No. 713,903. Patented Nov. 18. 1902.

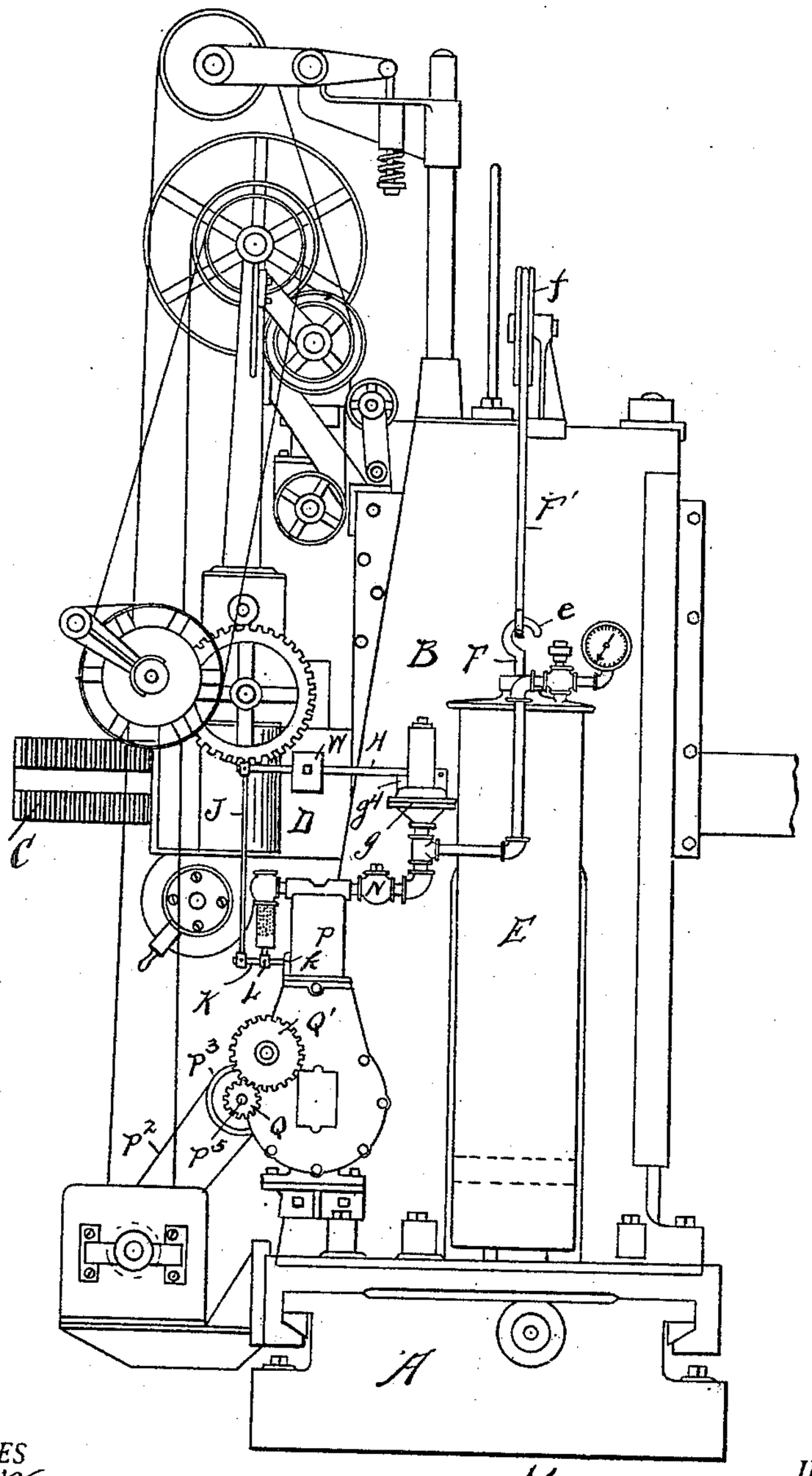
M. & H. E. MORTON.

COUNTERBALANCE FOR TRAVELING HEAD SHAPERS, &c.

(Application filed May 9, 1902.)

(No Model.) 4 Sheets—Sheet 1.

