

No. 883,377.

PATENTED MAR. 31, 1908.

J. S. BANCROFT & M. C. INDAHL.
RECORD STRIP COMPOSING MACHINE.

APPLICATION FILED MAR. 29, 1904.

7 SHEETS—SHEET 1.

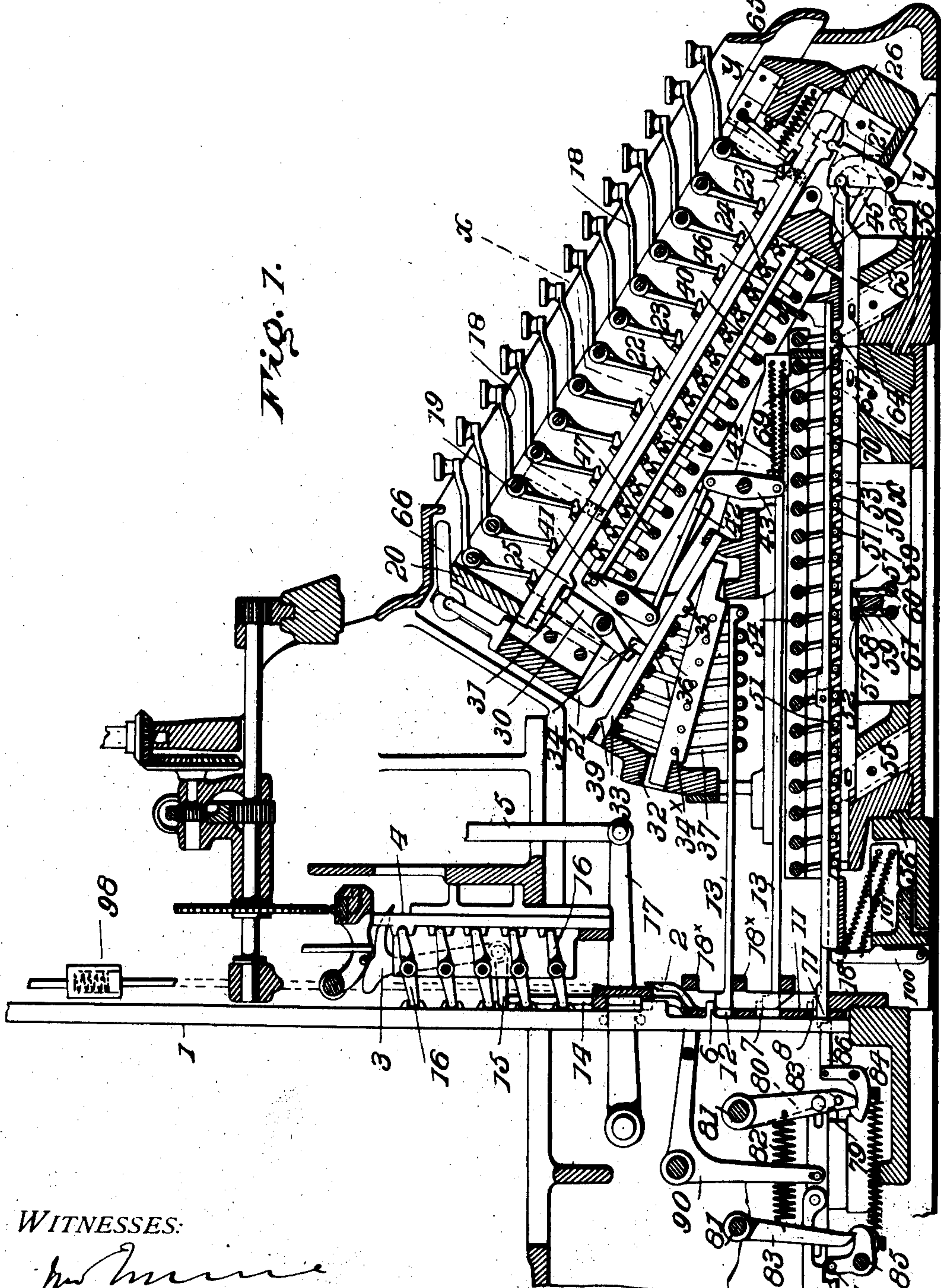


Fig. 1.

