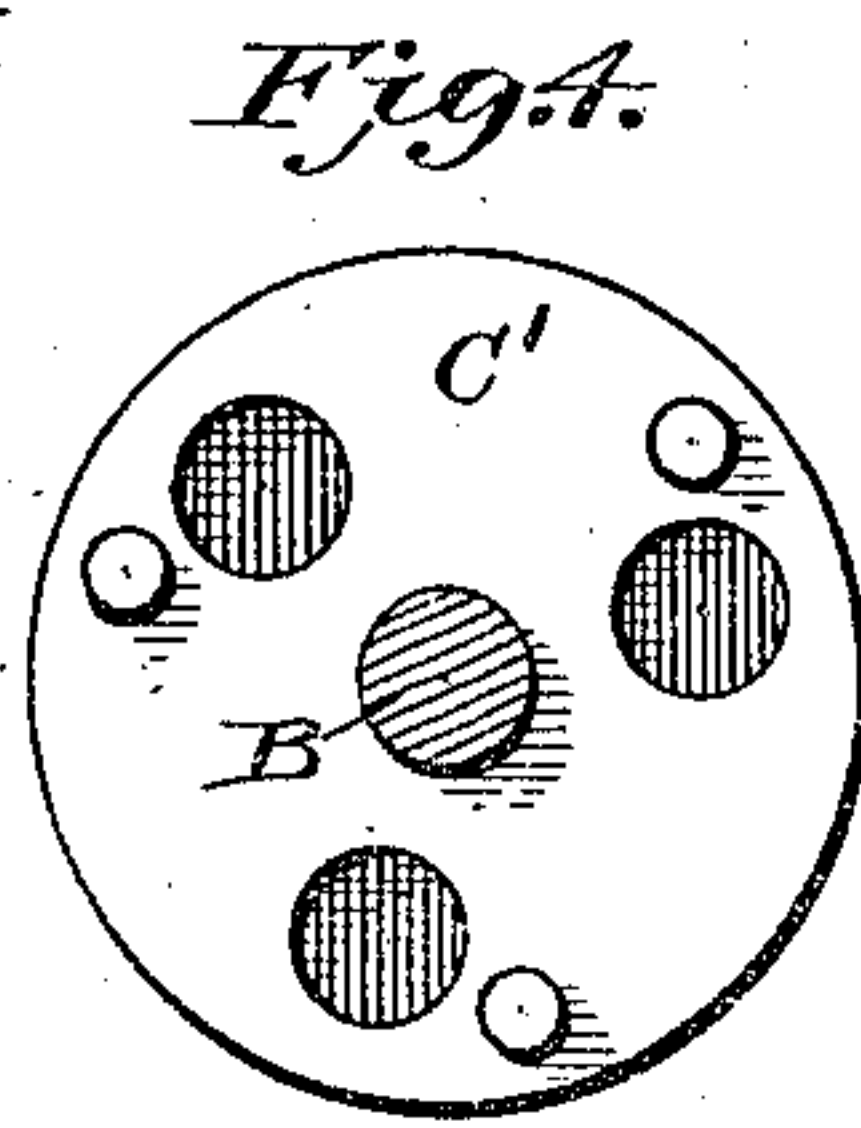
