

No. 790,126.

PATENTED MAY 16, 1905.

H. HARDWICK.
JACQUARD CARD PUNCHING MACHINE.

APPLICATION FILED NOV. 17, 1903.

5 SHEETS—SHEET 1.

Fig. 1.

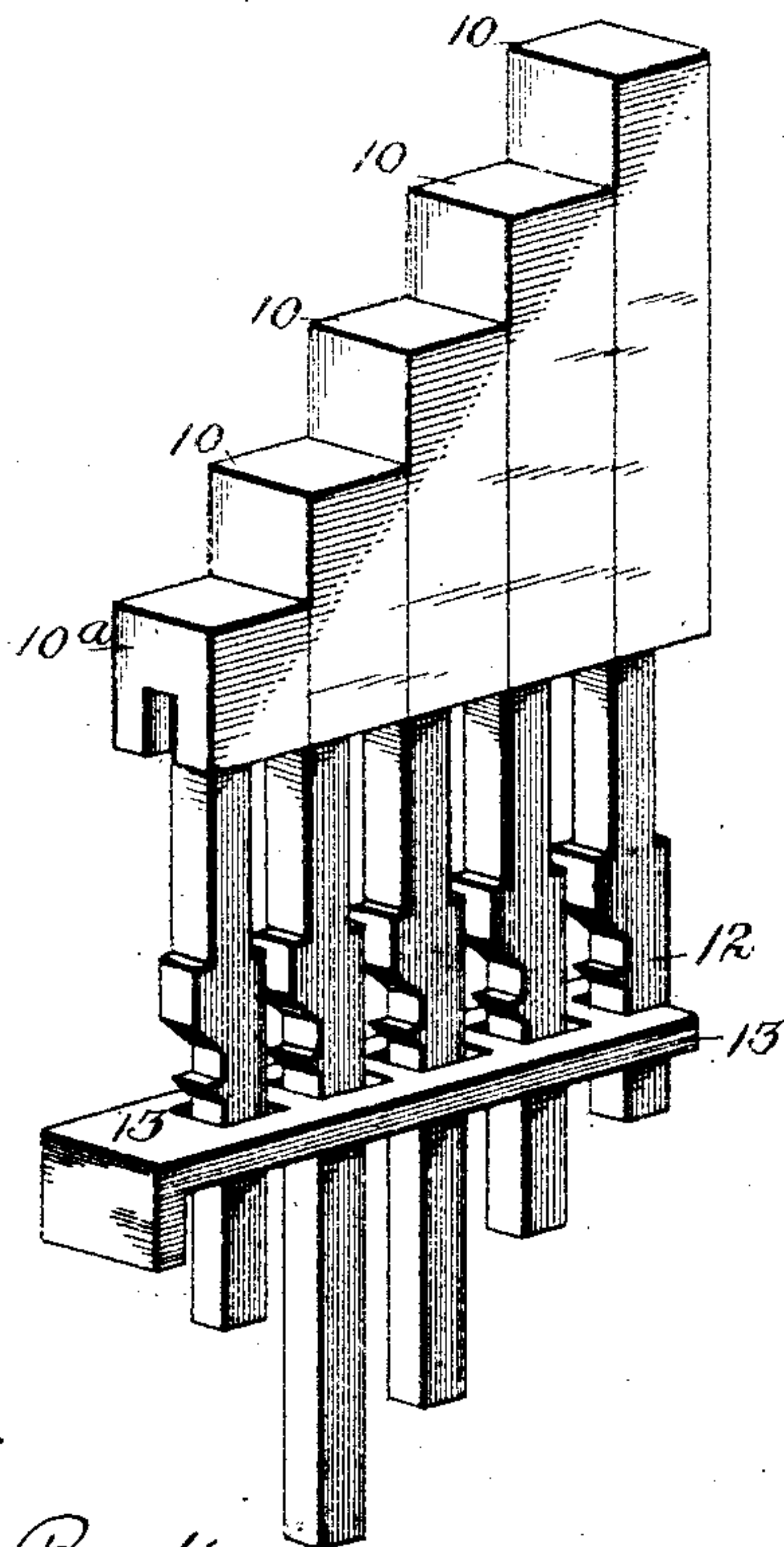
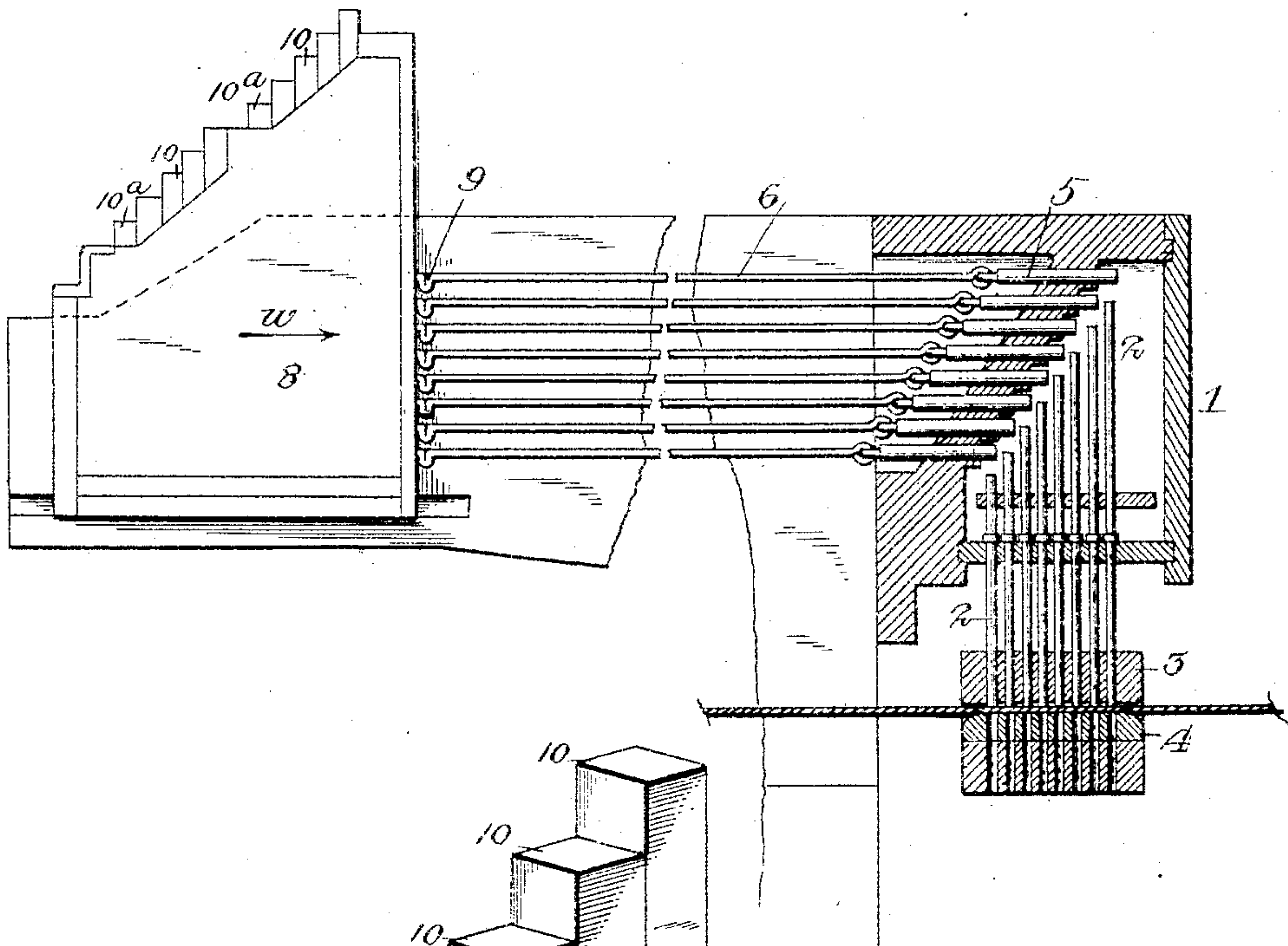


