

(No Model.)

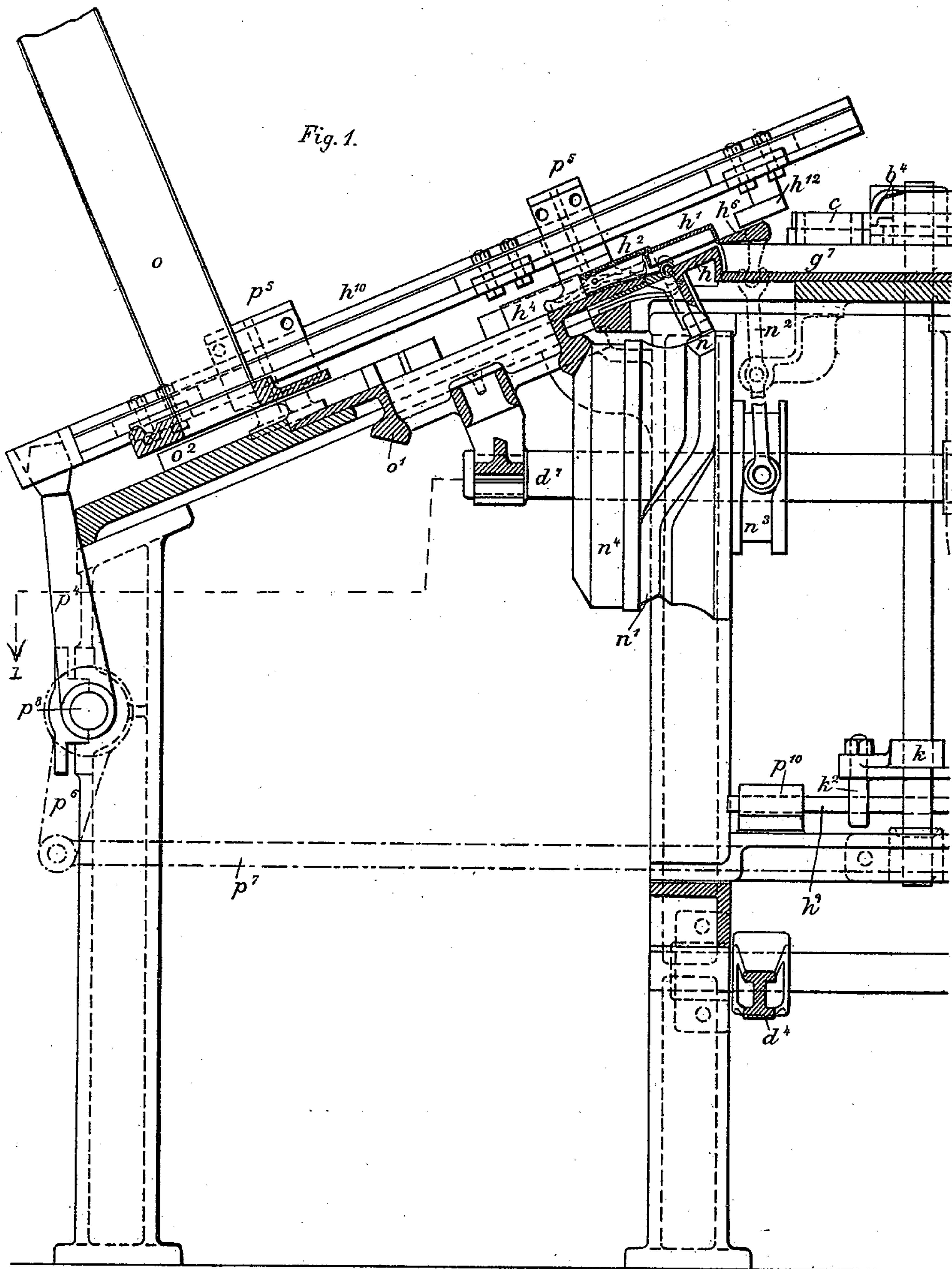
12 Sheets—Sheet 1.

N. M. STROM.

APPARATUS FOR FILLING MATCH BOXES WITH MATCHES.

No. 440,930.

Patented Nov. 18, 1890.



Witnesses:
John Revell.
Geo. A. Crane.

Inventor:
N. M. Strom
By his Attys. Horner and Horner

(No Model.)

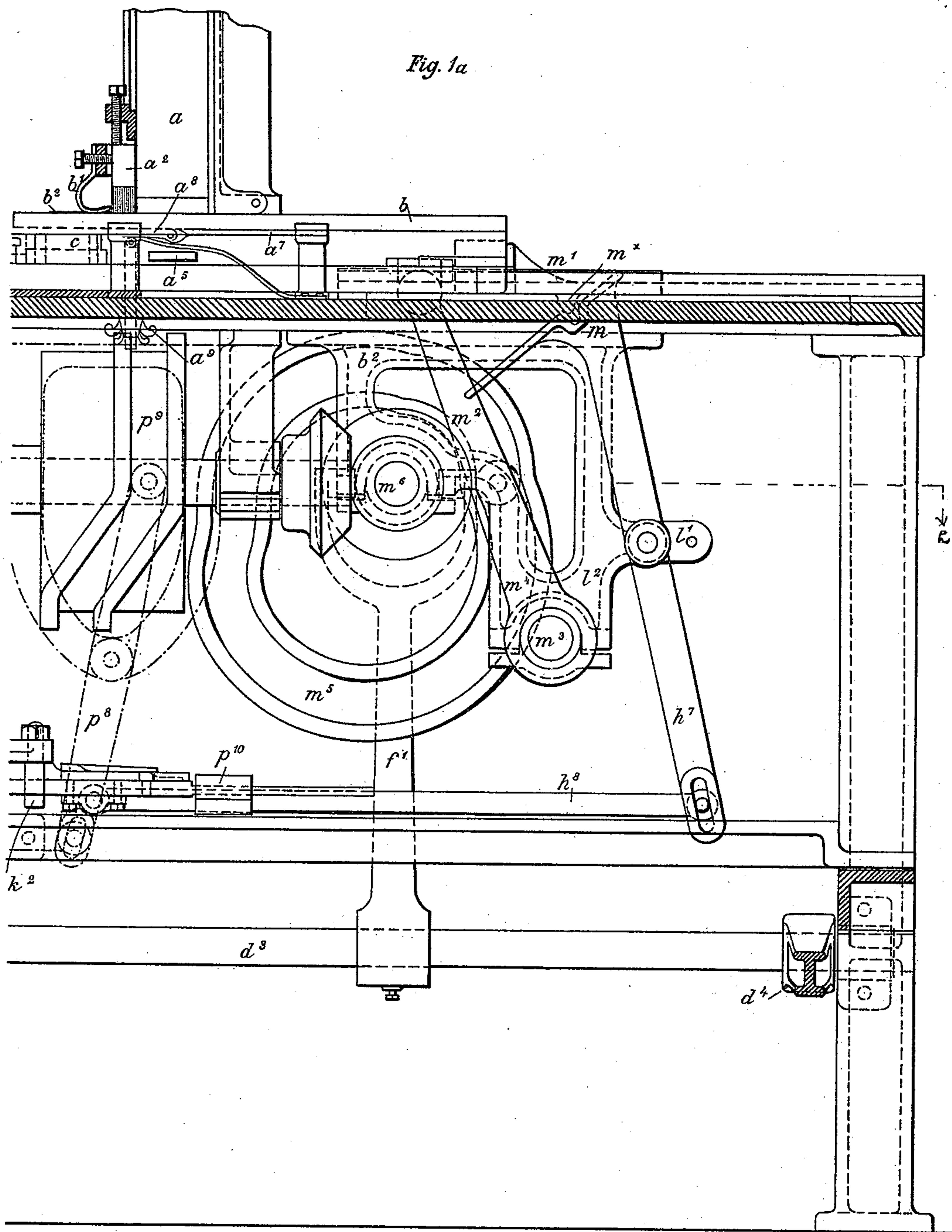
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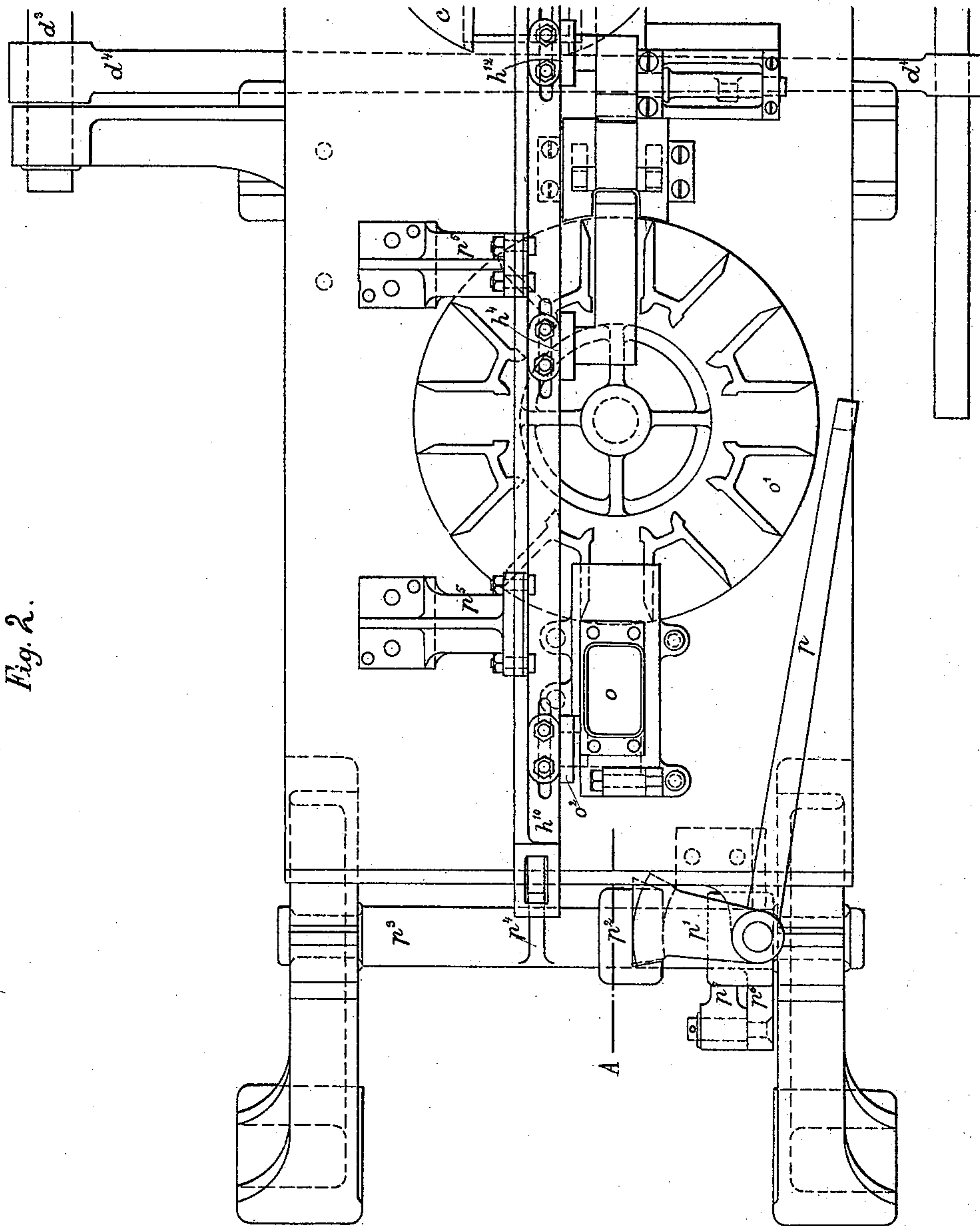