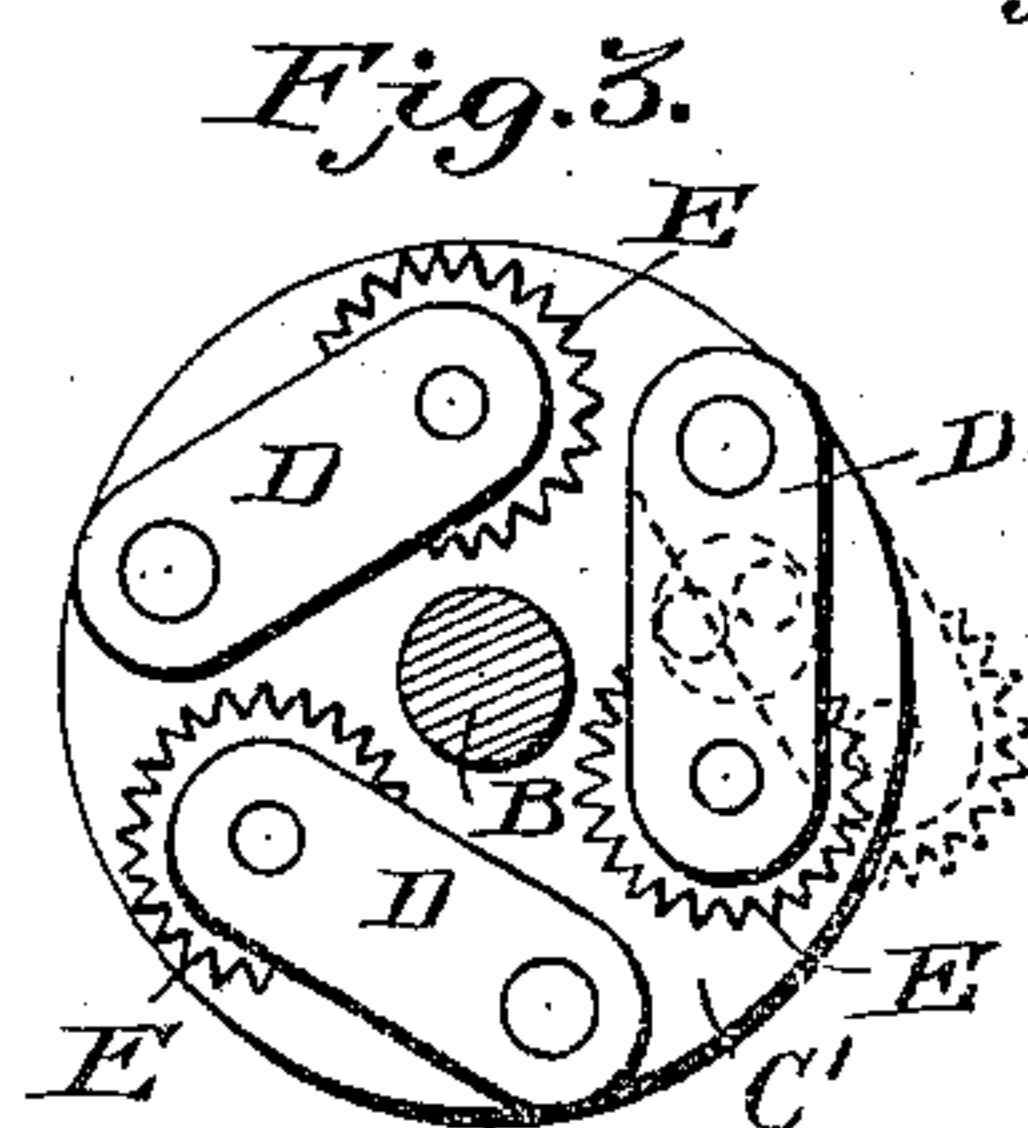
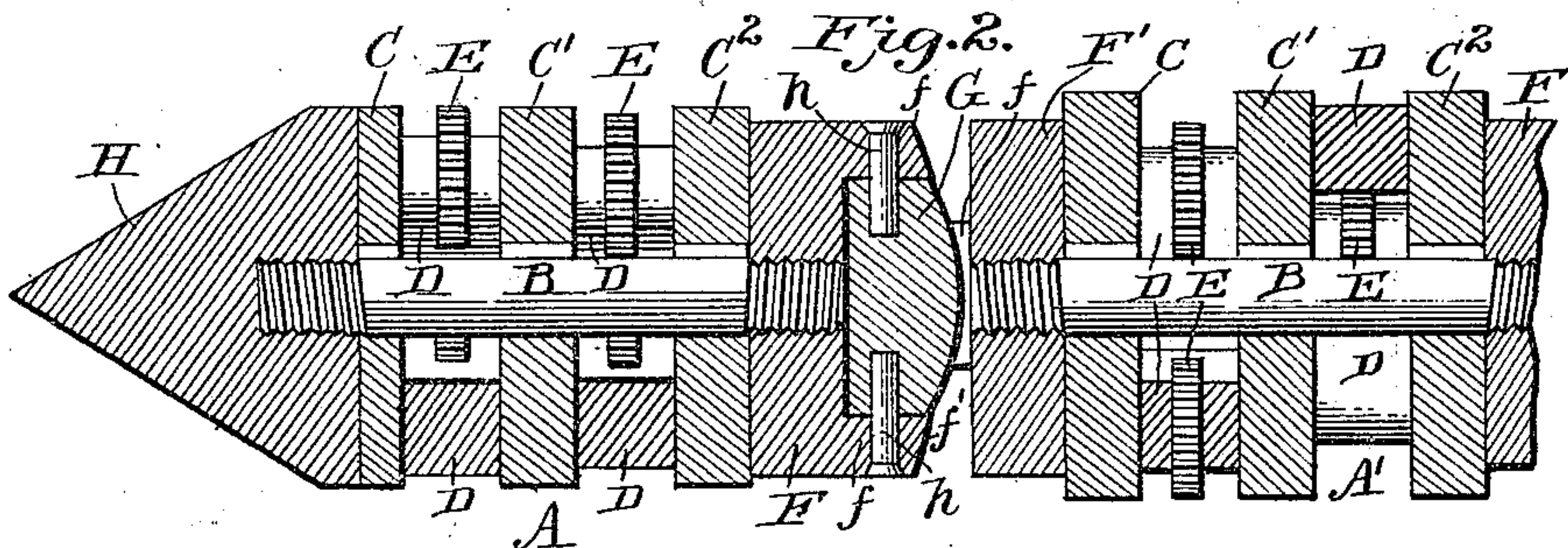