Fig. 4.

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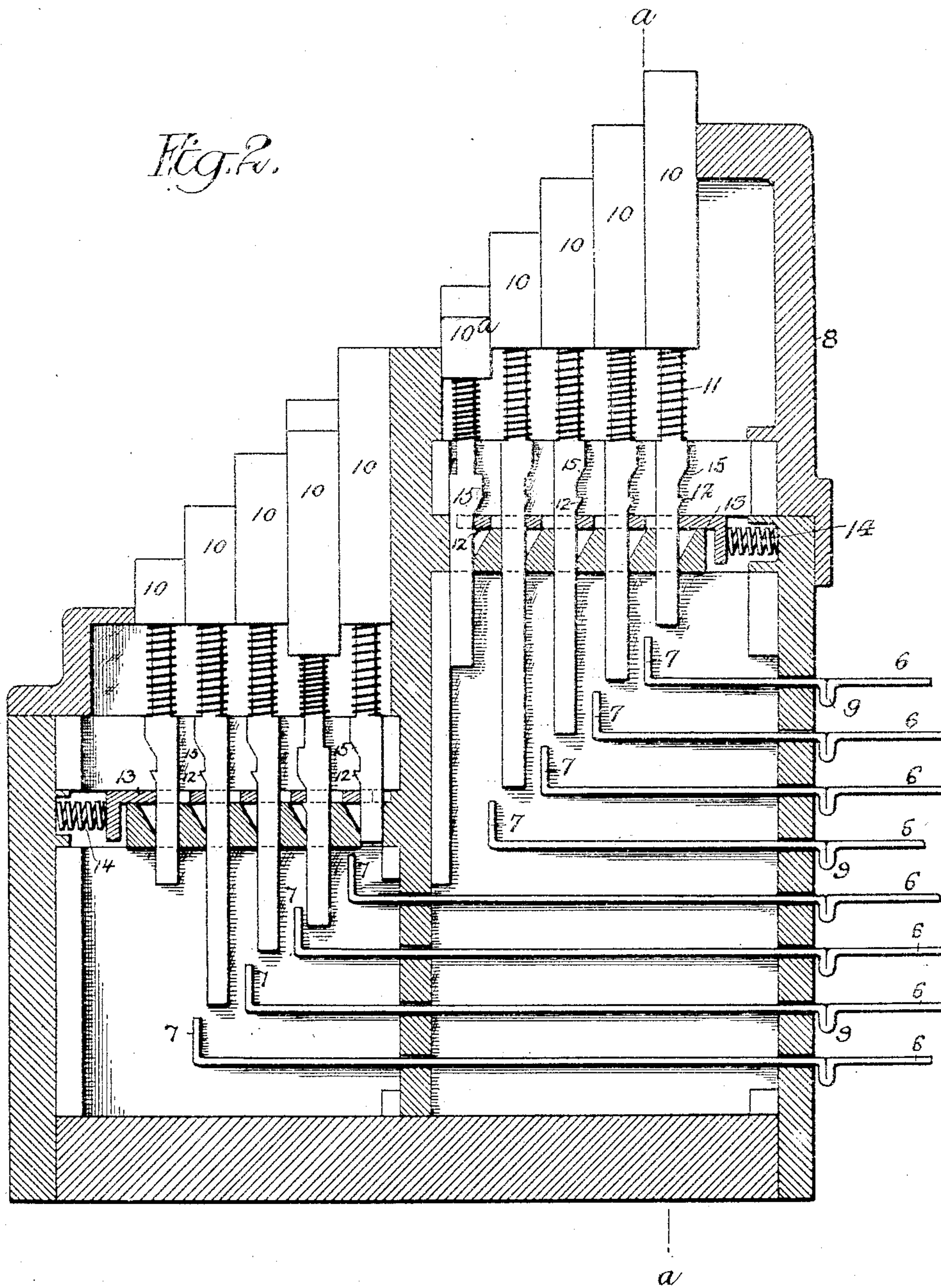
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5 SHEETS—SHEET 2.



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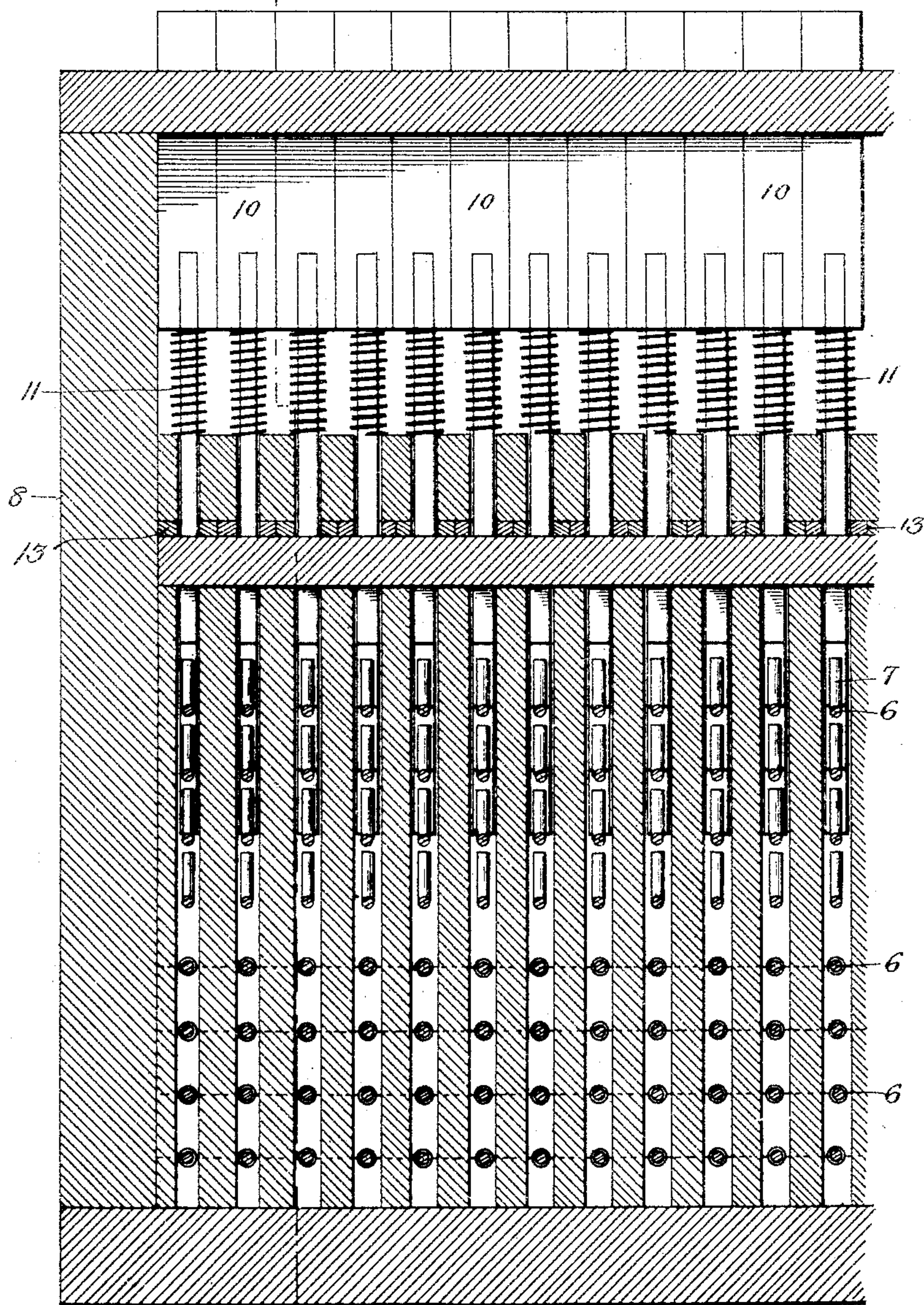
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5 SHEETS—SHEET 3.

