

(No Model.)

2 Sheets—Sheet 1.

J. M. SMITH.

CRANK MOVEMENT IN STEAM ENGINES AND OTHER MACHINERY.

No. 273,624.

Patented Mar. 6, 1883.

Fig. 1

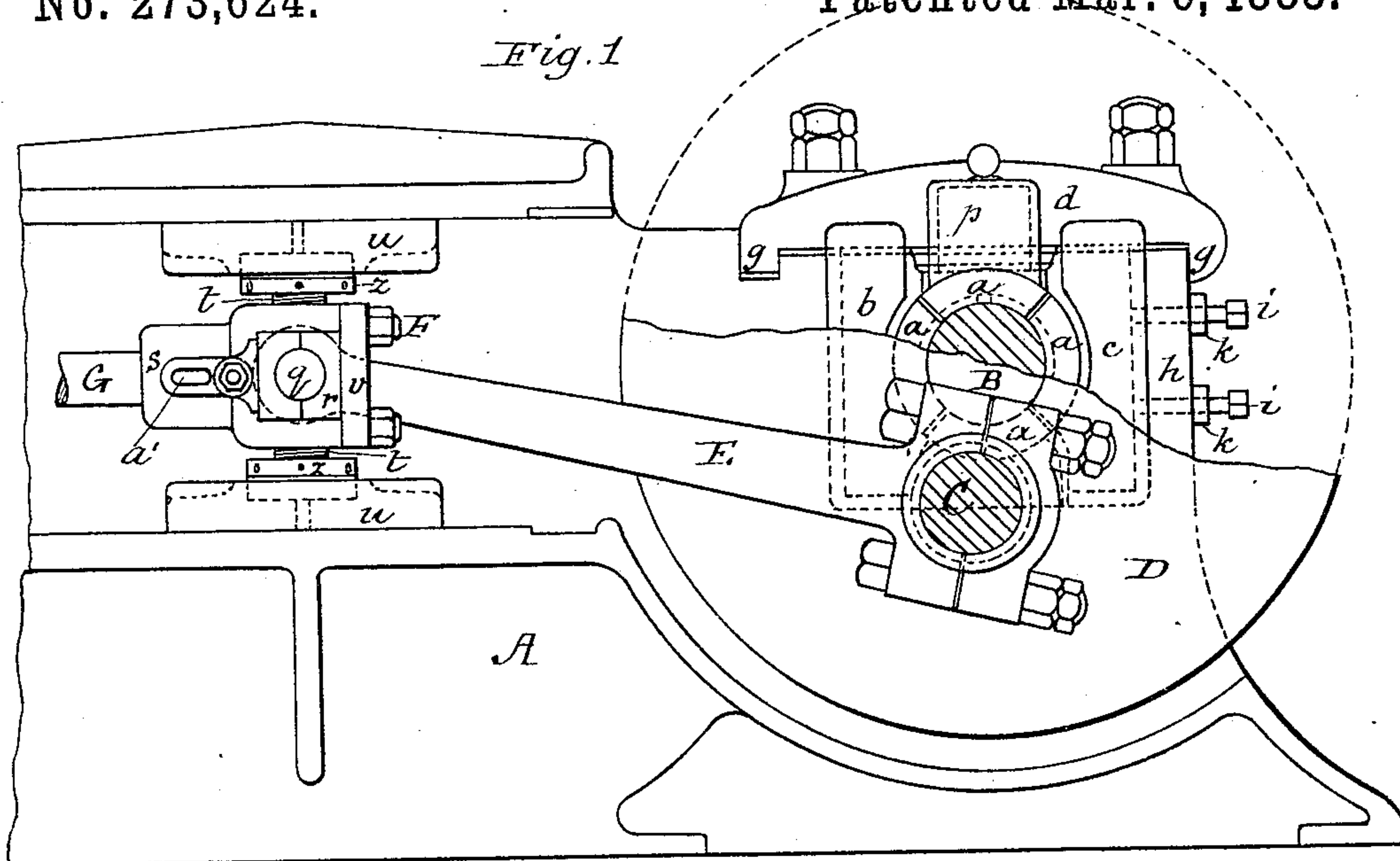
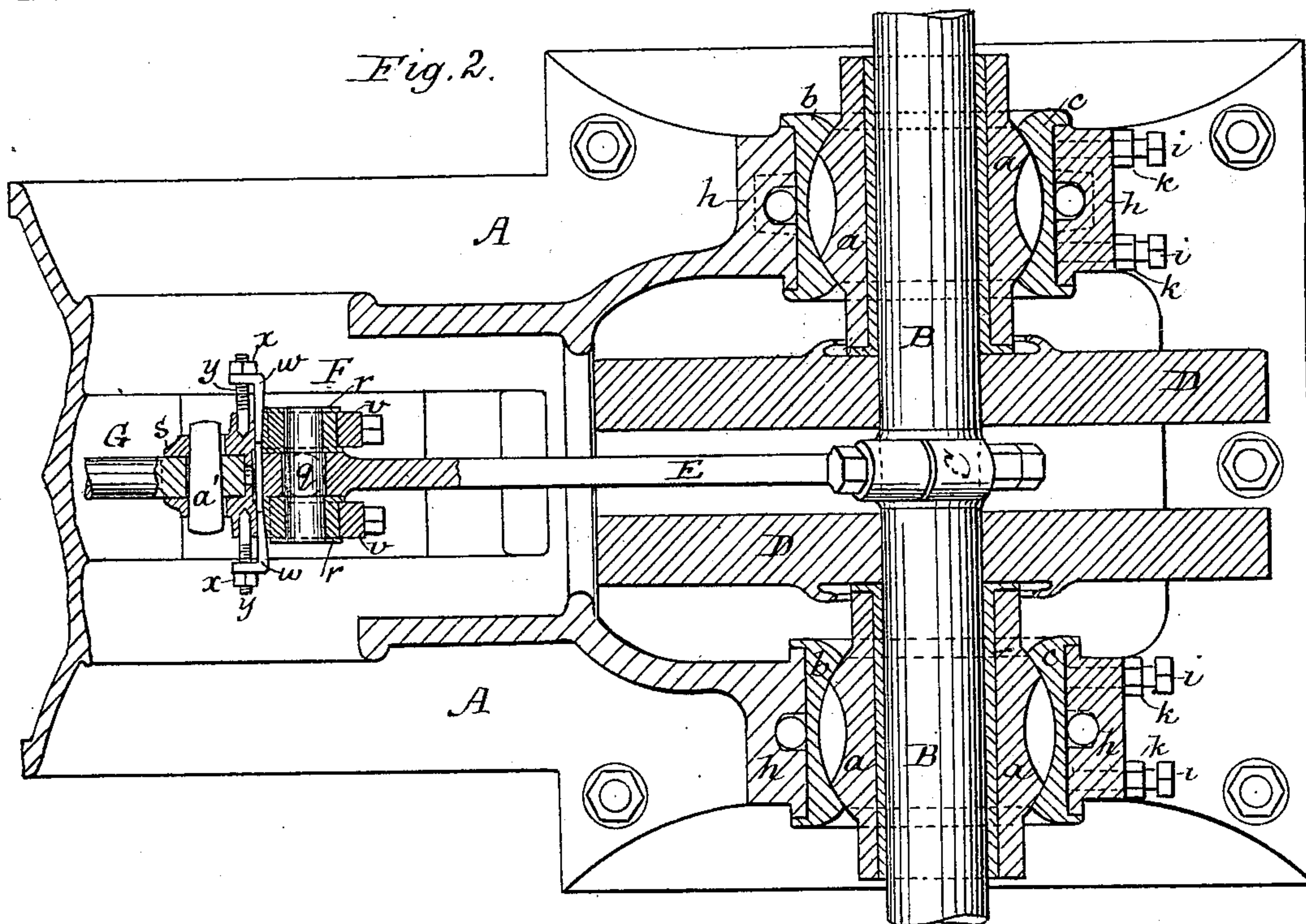


Fig. 2.



