No. 637,486.

Patented Nov. 21, 1899.

G. POOLE.

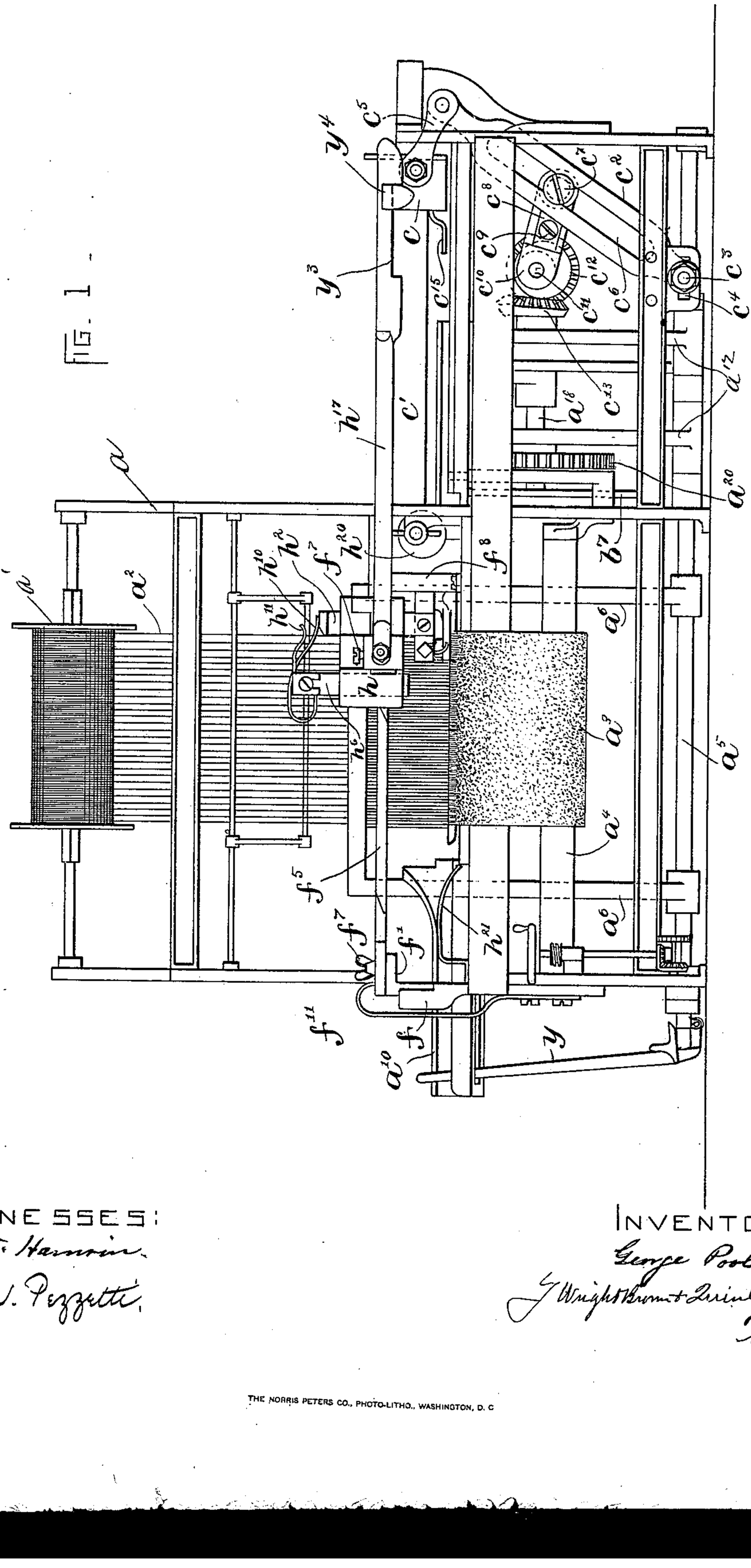
LOOM.

(Application filed Nov. 30, 1896.)

(No Model.)

4 Sheets—Sheet 1.

FIG. 1.



