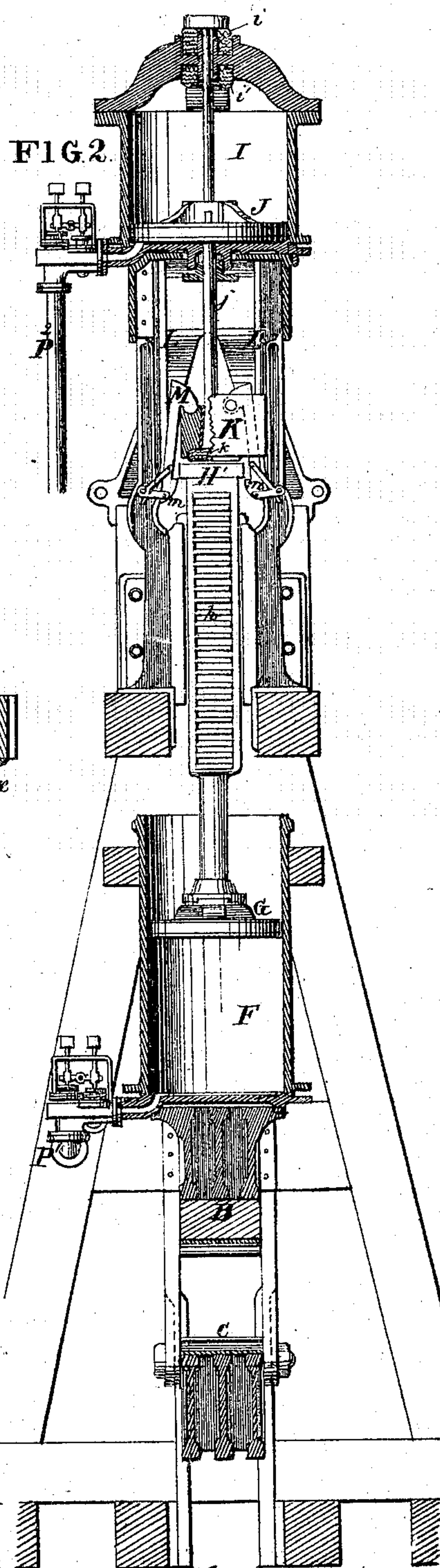
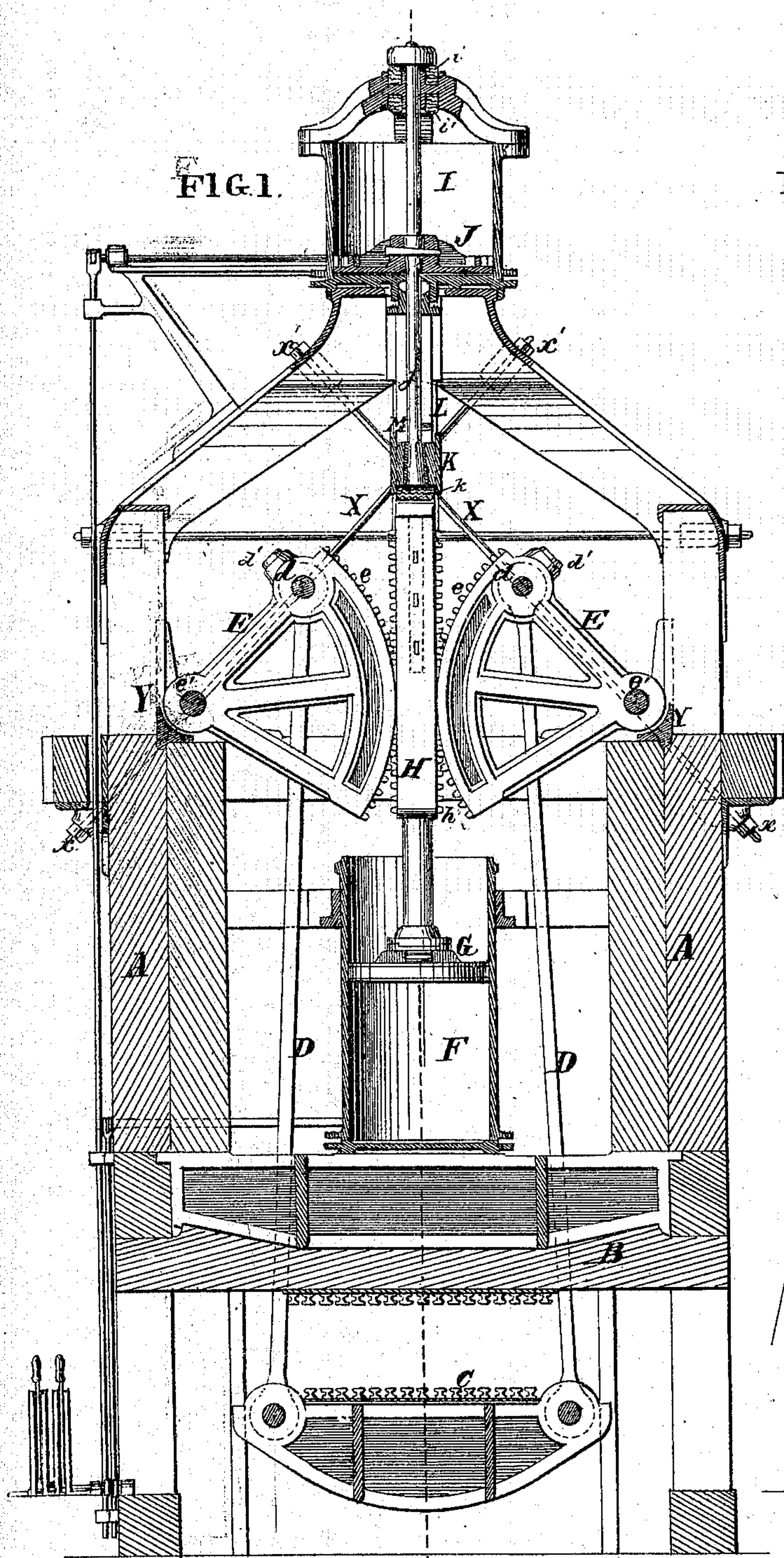