Witnesses:

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Inventor:

Jesse M. Smith by  
A. Pollok  
his attorney.

(No Model.)

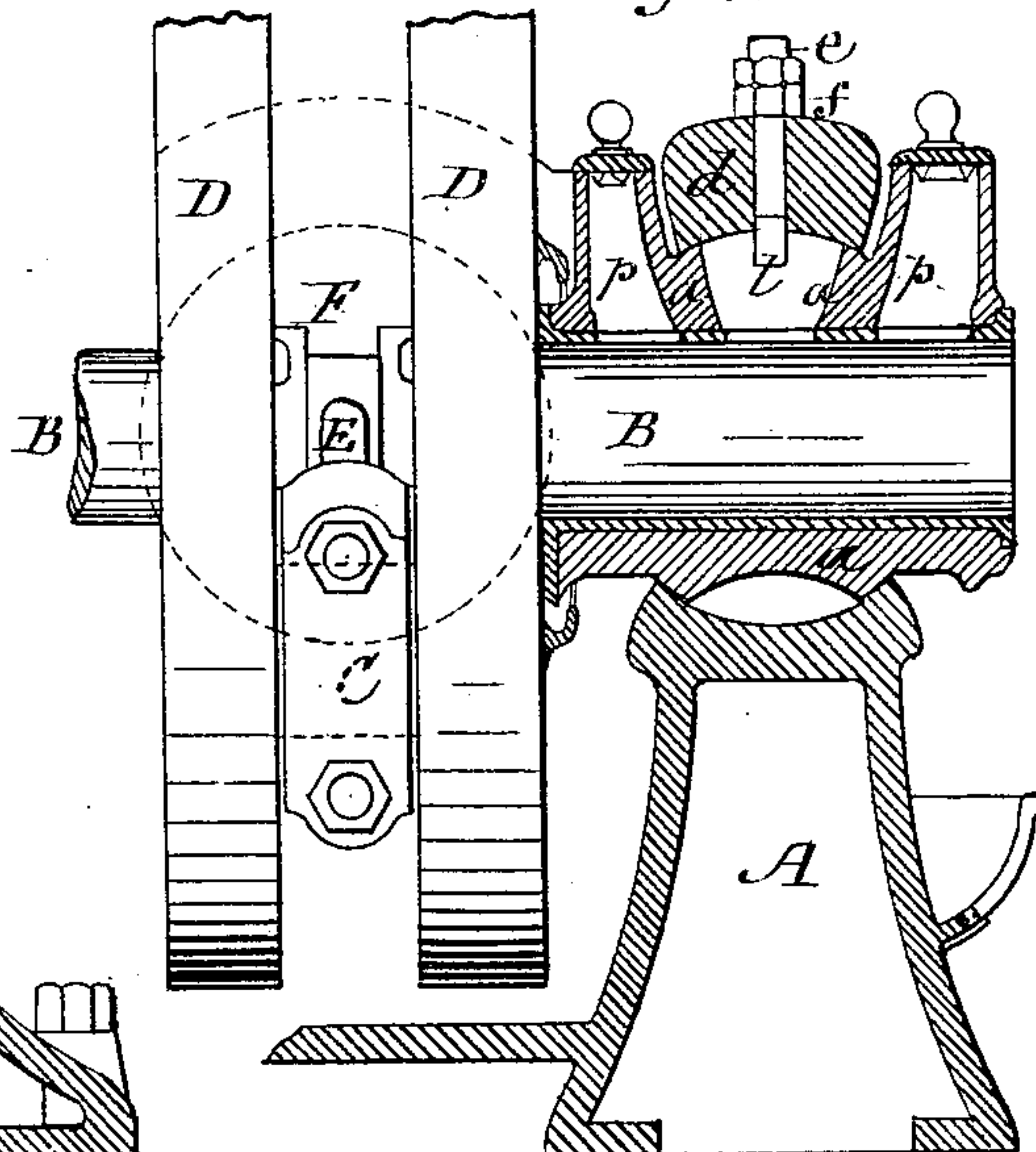
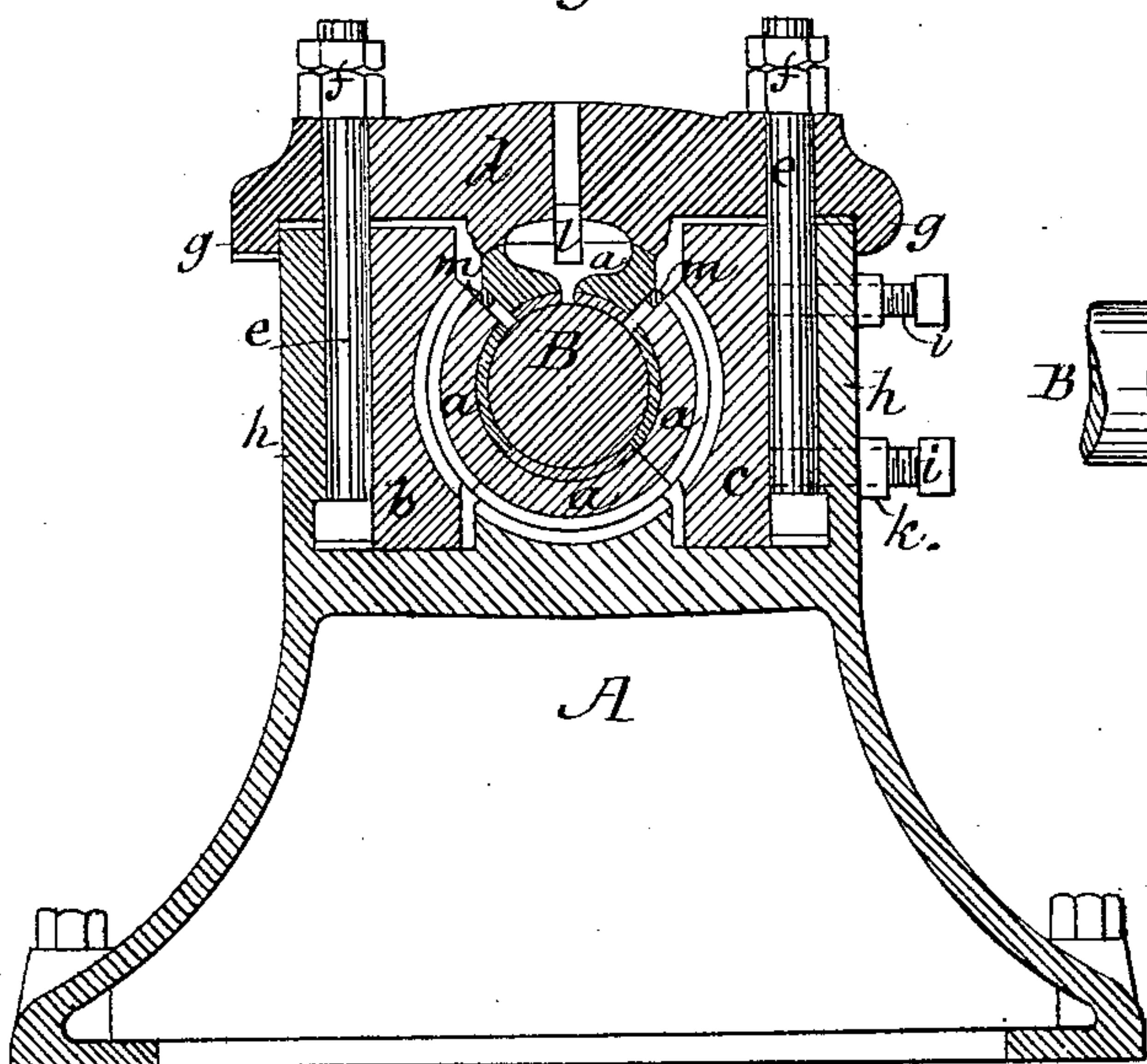
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J. M. SMITH.