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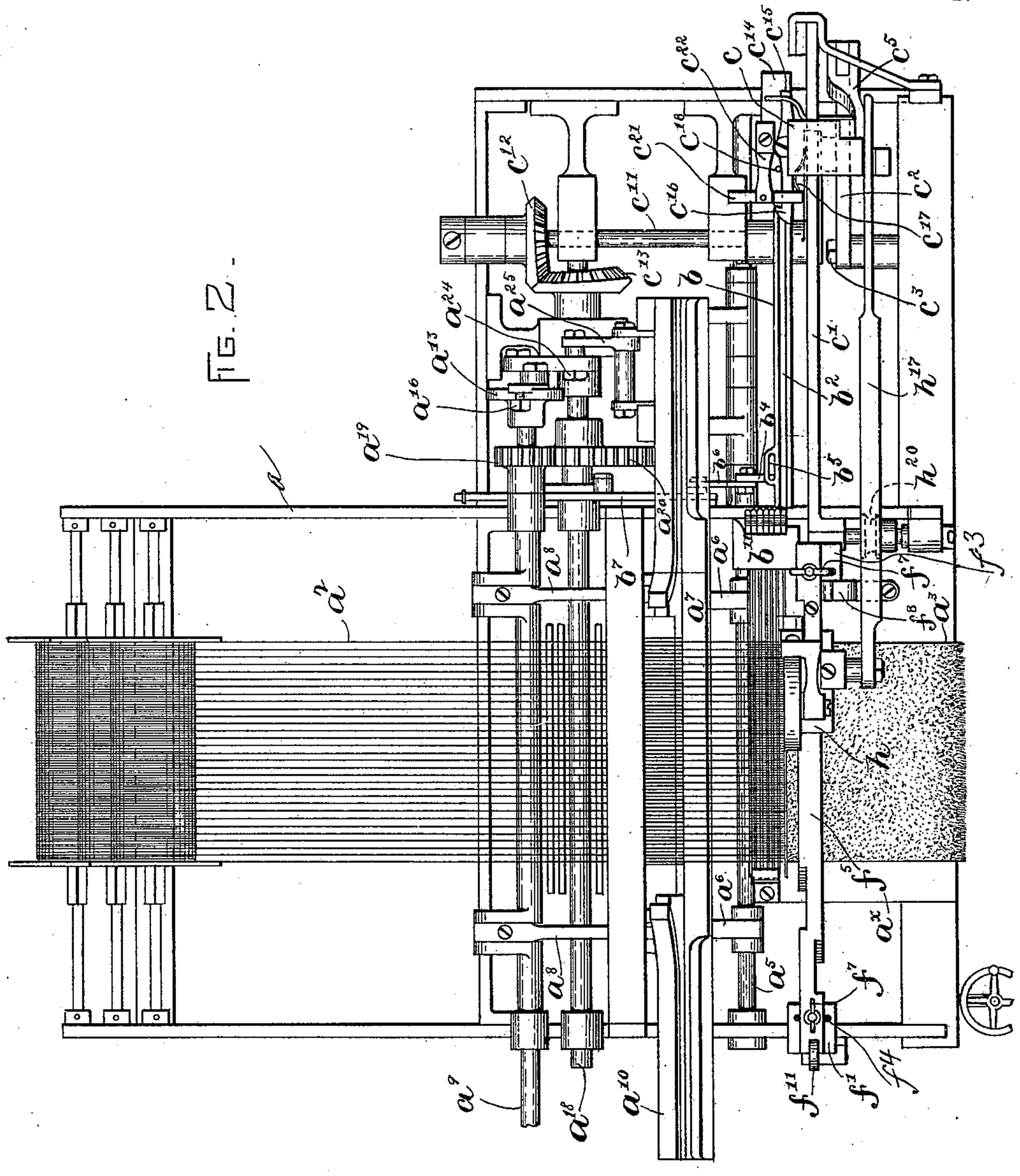
(No Model.) 4 Sheets—Sheet 2.

FIG. 2.



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(No Model.) 4 Sheets—Sheet 3.

FIG. 3.

