

No. 742,654.

PATENTED OCT. 27, 1903.

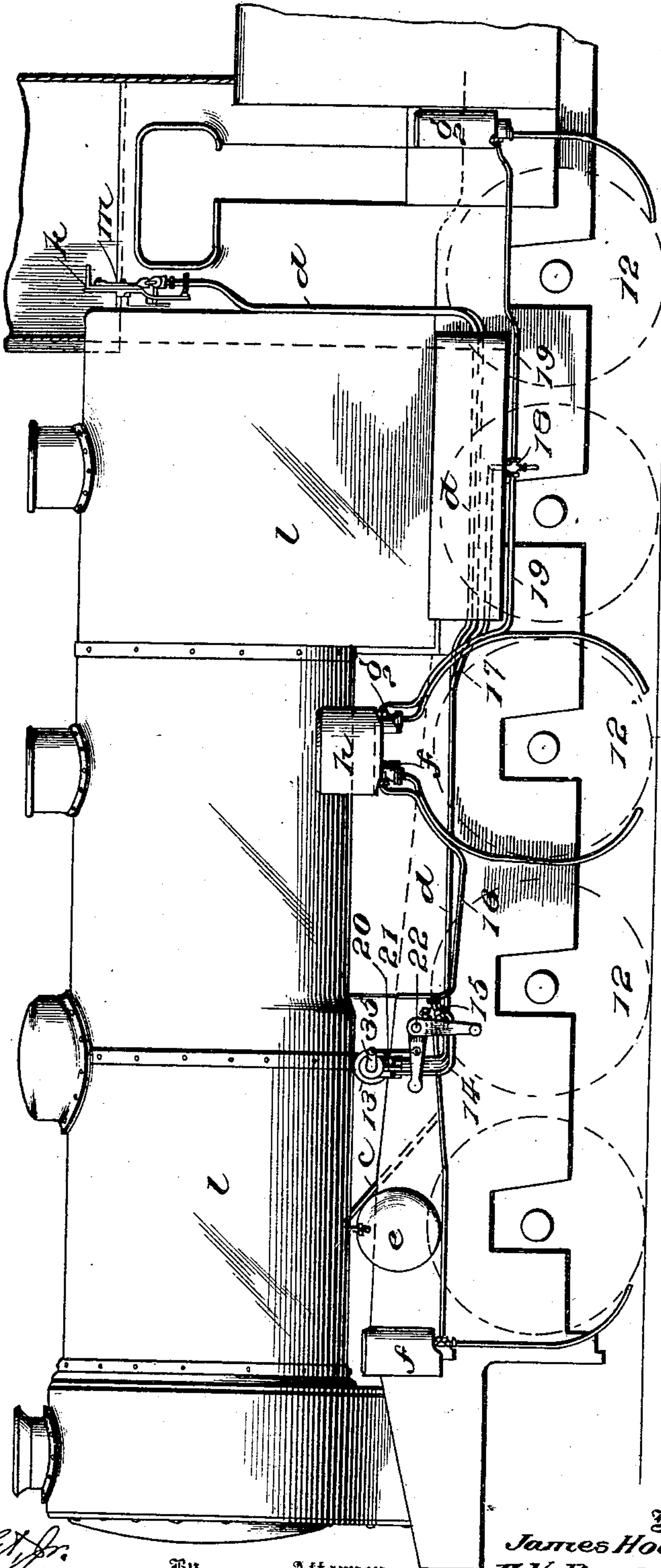
J. HOLDEN & F. V. RUSSELL.  
APPARATUS FOR DISTRIBUTING SAND BENEATH THE DRIVING  
WHEELS OF LOCOMOTIVE ENGINES, &c.

NO MODEL.

APPLICATION FILED APR. 15, 1903.

9 SHEETS—SHEET 1.

Fig. 7.



Witnesses:  
Chas. P. Wright, Jr.  
D. W. Gould.

By

Attorney

Inventors  
James Holden  
F. V. Russell.

Hubert E. Ack

No. 742,654.

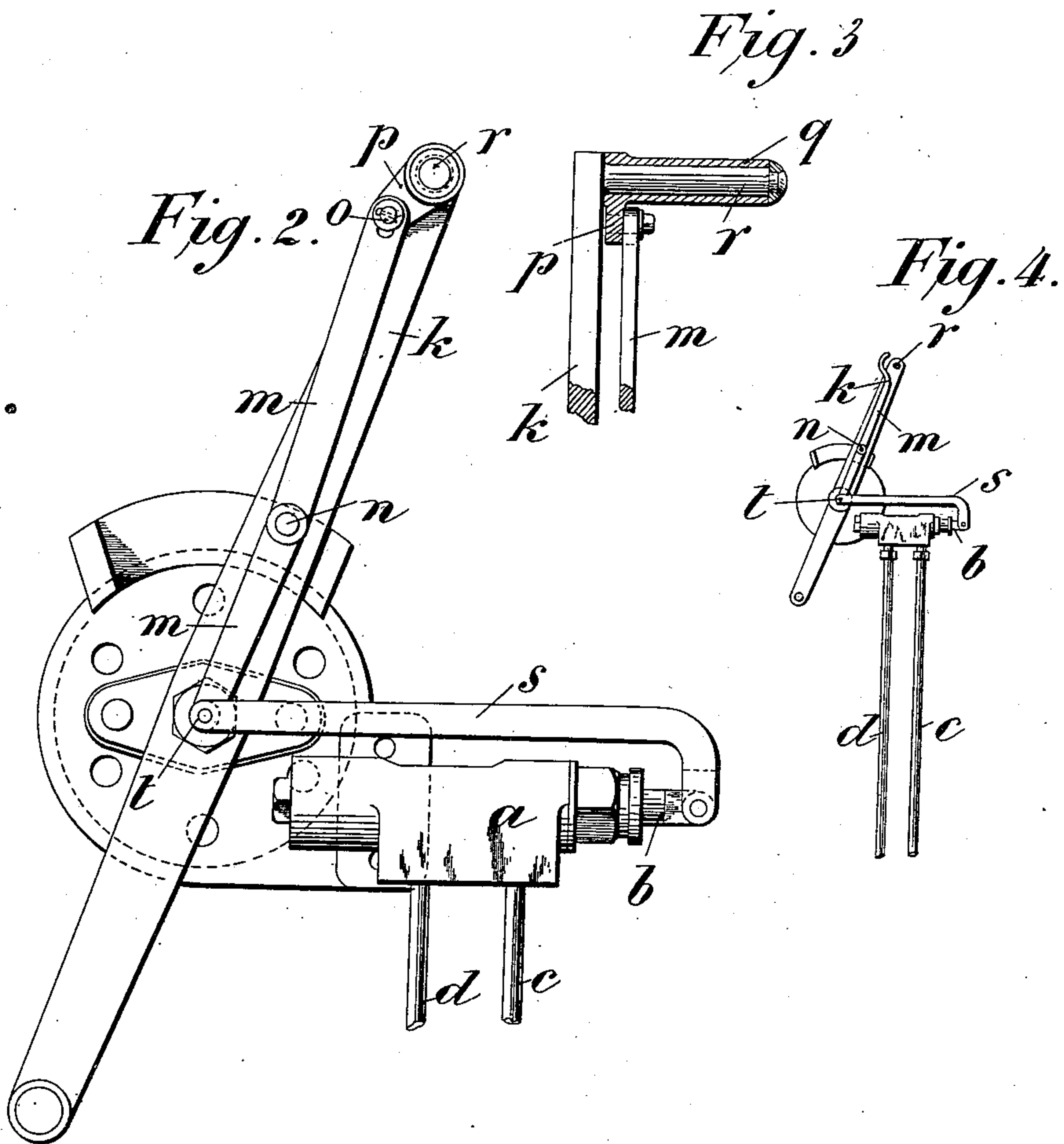
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9 SHEETS—SHEET 2.