GEORGE W. GRADER.

Improvement in Cotton Presses.

No. 119,346.

Patented Sep. 26, 1871.

ATTEST-*Wm. L. Allen**Walter Allen**Geo. W. Grader*
By Knight & Pomeroy

[88.]

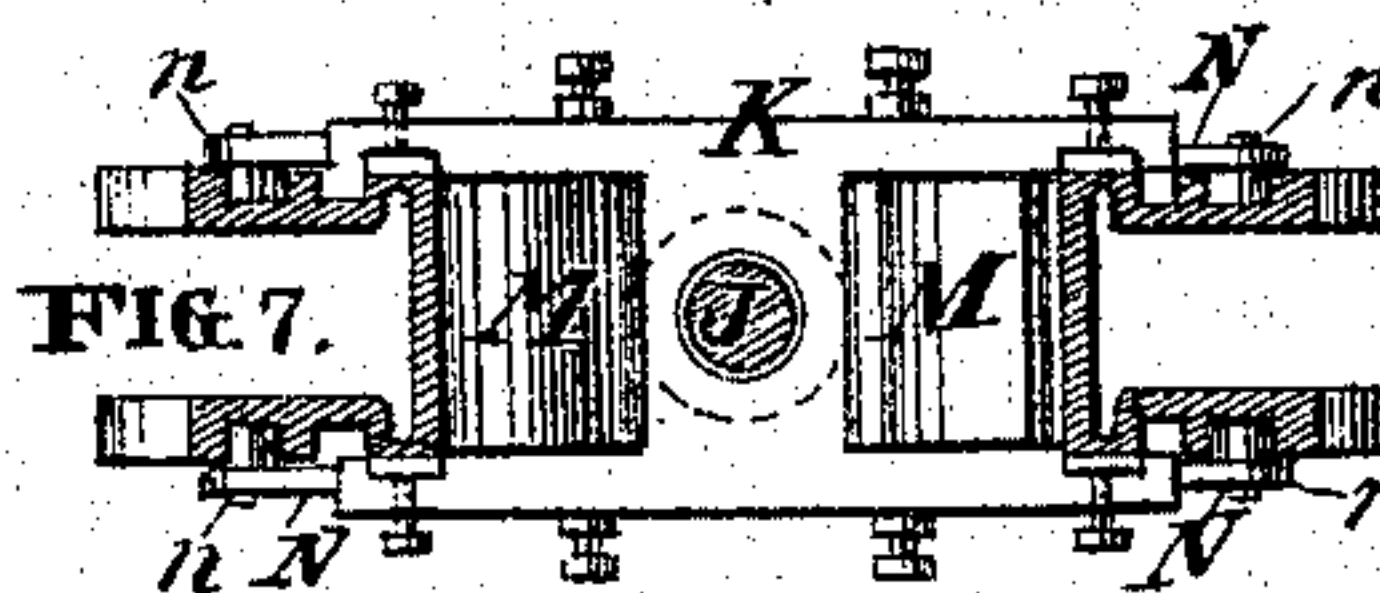