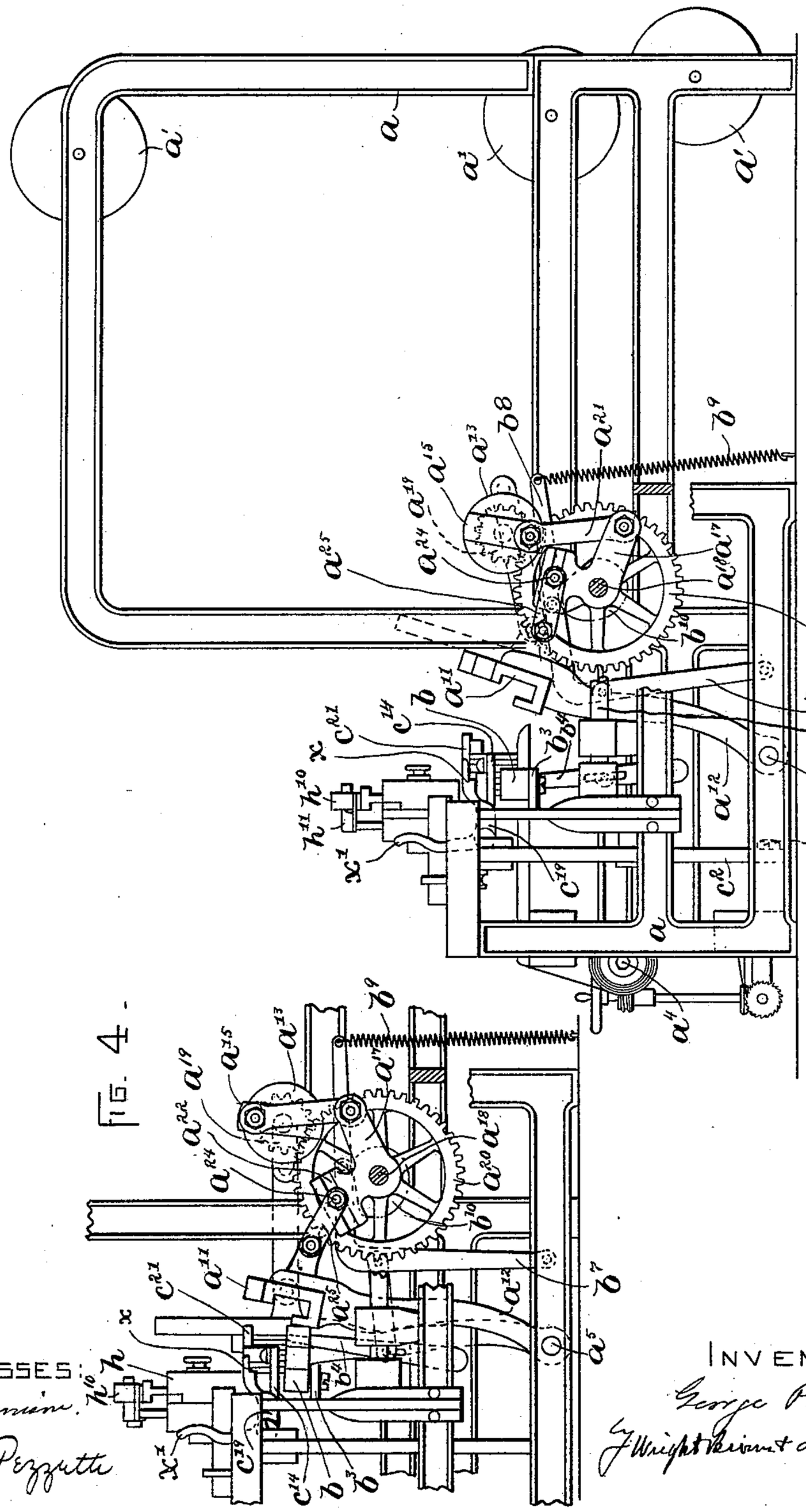

FIG. 4.

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4 Sheets—Sheet 4.

FIG. 5.