Witnesses

Alice H. Hoffman  
E. R. Peck

Inventors

James Holden

F. V. Russell

per Hubert Black  
atty

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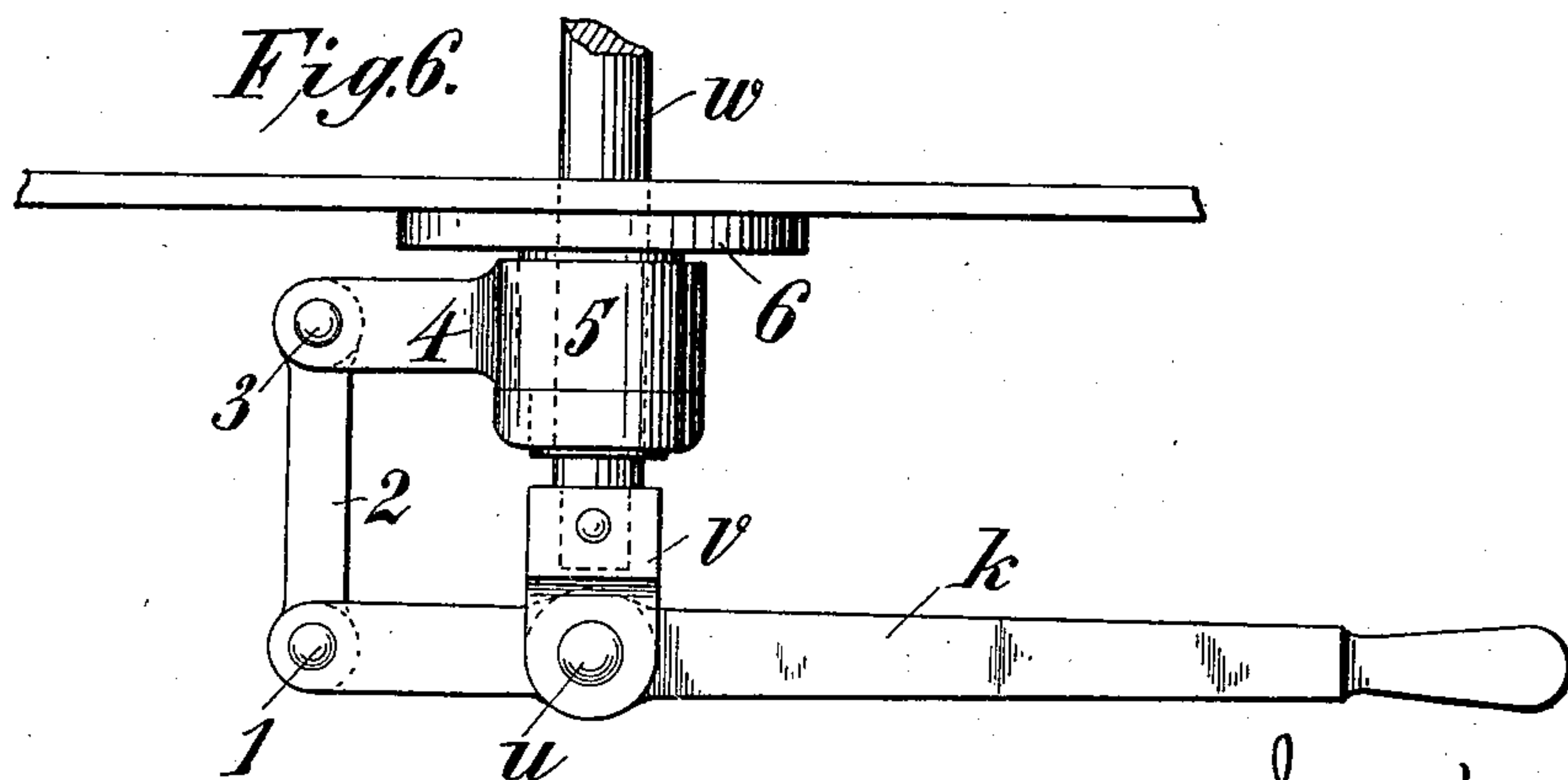
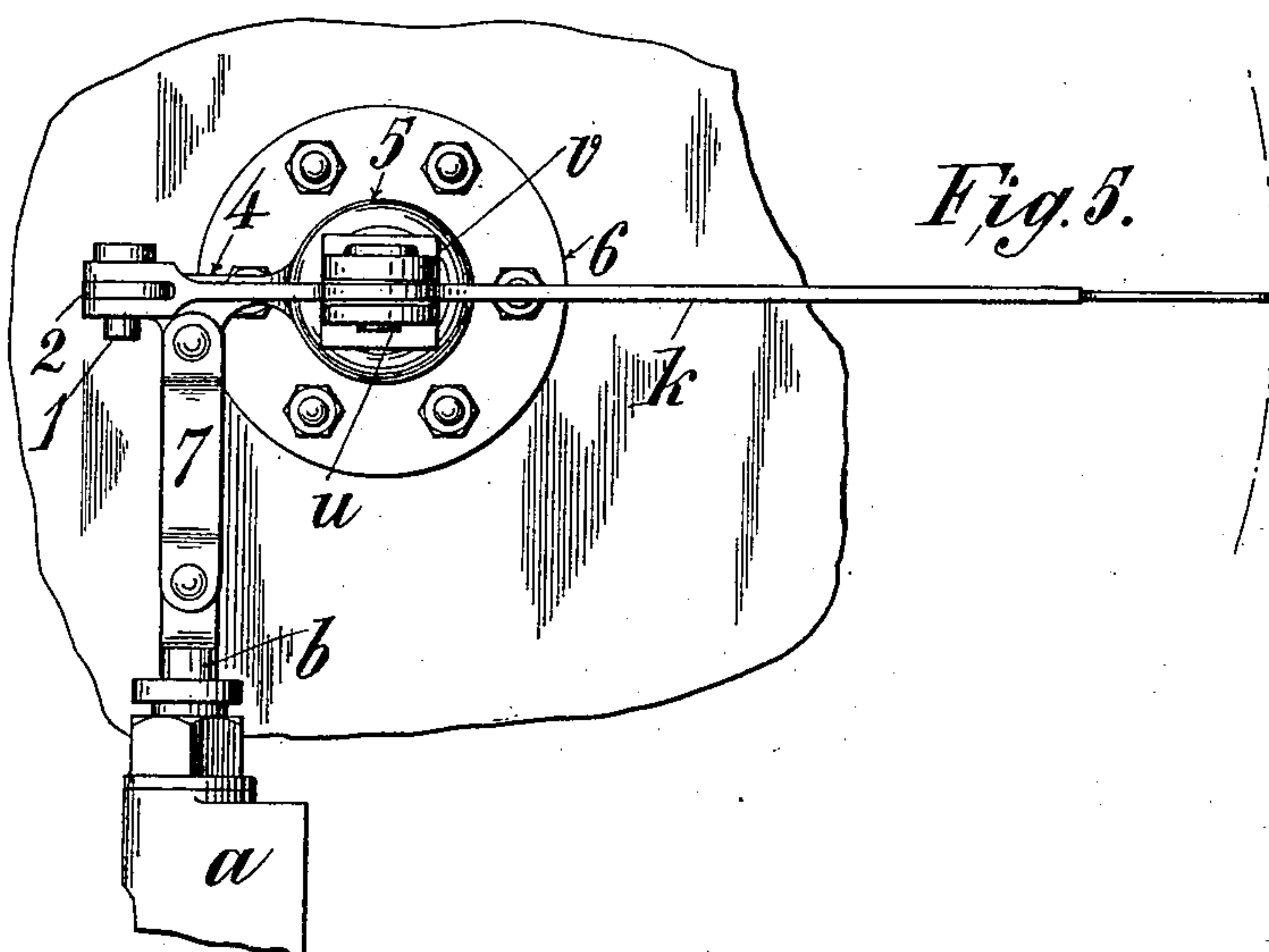
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Witnesses  
Alice H. Hoffman  
E. R. Peck

Inventors  
James Holden  
F. V. Russell  
per Robert E. Peck  
att'y

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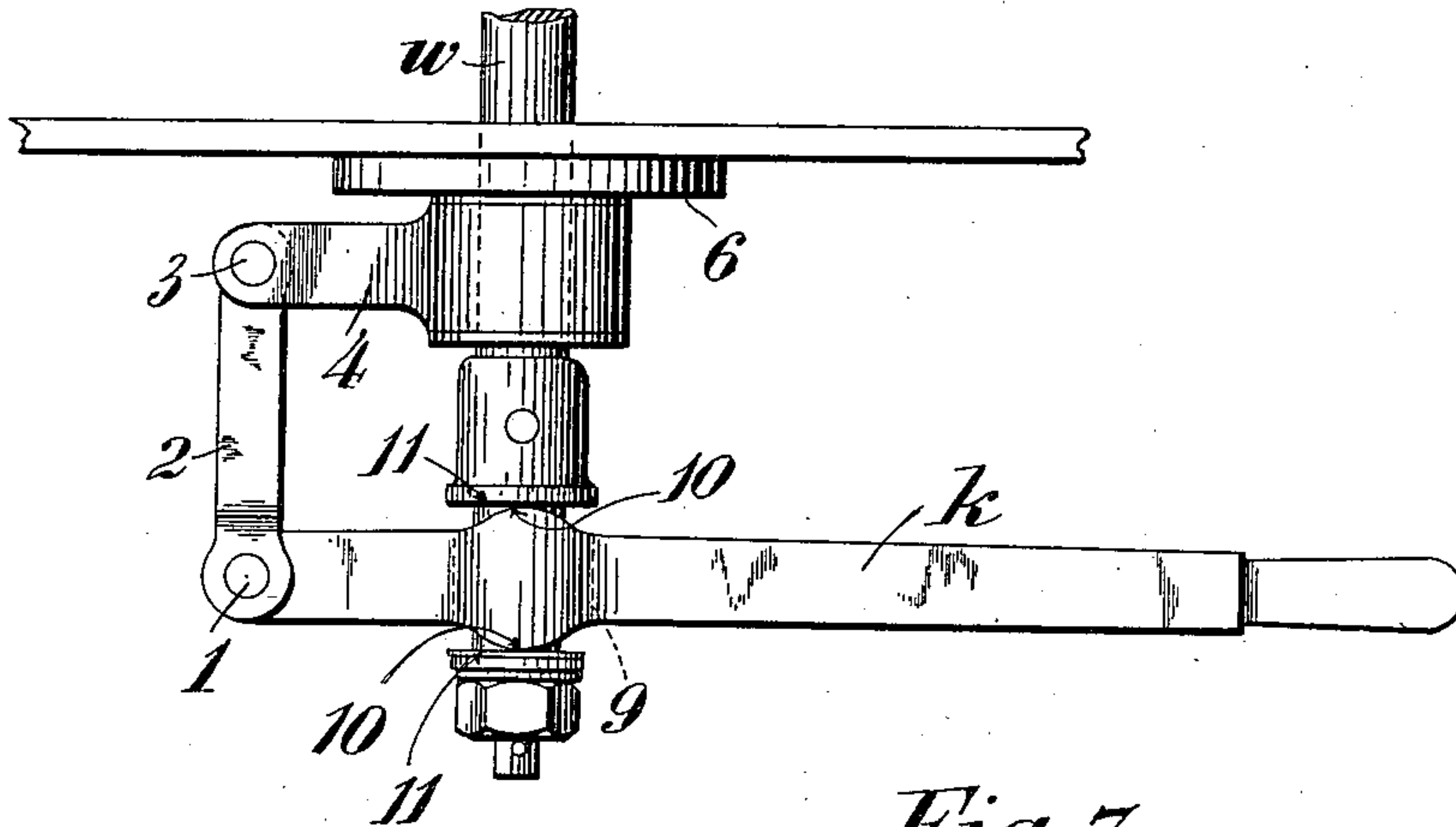
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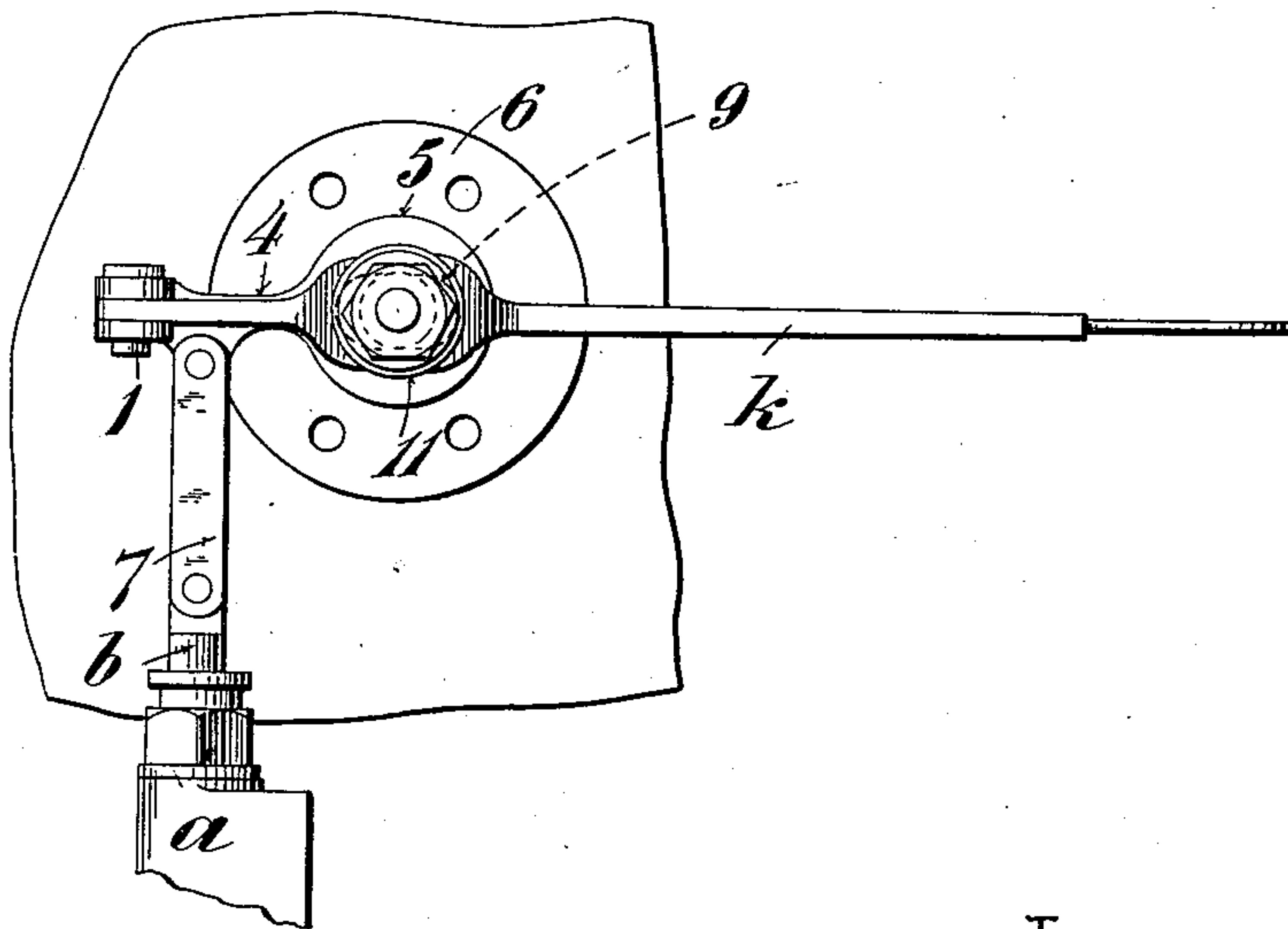
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9 SHEETS—SHEET 4.