Fig. 1.



WITNESSES
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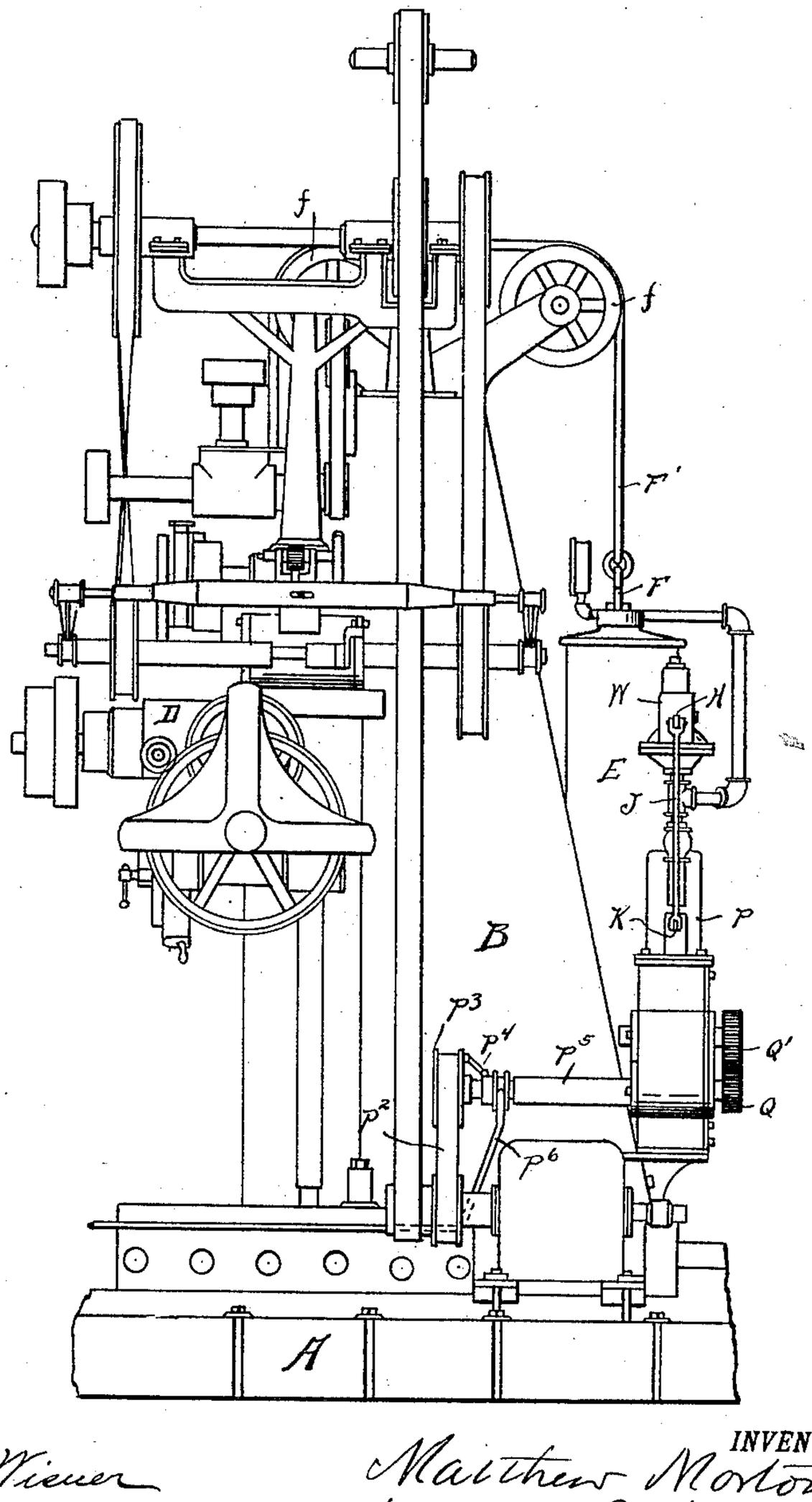
(No Model.) 4 Sheets—Sheet 2.

Fig. 2.



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(No Model.) 4 Sheets—Sheet 3.