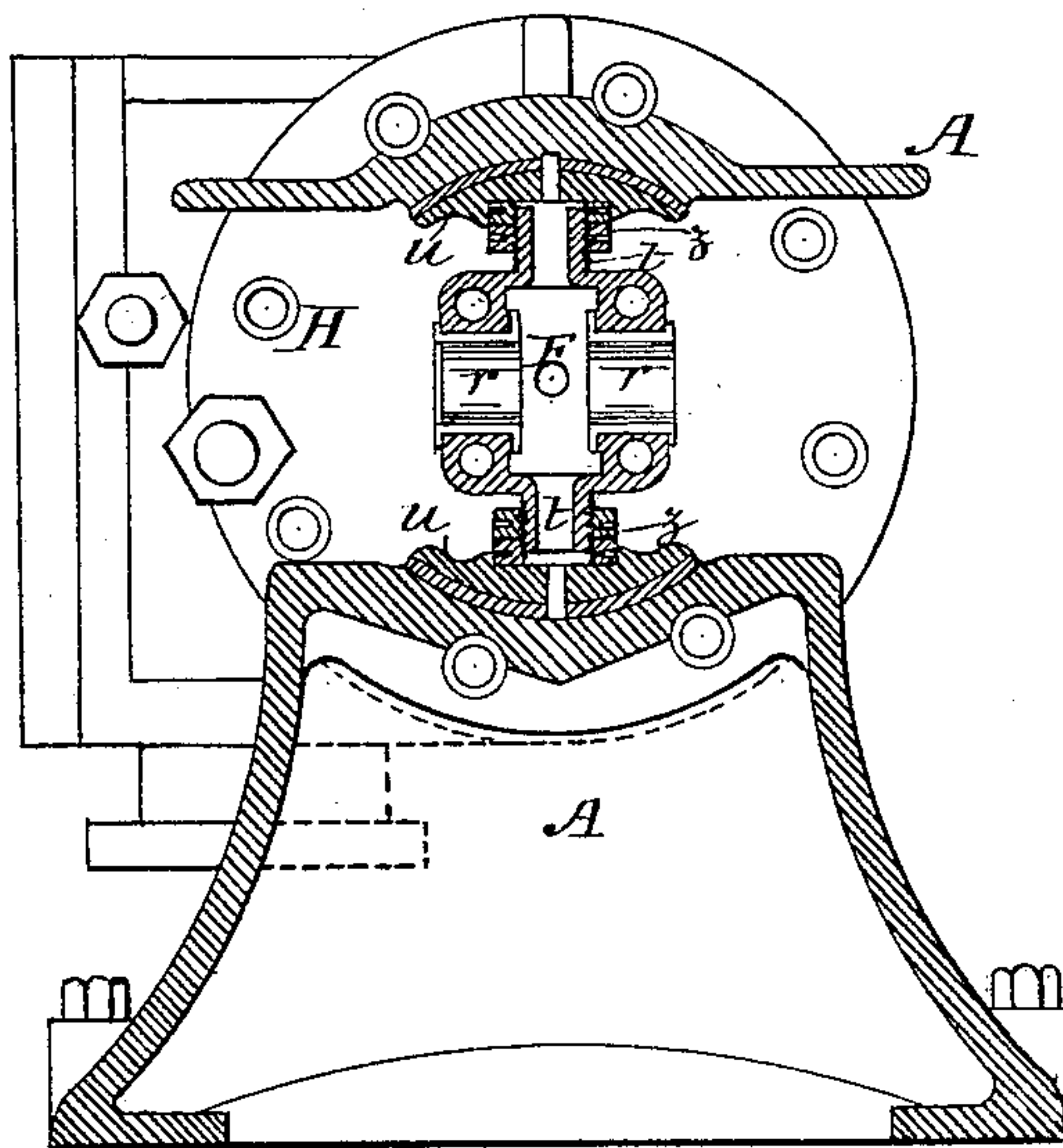
CRANK MOVEMENT IN STEAM ENGINES AND OTHER MACHINERY.