Fig. 3.



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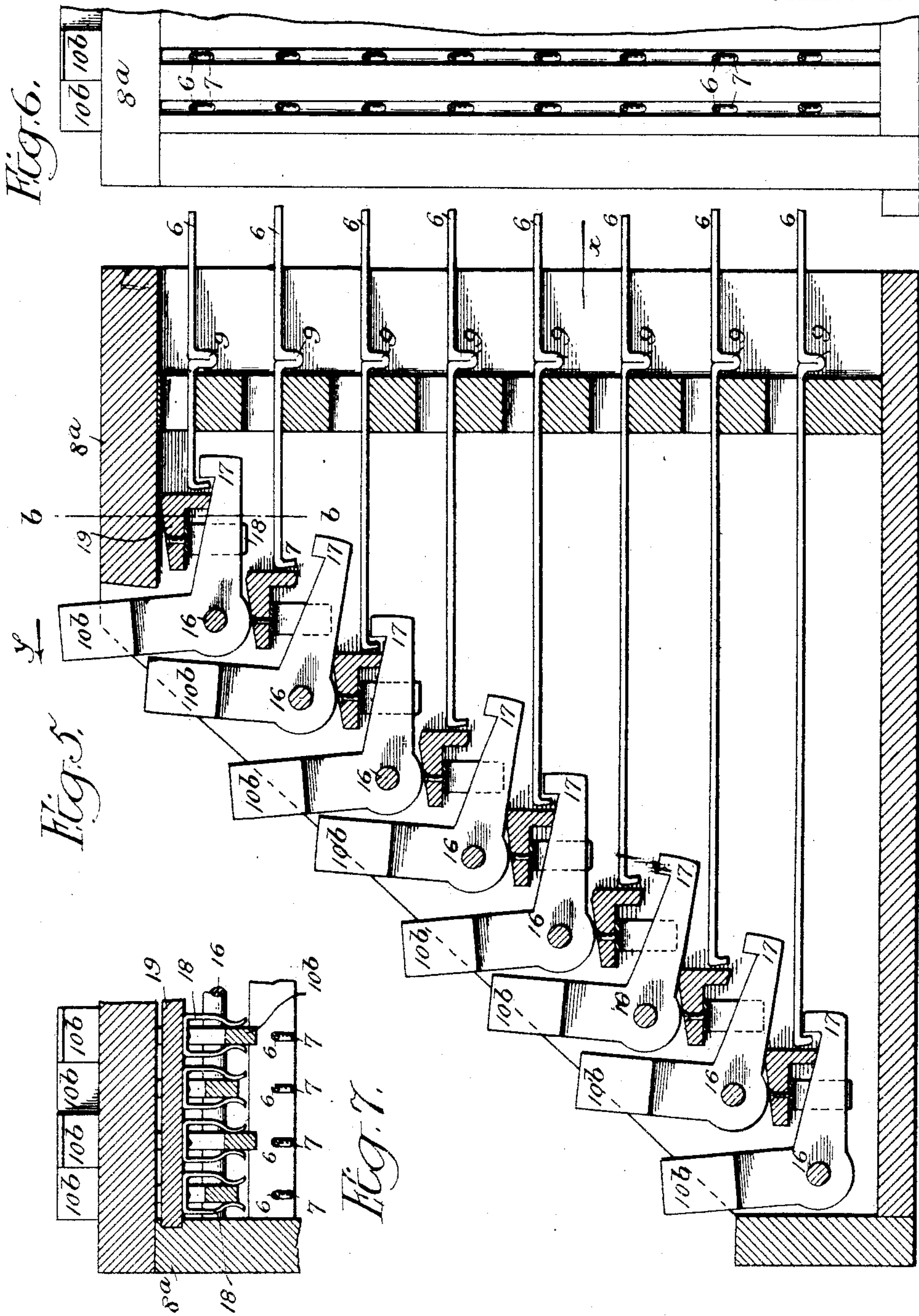
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5 SHEETS—SHEET 5.