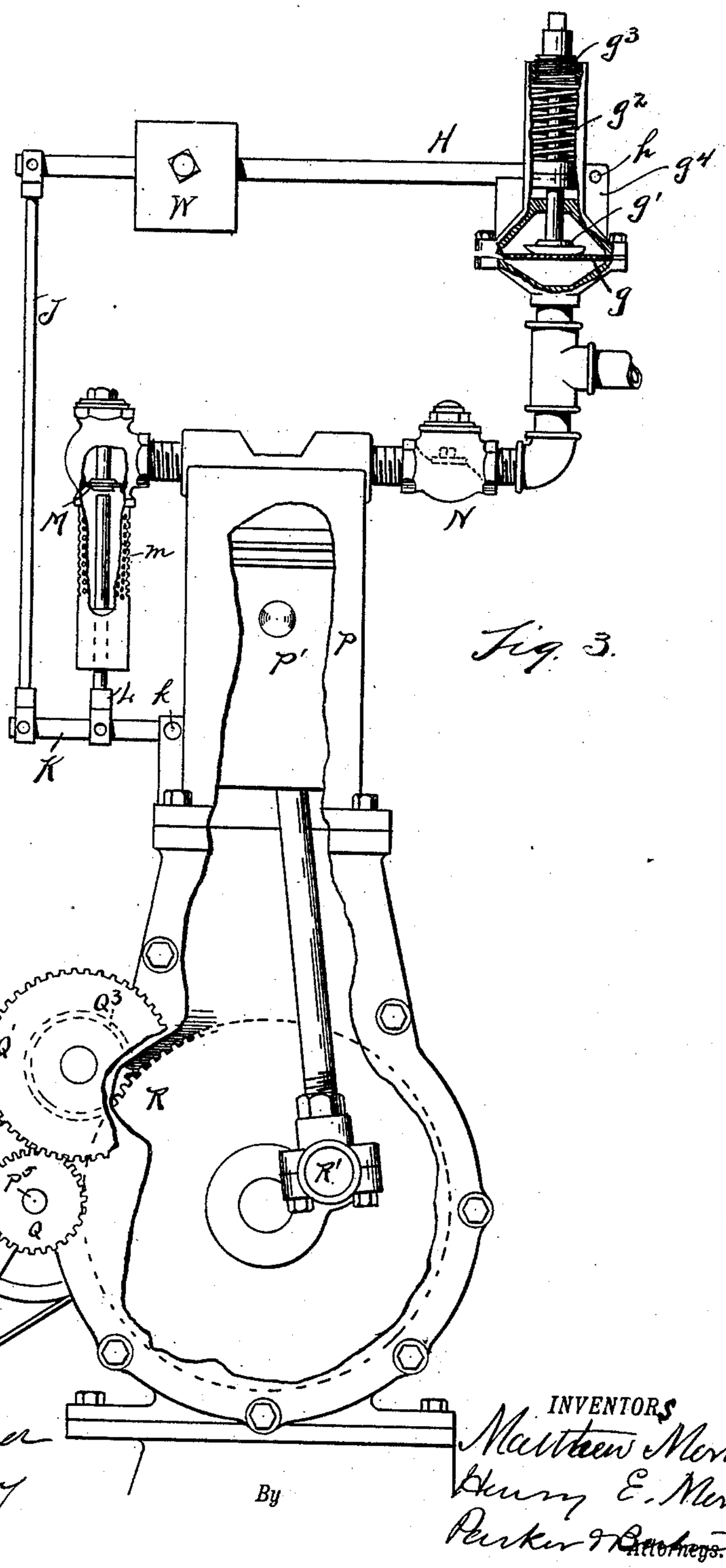

Fig. 3.