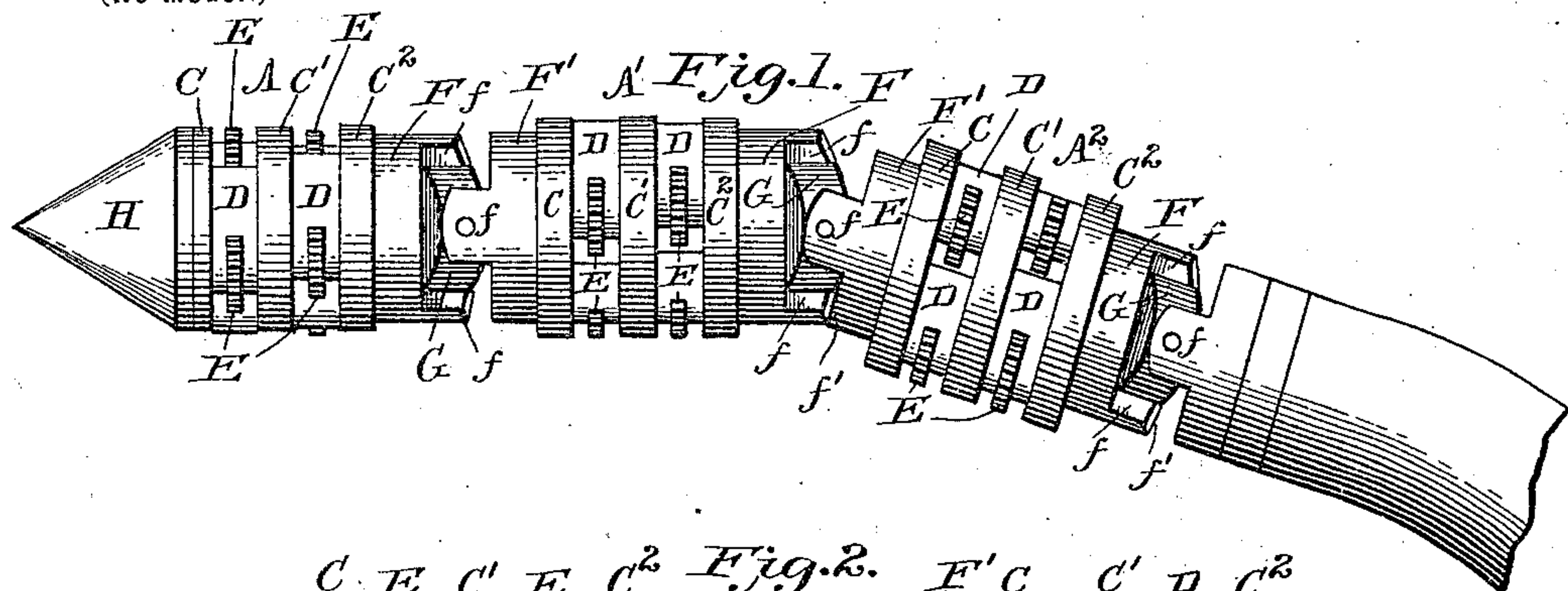