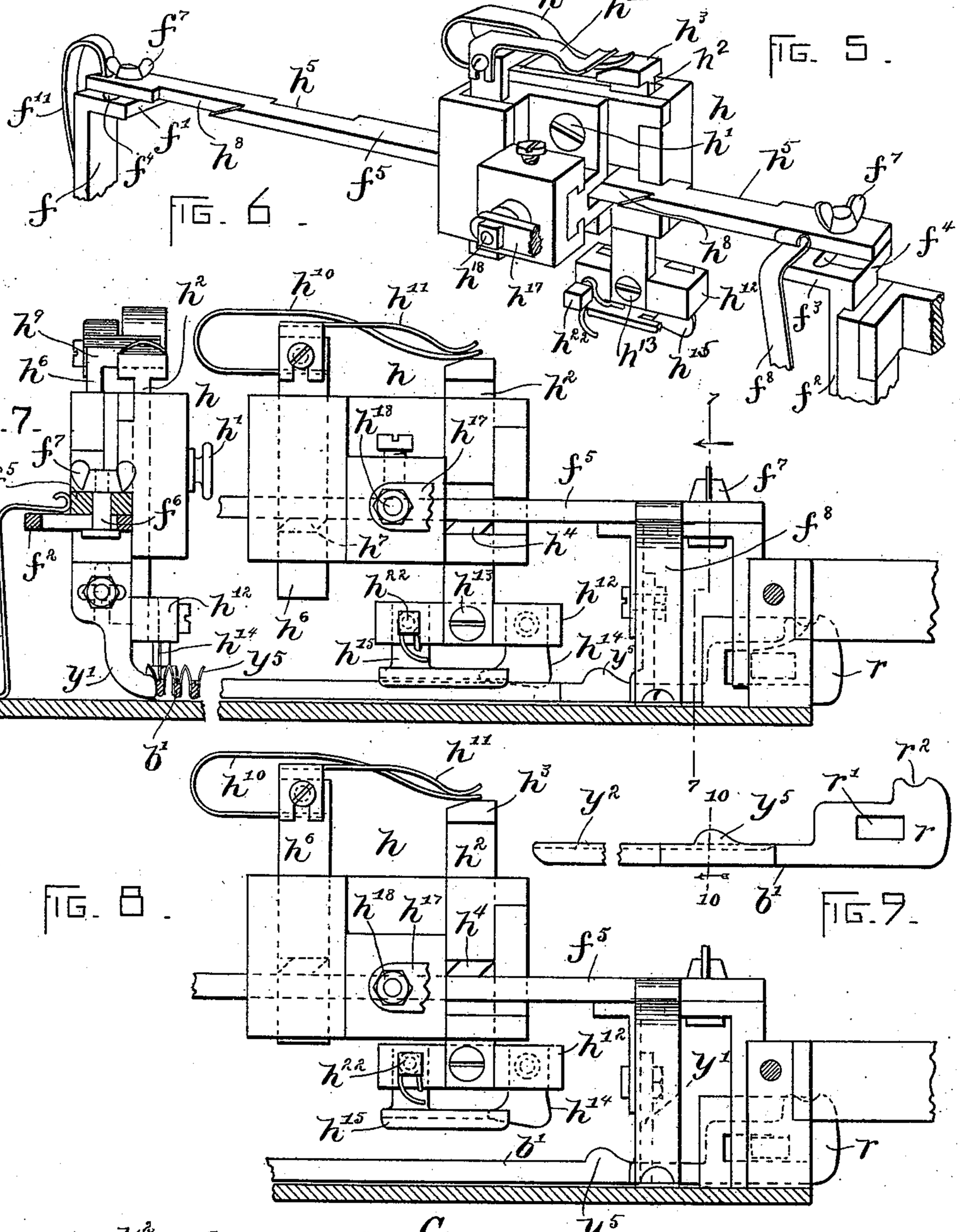

FIG. 6.

FIG. 7.

FIG. 8.

FIG. 9.

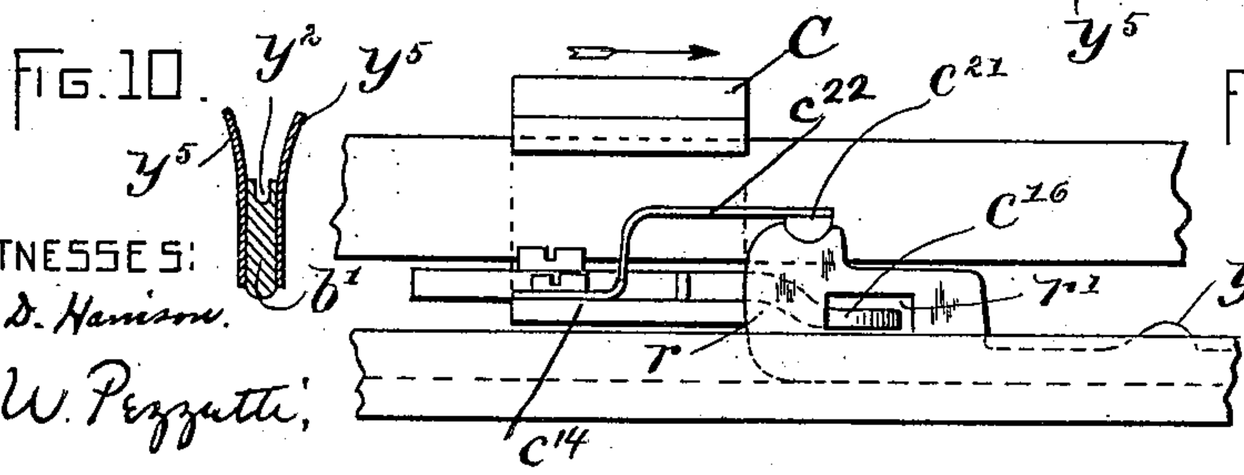

FIG. 10.

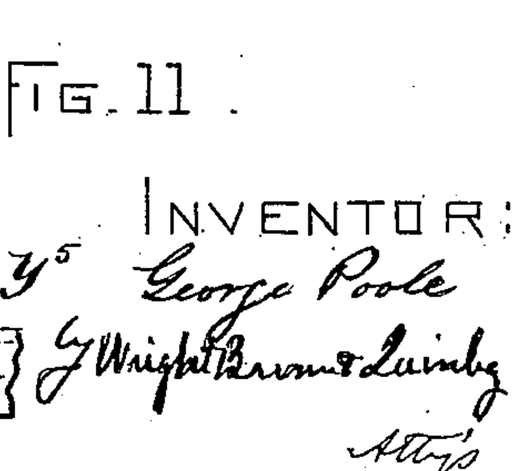

FIG. 11.

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UNITED STATES PATENT OFFICE.

GEORGE POOLE, OF LOWELL, MASSACHUSETTS.

LOOM.