No. 273,624. *Fig. 3.*

Patented Mar. 6, 1883. *Fig. 4.*



*Fig. 5.*



Witnesses:

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# UNITED STATES PATENT OFFICE.

JESSE M. SMITH, OF DETROIT, MICHIGAN.

CRANK-MOVEMENT IN STEAM-ENGINES AND OTHER MACHINERY.

SPECIFICATION forming part of Letters Patent No. 273,624, dated March 6, 1883.

Application filed January 26, 1883. (No model.)

*To all whom it may concern:*

Be it known that I, JESSE M. SMITH, of Detroit, in the county of Wayne and State of Michigan, have invented a new and useful  
5 Improvement in Steam-Engines and other Machines using a Crank-Movement, which improvement is fully set forth in following specification.

This invention relates more particularly to  
10 steam-engines in which the power is communicated to the crank and main shaft from a sliding cross-head by means of a connecting-rod or pitman, and has for its object to counteract the effects of wear upon the bearings of  
15 the main shaft, to make a strong and durable joint between the connecting-rod and cross-head, to relieve the piston-rod of strain where it joins the cross-head, and generally to improve what may be called the "crank-movement" of the machine.

The invention consists, first, in supporting the main or crank shaft in a universal pillow block or blocks with bearing-pieces adjustable to take up wear as well in a horizontal as in a  
25 vertical direction.

Heretofore universal pillow-blocks have been made; but the bearing-pieces have been adjustable only in one direction, and these blocks have been applied to the main or crank shaft  
30 of steam-engines, or such use of them has been proposed. They are not, however, adapted to such use, since, the thrust of the pitman or connecting-rod being in ever-varying directions, the wear takes place on all sides, and the ordinary adjustment, while sufficient for line-shafting, is inadequate to the purpose. By the present invention the difficulty is avoided. The universal pillow with the improved adjustment is believed to be new in itself as well  
40 as in its application to a steam-engine, and is itself a part of the invention.

The invention also consists in combining with the main or crank shaft, the universal block or blocks supporting it, and the connecting-  
45 rod or pitman, a cross-head with curved bearing-surfaces and means for taking up the wear as well on the cross-head as at the pillow block or blocks. It also includes the arrangement of the crank between two universal pillow-blocks, by which the crank-shaft is supported  
50 on either side of the crank; also, the provid-

ing of a pillow-block with safety lubricant-pockets of a peculiar shape, said pockets containing a solid lubricant, which, in case the journal gets hot, is melted and lubricates it. 55 The peculiar shape referred to is that of a pyramid or cone, so that the block of lubricant, as the bottom is melted away, will by its weight drop down upon the journal.

Ordinarily the connecting-rod or pitman is  
60 joined to the cross-head by a pin passing through the end of the connecting-rod and journaled therein. This arrangement gives a single short bearing with corresponding liability to wear. The end of the connecting-rod  
65 has sometimes been forked; but it is expensive to do this. In the present invention the pin is fixed in the end of the connecting-rod or pitman by shrinking or otherwise, and has its bearings in the cross-head, one on each side  
70 of the connecting-rod or pitman. These bearings are independent and have each an adjustable bearing-piece.