Fig. 8.

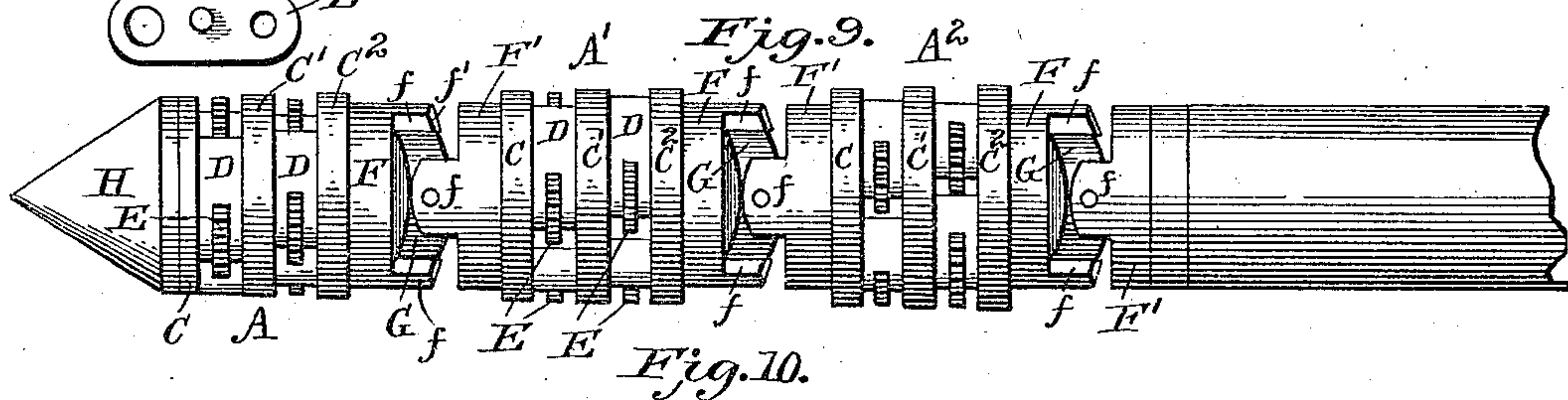
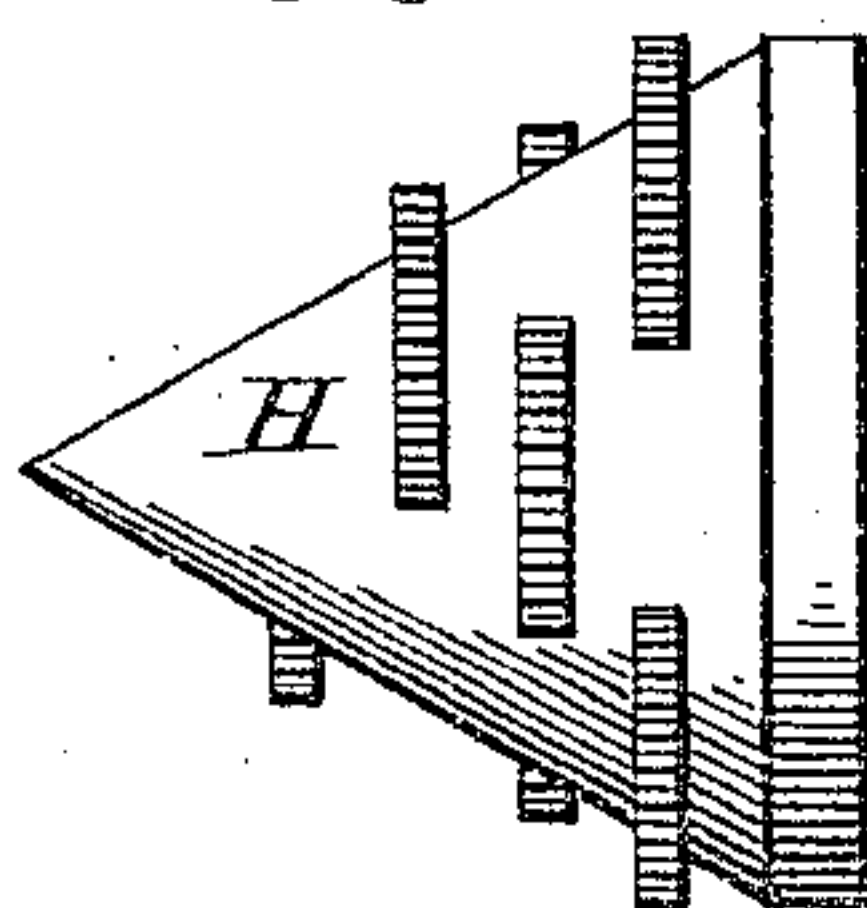