SPECIFICATION forming part of Letters Patent No. 637,486, dated November 21, 1899.

Application filed November 30, 1896. Serial No. 613,897. (No model.)

To all whom it may concern:

Be it known that I, GEORGE POOLE, of Lowell, in the county of Middlesex and State of Massachusetts, have invented certain new and useful Improvements in Looms, of which the following is a specification.

This invention relates to a new and useful improvement in looms; and it consists in the novel features of construction and relative arrangement of parts fully described in the specification, clearly illustrated in the drawings, and particularly pointed out in the claims.

Reference is to be had to the accompanying four sheets of drawings, forming a part of this application, in which like characters are used to indicate like parts wherever they occur.

Figure 1 represents in front elevation a loom constructed in accordance with my invention. Fig. 2 represents a top plan view thereof. Fig. 3 represents a side elevation thereof. Fig. 4 represents in side elevation a detail view of the mechanism for operating the shuttle-box. Fig. 5 represents a detail perspective view of the knife and its associated mechanism, showing the knife depressed in position to cut. Fig. 6 represents a side elevation thereof. Fig. 7 represents a detail cross-sectional view on the line 7 7 of Fig. 6. Fig. 8 represents a view similar to Fig. 6, showing the knife in its raised or inoperative position. Fig. 9 represents in side elevation my novel form of wire. Fig. 10 represents a cross-sectional view thereof on the line 10 10 of Fig. 9. Fig. 11 represents a detail view of the hook and latch.

Referring to the drawings, in the embodiment of my invention therein shown and selected by me for the purpose of illustration, a represents a framework in which are mounted the warp-beams a' and other devices usual in looms. The framework and other parts just mentioned may be of the conventional or any desired shape.

a^2 represents the warp; a^3, the woven fabric; a^4, the take-up roll upon which the fabric is wound in the usual way, and $a^\times$ the breast-plate over which the fabric passes.

a^5 represents a shaft upon which are mounted the sword-arms a^6, that support the lay a^7, the latter being driven in the usual way by crank-arms a^8, connected to a power-shaft a^9, mounted in the frame a. This shaft may be connected in any desired way to a source of power. (Not shown.) The lay a^7 has at one end a shuttle-box a^{10}, forming an extension of the lay, and moves with it. The shuttle-box a^{11} at the opposite end of the lay has mechanism for moving it independently from the lay, so that it may not interfere with the wire mechanism. The shuttle-box a^{11} is carried by sword-arms a^{12}, mounted on the shaft a^5. The shaft a^9 at the wire-mechanism side of the loom carries a disk a^{13}, formed on its face with a radial slot having a slide a^{15}, which is arranged in said slot and held there in any desired position by bolts a^{16}. A bell-crank lever a^{17} is loosely mounted on the shaft a^{18}. A pinion a^{19} on the shaft a^9 meshes with a spur-gear a^{20} on the shaft a^{18}, by which motion is imparted to the latter. One arm of the bell-crank lever a^{17} is connected by a link a^{21} to the adjustable slide a^{15}. The other arm of said lever is formed with a tangential groove a^{22}, in which is arranged a slide adjustably secured in any desired position by a bolt a^{24}. (See Figs. 2, 3, and 4.) A link a^{25} connects this block to the movable shuttle-box a^{11}. The movement of translation of the shuttle-box a^{11} by means of this mechanism just described can be regulated at will and is less than that of the lay a^7. The parts are so timed when the lay is in its rear position that the shuttle-box a^{11} is in alinement therewith, so that the shuttle can be received in the box and discharged as if the box were integral with the lay. When, however, the lay advances to beat up the weft, the shuttle-box a^{11} having a small movement of translation does not advance far enough to interfere with the wire mechanism. There will be the usual picker-staff y, &c., for each shuttle-box, the staff for the movable shuttle-box being removed to prevent confusion.

b represents the wire-trough into which the wires b' are withdrawn after the knife has cut the warp to form the pile and from which the wires are pushed in front of the last weft to be again woven into the fabric. This trough has a groove b^2, in which the wires lie, and is pivoted at its outer end to a bracket b^3. (See Fig. 3.)

b^4 represents a lever pivoted at its lower end to the framework (see Fig. 2) and having

its free end arranged loosely in a slot b^5 in the free end of the trough.

b^6 represents a link connected at one end to the lever b^4 and at its other end to the vertical arm of a bell-crank lever b^7. The end of the vertical arm of the lever b^7 is pivoted to the framework, while the horizontal arm b^8 of said lever is pulled down by a spring b^9 into engagement with a cam-disk b^{10}, fast on the shaft a^{18}. The arrangement of the parts is such that the cam lifts the horizontal arm of the bell-crank and holds it raised to throw the free end of the trough forward into the position shown in Fig. 2 and hold it in said position while a wire is being withdrawn from the wire-magazine b^{11}. When the wire-carriage begins its inward movement to insert said wire in front of the last weft, the shape of the cam permits the spring to depress the horizontal arm of the bell-crank lever to move the free end of the trough backward in a position to permit the insertion of the wire, as shown in Fig. 4. As soon as the wire is inserted the cam operates the lever to throw the free end of the trough forward for the withdrawal of another wire. (See Figs. 2 and 3.)

