

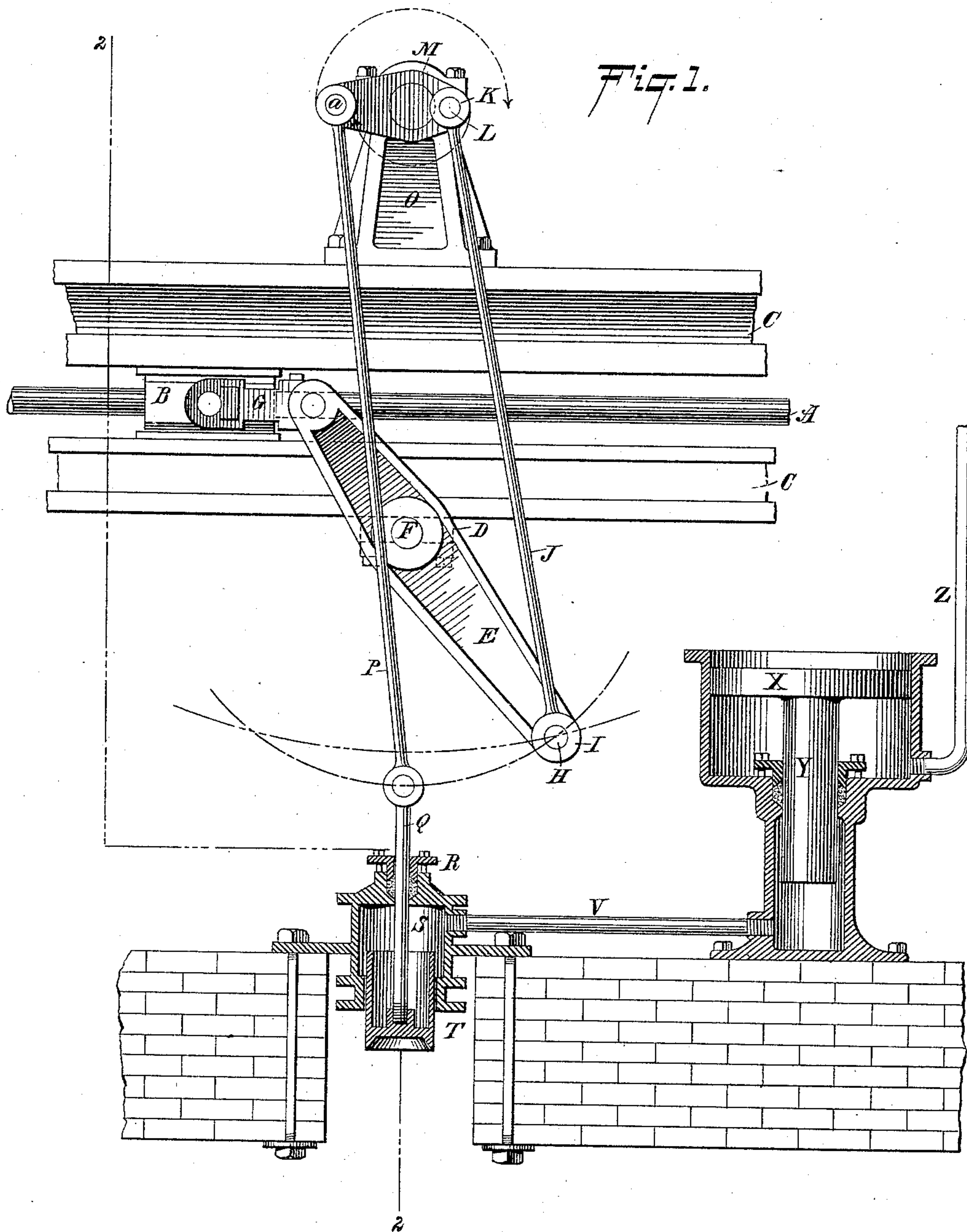
(No Model.)