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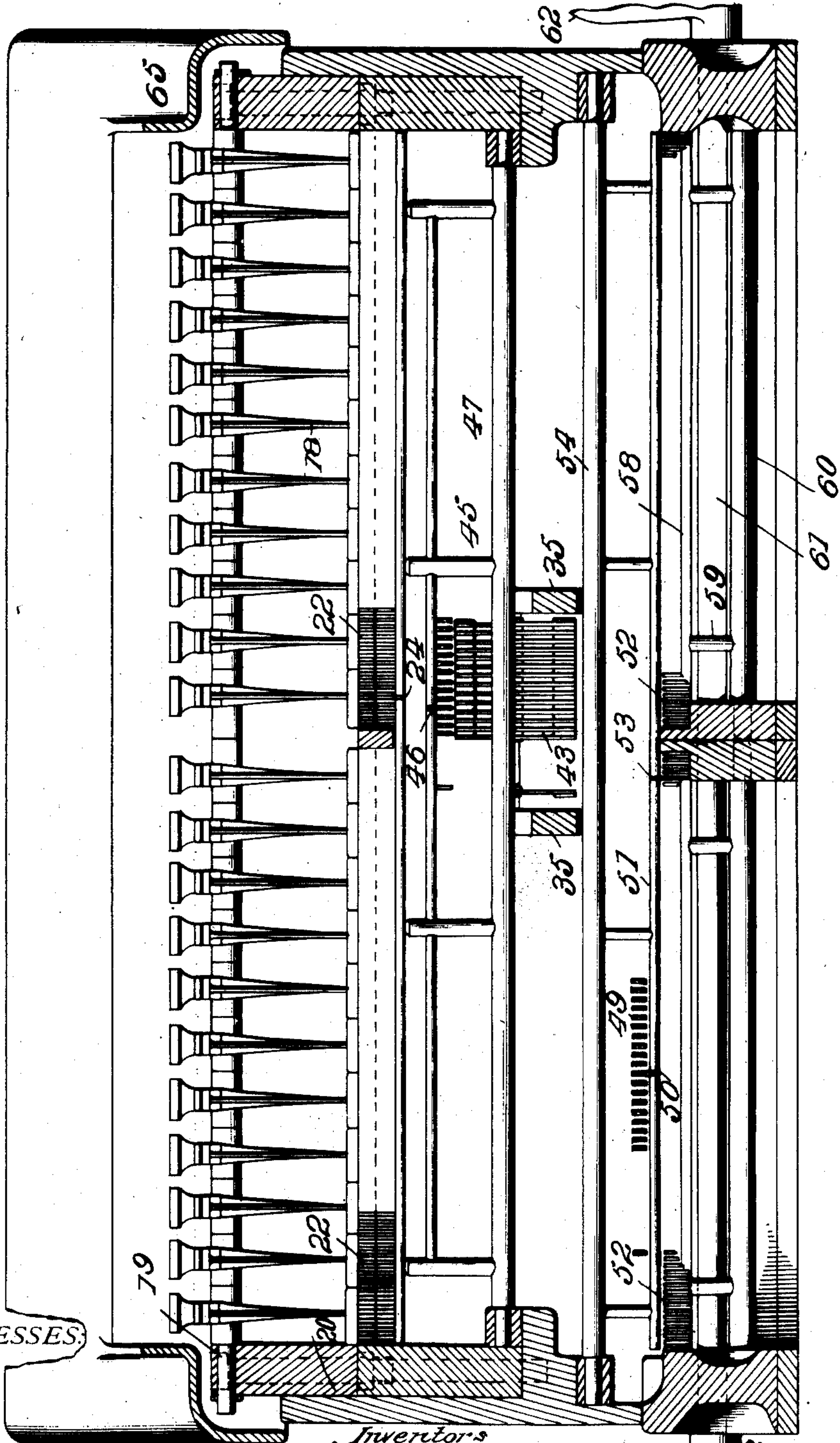
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7 SHEETS—SHEET 2.