*Fig. 8.*



*Fig. 7.*



Witnesses  
Alice H. Hoffman  
E. R. Oak

Inventors  
James Holden  
F. V. Russell  
Per Robert E. Oak  
att'y



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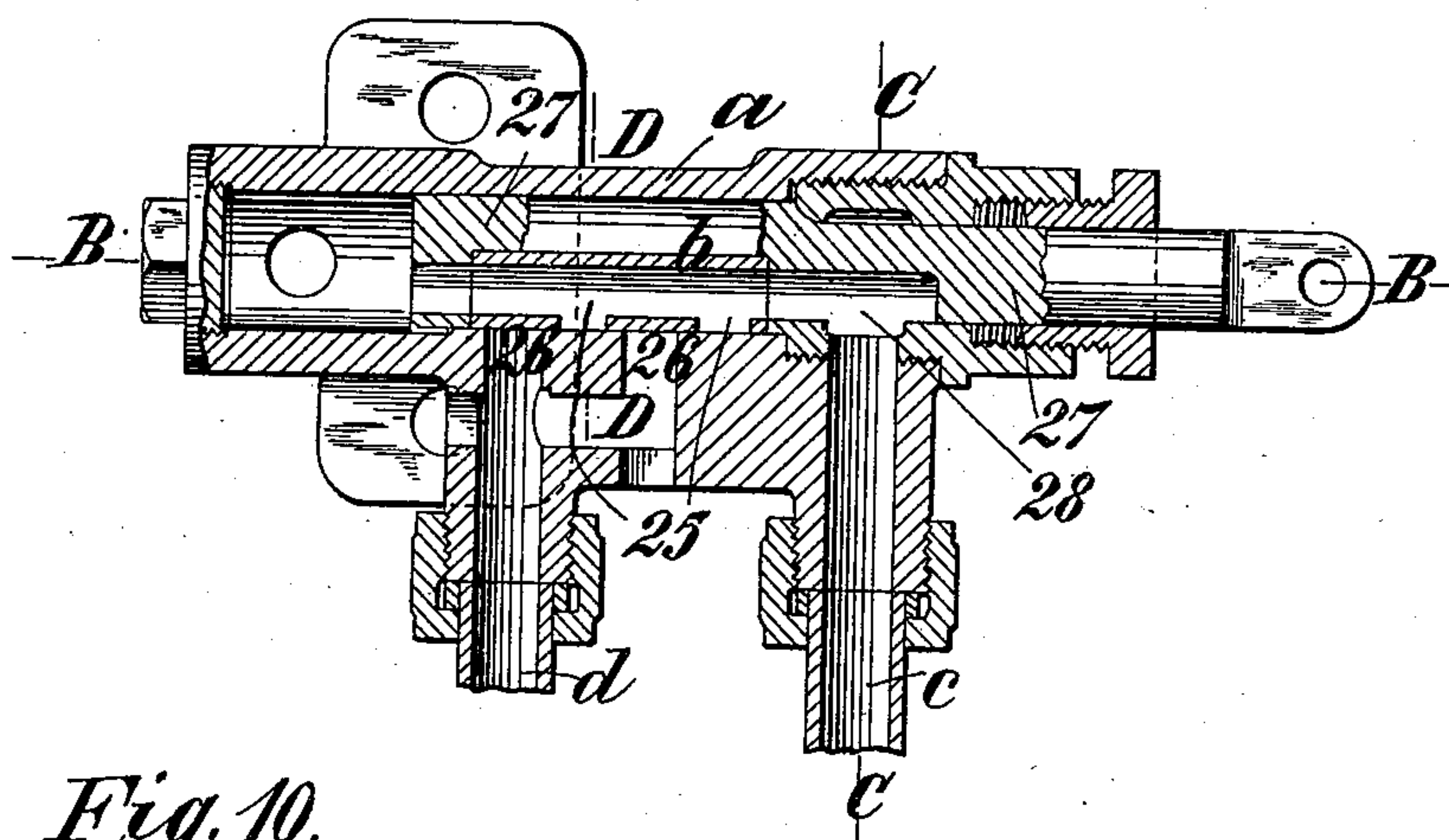
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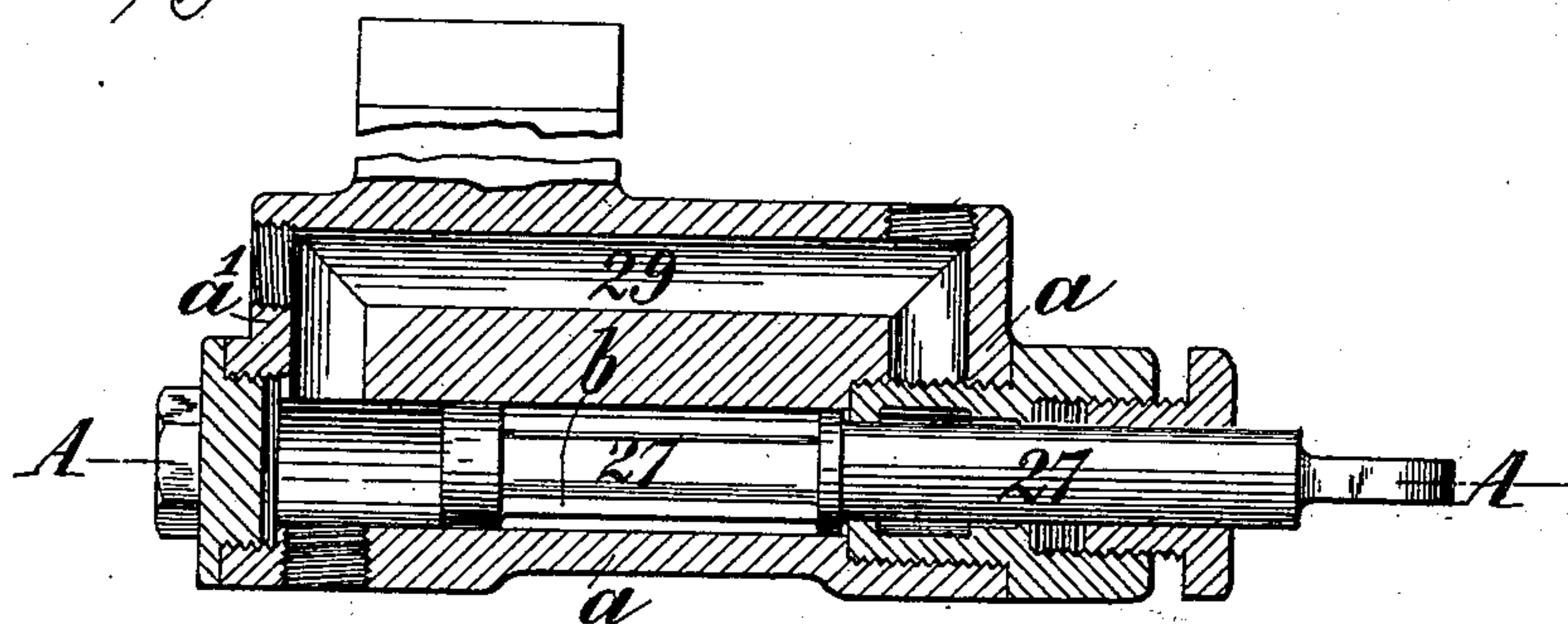
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9 SHEETS—SHEET 5.

*Fig. 9.*



*Fig. 10.*



*Fig. 12.*



Witnesses

*Alice H. Hoffman*  
*E. R. Peck*

Inventors

*James Holden*  
*F. V. Russell*  
*per T. H. & P. H. Peck*  
*atty*

No. 742,654.