It is very common to have the end of the piston-rod fit in a socket in the cross-head, to  
75 be held therein by a wedge inserted through holes in the walls of the cross-head and the end of the piston-rod, the said wedge, when driven home, bringing into contact-surfaces on the piston-rod and cross-head. Heretofore this  
80 contact has been made on the piston side of the wedge. The result is that when the wedge is driven home the part between the wedge and said contact-surfaces is put in a state of  
85 tension, and as the pull of the piston exerts tension on the same part of the rod, the combined strain is often sufficient to break the rod at this point. In the present invention the  
90 difficulty is avoided by transferring the contact-surfaces to the side of the wedge farthest from the piston, so that the rod will be relieved of strain on account of the wedge, the latter exerting a force of compression upon the end  
95 of the rod. The force will never be sufficient to crush this part of the rod. The wedge will be the part of least strength, and if it should give way its breakage is attended with less danger, and it can be much more easily replaced than in the case of a piston-rod.

The invention further comprises certain particular constructions and combinations of  
100 parts, as hereinafter set forth.



In the accompanying drawings, which form a part of this specification, Figure 1 is a side view, partly in vertical section, of the crank-movement of a steam-engine constructed in accordance with the invention; Fig. 2, a horizontal section; Fig. 3, a central vertical cross-section through one of the pillow-blocks; Fig. 4, a central vertical longitudinal section through the same, and Fig. 5 a vertical section through the cross-head.

A is the frame or bed; B, the main or crank shaft; C, the crank-pin carried by and between disks D, keyed to the two portions of the shaft B; E, the connecting-rod or pitman; F, the cross-head; G, the piston-rod, and H, Fig. 5, the steam-chest and cylinder.

The pillow-blocks by which the main or crank shaft B is supported have each four bearing-blocks, *a*. These blocks have a spherical bearing, the lower one in the bed or frame A, the side blocks in the piece *b* and slide *c*, and the upper one in the cap-piece *d*. The cap-piece *d* is attached to the bed or frame A by the bolts *e*, and it can be adjusted on said bolts by means of the nuts *f*. It has side flanges, *g*, which fit outside the upright extension *h* of the bed or frame and strengthen it. The piece *b* and slide *c* fit inside the extensions *h*, and the slide *c* is combined with bolts *i* and nuts *k*, whereby it can be adjusted and secured in the position to which it is adjusted.

The blocks *a* have the usual lining of brass or anti-friction metal. The wear at the bearing is taken up by adjusting the cap-piece *d* and slide *c*. At *l* is the oiling tube or passage. The top block, *a*, is preferably made of such dimensions as to leave a space on each side of it, and strips *m*, of wood, are inserted in the outer of these spaces, leaving small grease-pockets *n* between said strips and the shaft-journal. Safety-pockets *p* are provided preferably in the top block, *a*. They are made flaring toward the bottom. Lubricant in a solid state is placed therein by casting or otherwise. Should the usual supply of lubricant through the oil-passage *l* run short, so that the journal becomes heated, the solid lubricant in the pockets *p*, which rests upon said journal, melts and lubricates it. The block of lubricant will, owing to the shape of the pockets, drop down upon the shaft or journal as fast as the material is melted off at the bottom.

The crank-shaft may be supported in one pillow-block, but preferably in two, as shown.

The connecting-rod or pitman E is connected with the crank-pin preferably by the ordinary cylindrical joint; but a ball or other universal joint may be used.

The connection between the connecting-rod or pitman and the cross-head F is made by the pin *q*, which is fixed at the middle in the connecting-rod by shrinking the metal thereon, by a screw-thread, by a set-screw, or by other known or suitable means. The two ends of the pin are journaled in boxes *r* in the cross-head. The body of the cross-head is cast or

otherwise made with slots to receive the journal-boxes *r*, a socket, *s*, to receive the end piston-rod, G, and projections *t* for the attachment of the shoes *u*. The ends of the slots are closed by the bars *v*, which are bolted to the body of the cross-head, and which can be removed for the insertion of the pin *q* and its journal-boxes *r*. The boxes *r* are split and one of each is combined with a wedge, *w*, which fits behind the same and can be pressed inward by the nut *x* or bolt *y* to adjust the said part and take up the wear. The shoes *u* are connected with the projections *t* by nuts *z*, the said projections being threaded. The outer face of the shoes is curved, as shown in Fig. 5, and travels in curved ways of the bed or frame. Flat shoes could be used; but the curved ones are more easily made, and have, besides, a special advantage when used in connection with a crank-shaft supported by the universal pillow-blocks, in that the cross-head may turn in its ways should the crank-shaft get out of the horizontal.