c represents a wire carriage or slide arranged to slide on a horizontal bar c'. A lever c^2, pivoted at its lower end on a bolt c^3, arranged in a slot c^4 in the framework, is connected at its other end by a link c^5 to the slide c. By means of the slot c^4 the pivoted end of the lever may be adjusted as desired. The lever c^2 is formed with a slot c^6, in which is arranged a roller c^7, carried by a slide c^8, adjustably secured by a bolt c^9 to a crank c^{10}, fast on a counter-shaft c^{11}. An eccentric gear c^{12}, fast on said shaft, meshes with and is driven by a similar gear c^{13}, fast on the shaft a^{18}. The parts are so arranged that the movements of the slide are timed as in other looms of this class. The differential speed of the counter-shaft c^{11} is secured by the form of the gears c^{12} c^{13}. The throw of the lever c^2 may be regulated by means of the adjustable slide c^8.

An extension c^{14} of the slide c extends over the wire-trough b, (see Figs. 2, 3, and 4,) and upon its upper side is pivoted a lever c^{15}. The forward end of this lever is formed with a hook c^{16}, arranged to engage the apertures in the wire-heads to withdraw the wires from the wire-magazine. A spring c^{17} (see Fig. 2) is arranged to yieldingly throw the hook c^{16} into engagement with the heads of the wires. A pin c^{18} on the extension limits the inward movement of the hook. A bell-crank lever c^{19}, (see Figs. 3 and 4,) pivoted at its angle to the outer face of the slide c, beneath the bar c', has the end of its horizontal arm arranged over the end of the outer arm of the lever c^{15} and formed with a notch or part x, arranged to engage the outer arm of the lever c^{15} when the latter is moved inward to throw the hook back out of the path of the wires against the tension of the spring. When it is desired to have the hook engage the wires, the operator moves the vertical arm x' of the lever c^{19} (see Fig. 3) toward the front of the loom, thereby releasing the lever c^{15} from the horizontal arm of the lever c^{19}, thus permitting the spring c^{17} to throw the hook c^{16} into the path of the wires in the magazine.

c^{21} represents a latch secured to the extension c^{14} by a leaf-spring c^{22}. This latch is constructed and arranged to engage the notches r^2 on the tops of the heads of the wires to steady the latter and is of such a length that it will engage the heads of the wires in all of their lateral positions both when being inserted and withdrawn. (See Figs. 2 and 11.) The hook withdraws the wires into the trough, the latter holding and guiding the same, while the inner edge of the extension c^{14} pushes or inserts the wires into the warp.

f represents a bracket secured to the side frame of the loom and formed with a horizontal flange f'. A like bracket f^2 is secured to the opposite side of the loom, adjacent the wire magazine, and formed with a like flange f^3. Each of said flanges is formed with a slot f^4, arranged substantially parallel with each other and with the warp.

f^5 represents a knife-carriage bar or slide, supported at its ends upon the flanges f' f^3. Bolts f^6 are arranged in the slots f^4, passing through the ends of the bar f^5 and secured by wing-nuts f^7. By this arrangement the bar and the knife-carriage and knife hereinafter described have a slight play or movement in a line substantially parallel with the line of the warp. The bar can move or yield as a whole, or either end can move while the other end remains stationary, acting as a pivot.

f^8 represents a leaf-spring secured to the breastplate or framework of the loom and having its free end arranged to engage the bar to hold the latter yieldingly toward its normal or rearward position and keep the feeler y', that is attached to the bar f^5, yieldingly in engagement with the front wire near the wings, so that the knife-carriage is automatically adjusted into the position occupied by the wire and the knife automatically located in the proper position over the front wire on the cutting of the warp. (See Figs. 2, 5, and 7.) This feeler forms an important part of the cutting mechanism, since without any attention on the part of the operator the knife is automatically brought in proper contact with the warp on the front wire whether the front wire is in its normal position or has been diverted from its normal position by any means.

f^{11} represents a leaf-spring or a piece of spring-steel, one end of which is secured to the frame of the loom, while its other end is inserted in a hole or depression in the outer end of the bar. (See Figs. 1, 2, and 5.) The spring f^{11} is arranged to hold the outer end of the bar about midway of the slot in the flange f'. By having the wire-carriage bar arranged as described the carriage and knife can automatically locate and follow the plane occu-

pied by the particular wire on which the warp is being cut, the wire acting to guide the knife, as hereinafter described.