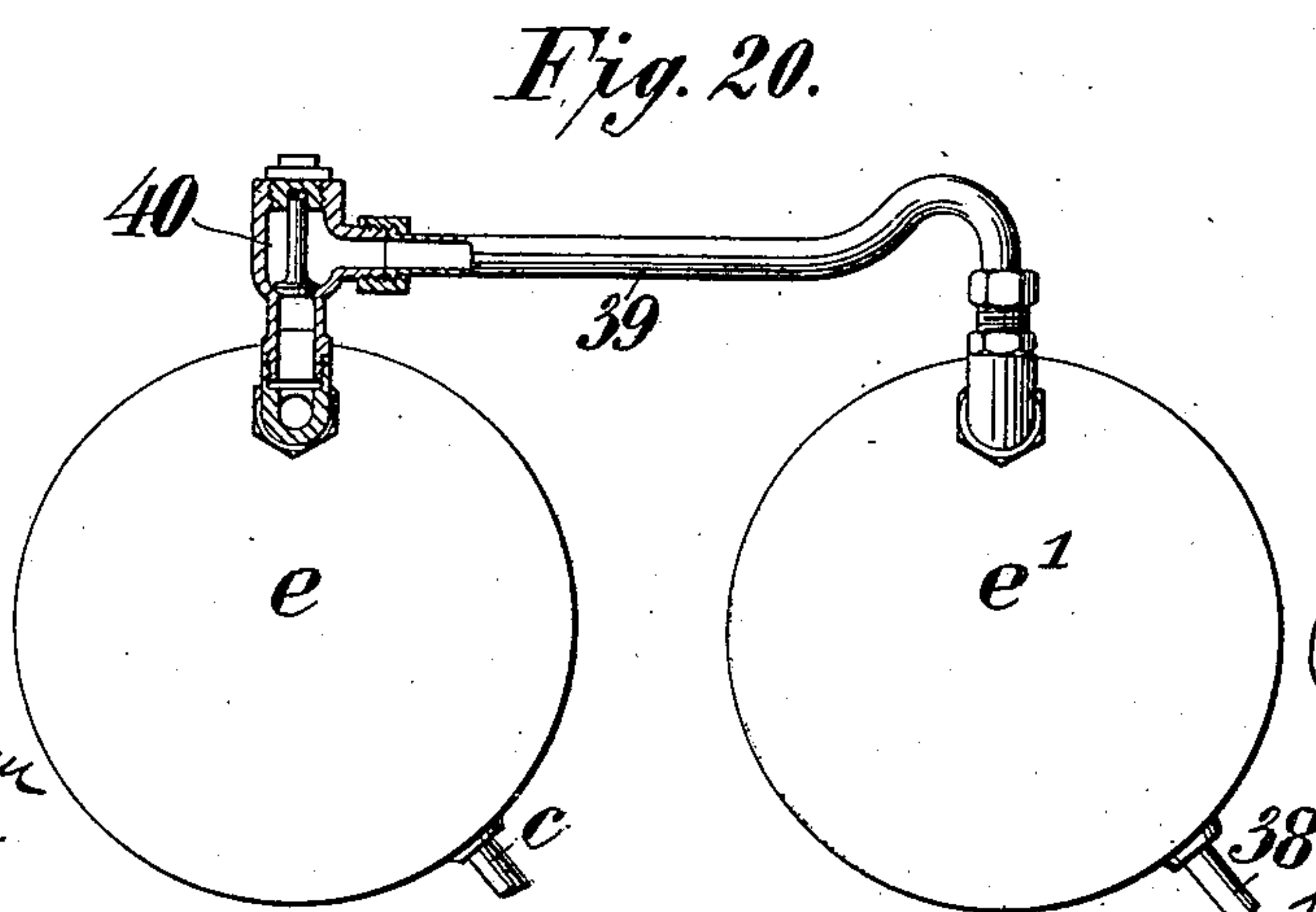
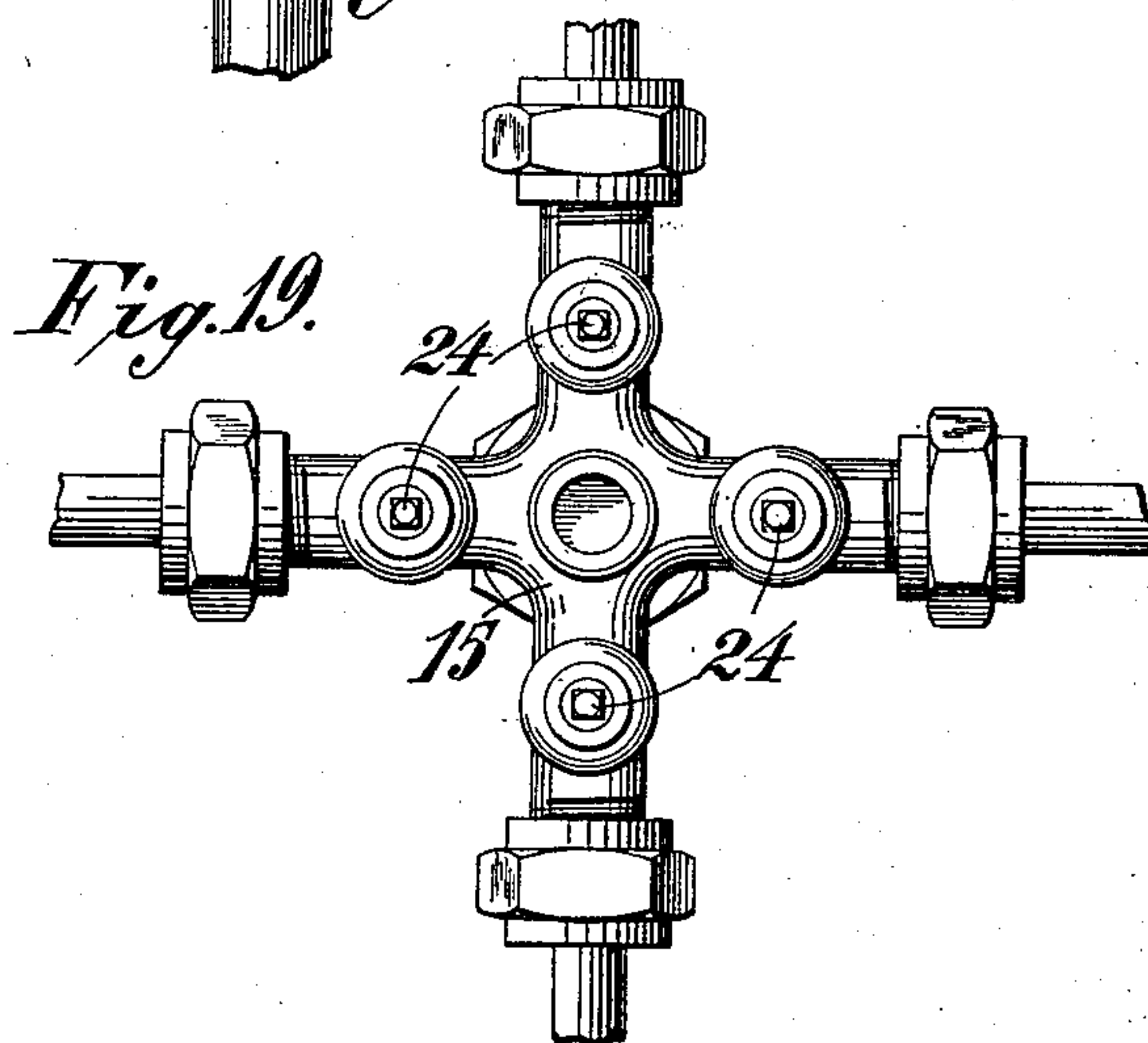
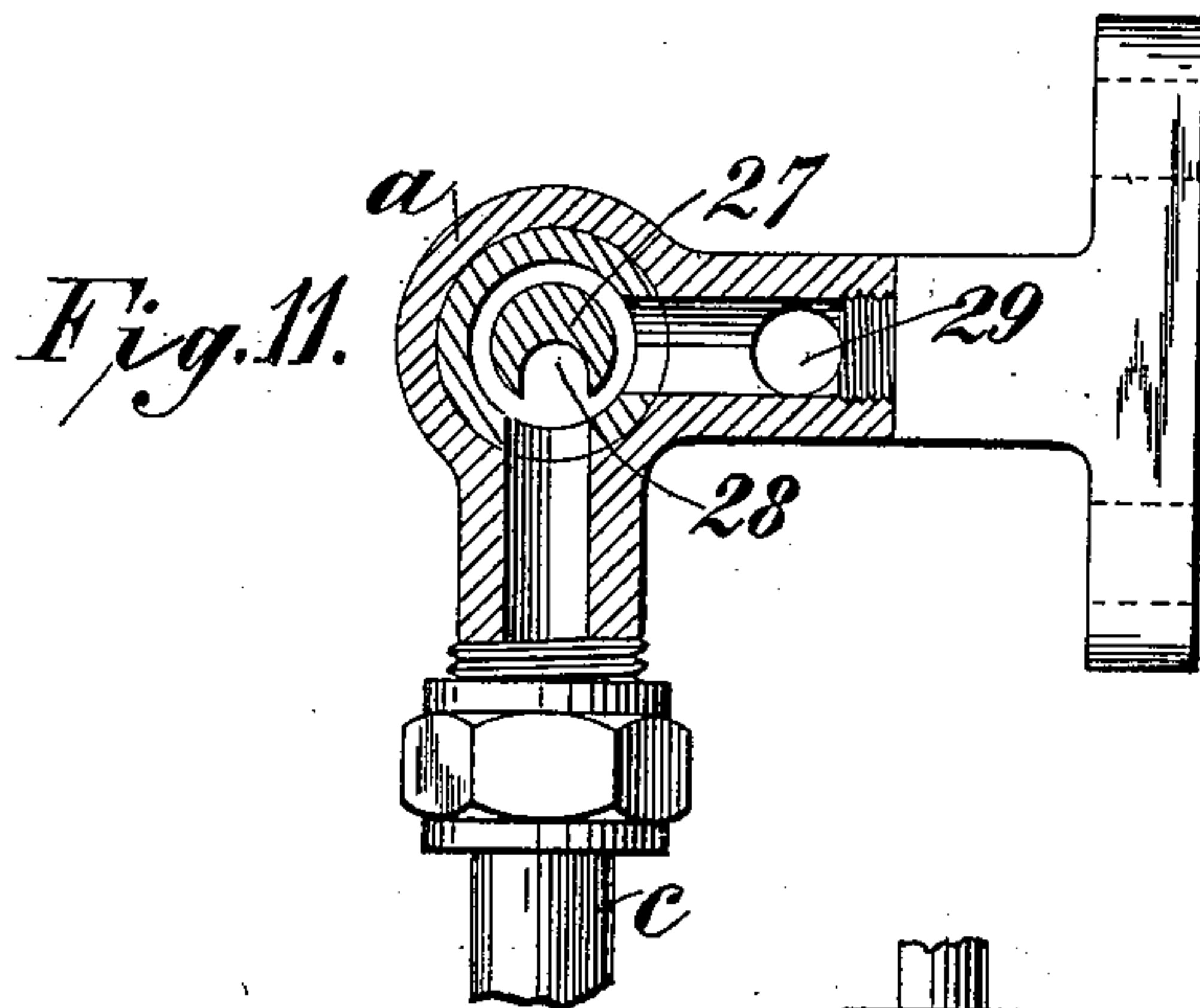
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9 SHEETS—SHEET 6.



Witnesses  
Abiel W. Hoffman  
E. R. Peck

Inventors  
J. Holden  
F. V. Russell  
per

Kuhnt & Peck  
attys

No. 742,654.