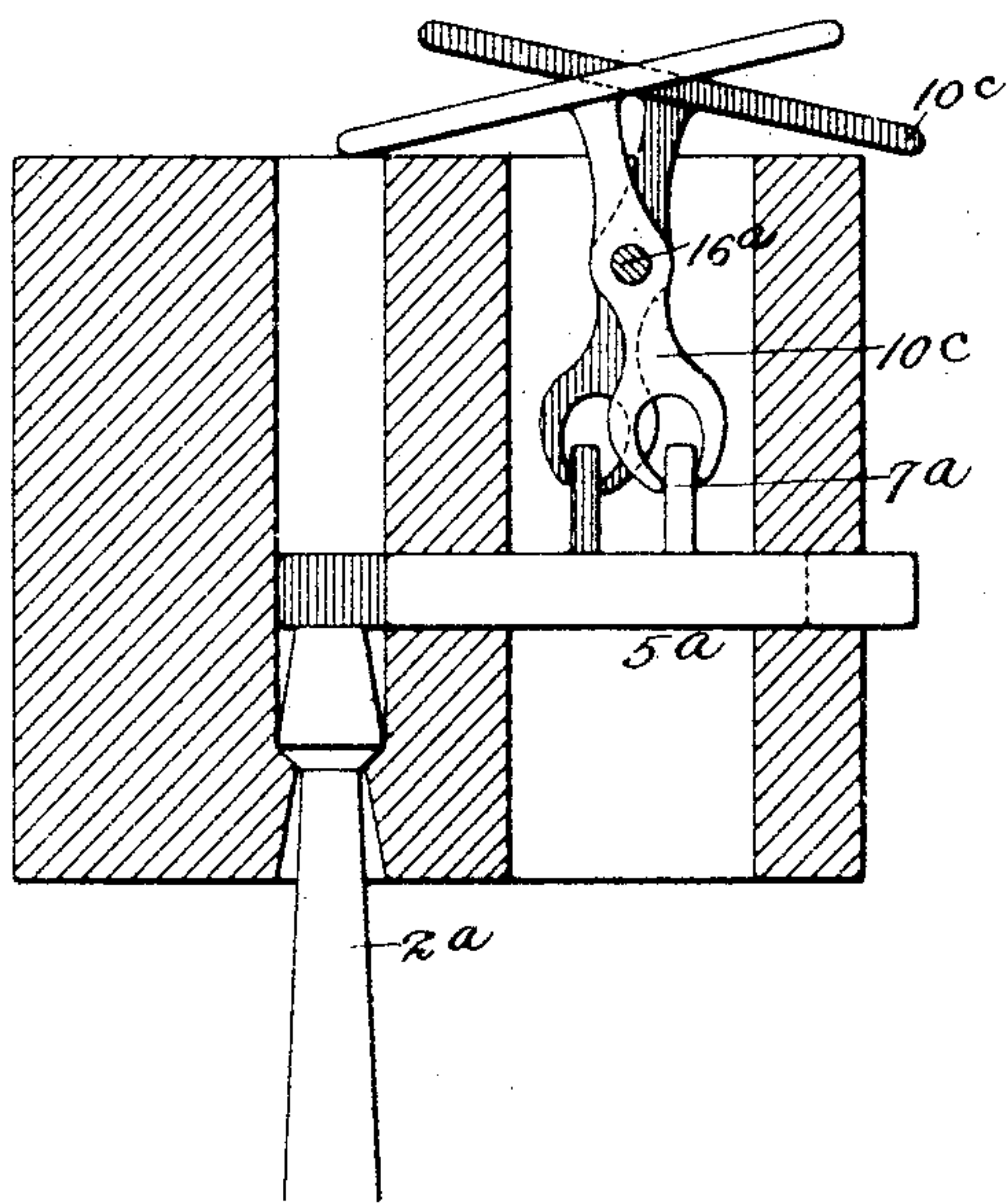


Fig. 8.