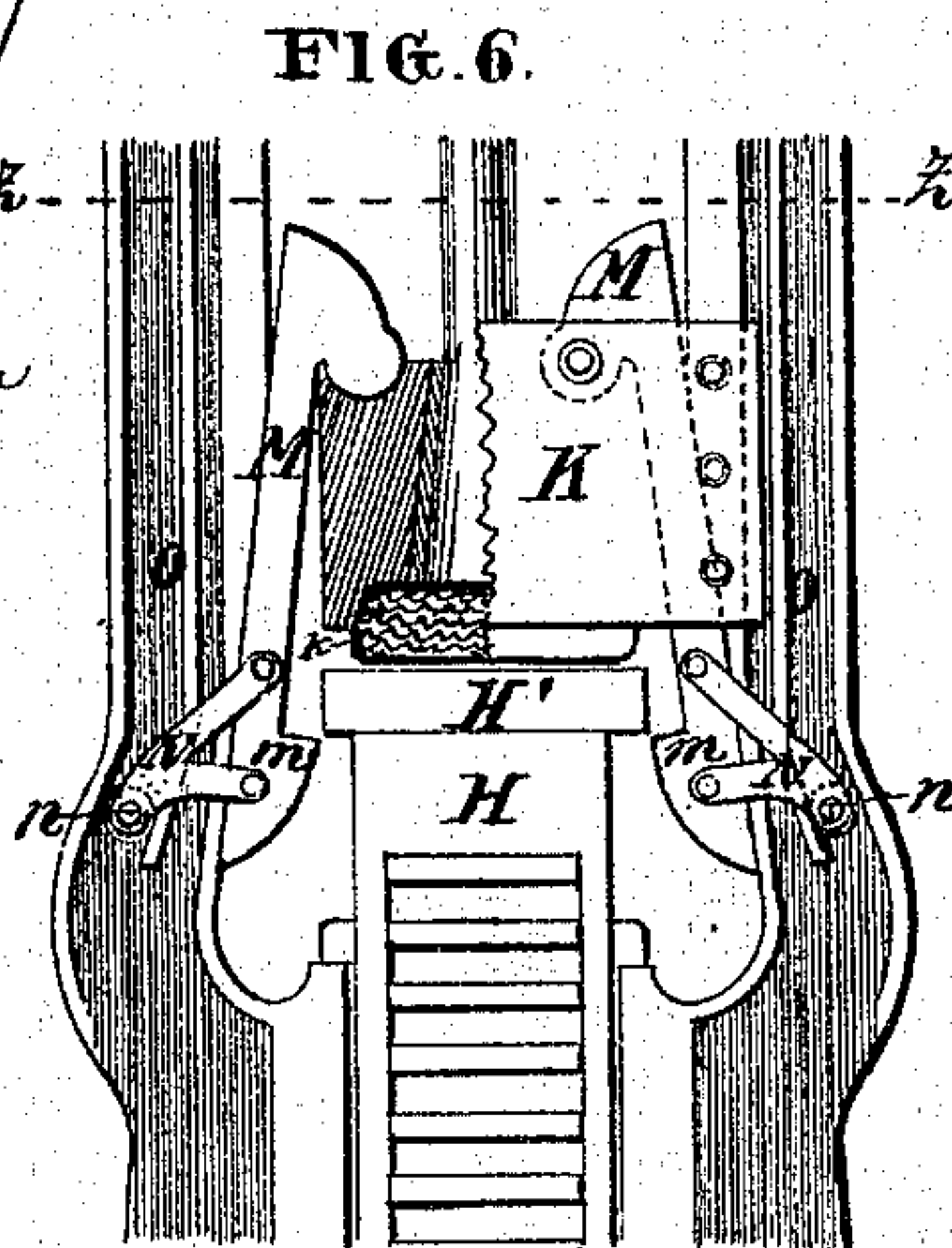
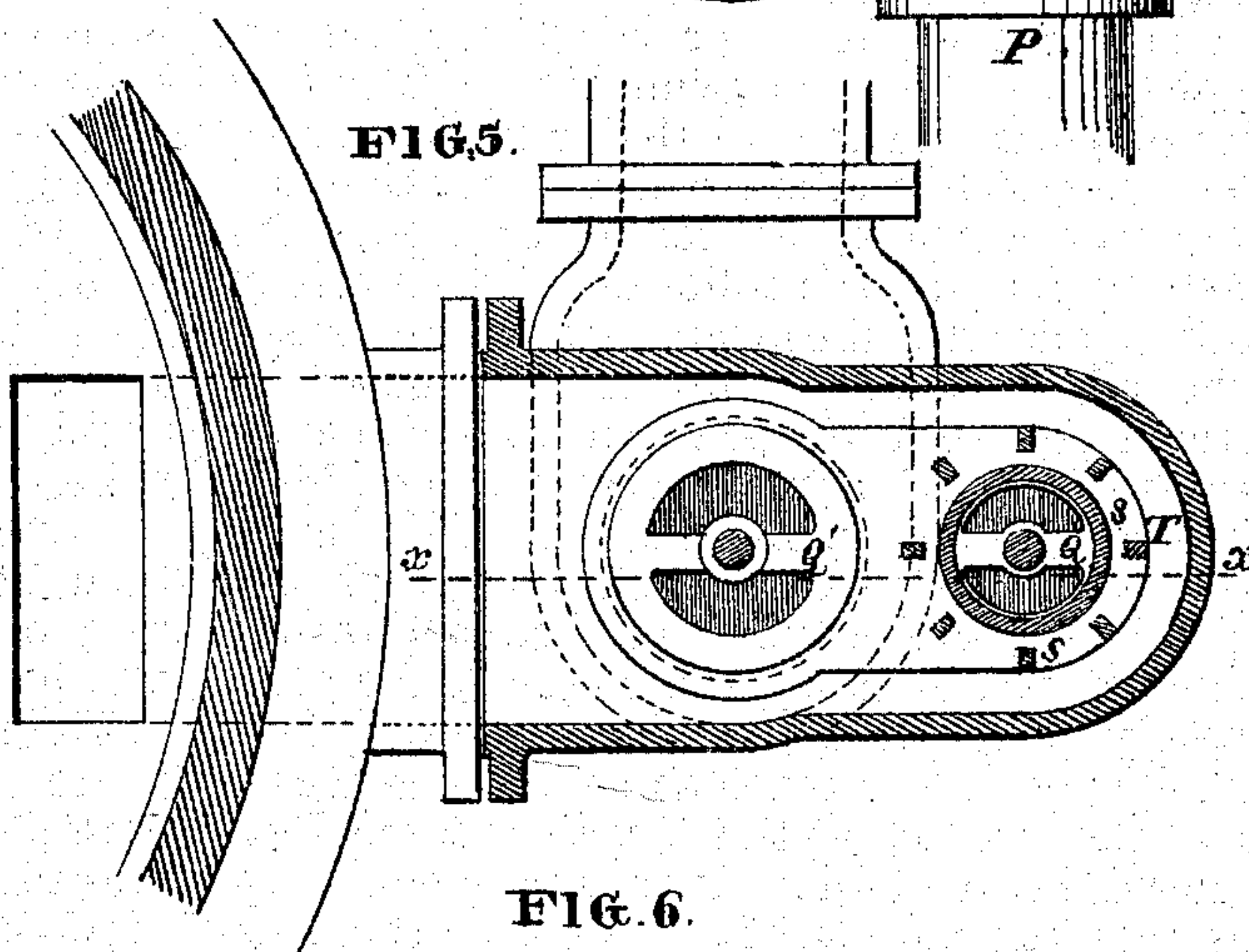