Fig. 2.

Inventor:

Nils Michael Strom

By his attorneys,
Howden and Howsair

(No Model.)

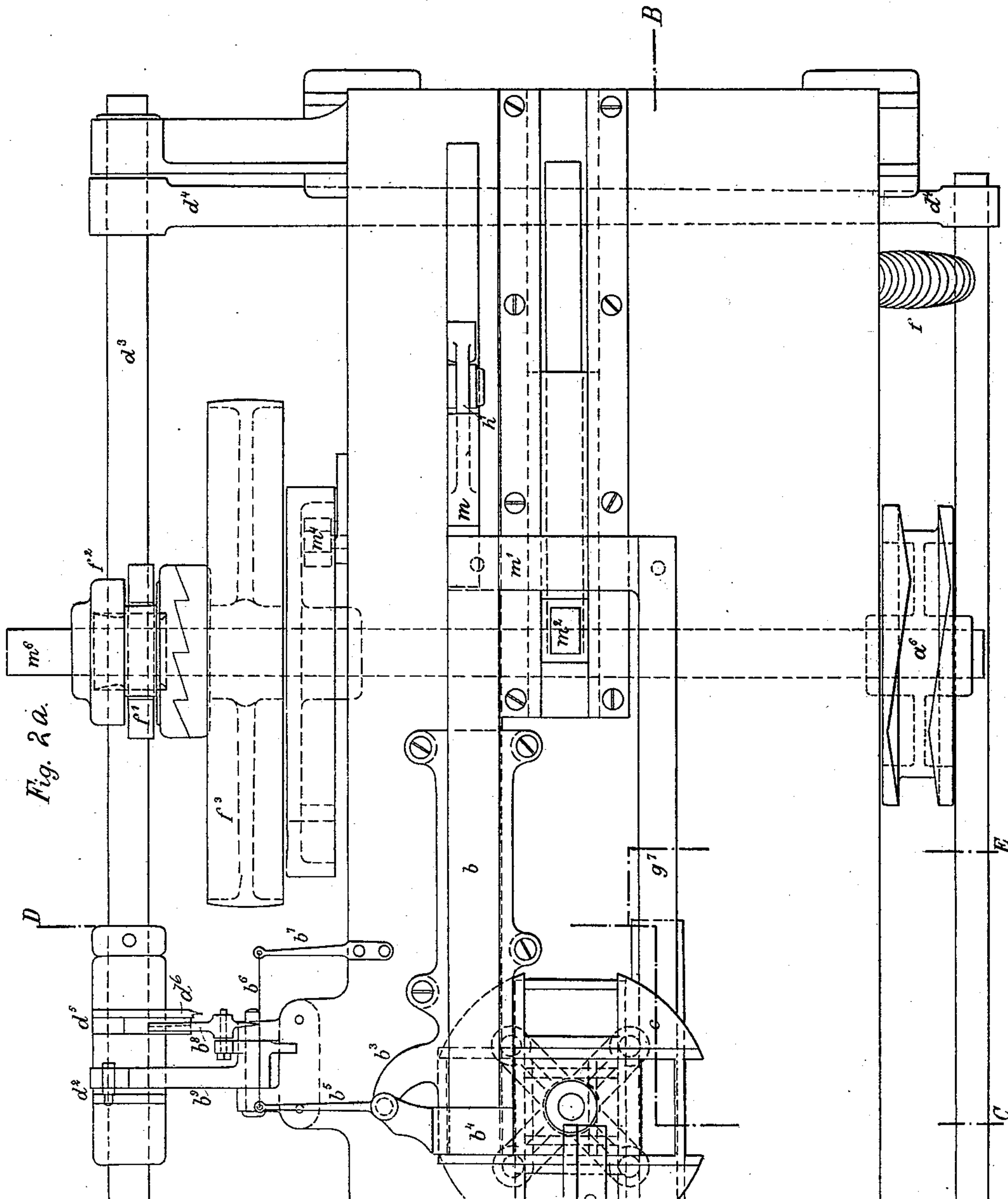
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Witnesses:

E. J. Gruswald
John Revell

Inventor:

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(No Model.)