Fig. 2.



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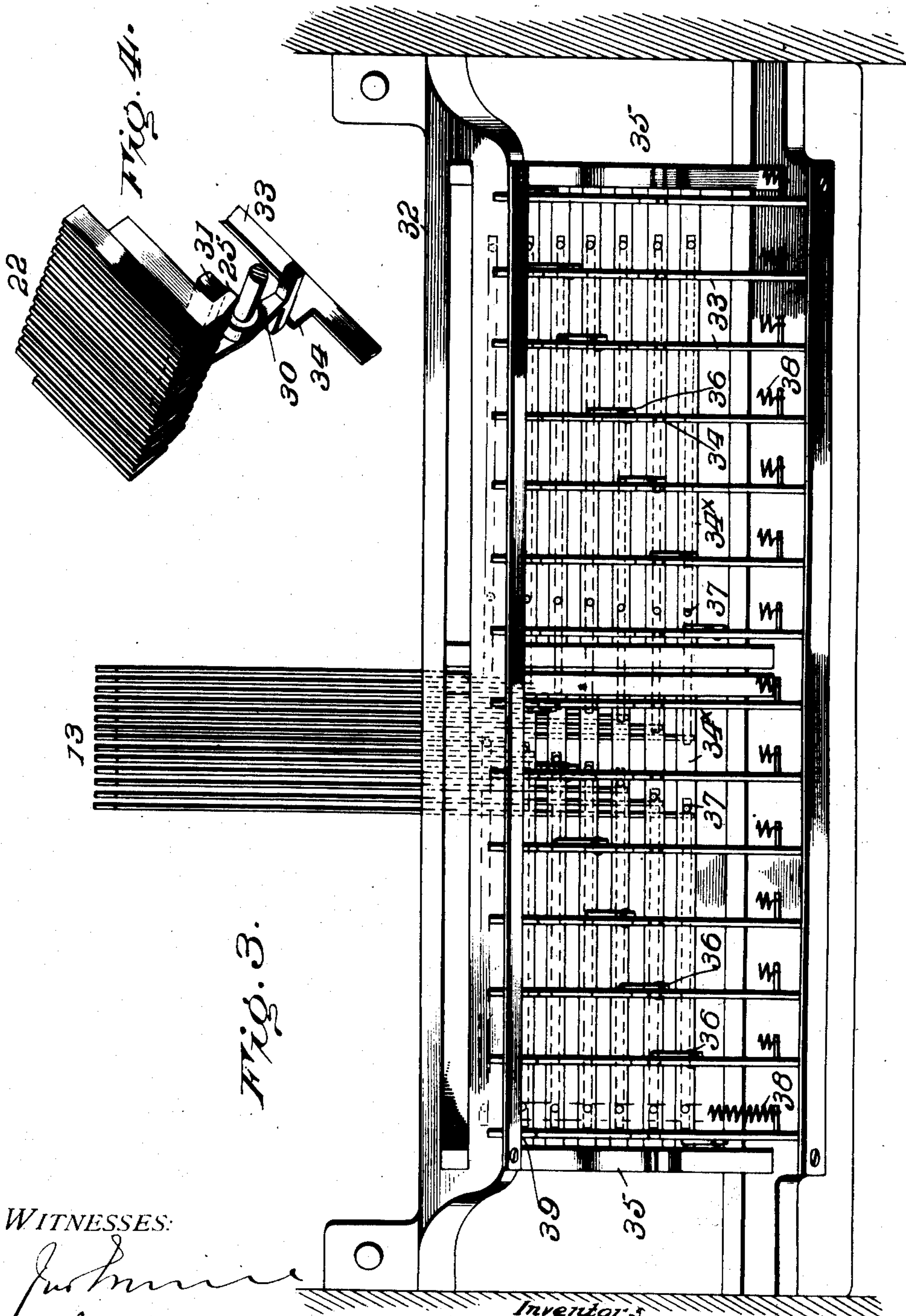
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7 SHEETS—SHEET 3.