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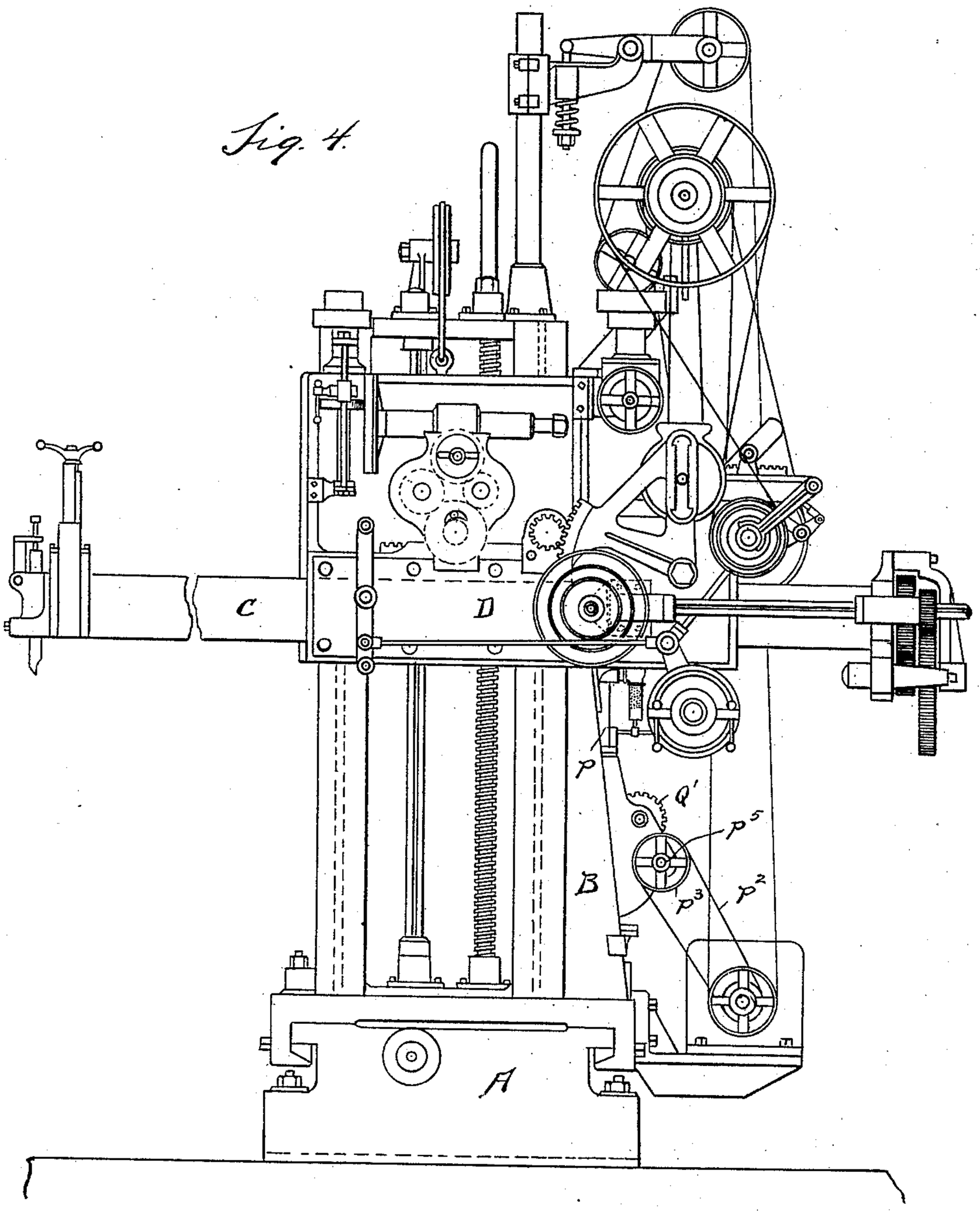
(No Model.) 4 Sheets—Sheet 4.

Fig. 4.



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UNITED STATES PATENT OFFICE.

MATTHEW MORTON AND HENRY E. MORTON, OF MUSKEGON HEIGHTS, MICHIGAN.

COUNTERBALANCE FOR TRAVELING-HEAD SHAPERS, &c.

SPECIFICATION forming part of Letters Patent No. 713,903, dated November 18, 1902.

Application filed May 9, 1902. Serial No. 106,576. (No model.)

To all whom it may concern:

Be it known that we, MATTHEW MORTON and HENRY E. MORTON, citizens of the United States, residing at Muskegon Heights, county of Muskegon, State of Michigan, have invented a certain new and useful Improvement in Traveling-Head Shapers; and we 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 pertains to make and use the same, reference being had to the accompanying drawings, which form a part of this specification.