Fig. 10.



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UNITED STATES PATENT OFFICE.

WILBER D. FORSYTH AND ENOS T. BELL, OF PITTSBURG, PENNSYLVANIA,
ASSIGNORS TO THE UNION BOILER TUBE CLEANER COMPANY, OF SAME
PLACE.

BOILER-TUBE CLEANER.

SPECIFICATION forming part of Letters Patent No. 617,327, dated January 10, 1899.

Application filed December 4, 1897. Serial No. 660,752. (No model.)

To all whom it may concern:

Be it known that we, WILBER D. FORSYTH and ENOS T. BELL, citizens of the United States, and residents of Pittsburg, in the county of Allegheny and State of Pennsylvania, have invented certain new and useful Improvements in Boiler-Tube Cleaners; and we do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to letters of reference marked thereon, which form a part of this specification.

Figure 1 of the drawings is a side elevation of a cleaner-head embodying our invention. Fig. 2 is a longitudinal section of a portion of the same. Figs. 3 and 4 are detail views of one of the cutter-carriers. Figs. 5, 6, and 7 are plan, side, and edge views, respectively, of one of the joint-pieces. Fig. 8 is a detail view of one of the cutter-carrying arms. Fig. 9 is a side elevation of a complete head in a different position, and Fig. 10 is a detail view of the cone-shaped guide.

This invention is designed to provide a boiler-tube-cleaning machine or implement of improved character.

While the art of cleaning straight tubes in an efficient manner has heretofore been made known by us in patents which have been granted to us and while various machines for the purpose have been devised and patented by others for the same purpose, but little, if any, attention has been paid to the necessity for a machine or implement designed for and capable of being used in a practical and efficient manner in curved tubes such as are found in some types of boilers. It is therefore our especial object to provide a machine which will meet the requirements and demand for a practical device adapted to work of this nature.