The knife-carriage h is formed of castings constructed to loosely fit about the bar f^5 and secured together by bolts h'. A shank h^2 is mounted in the carriage on one side of the bar f^5 and arranged to reciprocate vertically in said carriage. The upper end of the shank is formed with a head h^3 to prevent the shank dropping out of the carriage. (See Figs. 5 and 8.) An inwardly-projecting stud h^4 on the shank is arranged to engage the inclined walls of notches h^5 on the bar at either end of the limit of movement of the carriage to elevate or depress the shank, the latter being held in its elevated or depressed position by the engagement of the stud h^4 with the unnotched edge of the bar f^5. A rod h^6 is mounted in the carriage on the opposite side of the bar f^5 from the shank and is arranged to be reciprocated vertically in the carriage by a stud h^7, similar to the stud h^4, engaging the inclined walls of notches h^8 in the bar. The rod h^6 is reciprocated and held in its elevated or depressed position in the same manner as the shank h^2. The studs h^4 h^7 (see Figs. 6 and 8) are beveled or cam-shaped, as shown, and adapted, as stated above, to engage the inclined walls of the notches h^8 h^5 of the bar. Both the shank h^2 and the rod h^6 are spring-pressed. By this construction and arrangement it follows as the carriage is reciprocated that the rod h^6 and the bar h^2 will be automatically reciprocated in a vertical direction at each end of the stroke of the carriage, depressing the knife on the stroke of the carriage when the warp is cut and raising the knife clear of the wires and warp on the return stroke of the carriage. The rod h^6 is formed with a head h^9 to prevent the rod from slipping from the carriage. A leaf-spring h^{10}, secured to the head h^9, has its free end arranged to engage the head h^3 of the shank h^2 to force the shank down when its stud is on the upper surface of the bar f^5 and comes over a notch. A second spring h^{11} is secured to the head h^9 and has its free end arranged to be engaged by the spring h^{10} on the head of the shank h^2 when the latter is elevated. The spring h^{11} is stronger than the spring h^{10} and has less play. By this means I keep a continuous downward yielding pressure on the shank h^2, which pressure is made the greatest when the shank is in its elevated position and in position to be depressed. If only one spring were used, it would have to be so stiff that it would soon break by reason of the rapidity and amplitude of its vibrations.

h^{12} represents a block secured by a screw h^{13} to the lower end of the shank h^2. To the inner end of this block is secured a knife h^{14}, and to the outer end is secured a guide h^{15}. (See Figs. 6 and 8.) The guide and knife are arranged in different planes, whose distance apart is approximately equal to half the thickness of the wire plus the thickness of the warp-threads, the guide engaging the warp on the front side of the wire while the knife cuts the warp on the top of the wire, the cutting edge of the knife running in a groove y^2 (see Fig. 10) in the middle of the wire. (See Figs. 7 and 9.)

h^{17} represents a rod connected at one end to a bolt h^{18}, projecting from the knife-carriage. The free end of this rod is formed with a depression y^3, arranged to engage a stud y^4 on the wire-carriage, whereby the knife-carriage and wire-carriage are moved in unison. As the wire-carriage advances to insert a wire the knife-carriage is moved to cut the warp from the front wire. As the hook catches said wire and the wire-carriage retreats to draw the same into the trough the knife-carriage is brought back in position to cut the warp from another wire. As the knife-carriage is drawn to the right in Figs. 1 and 5 the knife is raised clear from the warp by means of the lugs. (See Fig. 8.) As the knife-carriage reaches the right-hand end of the bar f^5 the shank and knife are forced down by the springs to bring the knife into engagement with the warp. As the knife-carriage is then immediately forced to the left in said figures the lugs engage the under side of the bar, (see Fig. 6,) and the knife is maintained in engagement with the warp to cut the latter. Wings y^5 on each side of the wire, near its head and located below the inner notch h^5 when the wires are in the warp and in connection with the feeler, serve to guide the knife over the groove y^2 on the wire, while the yielding bar f^5 permits the knife to follow the wire accurately, even if the wire is out of the normal position. The knife-carriage requires less movement than the wire-carriage, and for that reason the necessary dwell of the knife-carriage is accomplished by having the walls of the notch y^3 in the rod h^{17} a distance apart equal to the difference between the stroke of the knife or wire carriages and amount of dwell of the knife-carriage at the limit of the movement of the wire-carriage, as shown in Fig. 1.

A cam h^{20} is arranged to be turned to lift and hold lifted the rod h^{17} clear from the stud when desired, so that the knife-carriage will not be affected by the movement of the wire-carriage. In some forms of fabric the knife will remain inoperative during a certain number of beats of the lay in order to weave a certain pattern, or it may be desired to stop the action of the knife for other purposes. The cam h^{20} may be connected to and operated by a pattern-chain (not shown) in any well-known way.