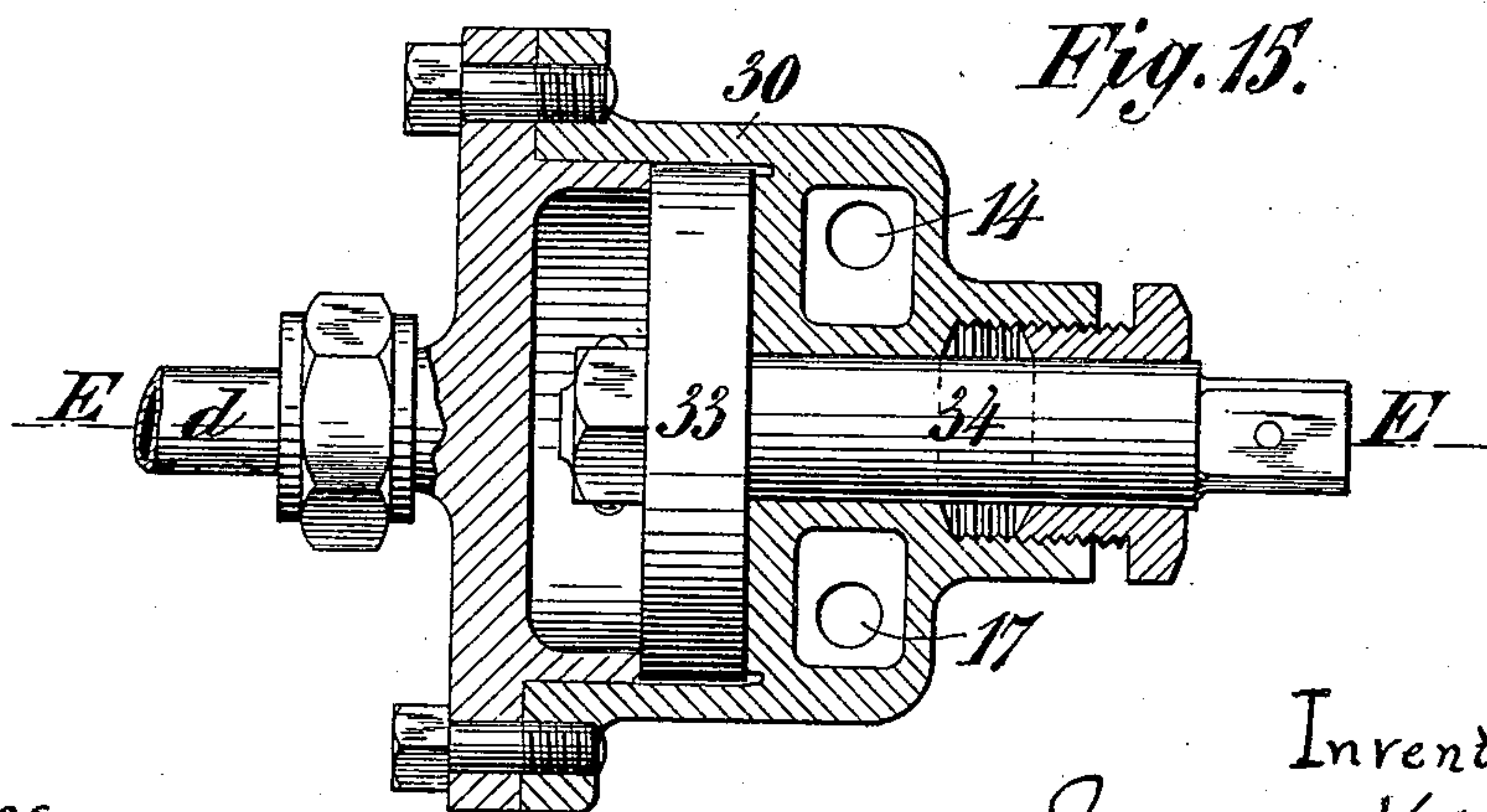
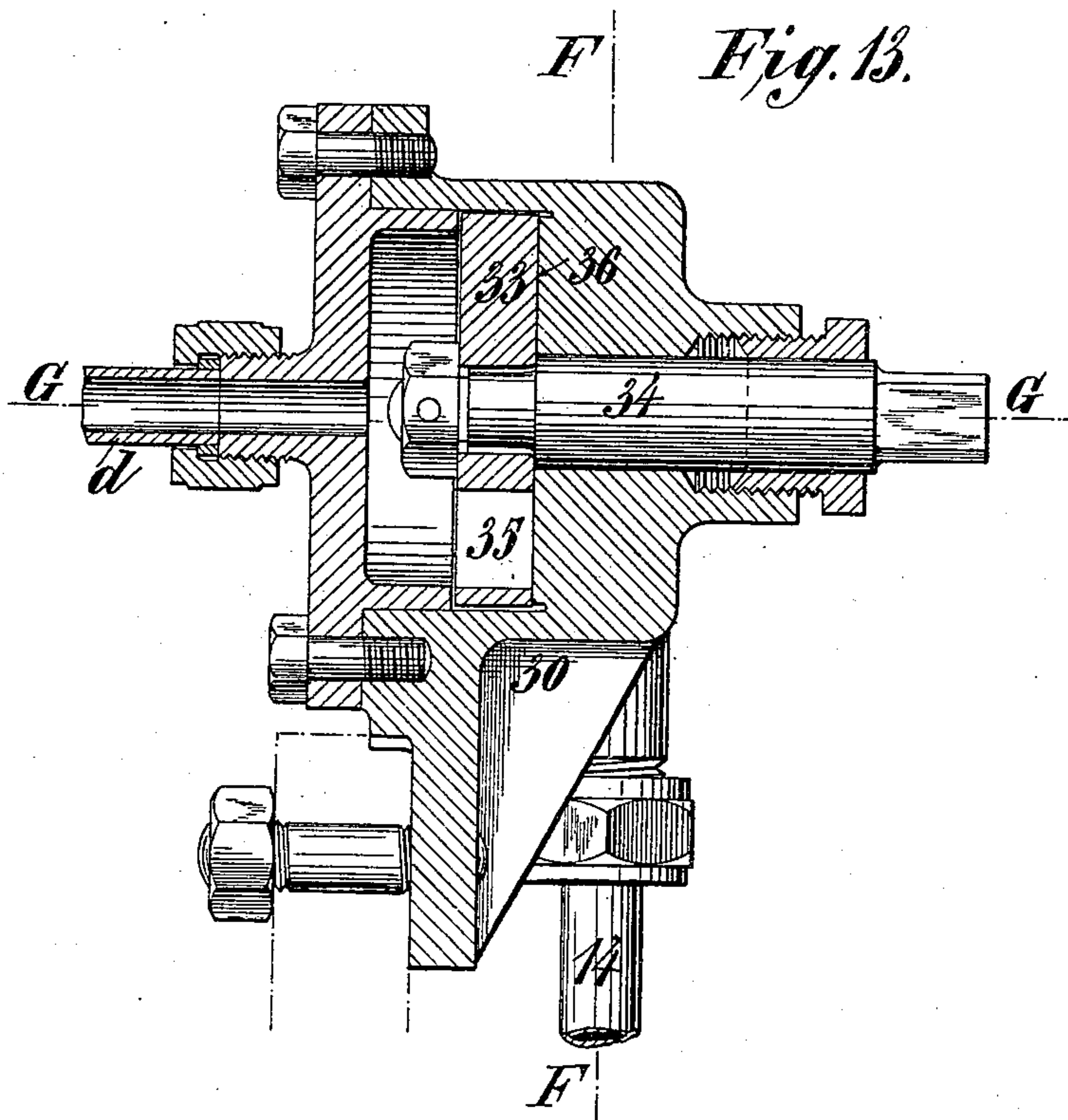
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Witnesses  
*Albie C. Hoffman*  
*E. R. Peck*

Inventors  
*James Holden*  
*F. V. Russell*  
*Per Robert E. Peck*  
*att'y*



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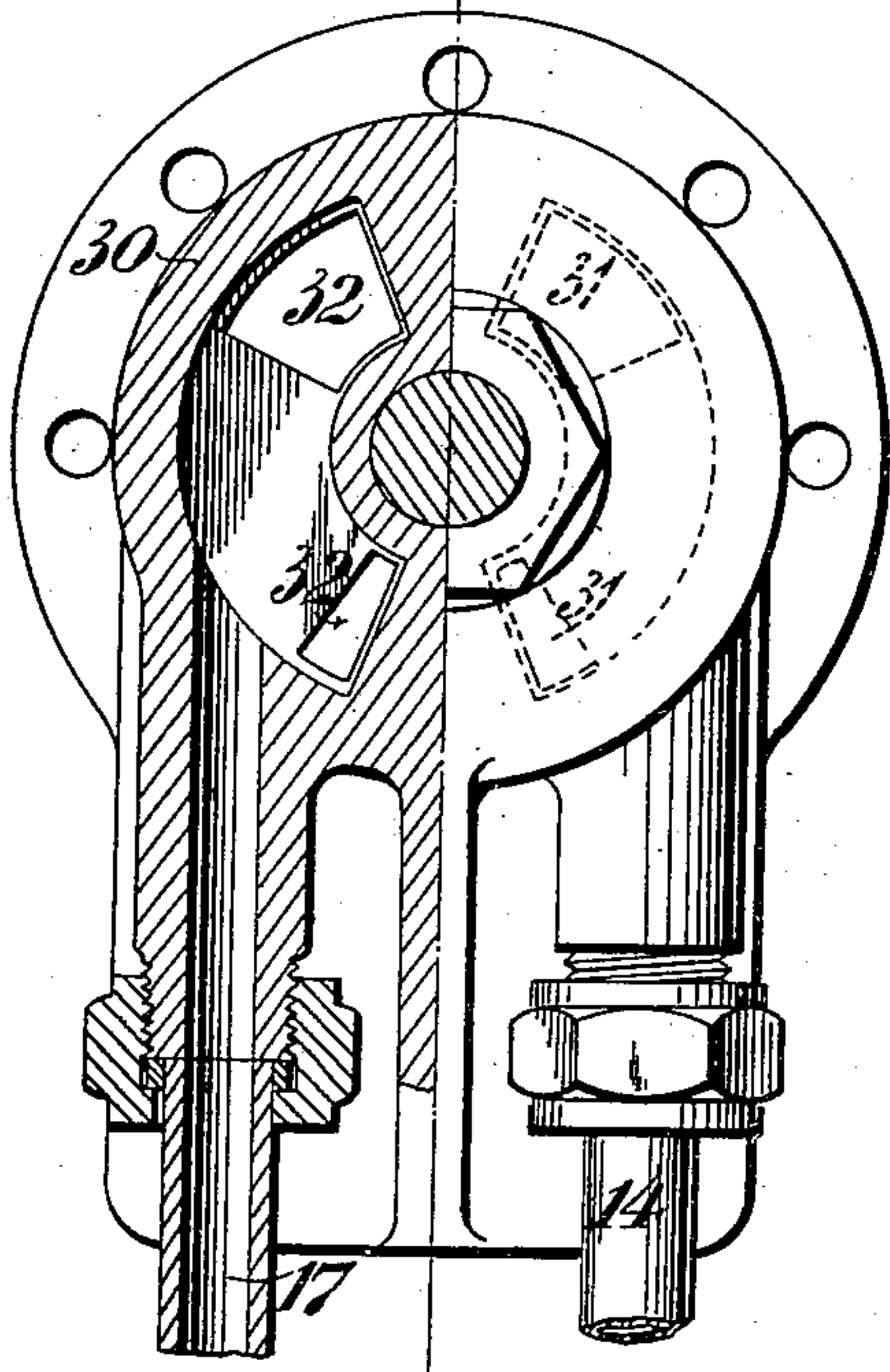
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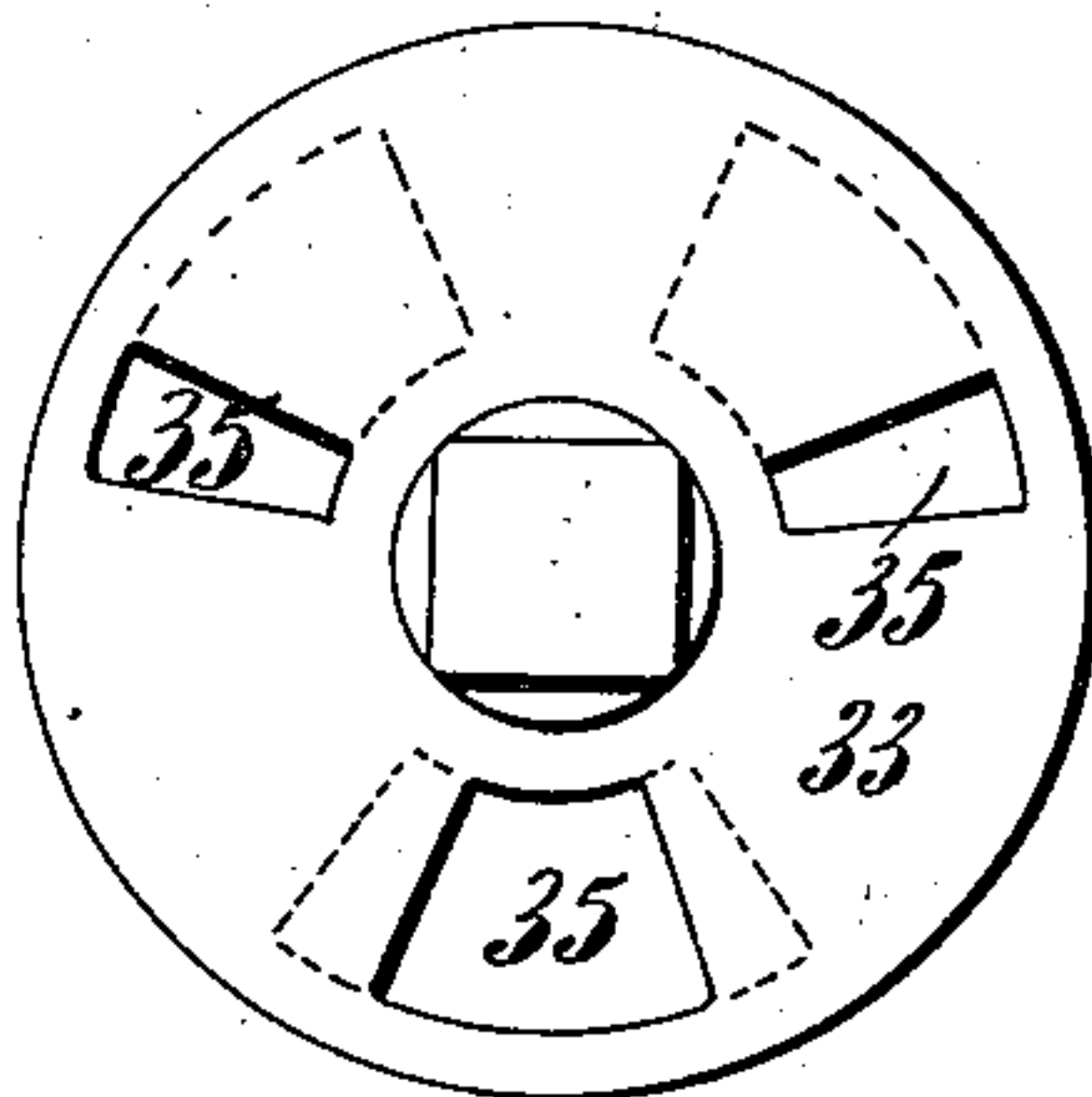
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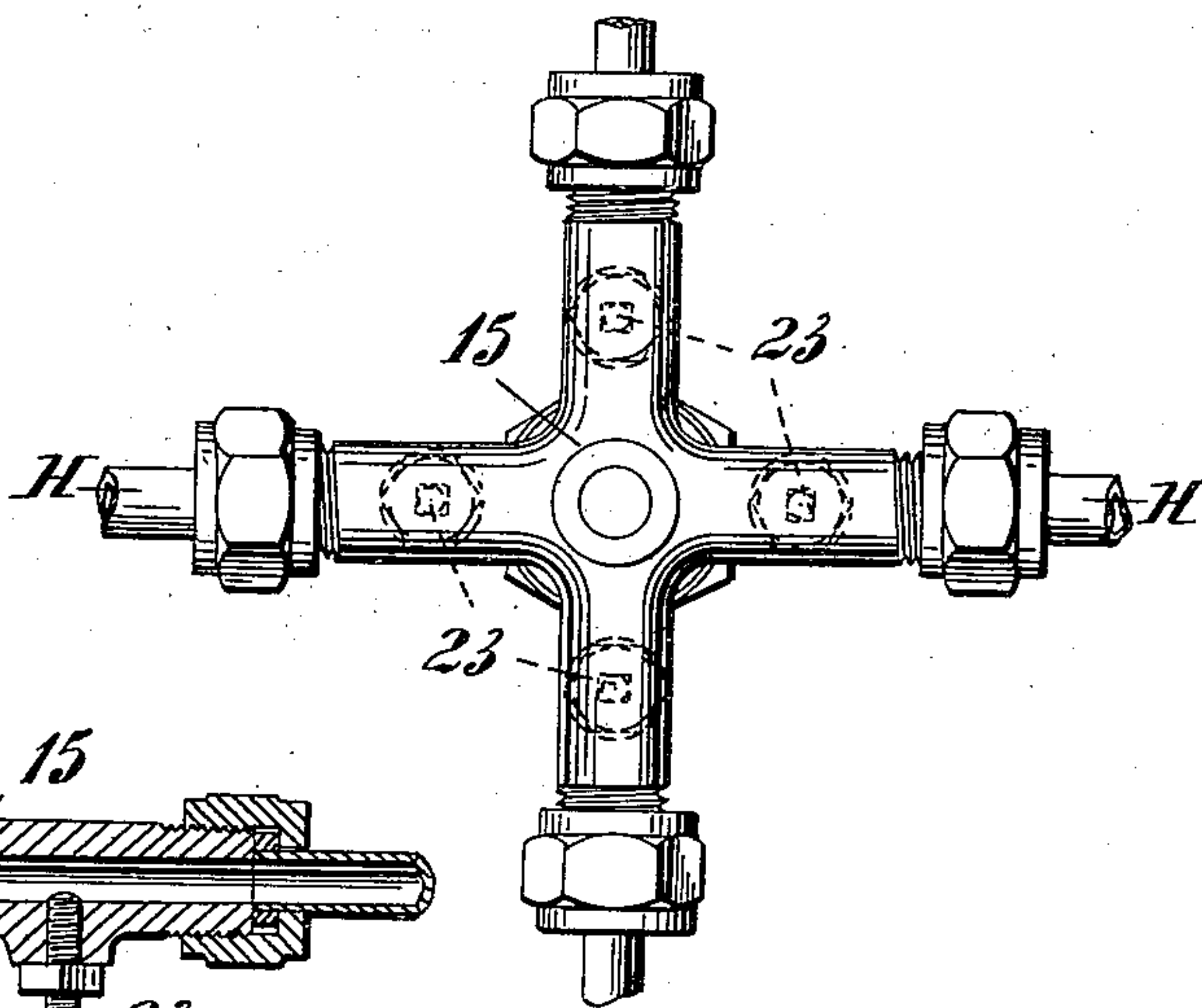
*Fig. 14.*