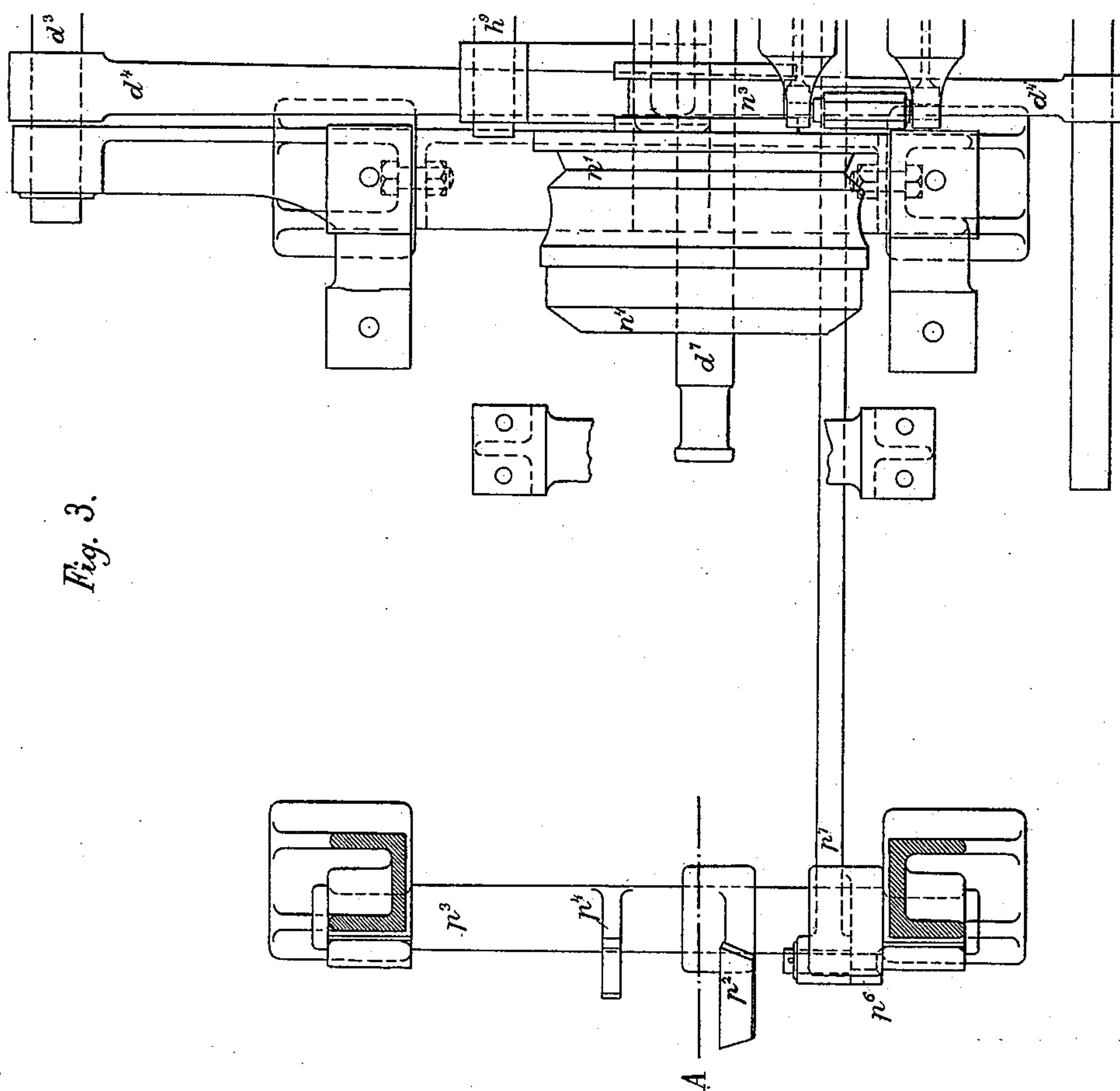
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Witnesses:

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John Revell

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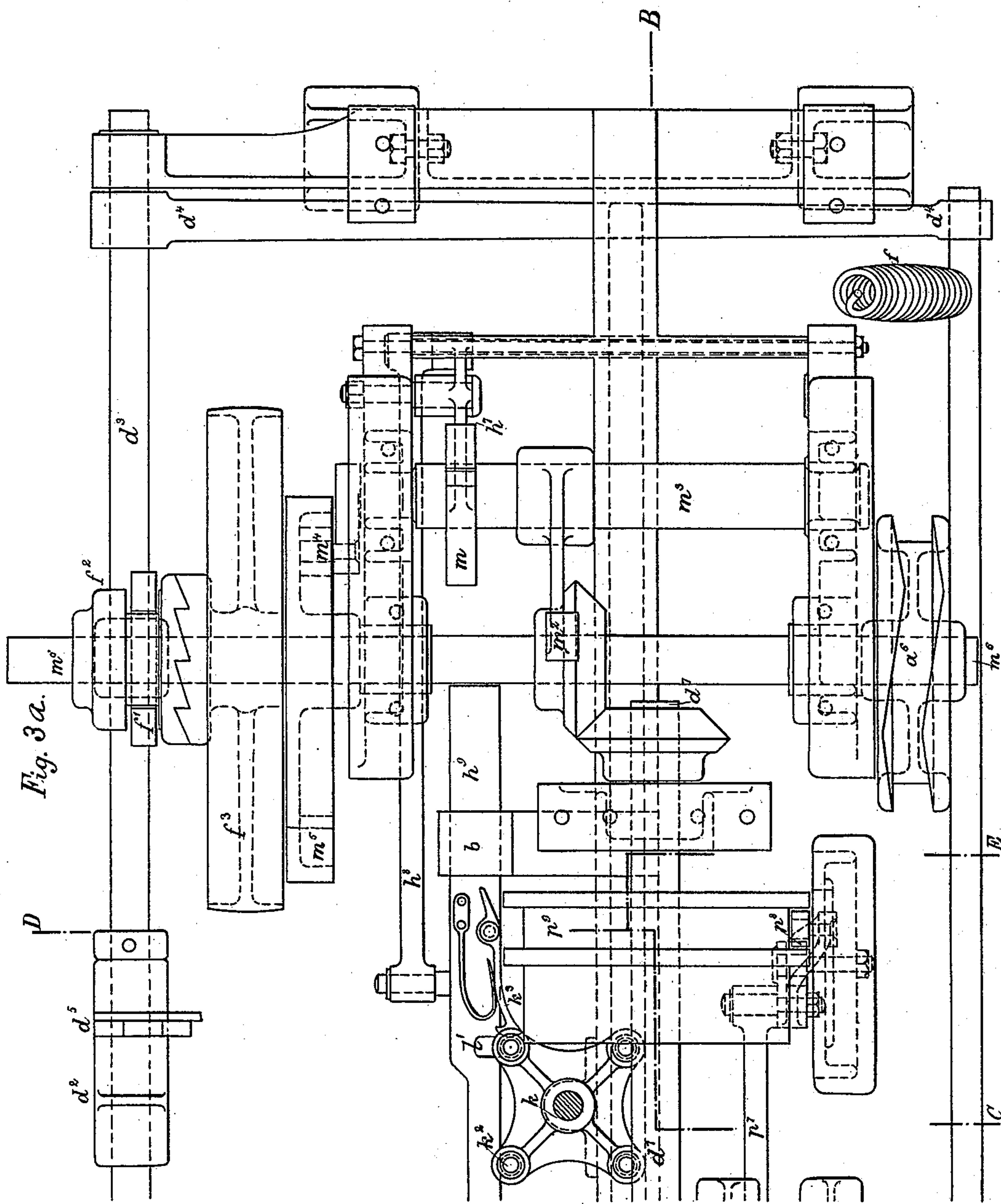
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Witnesses:

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(No Model.)

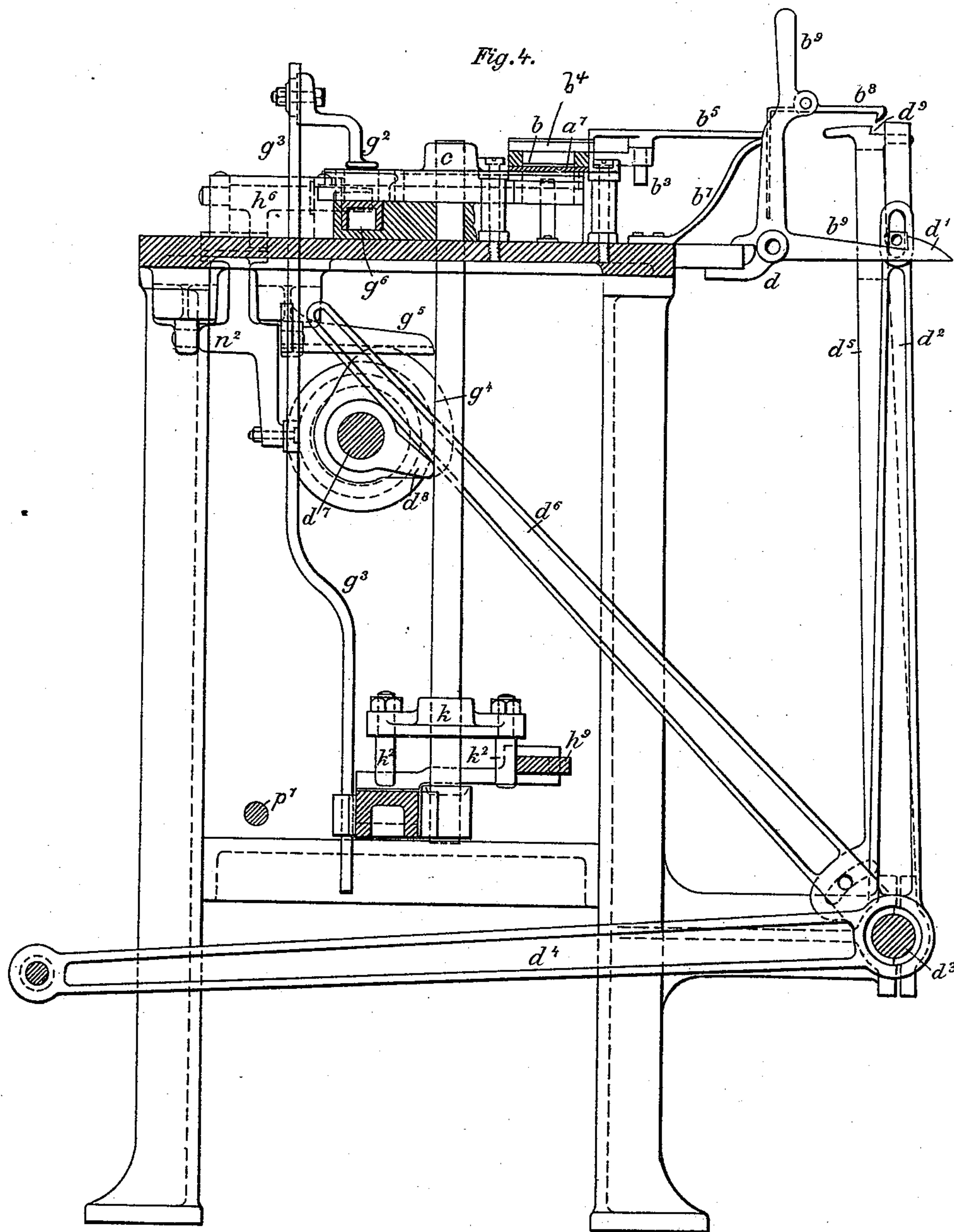
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Witnesses:

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(No Model.)

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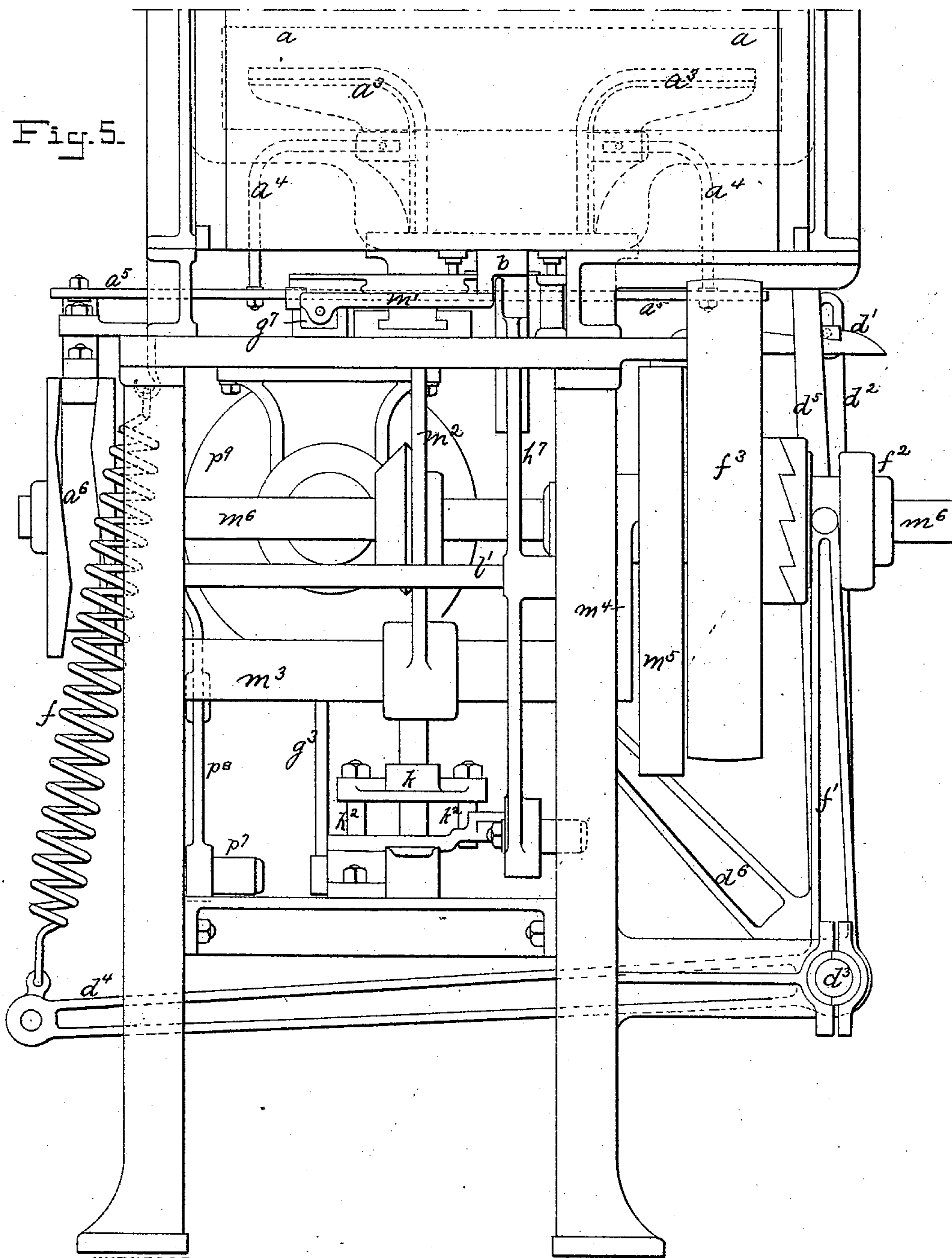
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Fig. 5.



WITNESSES:

E. J. Griswold
John Revell

INVENTOR

Nils Michael Strom

BY

Howson and Howson
his ATTORNEYS

(No Model.)

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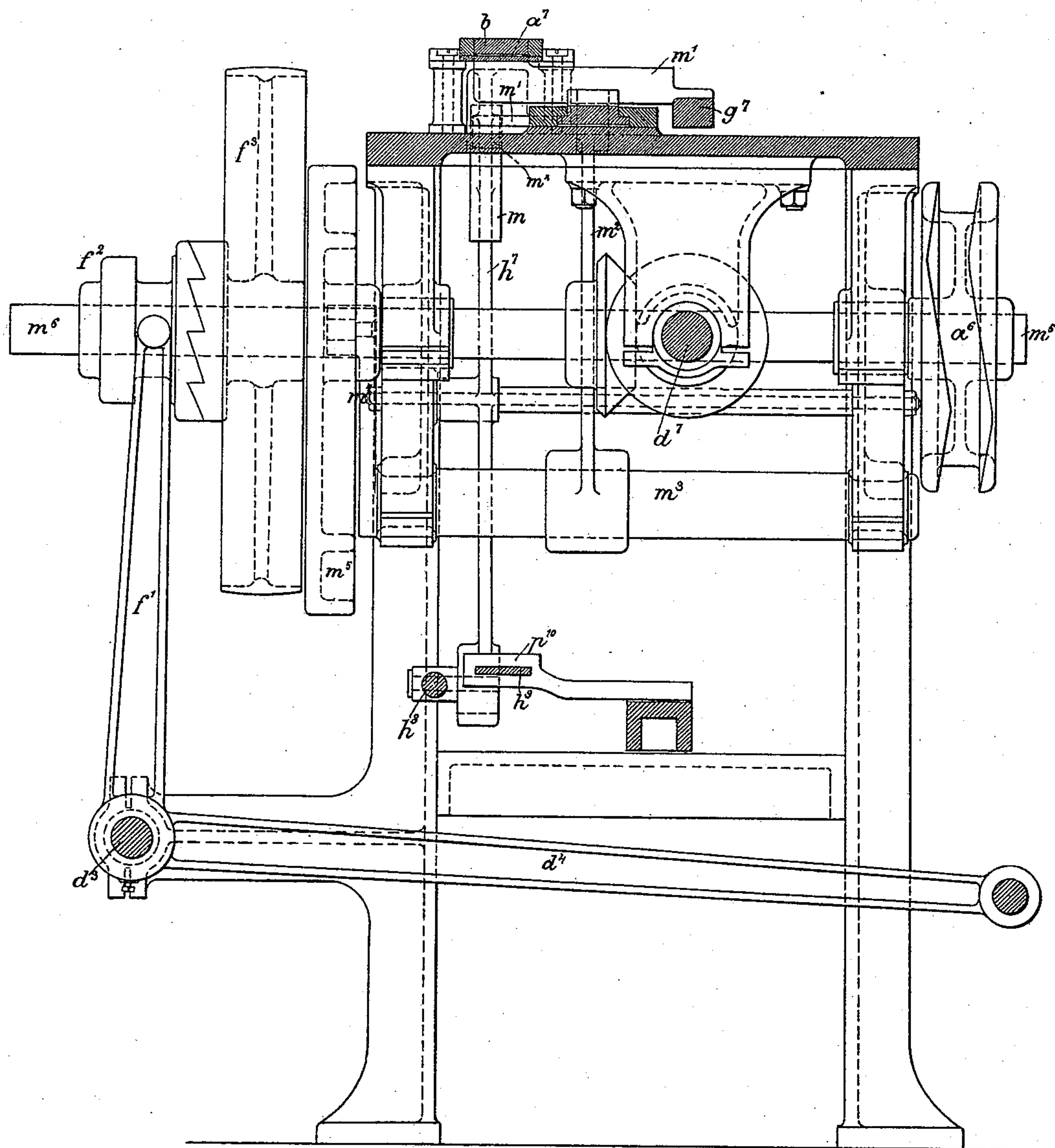
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Fig. 6.