2 Sheets—Sheet 1.

J. A. GROSHON.
DIRECT ACTING STEAM ENGINE.

No. 444,828.

Patented Jan. 20, 1891.



WITNESSES:

William Goebel.
Cyrus Dietrich.

INVENTOR

INVENTOR
John A. Groshaw,
BY
Chas. C. Gill
ATTORNEY.

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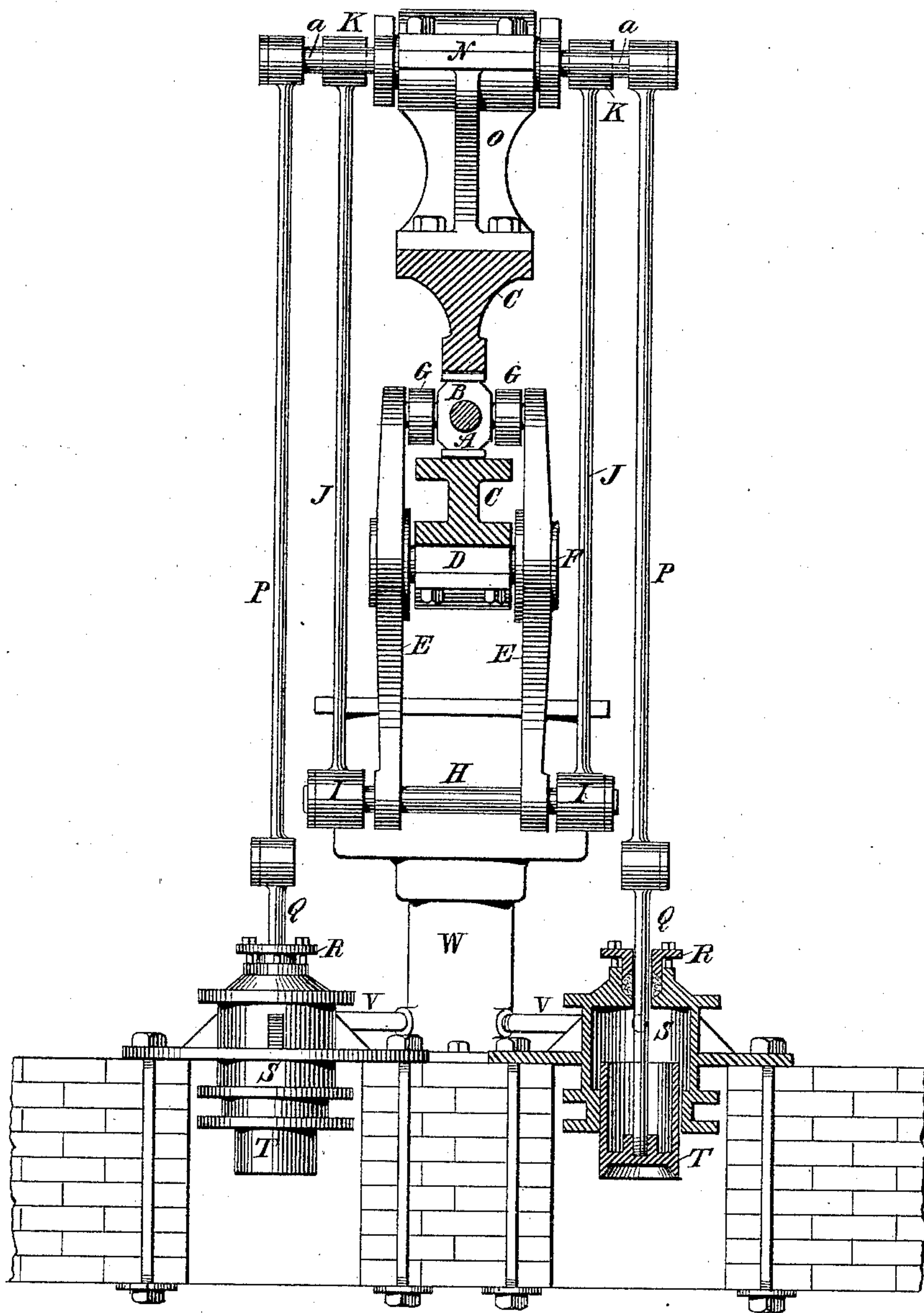
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Fig. 2.