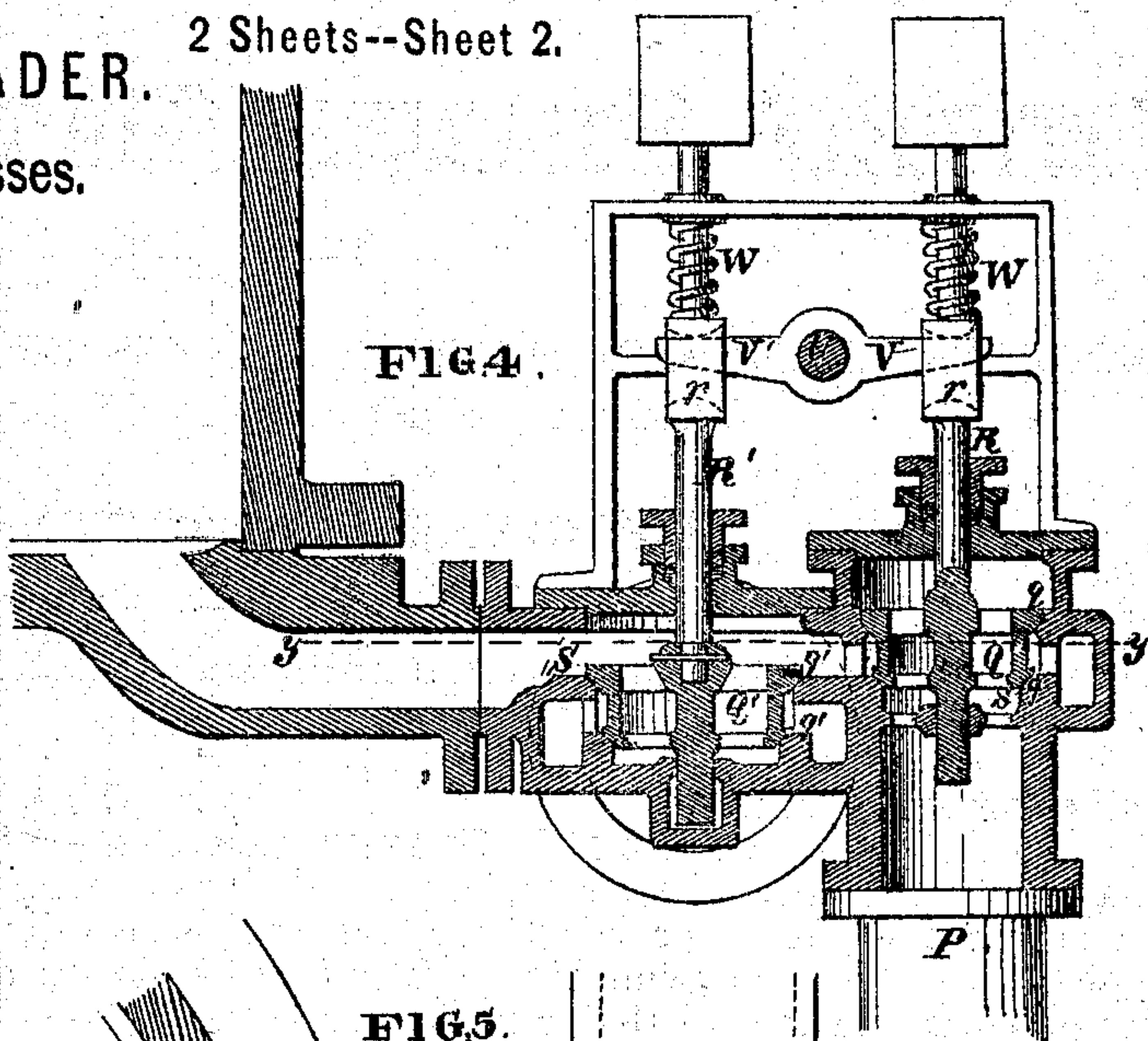
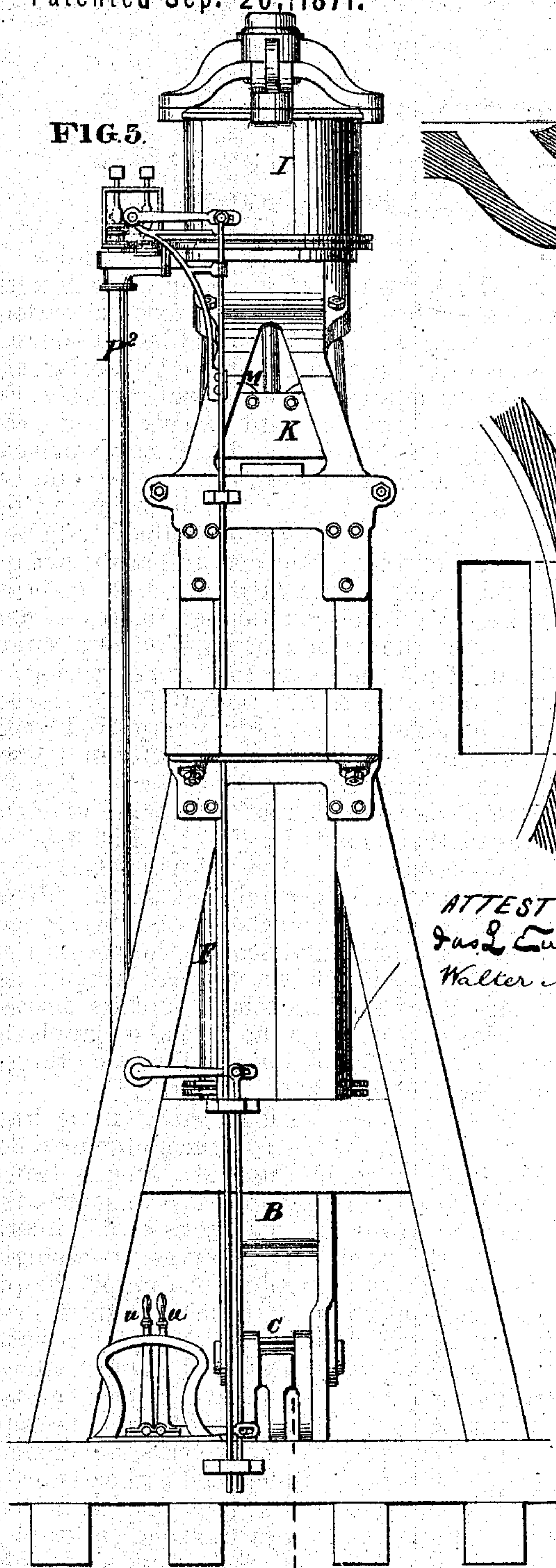
GEORGE W. GRADER.