Witnesses:

E. J. Griswold
John Revell

Inventor:

Nils Michael Strom
By his attorneys
Howson and Howson

(No Model.)

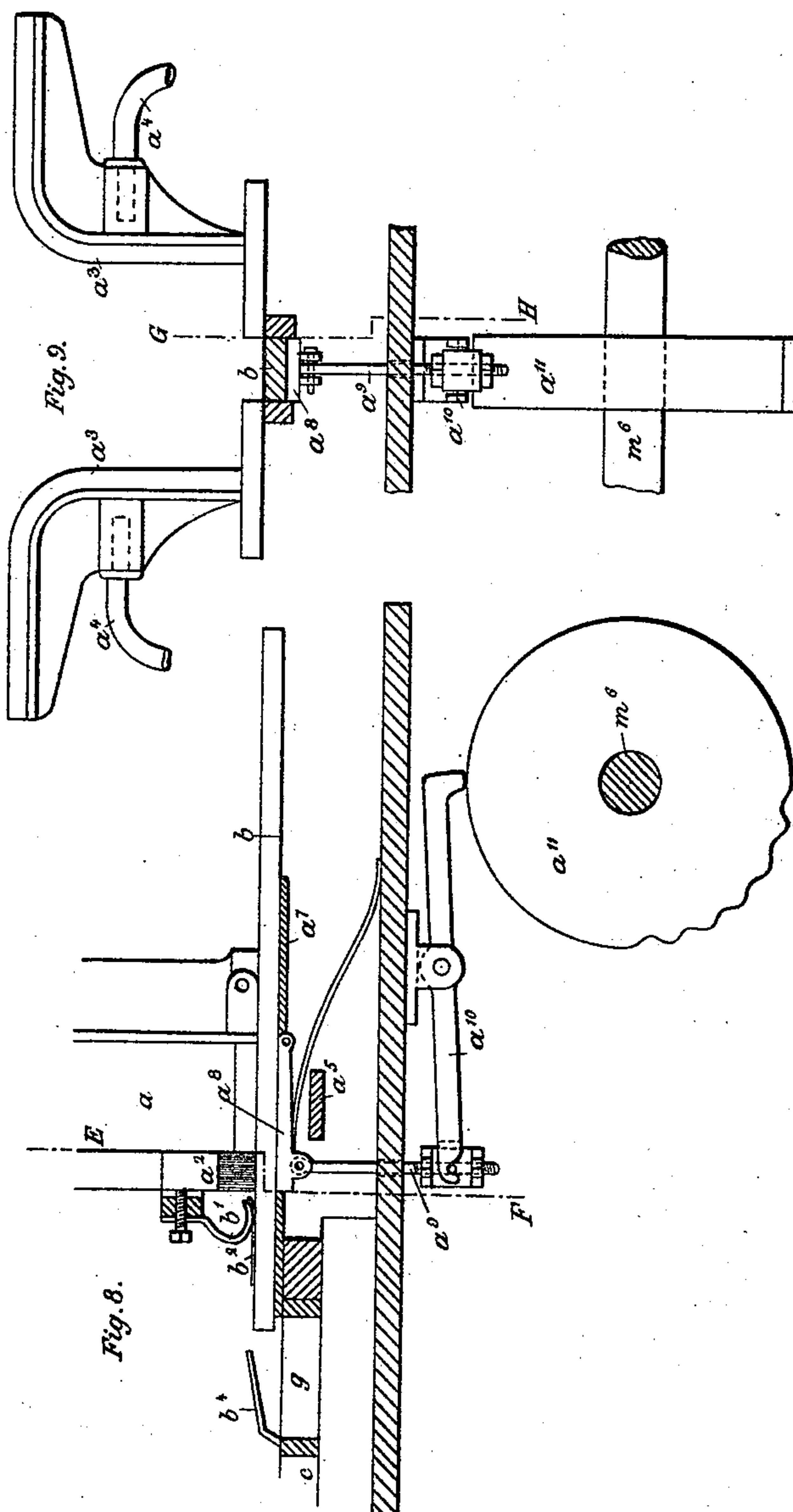
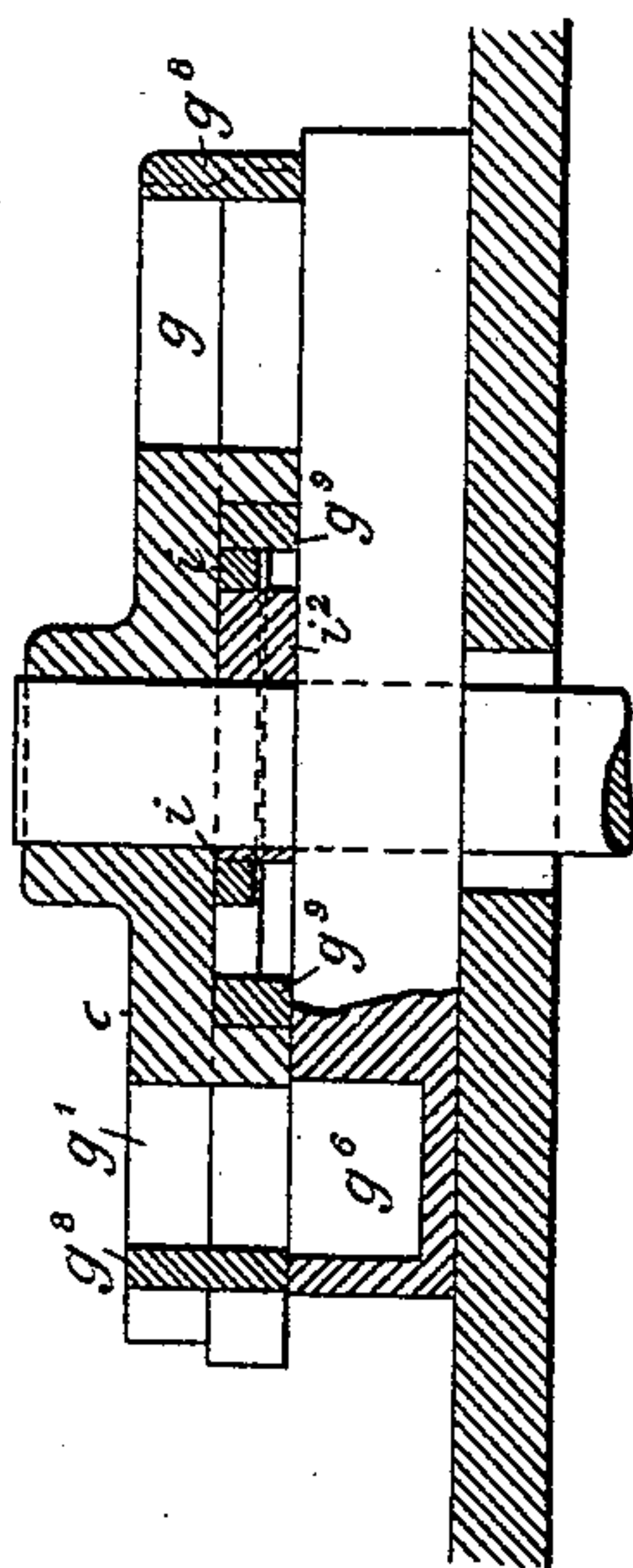
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Witnesses:

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Geo. A. Crane.