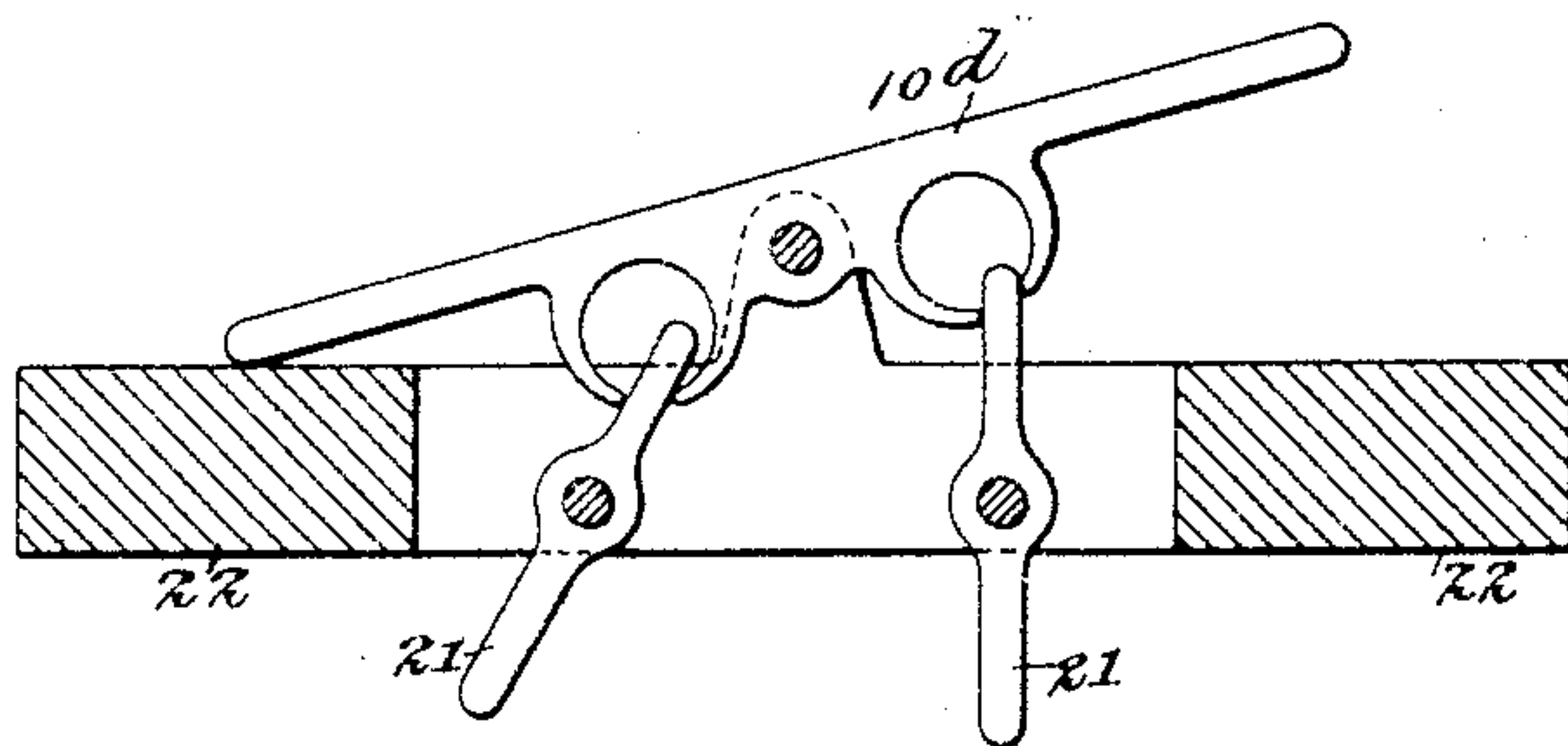


Fig. 9.

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UNITED STATES PATENT OFFICE.

HARRY HARDWICK, OF PHILADELPHIA, PENNSYLVANIA, ASSIGNOR TO
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JACQUARD-CARD-PUNCHING MACHINE.

SPECIFICATION forming part of Letters Patent No. 790,126, dated May 16, 1905.

Application filed November 17, 1903. Serial No. 181,527.

To all whom it may concern:

Be it known that I, HARRY HARDWICK, a citizen of the United States, residing in Philadelphia, Pennsylvania, have invented certain Improvements in Jacquard-Card-Punching Machines, of which the following is a specification.

One object of my invention is to adopt, in that class of machines in which an entire card is punched at one operation, the principle of controlling the punches by means of keys, as in single-row machines, or, as they are commonly termed, "piano" punching-machines, a further object being to retain the keys in either class of machines in either of their positions of adjustment, whereby in punching a series of successive cards or a series of successive rows in the same card only those keys need be manipulated which represent a change from punched to blank or from blank to punched.

In the accompanying drawings, Figure 1 is a view, partly in section and partly in side elevation, of sufficient of a machine for punching a complete card to illustrate my present invention. Fig. 2 is an enlarged section of that portion of the machine to which my invention particularly relates. Fig. 3 is a transverse section on the line *a a*, Fig. 2. Fig. 4 is a perspective view of part of the machine. Fig. 5 is a view similar to Fig. 2, but illustrating another form of machine embodying my invention. Fig. 6 is an end view of Fig. 5 looking in the direction of the arrow *y*. Fig. 7 is a transverse section on the line *b b*, Fig. 5. Fig. 8 is a vertical sectional view illustrating the application of my invention to a machine for punching a single row of openings at a time in the card, and Fig. 9 is a similar view of another form of such machine embodying my invention.