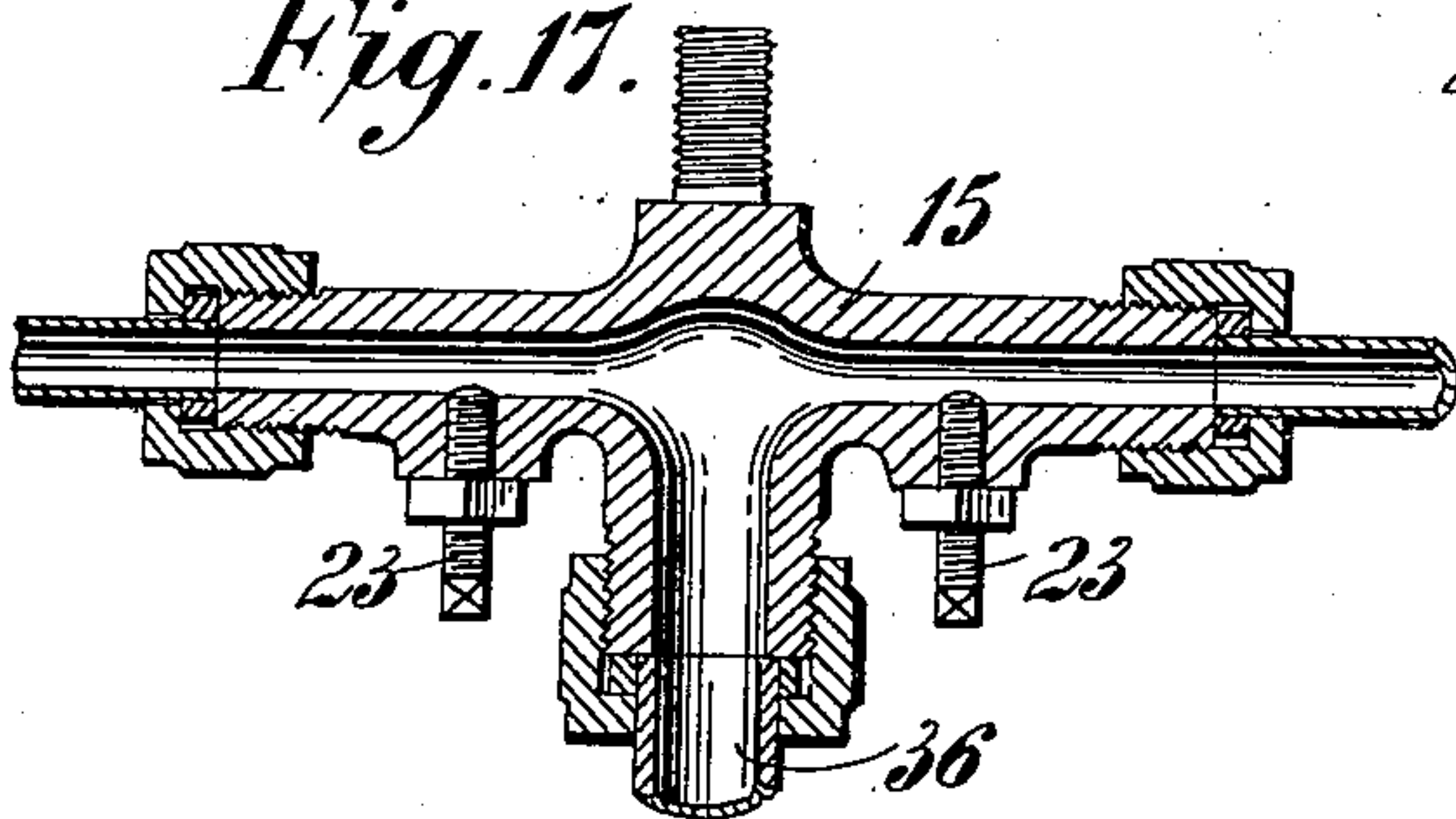
*Fig. 16.*



*Fig. 18.*



*Fig. 17.*



Witnesses

Alie H. Hoffman  
E. R. Peck

Inventors

James Holden  
F. V. Russell  
per Hubert E. Peck  
atty



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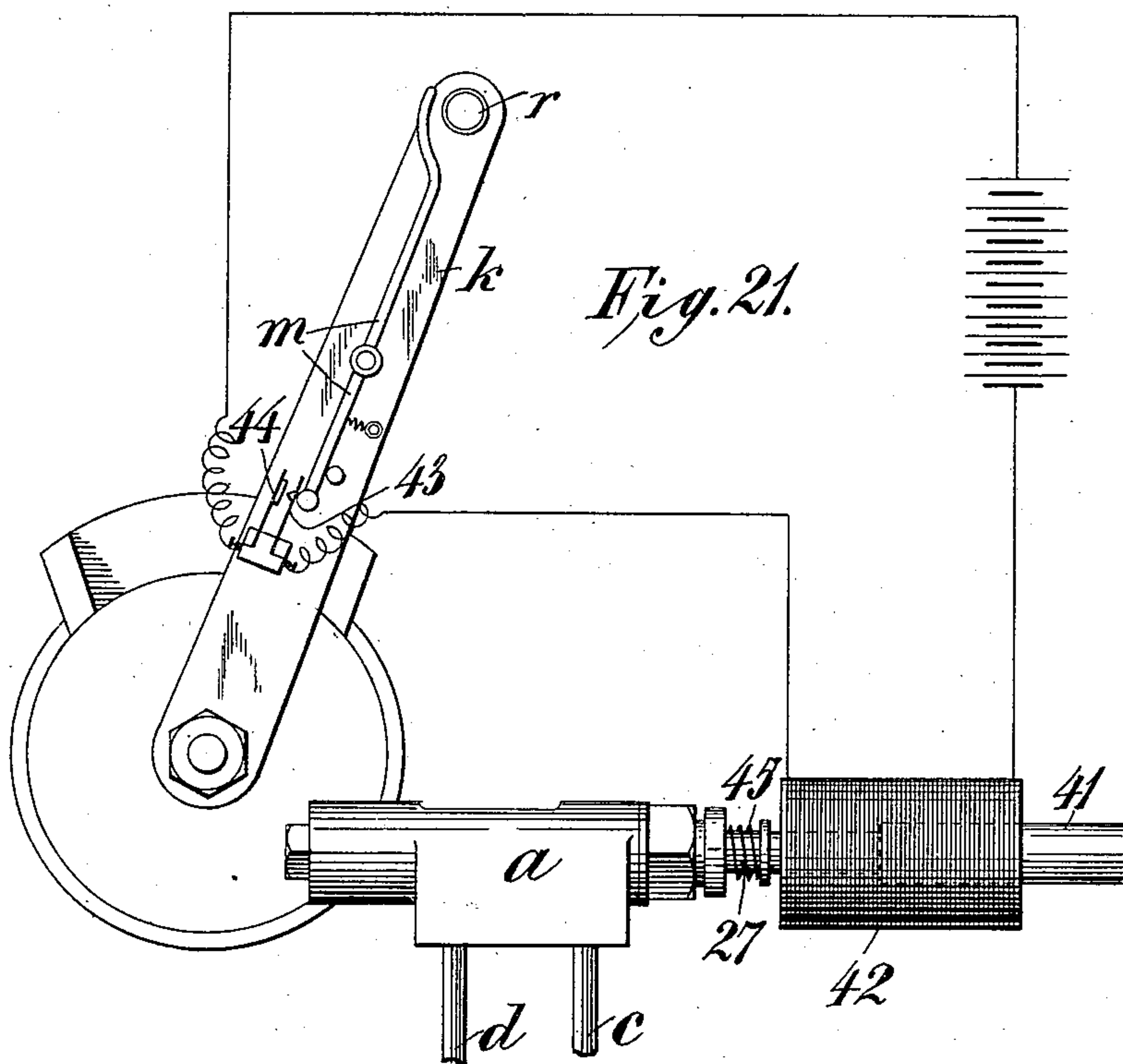
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9 SHEETS—SHEET 9.