Inventor:

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By his Attys. Horton and Horton

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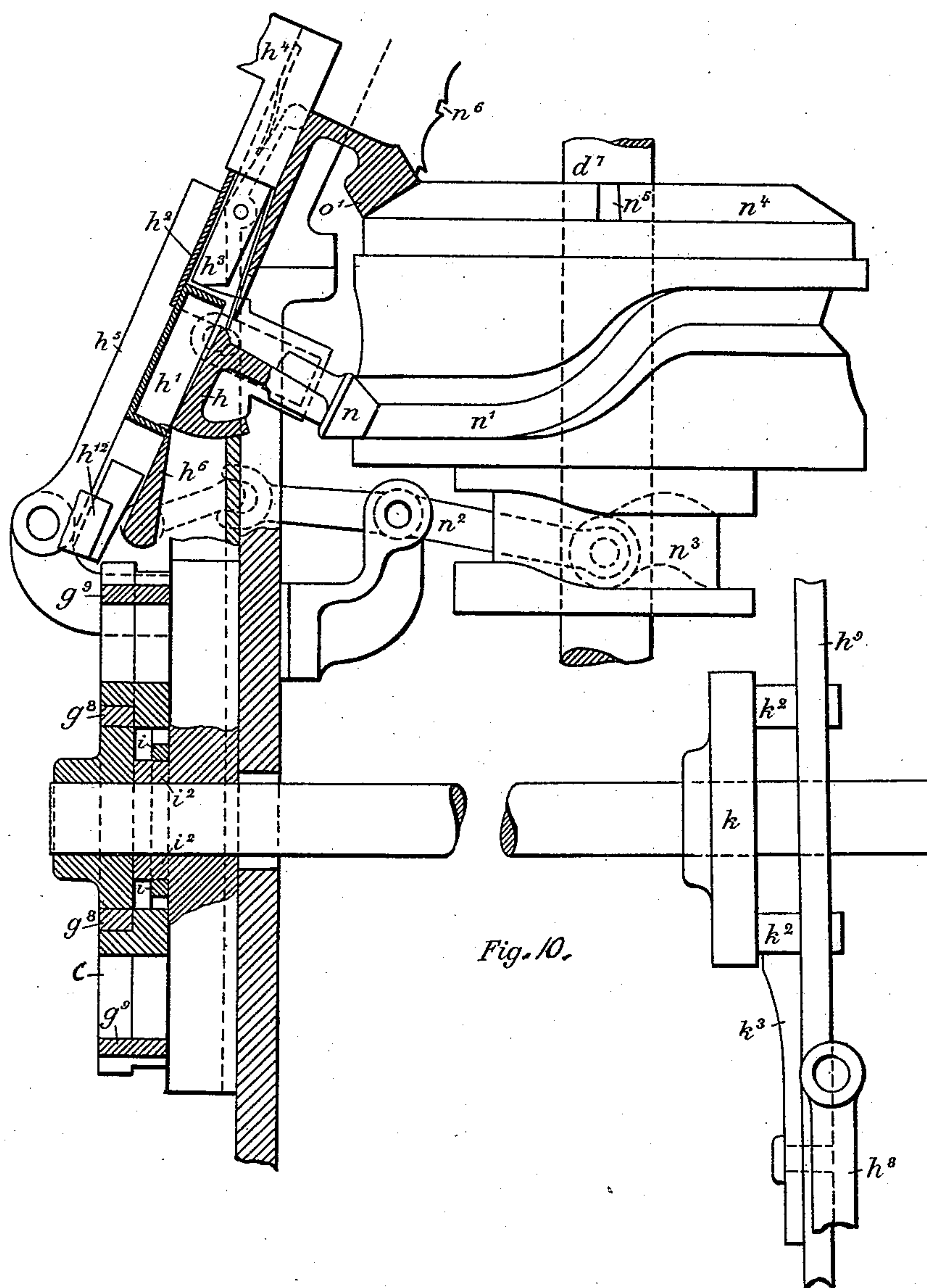
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Witnesses:
John Revell.

Geo. A. Crane.

Inventor:
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By his Attys. Horson and Horson

(No Model.)

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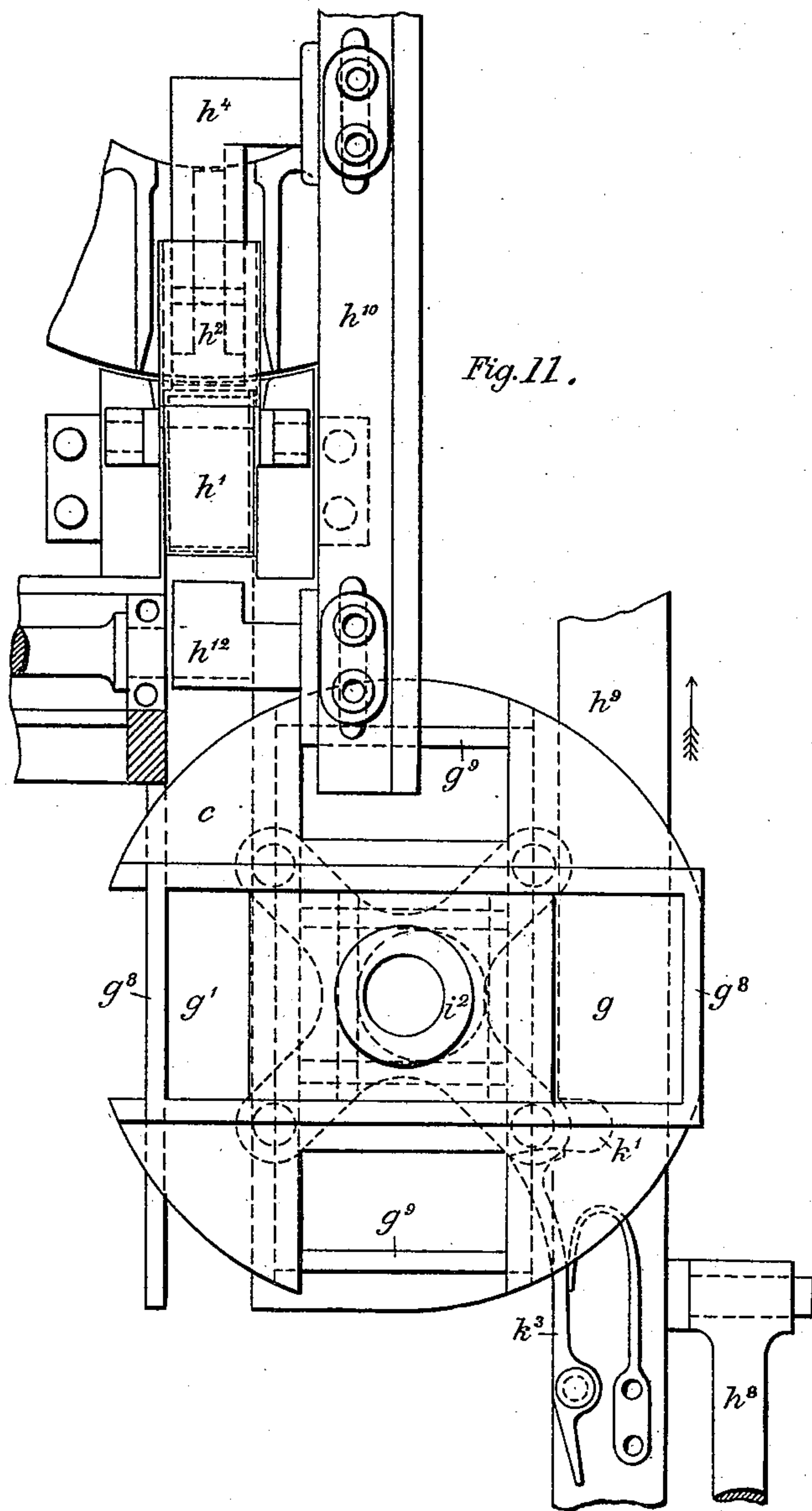


Fig. 11.

Witnesses:

John Revell

Geo. A. Crane

Inventor:

N. M. Strom

By his Attys Horner and Horner

UNITED STATES PATENT OFFICE.

NILS MICHAËL STRÖM, OF STOCKHOLM, SWEDEN.

APPARATUS FOR FILLING MATCH-BOXES WITH MATCHES.

SPECIFICATION forming part of Letters Patent No. 440,930, dated November 18, 1890.

Application filed July 10, 1888. Serial No. 279,520. (No model.)

To all whom it may concern:

Be it known that I, NILS MICHAËL STRÖM, a subject of the King of Sweden and Norway, and a resident of Stockholm, Sweden, have invented certain Improvements in Apparatus for Filling Match-Boxes with Matches, of which the following is a specification.