Referring in the first instance to Figs. 1, 2, 3, and 4 of the drawings, 1 represents the vertically-sliding head of a card-punching machine in which are vertically guided as many longitudinal and transverse rows of punches 2 as there are longitudinal and transverse rows of holes to be punched in a complete card,

these punches being also guided in a bar 3 and cooperating with the die 4 of the machine, so as to properly punch a card inserted between said bar 3 and the die 4, as shown in Fig. 1. Each punch 2 is under the control of a laterally-sliding bolt 5, mounted in the sliding head 1 of the machine, so that when a bolt corresponding to either punch occupies the projected position (shown in Fig. 1) said bolt will on the descent of the sliding head 1 act upon the punch so as to cause it to form an opening in the card inserted between the bar 3 and die 4; but if a bolt is retracted the corresponding punch will on the descent of the sliding head 1 be unlocked from said head and will be free to rise therein, and hence will not punch the card. The machine may also have punches for forming the lacing-holes and cylinder-peg openings in the card, as usual; but these have not been shown, as my invention has no reference thereto.

One feature of my invention consists in the employment of key mechanism whereby the bolts 5 are controlled, and thus caused to lock or release the punches 2 and determine the punching of the card in accordance with the line of the pattern represented by said card. In order to accomplish this result, each of the locking-bolts 5 has pivoted to it one end of a wire 6, whose opposite end is provided with an upwardly-projected hook 7, as shown in Fig. 2, these hooked ends of the wires extending into the laterally-sliding head 8, which can be moved in guides on the fixed frame in any available manner and which carries the keys whereby the control of the bolts 5 is effected. Each wire has a projecting lug 9, adapted to contact with the back of the sliding head 8 when the latter moves in the direction of the arrow *w*, Fig. 1, so as to restore all of the locking-bolts to their normal locking position. (Shown in Fig. 1.) The sliding head 8 carries a series of vertically-guided keys 10, each mounted upon a coiled spring 11 and each having a downwardly-projecting stem with lug or shoulder 12 and cam 15, the lower end of the stem when the key is depressed being adapted to engage the up-

turned hook 7 of its corresponding wire 6 and being retained in the depressed position by engagement of its lug or shoulder 12 with a sliding bolt 13, which is acted upon by a coiled spring 14, whereby it is normally held in position to engage the lug of the depressed key. A key 10 is therefore depressed for each point on the card which is to be left blank, the depressed keys engaging with the hooks of the wire 6, so that on the movement of the head 8 in a direction the reverse of that indicated by the arrow in Fig. 1 all of the locking-bolts 5 corresponding with such depressed keys will be retracted and the corresponding punches 15 will be rendered inoperative, the remaining punches being locked to the sliding head 1, so as to form the desired openings in the card.

My invention is applicable to machines for punching cards for any desired style of weaving in which a jacquard is employed; but for purposes of illustration I have selected a machine for punching cards for what is known as a "five-frame" Brussels, Wilton, or like carpet in which the pile-warp threads are in sets of five, one thread of each set or groups of sets being normally operative and each of the other four threads being controlled by a needle of the jacquard-machine. When a card is punched for each of these four needles, therefore, the normally operative thread is lifted; but if the card is a blank for any one of the four needles its corresponding thread is raised and the normally operative thread is rendered inoperative. The keys 10 are therefore arranged in sets of four each, combined with a dummy key 10^a, which represents the normally operative thread and does not engage with any one of the wires 6, but has the lug 12 and cam 15 similar to the keys 10. When any one of the keys is depressed, therefore, its lug 12 is engaged by the bolt 13, and the lower end of the key-stem is held in engagement with the hooked end of a wire 6 until another key 10 or the key 10^a is depressed, such action having the effect of releasing the previously-depressed key and permitting it to rise. If more than one of the keys of a set has been depressed, such series of keys can be released by depression of another key of the set, or by a further depression of either of the depressed keys the others can be released, such further depression of the key bringing its cam 15 into play and forcing back the locking-bolt 13, so as to free the lugs 12 of the remaining keys from control of such bolt. No change in the position of a key is required until a corresponding point on the card is to be changed from blank to punched or from punched to blank. Hence in punching the successive cards only those keys have to be manipulated which represent such changes.

In that embodiment of my invention shown in Figs. 5 to 7 the sliding head 8^a has rows of pivoted keys 10^b hung to transverse rods

16 on the head, each key being in the form of a bell-crank lever one arm of which carries the key-head, while the other arm is hooked, as at 17, for engagement with the hook 7 of a wire 6 when the head of the key has been drawn forwardly in the direction of the arrow *y*, Fig. 5, the key being retained in this position by engagement with a spring-yoke 18 or equivalent frictional retainer carried by a bar 19, rigidly mounted on the head 8^a. When once adjusted to engaging position, therefore, each key remains in position until removed therefrom by swinging it in a direction the reverse of that indicated by the arrow *y*.

So far as I am aware, no attempt has hitherto been made to apply the principle of key control to the punches of a machine for punching a complete card at one operation, and my invention in its broader aspect is therefore independent of mere matter of construction and arrangement of the keys or matters of minor mechanical detail, since these may be varied without sacrifice of the essential features of novelty upon which my invention is based.

Certain features of my invention can also be applied to that class of punching-machines which form only one row of openings at a time in the card.