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UNITED STATES PATENT OFFICE.

JOHN A. GROSHON, OF NEW YORK, N. Y.

DIRECT-ACTING STEAM-ENGINE.

SPECIFICATION forming part of Letters Patent No. 444,828, dated January 20, 1891.

Application filed August 12, 1890. Serial No. 361,779. (No model.)

To all whom it may concern:

Be it known that I, JOHN A. GROSHON, a citizen of the United States, and a resident of New York, in the county of New York and State of New York, have invented certain new and useful Improvements in Direct-Acting Steam-Engines, of which the following is a specification.

The invention relates to improvements in direct-acting steam-engines; and it consists in the combination with the main piston-rod of a series of levers pivoted on different fulcrums and having a simultaneous movement under pressure, one end of one of the levers being connected with the piston-rod and one end of another of the series of connected levers being in connection with an auxiliary piston inclosed within a cylinder in communication with a source of pressure, the whole being arranged as hereinafter more particularly described, whereby during the first portion of the stroke of the main piston-rod the pressure will be created therein in a line opposite to its line of movement, and during the latter portion of said stroke said pressure will be created in the line of the movement of the main piston-rod, the purpose being to oppose the movement of the piston-rod by said pressure during the first portion of its stroke and to assist said movement during the latter portion of its stroke.

The invention consists, further, in the details of construction and arrangement of said series of connected levers with the means of applying pressure thereto.

In the drawings I have illustrated the invention as applied for convenience to a steam pumping-engine of the "Blake" pattern; but it is to be understood that I do not limit the invention to any particular style of direct-acting steam-engine. I have omitted from the drawings the cylinders and pumps of the engine and illustrate simply the main piston-rod with its guiding-frames and represent the application of the invention thereto, the details of the construction of the steam-engine being deemed immaterial for the purposes of the present application, since they are clearly shown in Letters Patent heretofore granted to me, numbered 410,411, and dated September 3, 1889. This patent also

illustrates a series of levers under pressure connected with the main piston-rod for opposing the motion of said rod during the first portion of its stroke and assisting said movement during the latter portion of said stroke.

Referring to the accompanying drawings, Figure 1 is a side elevation, partly in section, of an arrangement of devices embodying my invention and shown applied to the main piston-rod of the engine; and Fig. 2 is a vertical section of same on dotted line 2 2 of Fig. 1.

In the drawings, A designates the main piston-rod of the engine, said rod having secured upon it the block or slide B, adapted to move with said rod between the braces or guides C, which extend from the usual steam-cylinders to the water-cylinders. Upon the lower side of the lower guide C is mounted in a suitable bearing D, the rocking levers E, the pivot F of said levers being preferably above their center, as illustrated in Fig. 1, whereby the upper arms of the said levers are made shorter than the lower arms thereof, as shown. The upper ends of the levers E are connected by links G with the block or slide B, one of said levers being on each side of the lower guide C and one of said links G being at each side of the slide B, as illustrated in Fig. 2. The levers E correspond in construction and outline and have a simultaneous movement on planes parallel with each other. The lower ends of the levers E are connected by the rod H, upon the ends of which are mounted the collars I, formed on the lower ends of the rods J, which extend upward, and are mounted by means of collars K upon the ends of the rods L, which pass through the short arms of the eccentrically-mounted levers M, the latter having a bearing in the journal N, located at the upper end of the support O, which is secured to the upper side of the upper guide C. One of the eccentrically-pivoted levers M is secured at each side of the support O, and each of these levers is connected by the rods J with the rod H, which passes through the lower end of the levers E. The levers M are shorter than the levers E and are mounted on the same vertical plane as said last-mentioned levers. Their arrangement with rela-