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ATTEST
Jas. L. Cline
Walter Allen

Geo. W. Grader
By *Wm. H. Knight*

UNITED STATES PATENT OFFICE.

GEORGE W. GRADER, OF MEMPHIS, TENNESSEE, ASSIGNOR TO HIMSELF AND
JAMES H. EDMONDSON, OF SAME PLACE.

IMPROVEMENT IN COTTON-PRESSES.

Specification forming part of Letters Patent No. 119,346, dated September 26, 1871.

To all whom it may concern:

Be it known that I, GEORGE W. GRADER, of Memphis, in the State of Tennessee, have invented a new and useful Improvement in Cotton-Presses, of which the following is a specification:

My invention relates to that class of cotton-presses in which a steam-piston is made to act upon a rack working between cog-segments connected by rods to the follower of the press in such a manner that the leverage will be increased as the follower is drawn up. By this means an enormous force is developed near the termination of the stroke of the press; but with presses heretofore constructed upon this principle a great difficulty has been experienced when, from inequality in the size of the bales to be compressed, or from any other cause, the power of the press is barely sufficient to perform the work, it is found impossible to reach so near the termination of the stroke that this large increase of leverage will be available. It thus frequently happens that the motion of a press is arrested before the piston has performed more than half its stroke; whereas, if it were near the termination of the stroke an equal pressure of steam would be amply sufficient to complete the work by reason of the increased leverage developed through the segments. A further difficulty in the class of presses referred to arises from the fact that, in order to insure a sufficient movement of the segments to avail themselves of their increased leverage near the termination of the stroke, it is usual to employ a cylinder of larger size than is necessary at the beginning of the stroke, or with bales of comparatively small size. My invention consists in combining with the platen or follower and cog-segments of a press of the construction referred to a plurality of engines, so arranged that an engine of comparatively small diameter may be employed to impart the first movement to the follower; and when this engine has reached the limit of its power, or nearly so, a second engine may be brought into action with sufficient force to insure the completion of the stroke to a sufficient extent to render the increased leverage of the segments available. I am thus enabled to use the steam in the most economical manner, employing a large area of piston only when the work to be performed renders it necessary. I prefer to construct the supplemental engine of larger diameter than that