Our invention relates to traveling-head shapers wherein the machine is adapted to be moved from place to place and lined up with a large piece of work on a suitable shop floor-plate; and it consists in the peculiar mode of counterbalancing without using counterbalancing-weights for the traveling head, as described in the following specification, the drawings, and claimed in the claims.

In the drawings, Figure 1 is a vertical elevation of the left side of the shaper, considering the projecting head to be the front. Fig. 2 is a vertical elevation of the rear of the shaper, showing the general assemblage of the counterbalancing mechanism. Fig. 3 is a detail elevation of the air-pump and connections used for counterbalancing, with some of the parts broken away to show internal construction. Fig. 4 is a vertical elevation of the right side, showing screw elevating mechanism.

Similar letters refer to similar parts.

A is a bed which is heavily ribbed and cross-ribbed and provided with open slots in the usual manner (not shown) and which is fitted and gibbed in the usual manner to a columnal saddle B. Fitted to the column B is an apron D, which carries a ram C and its actuating mechanism. Automatic features and other mechanism necessary to make the ram reciprocate and perform all necessary movements and operations are provided. As all of these form no part of our invention, they are not necessary to be described, especially as they are fully illustrated in previous patents—to wit: No. 472,061, Morton, April 5, 1892, shaper; Morton & Morton, No. 550,004, November 19, 1895, universal shaper.

E is an air-cylinder containing a piston carrying a piston-rod F, which rod passes through the upper cylinder-head and is packed by the usual stuffing-box. The piston-rod terminates in a hook *e*, and a plunger connection F′ is connected with the hook and passes over pulleys *f f* and then descending is attached to the apron D. Manifestly sufficient air-pressure, therefore, above the piston in the cylinder E would serve to counterbalance the weight of the apron and the machinery which it carries, including the ram. The air-pressure taking the place of a counterbalancing-weight, as well as providing means whereby the elevation adjustment of the apron may be made, as by increasing or decreasing the air-pressure in the air-cylinder, the apron may be raised and lowered to any degree desired, thus performing an additional function to that of a counterbalance, as well as obviating the great weight necessary in a counterbalancing-weight. In order to govern this air-pressure, an air-pressure regulator is provided consisting of a diaphragm *g*, Fig. 3, connected with a plunger carrying a head *g′*. This is attached to and backed by a spiral spring g^2, the spiral spring being governed by adjustable means, as a set-screw g^3, whereby the tension of the spring may be controlled.

H is a lever of the second class, pivoted at one end to the stationary pivot *h* and connected with the plunger, so as to be actuated by the pressure acting through the diaphragm *g* and the head *g′* of said plunger. This lever carries a weight W, and the outer end of it is pivotally connected to a reach-rod J, and this in turn is connected to another lever of the second order, K, pivoted at *k* to the frame. Pivoted to the lever K is a piston-rod L, which passes through a perforation in the fitting in the casing above, which casing is also perforated with small holes *m*. This permits the free egress or ingress of air therefrom. At the upper part of the casing is a check-valve M, which is the usual and ordinary check-valve used in pumps for the induction-port, an ordinary check-valve being shown at N for the eduction-port. It is obvious that the rod L, operating as a plunger, if raised, would impinge against the under side of the check-

valve M and raise it from its seat, forcibly holding it away from the seat on the upward stroke of the air-compressor piston P′. Therefore, simultaneously with the raising of the plunger g', due to an excess of pressure against the diaphragm g, the induction check-valve would be held open, so that air would be simply drawn in and forced out through the same valve, instead of being pumped into the cylinder E, and that this would take place on any excess of any assignable degree of pressure fixed by manipulating the check-nut g^3 and the pressure of the spring g^2. The pump consists of an upright cylinder P, carrying a trunk-piston P′, the side of the cylinder and casing being broken away in Fig. 3 to show the piston-connecting rod and crank, all of which are of the usual construction. This pump is driven by gearing (also shown in detail in Fig. 3) in which the belt P^2 from any convenient source of power drives a pulley P^3. This is connected by a clutch mechanism P^4 of the usual type, whereby the pulley may be connected or disconnected from a shaft P^5 by means of the lever P^6. As this is of the usual construction, it is unnecessary to further describe it.