One of the greatest difficulties when filling match-boxes by machinery has hitherto been the shooting in of the inner box, when filled, into the case or outer box. This difficulty is entirely obviated by allowing the empty inner box to be partly inserted into the outer while the matches are placed therein. To bring this about, the inventor places the boxes in such a manner that the opening of the inner box, which is partially inserted in the case, is downward and directly above an oscillating table, along which are pushed a suitable number of matches with the one end in that part of the inner box which is inserted in the case. When so many matches as are to fill the box are in, the table is turned up on a level with the edges of the downward open side of the inner box, and there is then no difficulty in pushing the filled inner box into the case.

The accompanying drawings show a box-filling machine constructed for this purpose. Figure 1 is the left-hand half, and Fig. 1^a the right-hand half, of a vertical section of the machine, taken on line A B, Figs. 2 and 2^a. Fig. 2 is one half, and Fig. 2^a the other half, of a plan of the machine with the magazine removed. Fig. 3 is one half, and Fig. 3^a the other half, of a sectional plan, taken on the line 1 2 of Figs. 1 and 1^a. Fig. 4 is a sectional view taken on line D C of Figs. 2^a and 3^a, looking toward the left. Fig. 5 is an end elevation of the machine, looking from the right-hand side of Fig. 1^a. Fig. 6 is a sectional view taken on the line D E of Figs. 2^a and 3^a, looking toward the right. Fig. 7 is a sectional view of the turn-plate for the loose matches. Figs. 8 and 9 are detail views showing the mechanism for arranging the matches. Figs. 10 and 11 are detail views showing the mechanism for filling the boxes with matches.

a is a magazine, in which the matches taken from the frames are laid with their heads in the same direction. In the lower part of this magazine there are two movable parts *a*³, Figs.

5 and 9, with reciprocating motion, which, by means of curved connecting-pieces *a*⁴, are coupled to a bar *a*⁵, which, by a grooved wheel *a*⁶ on the shaft *m*⁶, receives its motion (*Vide* Fig. 5.) The purpose of these movable pieces is to shake down the matches in proper position and make them sink evenly.

Under the magazine *a* there is a channel *a*⁷, into which the matches fall, (*vide* Figs. 1^a, 4, 6, 8, and 9,) the bottom of which is provided with an adjustable trap *a*⁸, regulated by an adjusting-screw *a*⁹, passing through the table of the machine and sustained by a spring. By raising or sinking this trap the number of matches to be taken from the magazine is determined, and by giving it a quick up-and-down motion the matches brought into the channel *a*⁷ are arranged. Figs. 8 and 9 show how this shaking may be accomplished. Fig. 8 is a section along the line G H in Fig. 9, and Fig. 9 is a section along the line E F in Fig. 8. On the screw *a*⁹, proceeding from the trap *a*⁸, there are two nuts surrounding a sleeve provided with projecting pins which are caught by the one arm of a lever *a*¹⁰, the other arm of which rests on the wheel *a*¹¹, mounted on the shaft *m*⁶. This wheel *a*¹¹ is at one part of its circumference provided with teeth. When this part of the circumference passes under the arm *a*¹⁰ the trap *a*⁸ is put in shaking motion.

In front of the opening from whence the matches are pushed out of the magazine *a* there is an adjustable brush *a*², the object of which is to retain those matches which are not to be taken by the pushing-rod *b*, Fig. 1^a. In front of the brush there is a lid *b*³, kept in place by a soft spring *b*⁴, which lid is pressed by the spring down on the matches and gives them a steady movement while being pushed out. When the matches leave the channel *a*⁷, in which the reciprocating rod *b* moves, they fall into a turn-table *c* under the channel, (*vide* Figs. 1, 1^a, and 2^a, as also the details in Figs. 7, 10, and 11,) which table is intended for turning the matches so that they are thrust head foremost into the inner box, which is partially inserted in the case or outer box. In front of the channel *a*⁷ (*vide* Figs. 1 and 2^a) there is a lid *b*⁴, movable round the pivot *b*³ and kept in the position shown in the drawings by a spring.

(Not seen in the drawings.) From the lid b^4 , Figs. 2^a and 4, an arm b^5 proceeds, to which a thread b^6 is attached, and which thread is kept taut between b^5 and an arm b^7 , fixed to the frame. This thread is intended to keep a hook b^8 in the position shown in the drawings, Fig. 4. This hook b^8 is pivoted on the uncoupling-handle b^9 , which is itself movable in the bearing d , and ends with a hook d' , which serves to retain an arm d^2 on the shaft d^3 , on which shaft the treadles d^4 are also fixed. (Vide Figs. 1, 1^a, 2, 2^a, 4, and 5.) There is, moreover, the bell-crank lever $d^5 d^6$ (vide Figs. 4 and 5) on the shaft d^3 . Every stroke of the machine causes that part of the bell-crank lever d^6 to be struck by the cog d^8 on the shaft d^7 (vide Fig. 4) when the bell-crank lever $d^5 d^6$ is given a reciprocating motion. The upper end of the lever d^5 has a notch d^9 , which has no influence on the hook b^8 on the handle b^9 so long as the thread b^6 (vide Figs. 2^a and 4) is kept taut; but should it occur that the matches when being pushed out of the magazine a come in disorder, which when the turn-plate c revolves causes the lid b^4 to be pushed forward, the thread b^6 becomes slack, which was before kept taut between the arms b^5 and b^7 . The hook b^8 then falls into the notch d^9 on the lever d^5 , and now when the cog d^8 on the shaft d^7 strikes the lever d^6 the hook d' is drawn from the catch of the arm d^2 , whence it follows that the spiral spring f , placed between the machine-table and the treadle d^4 , by means of the fork f' , (vide Figs. 1^a and 5,) uncouples the clutch f^2 from the driving-pulley f^3 , by which the machine is immediately stopped. To set the machine in motion again, the cells of the turn-plate are cleared from the disorder and the lid b^4 placed in its proper position, so that the thread b^6 becomes taut when the hook b^8 lets go the catch in the notch d^9 , after which the treadle d^4 is pressed down, so that the hook d' may retain the arm d^2 .

The turn-plate c (vide Figs. 1^a, 2^a, 7, 10, and 11) has the office of turning the matches pushed out from the magazine a . They first fall into the cell g , which is under the channel a^7 . The position of the turn-plate in the drawings is such as it has been when the matches have just been pushed out and have fallen into the cell g . (See also Fig. 8.)

As is seen from Figs. 7 and 11, the cell g is wider than the opposite cell g' , from which the matches by a presser g^2 are brought into the channel g^6 under g' . The presser g^2 , Fig. 4, is fixed to a rod g^3 , moving in guides, which rod is lifted by an eccentric g^4 , which acts upon an arm g^5 , projecting from the rod g^3 . In the channel g^6 there is a pushing-rod g^7 , (vide Figs. 1, 2^a, 5, and 6,) the purpose of which is to push up the matches on the table h (vide Figs. 1 and 10) and place them in the inner box h' , which is placed upside down and partially inserted in the outer box or case h^2 . While the matches are being laid in the outer box is expanded by a hook h^3 , con-

nected with a bar h^4 , (vide Figs. 10 and 11,) of which more hereinafter. The boxes during the time when they are fitted and closed are firmly held by a lid h^5 from above, besides which the inner box is retained by a hook h^6 . It will be seen from Figs. 7, 10, and 11 that there are frames g^8 and g^9 fitted into the turn-plate c , the one from below, the other from above, and joined by cross-pieces $i i$, which move round the fixed eccentric i^2 . When the frames and the turn-plate rotate, the former are driven to the side by the eccentric i^2 , and the width of the cells thus increased or diminished, and thus both collect and arrange the matches better than if the size of the cells remained unchanged. The rotation of the turn-plate c is operated from a lever h^7 , (vide Fig. 1^a,) pivoted on a bolt l' , fixed to the hanger l^2 . From the lever h^7 a bar h^8 proceeds to a bar h^9 , which runs in the guides p^{10} , fixed in the frame. (See Figs. 1^a, 3^a, 4, and 10.) On the lower end of the shaft of the eccentric there is a disk k , provided with four studs $k^2 k^2$.

The rotation of the disk k is one-fourth turn for every turn of the shaft of the machine, and this rotation takes place every time the bars b and g^7 , fixed to the common cross-piece m' , (vide Figs. 1^a and 2^a,) are drawn back. A cog m^x is attached to the cross-piece m' , which cog catches into a corresponding notch m in the lever h^7 , (vide Fig. 1^a,) by which the reciprocating motion of the lever can be limited to but a part of the course which the cross-piece m' runs.