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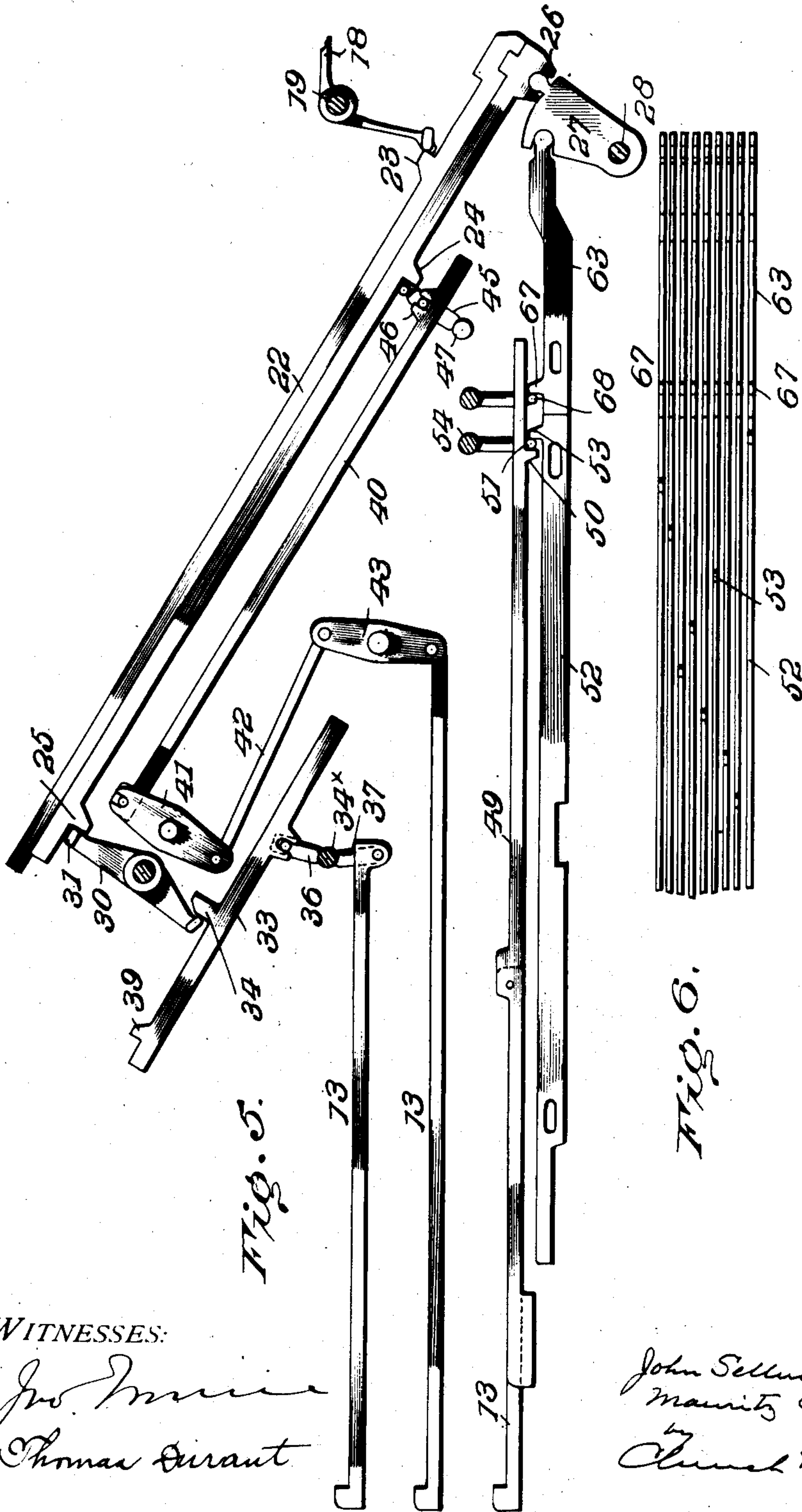
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7 SHEETS—SHEET 4.