Witnesses  
Alice H. Hoffman  
E. R. Peck.

Inventors  
James Holden  
F. V. Russell  
Per Hubert Peck  
att'y

# UNITED STATES PATENT OFFICE.

JAMES HOLDEN, OF WANSTEAD, AND FREDERICK VERNON RUSSELL, OF STRATFORD, ENGLAND.

APPARATUS FOR DISTRIBUTING SAND BENEATH THE DRIVING-WHEELS OF LOCOMOTIVE-ENGINES, &c.

SPECIFICATION forming part of Letters Patent No. 742,654, dated October 27, 1903.

Application filed April 15, 1903. Serial No. 152,795. (No model.)

*To all whom it may concern:*

Be it known that we, JAMES HOLDEN, residing at Wanstead, and FREDERICK VERNON RUSSELL, residing at Stratford, in the county of Essex, England, subjects of the King of Great Britain and Ireland, have invented improvements in or relating to apparatus for distributing sand beneath the driving-wheels of locomotive-engines and other motor-propelled vehicles on railways and tramways, of which the following is a specification.

In order to prevent the slipping of the driving wheel or wheels of a locomotive-engine or other motor-propelled vehicle (hereinafter included in the term "locomotive-engine") on a railway or tramway, it is now common to distribute sand or other equivalent material (herein included in the term "sand") beneath such driving wheel or wheels (hereinafter referred to as "wheels") by the aid of a current of steam or other fluid under pressure controlled by a valve adapted to be operated by a handle that is arranged away from and independent of the regulator or starting-handle (hereinafter referred to as the "starting-handle") used for starting the locomotive-engine. If when starting a locomotive-engine provided with sand-distributing apparatus of the kind referred to the driving-wheels should slip or should be liable to slip, it is usual to return the starting-handle to its closed or inoperative position and to then operate the handle controlling the sand-distributing apparatus so as to cause sand to be distributed onto the rails below the driving-wheels and to then again move the starting-handle into position for starting the locomotive, the sand-distributing apparatus remaining in operation until the locomotive has been properly started, after which the controlling-handle of the sand-distributing apparatus is moved into position to put the said apparatus out of use. With such an arrangement of sand-distributing apparatus it frequently happens that a delay, sometimes amounting to as much as a minute, is caused in starting the engine, which on busy lines often causes very serious inconvenience in the working of the traffic. Furthermore, there is liability of an undue amount of sand being used.

Now this invention has for object to enable the sand-distributing apparatus to be put in and out of operation in an easier and quicker manner than heretofore by the same hand, if need be, that operates the starting-handle of the locomotive-engine and without necessarily moving the hand from such starting-handle, so as to admit of the engine being started after slipping or at a place where slipping would be liable to occur in a quicker and better manner than heretofore usual and so as to save time and prevent undue waste of sand.

It also has for object to enable the sand to be applied to the rails at the proper side of the driving-wheels to suit the desired direction of travel, whether forward or backward, without any attention from the driver and also to admit of the amount of sand delivered to the rail or rails being easily regulated, so that the desired amount of sand will be delivered to the part or parts of the rail or rails as required.

For these purposes the invention consists in arranging the valve for controlling the passage of fluid under pressure to the sand-distributing apparatus proper in such a way that it can be operated from the starting-handle used for starting the locomotive-engine to which the apparatus is applied or from a separate handle carried by or arranged in close proximity to such starting-handle, so that it can be operated by the hand used for operating the starting-handle and without moving the hand from the said starting-handle, the arrangement in each case being such that if upon operating the starting-handle to start the engine it should be found that the driving-wheels are slipping or have a tendency to slip such handle or the second handle in proximity thereto can without releasing the hold on such starting-handle be operated to open the said controlling-valve and bring the sand-distributing apparatus into operation, and upon the slipping or liability to slip of the driving-wheels ceasing such starting-handle or the second handle can be immediately operated or allowed to operate in a direction to close the said controlling-valve and put the sand-distributing apparatus out of use, these operations being capa-



ble of being performed almost instinctively, according to requirement, and without any loss of time.

The invention also consists in reversing means whereby the sand can be distributed beneath the driving-wheels either at the front or the rear side of the same, according to the direction of motion of the engine, in means for regulating the quantity of sand discharged at each distributing-point, and in means for supplying fluid under pressure to the sand-distributing apparatus.

The invention further consists in various novel features of construction and in combinations and arrangements of parts, all as hereinafter more fully described, and pointed out in the claims.

In the accompanying illustrative drawings, Figure 1 shows in side elevation a ten-wheeled coupled locomotive-engine having sand-distributing apparatus according to this invention applied thereto. Figs. 2 and 3 are views at right angles to each other, showing part of the apparatus to a larger scale than Fig. 1. Fig. 4 is a similar view to Fig. 2, showing a modified arrangement. Fig. 5 is a front elevation, and Fig. 6 a plan, showing another modified arrangement. Figs. 7 and 8 are similar views to Figs. 5 and 6, respectively, showing a further modified arrangement. Fig. 9 is a vertical section on the line A A of Fig. 10. Fig. 10 is a horizontal section on the line B B of Fig. 9; and Fig. 11 is a cross-section on the line C C of Fig. 9, showing to a larger scale than Figs. 1 and 2 one construction of fluid-controlling valve suitable for use in carrying out the invention. Fig. 12 is a section of the valve proper on the line D D of Fig. 9. Fig. 13 is a vertical section on the line E E of Fig. 15. Fig. 14 is a part front elevation and a part section on the line F F of Fig. 13; and Fig. 15 a horizontal section on the line G G of Fig. 13, showing one construction of distributing-valve suitable for use in carrying out the invention. Fig. 16 is a face view of the distributing-valve proper detached from its casing. Fig. 17 is a vertical section on the line H H of Fig. 18, and Fig. 18 is a plan showing to a larger scale than Fig. 1 a junction-box with regulating means according to this invention. Fig. 19 is a similar view to Fig. 18, showing a modification. Fig. 20 is an end view, partly in vertical section, showing to a larger scale than Fig. 1 an arrangement of compressed-air reservoirs suitable for use in connection with the improved sand-distributing apparatus shown in Fig. 1. Fig. 21 shows diagrammatically a modified arrangement for operating the controlling-valve.

The controlling-valve for the said distributing apparatus shown comprises a valve-case *a* and a valve proper, *b*, the valve-case being connected to two adjacent vertical pipes *c* and *d*, through which fluid under pressure (hereinafter referred to as "compressed air") is supplied from a reservoir *e* to sand-dis-

tributing devices *f* and *g*, which may be of any known or suitable kind adapted to allow of the discharge of sand from sand-boxes *h* under the action of a current of fluid under pressure. The controlling-valve *a b* is arranged in proximity to the starting-handle *k* of the locomotive-engine *l* and is connected to a handle *m*. This handle *m* may, as shown in Figs. 1 and 2, conveniently be in the form of a lever pivoted on the starting-handle *k* at *n* and be connected at its upper end by a pin-and-slot connection *o* to a lever-arm *p*, fast on a sleeve *q*, mounted to turn on the projecting pin *r* of the starting-lever *k*. The lower end of the lever *m* is jointed to a link *s*, connected to the controlling-valve *b*. The joint *t* between the said lever *m* and link *s* is preferably arranged, as shown, at or near the axis about which the starting-lever *k* turns, so that the starting-lever can be operated without necessarily causing the second lever *m* to actuate the controlling-valve *b*, the latter valve being only operated by relative movement between the said starting-handle *k* and second lever *m*.

In the modified arrangement shown in Fig. 4 the upper end of the lever *m* is disconnected from the handle, but terminates in proximity thereto and is so bent that it can be readily operated by the same hand as that used to clutch the handle *m* for operating the starting-lever *k*. In other respects the arrangement is similar to that shown in Figs. 1, 2, and 3.

In the modified arrangement shown in Figs. 5 and 6 the starting-lever *k* is pivoted at *u* in a bearing *v*, fixed to the outer end of an endwise-movable regulator-valve rod *w*, and is fulcrumed at 1 to one end of a radius-link 2, the other end of which is jointed at 3 to an arm 4, projecting from a ring 5, mounted to turn upon a stuffing-box 6, through which the regulator-rod *w* can move endwise and in which it can also rotate. To the arm 4 is jointed a link 7, that is suitably connected to the controlling-valve *b*. The arrangement is such that the regulator-valve can be operated by moving the rod *w* in or out by turning the starting-lever *k* about its fulcrum at 1, and the starting-lever, with attached parts 2, 4, and 5, can be simultaneously turned about the axis of the rod *w* to operate the controlling-valve through the link 7.

The further modified arrangement shown in Figs. 7 and 8 is similar to that shown in Figs. 5 and 6 except that the starting-lever *k* is slotted at 9 to surround the regulator-rod *w* and has rounded parts 10, arranged between bearing-surfaces 11, on the regulator-rod *w*, so that it can be turned about the axis of the said rod for actuating the controlling-valve *b* without at the same time turning the regulator-rod *w*, which is consequently only subjected to an endwise movement by the action of the starting-lever.

To allow of sand being distributed beneath the driving-wheels 12 of the engine *l* at either



the front or rear side of the same, according to the desired direction of motion, the compressed-air-supply pipe *d* is connected through a reversing-valve 13 (hereinafter called for distinction the "distributing-valve") to delivery-pipes, usually two in number, one of which—viz., 14—is connected through a junction-box 15 and distributing-pipes 16 to the sand-distributing devices *f*, arranged to deliver sand, say, to the front sides of the driving-wheels or some of them at the two sides of a locomotive, and the other of which—viz., 17—is connected through a junction-box 18 and distributing-pipes 19 to the sand-distributing devices *g*, arranged to deliver sand, say, to the rear sides of the driving-wheels or some of them at the two sides of the locomotive. The distributing-valve 13 is connected to some convenient part of the reversing-valve gear of the engine—say, for example, through a link 20 to an arm 21 on the locomotive-reversing shaft 22—the arrangement being such that when the valve-gear is set for running forward the distributing-valve 13 will be moved into a position to permit compressed air to pass from the supply-pipe *d* to the pipe 14, junction-box 15, and distributing-pipes 16 to the devices *f* for distributing sand to the front sides of the driving-wheels 12, and when the valve-gear is set for running backward the said distributing-valve 13 will be automatically moved into a position to permit compressed air to pass from the supply-pipe *d* to the delivery-pipe 17, junction-box 18, and distributing-pipes 19 to the devices *g* for distributing sand to the rear sides of the driving-wheels. In the case of vehicles having a different number of driving-wheels to that shown the distributing-valve 13 can be so connected to the valve-controlling gear that sand will be distributed only to the wheel or wheels that is or are actually in use to propel the vehicle.

For regulating the quantity of sand discharged at each distributing-point the branches of the junction-box 15 or each junction-box 15 and 18 or the compressed-fluid-distributing pipes 16 and 19 extending therefrom are provided with regulating devices—such, for example, as endwise-adjustable screws 23, Figs. 17 and 18—that can be caused to project more or less into the said branches or the pipes extending therefrom or cocks 24, Fig. 19, whereby the amount of fluid under pressure passing to each sand-distributing device can be adjusted to suit requirements.

As will be obvious sand-distributing apparatus to operate in the manner described can be constructed in various forms and be used in connection with locomotive-engines of various kinds, including those designed to run on a single rail and whether operated by steam, electricity, or other power; also, that some of the improvements can be used without the others and in connection with known arrangements of sand-distributing apparatus.