The fact that in my machine a key remains in the position to which it has been adjusted until a change in the corresponding portion of the card is required constitutes an improvement upon the ordinary single-row machines in which all of the keys are restored by springs to normal position after each adjustment. In my machine, moreover, all of the keys are visible at all times, whereas in the ordinary machine the majority of the keys are hidden and are operated by the sense of touch and without aid from the sense of sight.

A simple application of my invention to a single-row punching-machine is that shown in Fig. 8, in which 2^a represents one of the rows of punches, and 5^a locking-bolts for said punches, each of these bolts having at the rear end a hook 7^a, which is engaged by a forked arm portion of one arm of the key 10^c, the latter being pivoted to the shaft 16^a and having two other arms at a right angle to the forked arm, so that pressure upon one of said latter arms will move the bolt 5^a into locking position, while pressure upon the other arm will move said bolt into unlocking position, the friction of the key upon its pivot-shaft 16^a or other frictional device being relied upon to keep the key in the position to which it has been adjusted.

In the construction shown in Fig. 9 the key 10^d has forked arms which engage the upper ends of swinging levers 21, whose lower ends are thereby moved into or out of position to engage the arms of a lever 10^c, which engages the hook of a bolt 5^a, as in Fig. 8.

The keys 10^d are mounted upon a fixed structure 22 above the vertically - reciprocating head of the punching-machine, and as a key 10^c rises with said head an arm of the key is brought into contact with one or the other of the levers 21, depending upon the adjustment of said levers by the key 10^d. In this machine, therefore, the readjustment of the keys 10^d can be effected during the operation of the punching mechanism—that is to say, while the keys 10^c are descending and again rising—and more time is afforded for effecting such readjustment of the keys than when the keys 10^c are themselves directly manipulated, as in the machine shown in Fig. 8. The use of the levers 21 relieves the keys 10^d of any strain which would otherwise be exerted upon them by the thrust of the keys 10^c. Hence there is no tendency for the said keys 10^d to be displaced from either position of adjustment.

Having thus described my invention, I claim and desire to secure by Letters Patent—

1. A jacquard-card-punching machine, having, in combination, a series of punches for simultaneously punching a number of rows of openings in a card, locking-bolts for said punches, keys for controlling said bolts, and a key-carrier independent of the carrier in which the punches are mounted, said key-carrier being movable in respect to the punch-carrier, substantially as specified.

2. A jacquard-card-punching machine, having, in combination, a series of punches, locking-bolts therefor, a movable carrier for said punches and locking-bolts, keys for controlling the locking-bolts, and a key-carrier independent of the punch-carrier and movable in a direction transverse to the direction of the movement of the latter, substantially as specified.

3. A jacquard-card-punching machine, having, in combination, a series of punches, locking-bolts therefor, a carrier for said punches and bolts, a series of keys movable into and out of connection with said locking-bolts, a key-carrier independent of the punch-carrier and means for retaining each of the keys in one of its positions of adjustment on said carrier, substantially as specified.

4. The combination, in a jacquard-card-punching machine, of a series of punches, locking-bolts therefor, a sliding head having keys whereby said locking-bolts can be connected to said head when the same is moved in one direction, and means whereby said head, on its return movement, restores said locking-bolts to normal position, substantially as specified.

5. The combination, in a jacquard-card-punching machine, of a series of punches, lock-

ing-bolts for said punches, hooked wires connected to said locking-bolts and a sliding head having keys for engaging the hooked ends of said wires, substantially as specified.

6. The combination, in a jacquard-card-punching machine, of a series of punches, locking-bolts for said punches, hooked wires connected to said locking-bolts and having projecting lugs thereon, and a sliding head having keys for engaging the hooked ends of said wires when the head is moved in one direction, said head also engaging the lugs on the wires when it is moved in the opposite direction, substantially as specified.

7. The combination, in a jacquard-card-punching machine, of a series of punches, locking-bolts for said punches, hooked wires pivoted to said locking-bolts, and a sliding head having keys for the hooked ends of said wires, substantially as specified.

8. The combination, in a jacquard-card-punching machine, of a series of punches, locking-bolts for said punches, and operating-keys mounted so as to be movable in either direction, said keys having heads free to be moved manually in both directions, substantially as specified.

9. The combination, in a jacquard-card-punching machine, of a series of punches, locking-bolts therefor, bolt-operating keys mounted so as to be movable in either direction, said keys having heads free to be moved manually in either direction and frictional retaining devices for said keys, substantially as specified.

10. The combination, in a jacquard-card-punching machine, of a series of punches so disposed as to simultaneously form a series of rows of openings in a card, locking-bolts for said punches, a series of keys mounted so as to be manually moved in either direction so as to engage with or be disengaged from said locking devices, and retainers engaging the keys and serving to hold them in adjusted position, substantially as specified.

11. The combination, in a jacquard-card-punching machine, of a series of punches so disposed as to simultaneously form a series of rows of openings in a card, locking devices for said punches, a series of keys mounted so as to be manually moved in either direction so as to engage with or be disengaged from said locking devices and frictional retainers engaging said keys and serving to hold them in adjusted position, substantially as specified.

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

HARRY HARDWICK.

Witnesses:

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