by which the stroke is begun. I am thus enabled to bring into action four gradations of power—first, by using the smaller cylinder alone; second, by introducing steam to the larger cylinder, in addition, and causing it to work expansively therein; third, by cutting off steam in the smaller cylinder, so that it may work expansively therein, in connection with the boiler-steam in the large cylinder; fourth, by using boiler-steam in both. I am thus enabled to apply any amount of power required and at the same time avoid waste by the application of unnecessary force. My invention further relates to devices by which the second or supplemental engine is brought into action at the proper period; also, to a peculiar construction and arrangement of steam-valves adapted to my improved press.

Figure 1 is a front view, partly in section, of a press illustrating my invention. Fig. 2 is a vertical section thereof in a plane at right angles to that shown in Fig. 1. Fig. 3 is a side view thereof. Fig. 4 is a vertical section, on a larger scale, of the combined steam-valves, the line *x x*, Fig. 5, indicating the plane section. Fig. 5 is a horizontal section thereof on the line *y y*, Fig. 4. Fig. 6 is a vertical section, also on a larger scale, of the clutch and its accessories employed to connect the second or supplemental engine. Fig. 7 is a horizontal section thereof on the line *z z*, Fig. 6.

A A represent various parts of the frame of the press; B, the bed; C, the platen or follower; D D, rods by which the said platen is drawn up. The said rods are pivoted at *d* to segments E E, which are provided with cogs *e*, and fulcrumed at *e'* to the frame A. F represents a single-acting steam-cylinder; G, its piston; H, the piston-rod, the upper part of which constitutes a rack, being provided with cogs *h*, gearing with the cogs *e* of the segments E. The parts above described may be constructed and arranged as they commonly are in presses of this description, which have been for many years in common use. I represents the cylinder and J the piston of my supplemental steam-engine, the piston-rod *j* of which projects downward through a stuffing-box in the cylinder-head, and is, at its lower end, connected to a cross-head or slide, K, which works on guide-ways L. M M are gibs, resting at their upper ends in suitable bearings on the cross-head K, and formed at their lower ends with hooks

m, so as to constitute a clutch by which, at the proper moment, the rack *H* is connected to the cross-head *K* and piston-rod *J*, as hereinafter described. The free lower ends of the gibs or clutch-jaws *M M* are controlled by arms *N*, provided at their outer ends with rollers *n*, which work in grooves *O* in the stationary frame, so formed that when the cross-head and clutch are in their lowest position the hooks *m* at the lower ends of the clutch-jaws will be drawn outward from the head *H'* of the rack *H*, but, as they rise, will be pressed inward so as to clutch the said rack and thus connect it with the upper or supplemental engine. The parts of the frame on each side of the cross-head are so formed that, as the said cross-head with its clutch rises from their lowest position, the frame will keep the jaws *M M* in close contact with the head *H'* and prevent the possibility of the latter escaping therefrom. *P*¹ represents the steam-pipe to supply the lower engine *F*, and *P*² the steam-pipe to supply the upper engine *I*. Steam is admitted to either of these pipes by balanced valves of peculiar construction. These valves are represented in Figs. 4 and 5. *Q* may represent the steam-valve; *Q'*, the exhaust-valves attached to the valves *R R*. These valves are of annular or cylindrical form, each constructed with two conical or double working faces, as shown at *q* and *q'*, resting upon separate seats, *S*, between which seats *S* are radial passages, as shown at *s*, Fig. 5, communicating with the ports *T'* in the outer part of the valve-chests. *P* is the main steam-supply pipe. To operate the valves *I* employ a rock-shaft, *U*, operated by a lever, *u*, and carrying arms *V'*, which engage in yokes *r* at the upper ends of the valve-rods *R R'*. *W* are springs employed to press the valve-rods *R* downward when they are released. It will thus appear that if the lever *u* be moved in one direction the steam-valve *Q* will be opened; and if it be moved in the other direction the exhaust-valve *Q'* will be opened, each being closed automatically as soon as the lever is permitted to move in the other direction, and both being inclosed while the lever is in its central or vertical position. It will be understood that separate levers, *u*, each controlling a system of exhaust and steam-valves such as are represented in Figs. 4 and 5, are used for each one of the engines *F* and *I*.