With this object in view our invention consists in the novel construction and combination of parts, all as hereinafter described, and pointed out in the appended claims.

In carrying out our invention we form the cleaning-head in two or more adjacent sections united by a universal joint or joints,

whereby said head is enabled to adapt itself to the curvature of and to pass through a curved water-tube.

Referring to the accompanying drawings, the letters A, A', and A'' designate, respectively, the several sections of a cleaner-head constructed in accordance with our invention. In the particular form of head which we have illustrated there are three of these sections, and each section is provided with two sets of cutting devices, this being the form which our experiments have led us to prefer; but we do not limit ourselves to the use of any particular number of sections or to the use of any particular number of sets of cutting devices on the sections, since it may be found advisable or desirable under certain conditions, depending upon the particular nature of the work, to vary the construction in these particulars, and while we prefer to use the particular construction and character of sections, cutting devices, and universal-joint connections shown in the drawings and hereinafter described our invention is not limited thereto, as we believe ourselves to be the first to construct in a machine of this character a cleaning-head composed of two or more adjacent sections united by a universal joint or joints.

In the particular form of the cleaner shown each of the three sections A A' A'' consists of a central shaft or carrier B, three circular plates or disks C C' C'', rigidly secured or keyed on said shaft or carrier at short intervals from each other, and a number of cutter-carrying arms D, eccentrically pivoted to the plates or disks C C' and capable each of a limited outward movement in a plane parallel to that of the plates or disks, said arms having loosely journaled to their free end portions cutters E, which consist of small peripherally toothed or serrated disks or wheels. The disks or plates C C', the cutter-carrying arms, and the cutters are of the same general character and construction as the corresponding devices described and claimed in our Patent No. 526,999, dated October 2, 1894, while the general relative arrangement of the disks and cutters is similar to that described and claimed in our Patent No. 568,247, dated Sep-

tember 22, 1896, and reference may be had to these patents for a more complete description thereof.

The universal joints which connect the sections consist each of end plates F F' and a connecting joint-piece G. The plates F F' are screwed upon the projecting threaded end portions *a* of the shafts or carriers B of the respective adjacent sections. The plates F F' are of circular form and are of the same or of approximately the same diameters as the adjacent plates C C'. Each plate has on its face which is toward the joint two oppositely-projecting lugs *f*, and these lugs are so disposed on the plates that those of one plate alternate with those of the other. The joint-plate G is also of general circular form; but its front and rear faces are each beveled outwardly in opposite directions from a central diametric line *g* to form oppositely-inclined surfaces *g'*, and the central lines *g* of the two faces are at right angles to each other. Said plate has four equidistant peripheral bearing-holes, two of which are pivotally engaged by studs *h* on the lugs *f* of the plate F, while the other two are engaged by similar pins or studs carried by the lugs of the plate F'. It will be readily seen that this double pivotal connection, together with the inclined or beveled faces of the joint piece or plate, permits a universal movement of one head-section with respect to another, such movement being limited, however, by the impingement of the lugs *f* of one plate with the face of the opposite plate. For this purpose the ends of the said lugs are of convex form, as shown at *f'*. The joint which connects the rearmost section to the driving-shaft is of the same construction as those which connect the adjacent sections of the head.

It will be seen that the construction of the universal-joint connections between the sections, as above described, is such as to brace the sections against independent rotary or endwise movement, and this is essential whatever may be the construction of the particular joint connection which is employed. We prefer that the length of the sections shall not exceed one and one-half times their diameters.

We prefer that the plates C C' C'' shall be of gradually-increasing diameters from the front to the rear end of the head and that the cutters shall be spirally disposed about the head in the same manner and for the same purpose as in our said Patent No. 568,247. The increase in diameter may be from one plate to another, or it may be from one section to another—that is to say, the plates of each section may be of gradually-increasing diameters, or all the plates in any one section may be of the same diameter, but of less diameter than those of the following section. At the forward end of the foremost section we usually employ a cone-shaped guide H, and this guide may or may not have cutter-wheels journaled therein.