tion to the levers E is clearly represented in Fig. 1. The longer arms of the levers M are connected by the rods P with the upper ends of the piston-rods Q, which extend downward through the glands or stuffing-boxes R into the cylinders S and carry upon their lower ends the pistons T, which are adapted to have a reciprocating movement within said cylinders. The rods P have a pivotal connection with the piston-rods Q, in order that the levers and said rods P may have the necessary swing, while the piston-rods Q have a direct reciprocating movement. The cylinders S are suitably mounted in masonry, as illustrated, and are connected at their upper ends by pipes V with the atmospheric accumulator W, having differential pistons X Y, and being in communication, by means of the pipe Z, with a condenser of usual construction. (Not shown.) It will be observed that the mechanism is duplicated on each side of the piston-rod A, and that but one piston-rod is shown, since this clearly illustrates the application of the invention for practical use. The one accumulator W, however, is connected with each of the cylinders S, as more clearly illustrated in Fig. 2.

The levers and their connections being in the position illustrated in Fig. 1, it will be observed that the pressure within the cylinders S will, through the medium of the rods P, levers M, rods J, and levers E, operate to oppose the movement of the piston-rod A during the first portions of its stroke or until the levers E have turned sufficiently to come at right angles to the piston-rod A, after which the pressure within the cylinders S, acting on the pistons T, will, through the system of levers and rods, operate to assist the movement of the said main piston-rod A.

I have indicated by the dotted lines in the drawings the movements of the levers M and levers E, and also the extent of the movement of the piston-rod Q while under pressure to permit the action of the rods J under the force applied to the longer arms of the levers M. It will be understood that during the first portion of the stroke of the main piston-rod the longer arms of the levers E will, through the rods J, cause the levers M to rotate and bring their longer arms, with the rods P, upward in the direction of the arrow or dotted line at the upper portion of Fig. 1, the effect being to draw the pistons T against the pressure within the cylinders S, and thereby to transmit said pressure to the piston-rod A in a line opposite to its movement during the first portion of its stroke, and it will also be noted upon following the movement of said levers and rods that after the levers E have passed their center the pressure within the cylinders S will be transmitted to the main piston-rod A in line with its movement, and thereby assist the same during the latter portion of its stroke.

I do not limit my invention to the duplication of the rods and levers upon each side of

each piston-rod A; but I consider that they may be so arranged with advantage. Neither do I limit myself exclusively to the use of the atmospheric accumulator W, since other means of pressure may be placed in connection with the cylinders S. I, however, regard the atmospheric accumulator T when employed in the combination claimed as of superior advantage and constituting an organization of parts which may be employed with entire satisfaction.

The rocking levers E and auxiliary levers M, being eccentrically mounted on their bearings, enable me to increase the power, and hence to make use of the minimum diameter of cylinder S; but while I recommend that the said levers be eccentrically mounted I do not confine the invention to such arrangement of them. The longer arms of the auxiliary levers M are connected by the rod *a*, which projects outward beyond said levers, so as to receive the up ends of the rods P at points beyond the path of the rods J, and hence during the use of the engine the rods P and J may pass each other without obstruction.

I am aware of German Patent No. 26,098, of August 14, 1883. This patent shows a lever fulcrumed on a fixed pivot at its lower end and connected at its upper end by a link with the piston-rod, and said lever is connected by a link with one end of a rocking lever whose other end is in communication with an auxiliary pressure-cylinder. The arrangement of levers shown in the said German patent does not possess the advantages secured by the system of devices claimed in this application. In the first place the two main levers of the German patent are substantially at right angles to each other, and a large proportion of the force in the auxiliary cylinder is exerted in the line of the length of the one of said levers, which is connected with the main piston-rod and operates to draw against the pivot, on which the lower end of said lever is fulcrumed, instead of being directed against the main piston-rod in line with its length. No such result occurs in the use of the series of levers, which form the subject of this application. The force of my auxiliary cylinder is not expended in pulling the lever E against its sustaining-pivot, but in simply turning it thereon, so as to transmit the power in line with the length of the piston-rod.