In the bar h^9 there is a notch k' , in which the studs k^2 , projecting from the disk, engage, the one after the other, at the reciprocating motion of the bar h^9 . (See Figs. 3^a and 11.) In front of this notch there is placed the mechanism k^3 , which is kept in the position shown in the drawings by a spring. When the bar h^9 moves in the direction of the arrow, one of the pins k^2 enters the notch by means of the operating-pawl k^3 , and the disk is obliged to follow one-fourth turn when the pin k^2 will have left the notch, and when the bar h^9 is drawn back the disk is kept firm in the given position by the studs k^2 being firmly pressed against the bar. The cross-piece m' (vide Figs. 1^a, 2^a, and 6) is actuated by the arm m^2 , which arm, mounted on the shaft m^3 , is moved by the arm m^4 , which, with a roller, engages into the eccentric-groove m^5 in a pulley fixed on the shaft m^6 . A conical gearing leads the motion from the shaft m^6 to the shaft d^7 .

The table h (vide Figs. 1 and 10) is adapted to receive the matches after they leave the turn-plate c and raise the matches to press them into the empty boxes. This elevating-table is provided with a descending arm with a conical end n reaching down into the groove n' in a drum n^6 on the shaft d^7 and receives its motion from this shaft. By this arrangement the table may get the most suitable and softest motion for the filling, while the axle round

which the table turns can thereby be somewhat heightened and sunk while the table is turned upward. This soft movement is simply attained by making the depth of the groove n' unequal. The work proceeds more easily if the table be provided with a slight longitudinal groove. (*Vide* Fig. 10.) The hook h^6 , which keeps the inner box in its place, is operated by the lever n^2 , which with its one end engages in the groove n^3 of a disk on the shaft d^7 , and with the other end embraces an arm descending from the axle of the hook. (*Vide* Figs. 10 and 11.)

The empty boxes are placed shut in the magazine o , (*vide* Figs. 1 and 2,) with the open side of the inner boxes turned downward. From this magazine the boxes are fed into one of the cells of the turn-plate o' , Figs. 1 and 2, by an arm o^2 , attached to a bar h^{10} , which moves in the guides p^5 , fixed to the table of the machine. On the bar h^{10} there is also an arm h^4 , which pushes open the boxes and places them in proper position above the elevating-table h , as also an arm h^{12} , which closes the filled boxes and pushes them again into the turn-plate o' . The bar h^{10} is put in motion by a lever p^4 , fixed on the shaft p^3 , and the shaft p^3 is put in motion by the arm p^6 , the lever p^7 , and the lever p^8 , the upper end of which is provided with a roller which runs in the groove p^9 in a disk mounted on the shaft d^7 . (See Figs. 1 and 1^a.) The turn-plate o' is set in motion by a cog n^5 on the disk n^4 , (*vide* Fig. 10,) which cog engages in the notches n^6 in the under side of the turn-plate o' . The surfaces between the notches n^6 are formed like the surface of the disk n^4 , which disk is firmly pressed against one of these surfaces, from which it follows that the turn-plate o' is held immovably in that position given it by the cog n^5 . When one of the cells of the turn-plate c reaches that point opposite the place of the elevating-table, the bar h^{10} , with its arms, moves upward, a new box is placed in the turn-table from the magazine o , and the box standing opposite the elevating-table is pushed forward and opened by the arm h^4 at the same time as it is slightly enlarged by the hook h^8 . (*Vide* Fig. 10.) The filling being completed and the boxes about to be closed, the bar h^{10} begins to descend, the hook h^6 sinks, and the arm h^{12} again pushes the boxes onto the turn-plate o' and closes them. The turn-plate is then rotated until the next cell is opposite to the elevating-table. During the continued motion of the turn-plate the cells, with the filled boxes, reach a point opposite a descending hook from the arm p , (*vide* Fig. 2,) the business of which is the removal of the filled boxes out of the cells. This hook of the arm p is placed over the turn-plate when it turns. The arm p is connected with a toothed segment p' , gearing with another toothed segment p^2 , mounted on the shaft p^3 . The boxes are thus carried off and either fall into a channel or else into a box standing beside the machine. After having removed a box

from a cell the arm p is brought back through the empty cell to a position behind the cell above the turn-table, ready to recommence the operation when the next cell comes before the hook of the arm.

As is seen from the drawings, the mechanism is placed on a frame resembling a table, and that part of the table on which the turn-plate o' has its place inclines to the horizontal part so far as is necessary for the matches while being pushed into the box to come straight into the inner box placed above the elevating-table—a proceeding which plainly causes good work.

I claim as my invention—

1. In an apparatus for filling match-boxes with matches, the combination of a holder for the outer box with a holder for the inner box adapted to maintain the latter partially inserted in the outer box during the filling, and mechanism, substantially as set forth, for feeding the matches into the inner box while the outer and inner boxes are thus held, all substantially as described.

2. In an apparatus for filling match-boxes with matches, the combination of means for partially opening the empty boxes, a holder for the inner box and a holder for the outer box, and mechanism, substantially as set forth, for feeding the matches into the boxes while in this partially-open position.

3. In an apparatus for filling match-boxes with matches, the combination of a turn-table provided with cells for the reception of the closed empty match-boxes, and means for partially opening the boxes with a hook or similar device for firmly holding the inner box while in this open position, and mechanism for actuating the hook, substantially as set forth.

4. In an apparatus for filling match-boxes with matches, the combination of a turn-table provided with cells for the reception of the boxes, mechanism, substantially as described, for giving the turn-table an intermittent rotary motion with a reciprocating bar provided with three arms, one to push the empty boxes onto the turn-table, the second to push open the empty boxes, and the third to close the filled boxes, substantially as described.

5. In an apparatus for filling match-boxes with matches, the combination of a turn-table provided with cells for the reception of the match-boxes, means for supplying the cells with empty boxes, and mechanism for filling the boxes, with a device for removing the filled boxes, substantially as set forth.

6. In an apparatus for filling match-boxes with matches, the combination of an elevating-table, and means for raising and lowering the same, substantially as described, with means for holding the inner match-box upside down above the elevating-table, substantially as and for the purposes set forth.

7. In an apparatus for filling match-boxes with matches, the combination of an elevat-

ing-table adapted to raise the matches into the empty boxes and hold them therein until the boxes are closed, devices for supplying matches to the said table, and means for operating the elevating-table, substantially as set forth.

8. In an apparatus for filling match-boxes with matches, the combination of an elevating-table for pushing the matches into the boxes, with means for actuating the table, consisting of a drum provided with a groove of graduated depth, and an arm on the table provided with a conical end operated by the groove on the drum, substantially as and for the purposes set forth.

9. In an apparatus for filling match-boxes with matches, the combination of a magazine for the loose matches and a channel beneath the magazine for the loose matches, a match-arranging device in the channel, with a reciprocating rod for pushing matches along to the next part of the machine, and means for actuating the rod, substantially as described.

10. In an apparatus for filling match-boxes with matches, the combination of a magazine for holding the loose matches, a channel beneath the magazine, with an adjustable brush for holding back superfluous matches, and a lid above the channel to guide the matches as they are pushed along, substantially as set forth.

11. In an apparatus for filling match-boxes with matches, the combination, with a magazine for the loose matches and a channel beneath the magazine, of an adjustable trap in the channel, and mechanism for giving the trap a quick up-and-down movement, substantially as and for the purposes set forth.

12. In an apparatus for filling match-boxes with matches, the combination of a turn-table with cells to receive the loose matches and provided with movable frames, an eccen-

tric, by means of which the frames are moved in and out in the turn-table to increase or diminish the breadth of the cells, with mechanism, substantially as described, for giving the turn-table an intermittent rotary motion, substantially as and for the purposes set forth.

13. In an apparatus for filling match-boxes with matches, the combination of a turn-table for receiving the loose matches and mechanism for turning the same, with pushing-rods, one to push the matches from the magazine onto the turn-table and the other to push the matches from the turn-table, and means for operating the pushing-rods, substantially as and for the purposes set forth.

14. In an apparatus for filling match-boxes with matches, a stopping device comprising a pivoted lid above the channel along which the matches are pushed, the said lid being held in position by a slight spring, an uncoupling-lever, and mechanism to operate the said lever held out of working position by the lid, substantially as described.

15. In a machine for filling match-boxes, a stopping device comprising a pivoted lid, a thread held taut by the lid when in its normal position, a reciprocating bell-crank lever, one end of which is provided with a notch, an uncoupling-fork, a pivoted hook to retain the fork, another hook pivoted to the aforesaid hook adapted to engage the notch on the bell-crank lever, but held out of engagement therewith by the thread when taut, and a spring to act on the uncoupling-hook, as and for the purposes set forth.

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

NILS MICHAËL STRÖM.

Witnesses:

FREDRIK L. ENQUIST,
AUG. MALMBERG.