It will be seen that the knife severs the warp on the top of the wire in an even uniform manner and that the knife can automatically adapt itself to and follow the wire. Any suitable sharpening device may be used for sharpening the knife, preferably at the limit of the outer movement of the knife-carriage. A spring h^{21} (see Fig. 1) is arranged to engage

a lug h^{22} (see Figs. 5, 6, and 8) on the block h^{12}, fast to the shank h^2, to yieldingly raise the block, so that on the reverse movement of the knife-carriage the lug h^7 will certainly engage the inclined sides of the notch h^8 and the lug h^4 will engage the inclined sides of the notch h^5 and be carried on the top of the bar. (See Figs. 1, 5, 6, and 8.)

It is evident that some of the features of the present invention may be included in other types of pile-fabric looms.

Having thus explained the nature of my invention and described a way of constructing and using the same, though without attempting to set forth all of the ways in which it may be made or all the modes of its use, what I claim, and desire to secure by Letters Patent, is—

1. In a pile-fabric loom, a lay, a shuttle-box movable independently of the lay, a shaft connected to said lay, a disk on said shaft, a bell-crank, connections between one arm of said bell-crank and said disk, and connections between the other arm of said bell-crank and said shuttle-box.

2. In a pile-fabric loom, a wire-carriage, and means for operating the same, and a warp-cutting mechanism comprising a movable bar, a carriage adapted to slide thereon, a reciprocating knife-shank mounted in said carriage and formed with a stud to engage notches in the bar to reciprocate the shank transversely of the bar and connections between said carriage and the wire-carriage.

3. In a loom, a wire-carriage and means for operating the same, and a warp-cutting device comprising a movable spring-pressed bar having notches, a knife-carriage arranged to slide thereon, a knife-shank mounted in said carriage formed with a stud to engage inclined walls of the notches in the bar, a spring-rod mounted in said carriage formed with a stud to engage the inclined walls of other notches in said bar, springs carried by said rod to engage the knife-shank, a knife carried by the knife-shank, a wire-guide carried by said shank, and adapted to engage the wire, and a feeler-lever carried by the bar adapted to be engaged by a wire, to adjust the position of the bar and the parts carried thereby.

4. A pile-fabric loom comprising a wire-carriage, means for operating said carriage, a knife-carriage, means for reciprocating said knife-carriage, a movable knife on said carriage, a guide-bar, a projection on said knife adapted to engage said bar, and means for causing said projection to slide in one direction on top of said bar and in the other direction under said bar.

5. A pile-fabric loom comprising a wire-carriage, means for operating said carriage, a knife-carriage, means for reciprocating said knife-carriage, a knife on said carriage and a spring-held guide-bar for said carriage having means moving said knife toward and from the wire.

6. In a pile-fabric loom, a plurality of independent wires, a wire-carriage, a slide bar or guide, a knife, a knife-carriage slidable on said bar or guide, provisions on said slide-bar and knife-carriage for automatically moving said knife into and out of operative position, and connections between said carriages whereby one is operated by the other.

7. In a pile-fabric loom, a plurality of independent wires, a guide-bar spring-held and loosely mounted at its ends, a carriage movable longitudinally of said bar, a movable knife carried by said carriage, and provisions on said bar and knife for moving said knife into and out of operative position.

8. In a pile-fabric loom, a plurality of wires, a knife-carriage movable longitudinally of said wires, a shank slidably supported by said carriage, and having at its lower end means for attaching the knife thereto, and a guiding-shoe on said shank to engage the wires.

9. In a pile-fabric loom, a plurality of independent wires, a wire-carriage, a knife, a knife-carriage, means for moving one of said carriages, and loose connections between said carriages whereby one is moved by the other with a predetermined lost motion at the beginning of each movement.

10. In a pile-fabric loom, a plurality of wires, a knife-carriage, a sliding shank supported by said carriage and carrying a knife at one end, and one or more springs bearing upon the other end of said shank.

11. In a pile-fabric loom, a plurality of wires, a knife-carriage, a knife supported by said carriage, means for moving said knife toward and from the wire, a movable rod, and springs carried by said rod and exerting their pressure upon said knife.

12. In a pile-fabric loom, a plurality of wires, a knife, a knife-carriage, a spring for moving said knife toward said wires, means for moving said knife away from said wires, and a guide for said carriage having means for maintaining said knife in either of said positions.

In testimony whereof I have signed my name to this specification, in the presence of two subscribing witnesses, this 19th day of October, A. D. 1896.

GEORGE POOLE.

Witnesses:
A. D. HARRISON,
C. F. BROWN.