The device is designed to be driven by any suitable mechanism, such as a flexible shaft. In another pending application we have described and claimed mechanism which is especially adapted for operating a cleaner of this character; but such mechanism forms no part of the present invention.

The cleaner is operated under rapid rotation (usually from eighteen hundred to two thousand revolutions per minute) and is either forced through the tube to be cleaned or is allowed to feed therethrough by its own gravity and natural tendency in that direction. During the operation the tube should be flushed with a small stream of water for the purpose of removing the disintegrated scale and also to prevent the device from heating.

It will be readily seen that owing to the screw connections of the plates F F' with the sections and the key connections between the disks C C' C'' and the shafts or carriers B the several parts of the cleaner can be readily taken apart for repairs, &c.

We are aware that heretofore devices have been proposed for use in cleaning boiler tubes and flues wherein two or more cleaner-sections loosely linked together are to be pulled through the flue or tube by means of a rope or the like attached to one of such sections. We are not aware, however, that prior to our invention a power-operated rotary cleaner-head composed of two or more universally-jointed short sections braced against independent rotary or longitudinal movement has ever been known or used.

Having thus described our invention, what we claim as new, and desire to secure by Letters Patent, is—

1. In a tube-cleaner designed for use in curved tubes and adapted to be pushed through the same under rotation, a cleaner-head composed of two or more adjacent short sections connected by a universal joint or joints braced to prevent independent rotary or longitudinal movement of the sections, and a flexible driving-shaft connected to one of said sections, substantially as specified.

2. In a tube-cleaner designed for use in curved tubes and adapted to be pushed through the same under rotation, a cleaner-head composed of two or more adjacent short sections connected by a universal joint or joints braced to prevent independent rotary or longitudinal movement of the sections, each of said sections having a plurality of rolling toothed cutters, said cutters being arranged in a progressively-graduated series, substantially as specified.

3. In a tube-cleaner designed for use in curved tubes, and adapted to be pushed through the same under rotation, a cleaner-head composed of two or more adjacent short sections connected by a universal joint or joints braced to prevent independent rotary or longitudinal movement of the sections, each of said sections having a plurality of

rolling toothed cutters, said cutters being arranged in progressively-graduated series, and also spirally with relation to the axis of said head, substantially as specified.

5 4. In a boiler-tube cleaner designed for use in curved tubes, a cleaner-head constructed in two or more adjacent short sections, a universal joint or joints connecting the said sections, and braced to prevent independent rotary or longitudinal movement of the sections, a cone-shaped guide secured to the foremost of the said sections, and a flexible driving-shaft connected to the rearmost section, substantially as specified.

15 5. In a tube-cleaner designed for use in curved tubes, a cleaner-head formed in adjacent sections, and universal joints connecting the said sections, said joints consisting each of two plates secured to the adjacent
20 ends of adjacent sections and having projecting alternating lugs on their opposing faces, and a connecting joint-piece pivotally connected to the lugs of both the said plates, and

having double beveled or inclined faces, substantially as specified.

25 6. In a tube-cleaner designed for use in curved tubes, a cleaner-head formed in adjacent sections and connected by a universal joint or joints, each of said joints consisting of plates removably secured to the adjacent
30 sections to be connected and provided with projecting lugs on their opposing faces, said lugs being equidistantly and alternately disposed, and a connecting-piece pivoted to the lugs of both plates and having its faces oppositely beveled or inclined from central
35 lines, the central lines of the two faces being at right angles to each other, substantially as specified.

In testimony whereof we affix our signatures in presence of two witnesses.

WILBER D. FORSYTH.

ENOS T. BELL.

Witnesses:

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C. E. DENNIS.