The shaft P^5 carries a pinion Q, which meshes into a gear-wheel Q′, and this in turn carries upon its shaft a pinion (shown in Fig. 3 in dotted lines) Q^3, which meshes into a spur-wheel R, which carries the crank-pin R′ of the pump.

Obviously the operation of the clutch mechanism P^4 would be to connect or disconnect the shafts, which are being constantly driven, with the pulleys of the pump mechanism, and thereby throw in or out the pump, as may be desired.

It is obvious that by closely adjusting the escape-valve and its connections that the ram, apron, and contained machinery would be counterbalanced in any given position and also that it could be raised or lowered by increasing or decreasing the pressure of the air in the cylinder E; but we do not depend upon this means for raising and lowering and especially feeding the ram upward or downward in case such feeding becomes necessary.

As shown in Fig. 4, the apron D is controlled by a screw, with means for rotating the same in the usual manner, or it may be connected in the usual manner to other portions of the mechanism, so as to feed gradually in either direction. Said screw may be connected with and disconnected from the apron by a screw-clutch or other suitable means. It is not necessary to describe the feeding mechanism, however, as it forms no part of our invention. By these means of counterbalancing very little or no strain is brought upon the feeding mechanism, and it has this advantage over counterbalancing by weights. A very small amount of metal or weight in the air-cylinder and its attachment will enable it to counterbalance successfully several tons' weight in the apron and its attachment, and this is of great importance in a shaper which is designed to travel around heavy work placed upon a floor-bed and where heavy weights for counterbalancing are very objectionable. It also affords a means of arranging the mechanism in a much more compact compass, thereby taking less room and enabling it to work in a space where machines counterbalanced by weights would not be able to operate at all.

To counterbalance by air-pressure involves a different problem from that of counterbalancing by liquid-pressure, inasmuch as liquid-pressure can either by its weight or its pressure be rendered comparatively constant, whereas air is elastic, liable to leak, and varies in its pressure in a definite ratio to its temperature. Therefore there must be provided means for permitting the air to escape only upon the rasing of the pressure to a predetermined limit, this limit being that necessary to counterbalance the weight required. To keep the pressure of the air at this limit, as there is more or less air escaping, there must be an operation of the air-pump adapted to keep up the pressure and to supply the leakage. Our invention therefore consists in the devising of means whereby the constant air-pressure may be retained with a minimum amount of pumping.

What we claim is—

1. In a traveling-head shaper, the combination of a movable column having shaper mechanism thereon comprising a vertically-movable apron, an air-chamber on said column, a piston in said air-chamber connected with said apron, an air-pump on said column adapted to be actuated by said mechanism and to deliver compressed air to said chamber so as to act on said piston to counterbalance the apron, and an automatic means for preventing the air in said chamber from rising above a predetermined pressure.

2. In a traveling-head shaper, boring or milling machine, the combination of a vertical column carrying a movably-attached apron adapted to be positively raised and lowered, means for positively raising and lowering it, said apron carrying cutting, feeding and other actuating mechanism, with counterbalancing mechanism carried by said column, comprising a cylinder carrying a piston, which piston is connected with said apron and adapted to counterbalance the same by air-pressure, an air-pump connected with the chamber above said piston in said cylinder, and means connected with said air-pump whereby when the air-pressure has reached any assignable limit the induction-valve is held constantly open until the pressure is decreased below that limit and is then permitted to operate, substantially as described.

3. In a traveling-head shaper, the combination of a movable column having shaper mechanism thereon comprising a vertically-movable apron an air-chamber on said column,

a piston in said air-chamber, means connecting said piston with the apron, means for forcing air into said chamber to balance the apron, said means for forcing the air being operated by the mechanism on said column, and means for leading the air from the forcing means either to said chamber or to the outer air.

In testimony whereof we sign this specification in the presence of two witnesses.

MATTHEW MORTON.
HENRY E. MORTON.

Witnesses:
HOMER B. CLARK,
MASON B. MORTON.