By dotted lines in the drawings I illustrate arcs of two circles differing in diameter, one being long and flat and the other of a greater curve. These indicate the lines of travel of the lower end of the rocking lever E and of the rod J. If the lever E and rod J were allowed their natural movement from their points of suspension they would travel on the arcs indicated by dotted lines in the drawings, and hence in operation there must be either a force applied or the overcoming of a force to compensate for the difference between

these two arcs, and this force is that which is transmitted to the piston-rod in line with its length.

In the moving of the lower end of the lever 5 E on its line of travel it is retarded by the rod J, which has a different line of travel, and to overcome this the piston in the auxiliary cylinder is compelled to rise and overcome the force from the accumulator to an extent 10 which would turn the auxiliary lever M sufficiently to permit the lower end of the lever E and lower end of the rod J to travel on the same arc, although hung from different centers, and if left in their natural state would 15 travel on different arcs. This principle of operation is not present in the German patent above referred to.

What I claim as my invention, and desire to secure by Letters Patent, is—

20 1. The rocking lever E, connected at one end by the link G with the main piston-rod of the engine, and the auxiliary lever M, combined with the rod J, connecting the lower end of the lever E with one end of the lever 25 M, and the rod P, passing from the other end of said lever M to a source of pressure to resist the movement of the main piston-rod during the first portion of its stroke and assist said rod during the latter part of its 30 stroke, the elements specified being arranged and operating substantially as set forth.

2. The eccentrically-mounted rocking lever E, connected at one end with the main piston-rod of the engine, and the eccentrically- 35 mounted auxiliary lever M, combined with the rod J, connecting the lower end of said lever E with one end of said lever M, and the rod P, passing from the other end of said lever M to a source of pressure to resist the move- 40 ment of the main piston-rod during the first portion of its stroke and assist said rod during the latter part of its stroke, the elements specified being arranged and operating substantially as set forth.

45 3. The rocking levers E, connected at their upper end by the links G and slide B with the main piston-rod of the engine, and the auxiliary levers M, mounted above said levers

E, combined with the rods J, connecting the lower end of the levers E with one end of the 50 levers M, and the rods P, passing from the other end of said levers M to a source of pressure to resist the movement of the main piston-rod during the first portion of its stroke and assist said rod during the latter portion 55 of its stroke, substantially as set forth.

4. The rocking lever E, connected at one end with the main piston-rod of the engine, and the auxiliary rocking lever M, combined with the rod J, connecting the lower end of 60 the lever E with one end of said lever M, the rod P, extending from the other end of said lever M, the piston connected with said rod P, and the cylinder receiving said piston and being in communication with a source of 65 pressure, the elements specified being arranged and operating substantially as set forth.

5. The rocking lever connected at one end with the piston-rod of the engine and the 70 auxiliary lever connected with the other end of said rocking lever, combined with the rod extending from said auxiliary lever, the piston connected with said rod, the cylinder receiving said piston, and the atmospheric ac- 75 cumulator in connection with said cylinder and containing differential pistons, substantially as set forth.

6. The atmospheric accumulator containing differential pistons and having the pipe 80 leading thereto from the condenser and the cylinder and piston communicating with said accumulator, combined with the system of levers under the pressure of said accumulator for opposing the movement of the piston-rod 85 of the engine during the first portion of its stroke and assisting the same during the latter portion of its stroke, substantially as set forth.

Signed at New York, in the county of New 90 York and State of New York, this 11th day of August, A. D. 1890.

JOHN A. GROSHON.

Witnesses:

CHAS. C. GILL,
ED. D. MILLER.