A bale of cotton which is to be compressed being placed upon the follower *C*, the steam-valve of the engine *F* is opened, admitting steam to the cylinder, and thereby elevating the follower through the medium of the rack *H* and segments *E*. At about one-half stroke, more or less, of the lower engine *F* the head *H'* strikes the cross-head *K*, carrying it upward with the clutch *M*, which action causes the jaws *m* to engage beneath the head *H'* and thus couple the rack with the upper piston *J*. If, now, the work to be done be too heavy for the engine *F*, so that it fails to reach a stroke of sufficient length to avail itself of the most advantageous leverage of the segments *E*, steam is admitted through the pipe *P*² to the upper cylinder *I* beneath the piston *J*. If but a slight additional force be required, a small vol-

ume of steam is admitted to the cylinder *I* and allowed to work expansively therein; but if a still greater force be required the boiler-steam may be freely admitted to the cylinder *I*, while the steam in the smaller cylinder *F* is cut off and caused to work expansively. If this still be insufficient to produce the requisite pressure, the full boiler steam is admitted to the cylinder *F* also. It will thus appear that my invention makes available four gradations of power, whereby any necessary force may be exerted in the most economical manner. With small bales the smaller cylinder *F* will often be found sufficient, and also for the retying of "back" bales, or those in which the bands have been broken in transportation after leaving the compress; and in this case I avoid the unnecessary expenditure of steam which would result from using it in a cylinder of large diameter. The utility and economy of my invention will further appear from the fact that a small cylinder is employed to produce the first pressure upon the bale, and a cylinder of large area is not brought into requisition until a considerable portion of the stroke of the press has been made.

In order to provide the necessary strength in the frame press, and especially in its upper part, to enable me to apply any necessary pressure to reduce bales of various weights to an approximately uniform size, I employ braces *X*, bearing at their lower ends in shoes *x* and tied above by nuts *x'*. The line of these braces will be seen to coincide about with the mean line of strain of the segments *E* upon the frame. The pivots of the segments *e'* rest in steps *Y*, which are in the plane of the tie-rods or braces *X*. The valves *Q* and *Q'* will be seen to be balanced as nearly as is desirable, possessing all the advantages of cylindrical valves and combining therewith the advantages of double puppet-valves, as they work with little or no friction and are held upon their seats with a slight steam-pressure, the amount of which pressure will be determined by the relative areas of the exposed upper and lower faces of the valves. A slight elevation of the valve exposes both its seat-ports simultaneously to the passage of steam, the steam passing through the central cavity of the valve. To reach the port of the second seat, which in the illustration shown in Fig. 4 will be the upper one in the steam-valve *Q* and the lower one in the exhaust-valve *Q'*, this improved construction of valve is of special value in connection with steam cotton-presses, and combines in an unusual degree the advantages of affording ample passages with a very slight motion of the valve, the absence of friction, and as complete balancing of the valves as may be desired.

Buffers are provided at the various parts of the machine to avoid jar and concussion. The buffer *k* is placed beneath the cross-head *K* to receive the impact of the head *H'*. The buffers *d' d'* are upon the flanks of the segments, at the points where they come in contact with the frame. The buffers *i i'* are above and below the bridge-piece over the upper cylinder *I*. The duty of the buffer *i* is to prevent the piston *J* from battering up-

on the cylinder-head. The buffer *v'* gives an elastic resistance to the piston J at the upper end of its stroke.

I claim as my invention—

1. The combination of the two engine-cylinders F I with the segment-levers E E and the platen and follower of a press, substantially as and for the purposes set forth.

2. The automatic clutch and cross-head, constructed to operate substantially as herein described, for the purposes set forth.

3. The grooves O, arms N, and rollers *n* in

combination with the jaws M, substantially as described, for guiding and tripping the clutch.

4. The wrought-iron draw-bar and rack H H' *h* in combination with the clutch M M, substantially as set forth.

5. The double annular puppet-valves Q Q' in combination with a press, operating substantially as herein set forth.

GEO. W. GRADER.

Witnesses:

OCTAVIUS KNIGHT,
WM. H. BRERETON, Jr.

(88)