The end of the piston-rod G, fitting within the socket *s*, has an oblong hole, and beyond this hole it has an end bearing against the end wall of the socket, as shown. The wedge *a'* is inserted through holes in the sides of the socket *s* and the hole in the piston-rod, and when driven home forces the end of the piston-rod against the bottom of the socket, so that the rod is held firmly from moving independently. The force of the wedge *a'* compresses the metal at the end of the rod, but puts no tensile strain thereon.

Through the shoes *u* and projections *t* is an oil-hole, through which oil that is applied to the top way of the cross-head may pass to the lower one, lubricating the journals of the pin *q*.

The operation is sufficiently obvious without further description. The parts may be economically made and put together, are light-running, durable, and not likely to get out of order. Should the bearings of the main or crank shaft wear and let it down on one side, the pillow-blocks and the cross-head will adapt themselves automatically to the new position. Ample means are provided for taking up the wear at all points where it is liable to occur.

Modifications in details of construction could be made without departing from the spirit of the invention, and portions of the invention could, if desired, be used without the others.

Having now fully described my said invention and the manner of carrying the same into effect, what I claim is—

1. The combination, with a connecting-rod or pitman, crank, and crank-shaft, of a pillow block or blocks having bearing-pieces adjustable to take up wear both in a horizontal and in a vertical direction, substantially as described.

2. In a universal pillow-block, the combination, with the bearing-pieces, of means for adjusting the same vertically and horizontally to take up the wear, substantially as described.



3. The combination, in a pillow-block, of the frame or bed, the cap-piece, the slide, the additional side piece, the blocks having a ball or universal bearing in said bed, cap-piece, 5 slide, and side piece, respectively, and the adjustable bolts, substantially as described.

4. The combination of the shaft supported in two universal pillow-blocks, the crank in the shaft between said blocks, and the connecting-rod or pitman, substantially as described. 10

5. The combination, with the universal pillow-block, the means for taking up wear therein, the crank-shaft, the connecting-rod or pitman, the cross-head having shoes with curved faces, and the means for adjusting the shoes, 15 substantially as described.

6. The combination, with the connecting-rod or pitman and the cross-head, of the pin fixed in the connecting-rod or pitman, and having its two ends journaled in the cross-head, substantially as described. 20

7. The cross-head provided with slots on opposite sides of the connecting-rod or pitman, in combination with the journal-boxes in said slots, and the pin fixed in the connecting-rod or pitman and supported in said boxes, 25 substantially as described.

8. The pin fixed in the connecting-rod or pitman, and having its ends supported in independent boxes on the cross-head, in combination with the adjusting-wedges, substantially as described. 30

9. The body of the cross-head, having a socket for the end of the piston-rod, slots for the journal-boxes of the pin on the connecting-rod, and the projections for making adjustable connection with the shoes, substantially as described. 35

10. The piston-rod projecting into a socket of the cross-head, in combination with the holding-wedge, said rod having a bearing to prevent end motion inside of the wedge—as, for example, against the bottom of the socket—substantially as described. 40

11. The combination of the frame or bed, the cross-head having shoes with curved faces, supported in ways similarly curved, the piston-rod projecting into a socket of the cross-head and held therein by a wedge, and bearing against the wall of the socket inside said wedge, the connecting-rod or pitman, the pin fixed therein, the journal-boxes on the cross-head for the ends of said pin, the crank-shaft, and the universal pillow-blocks with the adjusting means, all substantially as described. 45 50 55

In testimony whereof I have signed this specification in the presence of two subscribing witnesses.

JESSE M. SMITH.

Witnesses:

PHILIP MAURO,  
C. J. HEDRICK.