In the example the controlling-valve comprises, as shown more clearly in Figs. 9 to 12,

inclusive, a valve *a*, connected to and carried by the two adjacent vertical portions *c* 70 and *d* of the compressed-air-supply pipe, and the controlling-valve proper, *b*, which is a hollow slide-valve open at its ends and formed with two or more exit-ports 25 in its lower side, works, in connection with two or more ports 26, in the valve-face leading to the forward portion *d* of the supply-pipe, the arrangement being such, as shown, that the valve can be fully opened or closed by a small movement. The valve is held within a valve-rod 27, formed with a cavity 28, by which the interiors of the valve *b* and valve-case *a* are placed in connection with the rear portion *c* of the supply-pipe. The front end *c'* of the interior of the valve-case *a* is connected 85 through a by-pass passage 29 with the rear portion *c* of the compressed-air-supply pipe, so that the inner end of the valve-rod 27 will be constantly subjected to a pressure greater than that of the external atmosphere and which tends to automatically close the controlling-valve *b*, and will do so when the valve is released. The outer end of the valve-rod 27 is connected through the link *s*, Fig. 2, to the controlling-lever *m*, as hereinbefore described. As will be obvious other means may be provided to cause the controlling-valve to close automatically immediately it is released. The arrangement may, however, be such that the controlling-valve must be positively operated by hand both to open and to close it. 100

The distributing-valve 13 in the example Fig. 1 comprises, as shown more clearly in Figs. 13 to 16, inclusive, a casing 30, that is connected at one side to the supply-pipe *d* 105 and is provided with two sets of ports 31 and 32, leading to the two separate delivery-pipes 14 and 17, extending from its periphery, the valve proper being a rotary disk valve 33, that is formed with three ports 35 and is forced against the valve-face 36 by the compressed air supplied to the valve-case by the supply-pipe *d*. The several ports are so formed and arranged, as shown, that when the ports 35 in the disk 33 are in the central positions 115 shown in Fig. 16 the ports 31 and 32 will be both closed, and by turning the valve in one direction to a small extent one or other set of ports 31 or 32 can be opened to admit compressed air to the delivery-pipe 14 or 17. The said valve 33 is fixed to a spindle 34, the outer end of which has fixed to it an arm 35, Fig. 1, that is connected, through the link 20, as hereinbefore described, to a suitable part of the reversing-gear of the engine. In the example each delivery-pipe 14 and 17 is connected 125 to a junction-box 15 or 18, having five branches, (see Figs. 17 and 18,) one of which—viz., 36—may be axial and is connected to the delivery-pipe 14 or 17 and the other four of which—viz., 37—may, as shown, be radial and are connected to the distributing-pipes 16 and or 19, that extend to four sand-distributing devices *f* or *g*. One set of four sand-distributing 130



uting devices *f* are arranged to deliver sand to the forward sides of the leading and center driving-wheels and the other set of four distributing devices *g* are arranged to deliver sand to the rear sides of the trailing and center driving-wheels.

The fluid under pressure supplied to each sand-distributing device *f* or *g* may, as heretofore, be steam, but, as hereinbefore stated, is preferably compressed air obtained from a compressed-air reservoir *e*, Figs. 1 and 20, on the locomotive-engine *l*. In the latter case the compressed-air reservoir *e* may be one from which compressed air is taken for working the brake apparatus of a train. In this case to prevent the brake being accidentally applied by reduction of pressure in the reservoir due to use of air therefrom in the sand-distributing apparatus two such compressed-air reservoirs may advantageously be used, one of which—viz., *e*—is connected to an air-compressor and to the compressed-air-supply pipe *c* of the sand-distributing apparatus and the other—viz., *e'*—to the brake train-pipe 38, and both of which are connected together by a pipe 39, provided with an automatic non-return valve 40, opening toward the reservoir *e'*. With this arrangement reduction of pressure in the reservoir *e* by reason of some of the air being supplied to the sand-distributing apparatus will not affect the pressure in the second reservoir, *e'*, and the latter reservoir will be able to receive compressed air from the first one when the pressure of the air in the second falls below that in the first, so that practically the whole contents of the two reservoirs is available for operating the brakes.

In some cases the valve for controlling the passage of air from the part *c* to the part *d* of the air-supply pipe may be operated by an electromagnetic device the circuit of which is controlled by the starting-handle or by a contact closing and opening device carried thereby or arranged in proximity thereto. Fig. 21 shows diagrammatically an arrangement of this kind wherein the outer end portion 41 of the valve-rod 27 of the controlling-valve is of iron and arranged to form the movable core of a solenoid 42, the circuit of which is adapted to be closed through movable and fixed contacts 43 and 44, respectively, that are arranged to be pressed together by the operation of the controlling-lever *m*. When the solenoid 42 is energized, the core 41 is drawn in and the controlling-valve opened against the action of a spring 45, that serves to close the valve when the circuit is opened by releasing the controlling-lever *m*.

What we claim is—

1. In sand-distributing apparatus for a locomotive or other motor-propelled vehicle, the combination with controlling means for putting the sand-distributing apparatus into and out of use and the starting-handle of the locomotive or other vehicle, of means for op-

erating said controlling means, said operating means being operable from said starting-handle.

2. In sand-distributing apparatus for a locomotive or other motor-propelled vehicle, the combination with controlling means for putting the sand-distributing apparatus into and out of use and the starting-handle of the locomotive or other vehicle, of means for operating said controlling means, said operating means being connected to said starting-handle.

3. In sand-distributing apparatus for a locomotive or other motor-propelled vehicle, the combination with a valve for controlling the operation of said sand-distributing apparatus and the starting-handle of the locomotive or other vehicle, of valve-operating mechanism connected to said starting-handle and valve.

4. In sand-distributing apparatus for a locomotive or other motor-propelled vehicle, the combination with a valve for controlling the operation of said sand-distributing apparatus, and a starting-handle for said locomotive or other vehicle, of means carried by said starting-handle for controlling the action of said controlling-valve.

5. In sand-distributing apparatus for a locomotive or other motor-propelled vehicle, the combination with a valve for controlling the working of said sand-distributing apparatus, of a starting-handle for said locomotive or other vehicle, said handle being adapted to also operate said controlling-valve.

6. In sand-distributing apparatus for a locomotive or other motor-propelled vehicle, the combination with the sand-distributing devices, of a valve adapted to control the supply of fluid under pressure to said devices and having a constant tendency to remain in its-closed position or to move into its closed position, a starting-handle for the locomotive or other vehicle, and means adapted to open said valve and capable of being actuated by the hand of an operator while applied to said starting-handle.

7. In sand-distributing apparatus for a locomotive or other motor-propelled vehicle, the combination with a valve for controlling the operation of said sand-distributing apparatus, of a starting-handle capable of two movements one for regulating the motion of said vehicle and the other for controlling the action of said valve.

8. In sand-distributing apparatus for a locomotive or other motor-propelled vehicle, the combination with a valve for controlling the action of said sand-distributing apparatus, of a starting-handle for said vehicle, a valve-rod adapted to be moved endwise by said starting-handle, said starting-handle being adapted to turn about the axis of said valve-rod, a rotary body mounted to turn about said valve-rod, a link jointed at one end to said rotary body and to the other end of which said starting-handle is fulcrumed, and con-



necting means between said controlling-valve and rotary body and adapted to be operated by turning movement of the latter body.

9. In sand-distributing apparatus for a locomotive or other motor-propelled vehicle, the combination with separate sand-distributing devices for respectively delivering sand to the front and rear sides of one or more driving-wheels of the vehicle, and fluid-pressure-delivery pipes connected to said sand-distributing devices, of a main fluid-pressure-supply pipe and a distributing-valve whereby said supply-pipe can be placed in communication with any one of the said delivery-pipes at will.

10. In sand-distributing apparatus for a locomotive or other motor-propelled vehicle, the combination with separate sand-distributing devices for delivering sand to the front and rear sides of one or more driving-wheels of the vehicle, fluid-pressure-delivery pipes connected to said sand-distributing devices, and the reversing-gear of said vehicle, of a main fluid-pressure-supply pipe, a distributing-valve whereby said supply-pipe can be placed in communication with any one of said delivery-pipes, and means for automatically reversing the position of said distributing-valve when the position of said reversing-gear is reversed.

11. In sand-distributing apparatus for a locomotive or other motor-propelled vehicle, the combination with separate sand-distributing devices for delivering sand to the front and rear sides of one or more of the driving-wheels of said vehicle, fluid-pressure-delivery pipes connected to said sand-distributing devices, and the reversing-shaft of said vehicle, of a main fluid-pressure-supply pipe, a rotary distributing-valve adapted to place said supply-pipe in communication with one or other of said delivery-pipes, and lever-and-link mechanism between said reversing-shaft and distributing-valve, substantially as described.

12. Sand-distributing apparatus for a locomotive or other vehicle comprising a main fluid-pressure-supply pipe, a valve for controlling the passage of fluid therethrough, a reservoir of compressed fluid carried by said vehicle and connected to one portion of said pipe, a distributing-valve connected to the delivery end of said pipe, delivery-pipes connected to said distributing-valve and adapted to be placed thereby alternately in communication with said supply-pipe, junction-boxes connected to said delivery-pipes, separate sand-distributing devices arranged to discharge sand below the front and rear sides of the driving-wheels of said vehicle, fluid-pressure-distributing pipes between said junction-boxes and said distributing devices, and means connecting the movable part of said distributing-valve to the reversing-gear of said locomotive or other vehicle.

13. In sand-distributing apparatus for a locomotive or other motor-propelled vehicle,

the combination of a number of said distributing devices, a fluid-pressure-distributing pipe, a junction-box connected to said pipe, a number of independent fluid-pressure-distributing pipes or conduits connecting said junction-box to said sand-distributing devices, and means for controlling the amount of fluid under pressure passing through each distributing pipe or conduit.

14. In sand-distributing apparatus for a locomotive or other motor-propelled vehicle, the combination of a number of said distributing devices, a fluid-pressure-distributing pipe, a junction-box connected to said pipe, a number of independent fluid-pressure-distributing pipes or conduits connecting said junction-box to said sand-distributing devices, and means for varying the cross-sectional area of each of said distributing pipes or conduits.

15. In sand-distributing apparatus for a locomotive or other motor-propelled vehicle, the combination with a pipe for supplying compressed air to said apparatus, of two compressed-air reservoirs arranged on said vehicle and one of which is connected to said compressed-air-supply pipe and is adapted to be connected to an air-compressor, and the other of which is connected to an air-brake train-pipe, said reservoirs being connected by a pipe provided with a non-return valve opening toward the second reservoir.

16. In sand-distributing apparatus for a locomotive or other motor-propelled vehicle, the combination with sand-distributing devices and a pipe for supplying fluid under pressure thereto, of a controlling-valve comprising a case connected to adjacent portions of said pipe and having a by-pass connecting its ends, and a hollow slide-valve adapted to open and close communication between said adjacent portions of the pipe, a valve-rod the inner end of which engages said slide-valve, and valve-operating mechanism connected to the outer end of said valve-rod, substantially as described.

17. In sand-distributing apparatus for a locomotive or other motor-propelled vehicle, the combination with separate sand-distributing devices, delivery-pipes connected thereto and a fluid-pressure-supply pipe, of a distributing-valve for placing said supply-pipe in communication with any one of said delivery-pipes, the said distributing-valve comprising a stationary casing formed with separate sets of ports connected with the respective delivery-pipes and a rotary disk valve formed with ports adapted to control the ports in said casing.

Signed at 75 and 77 Cornhill, London, England, this 25th day of March, 1903.

JAMES HOLDEN.

FREDERICK VERNON RUSSELL.

Witnesses:

PERCY E. MATTOCKS,

WM. O. BROWN.