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7 SHEETS—SHEET 5.

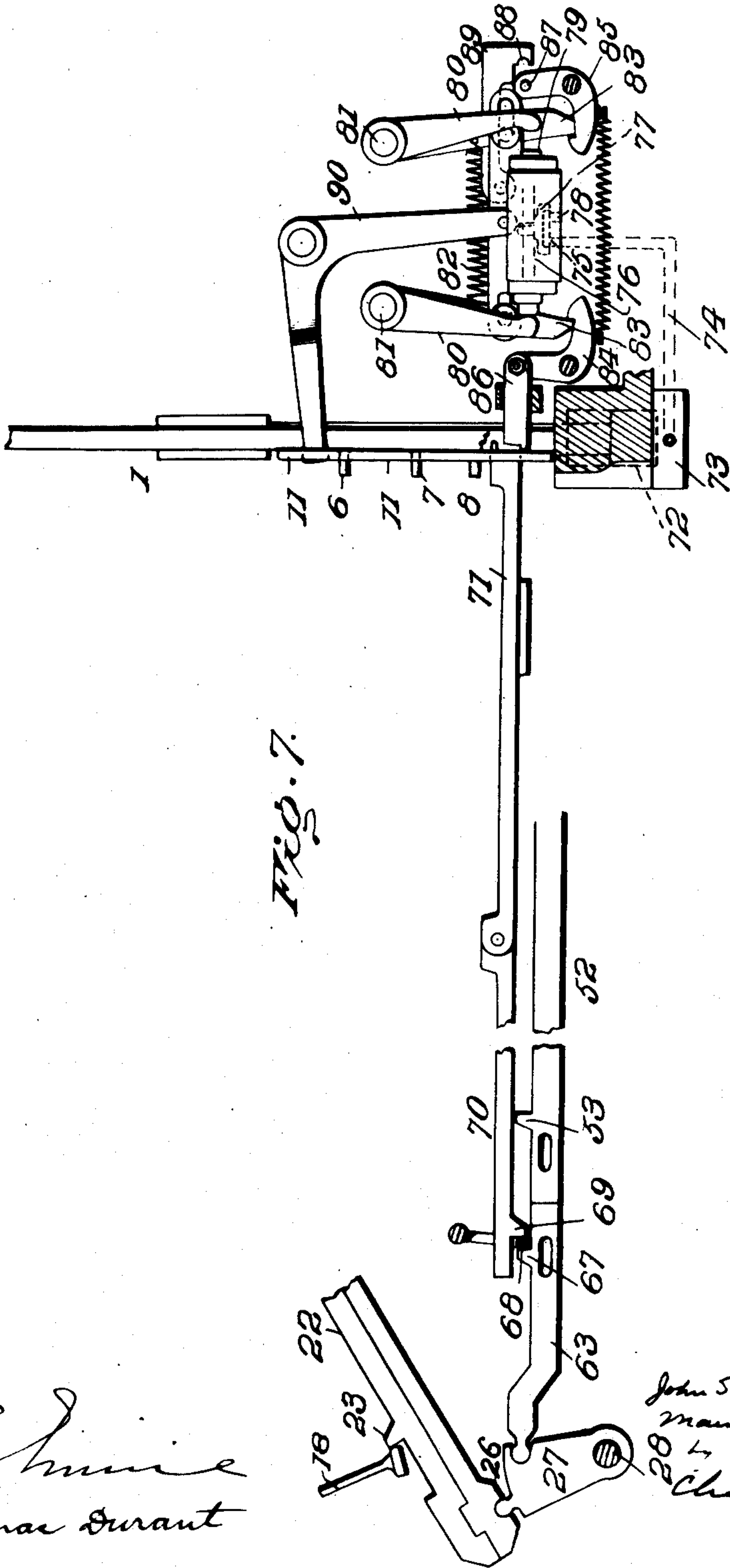


Fig. 7.

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7 SHEETS—SHEET 6.

Fig. 9

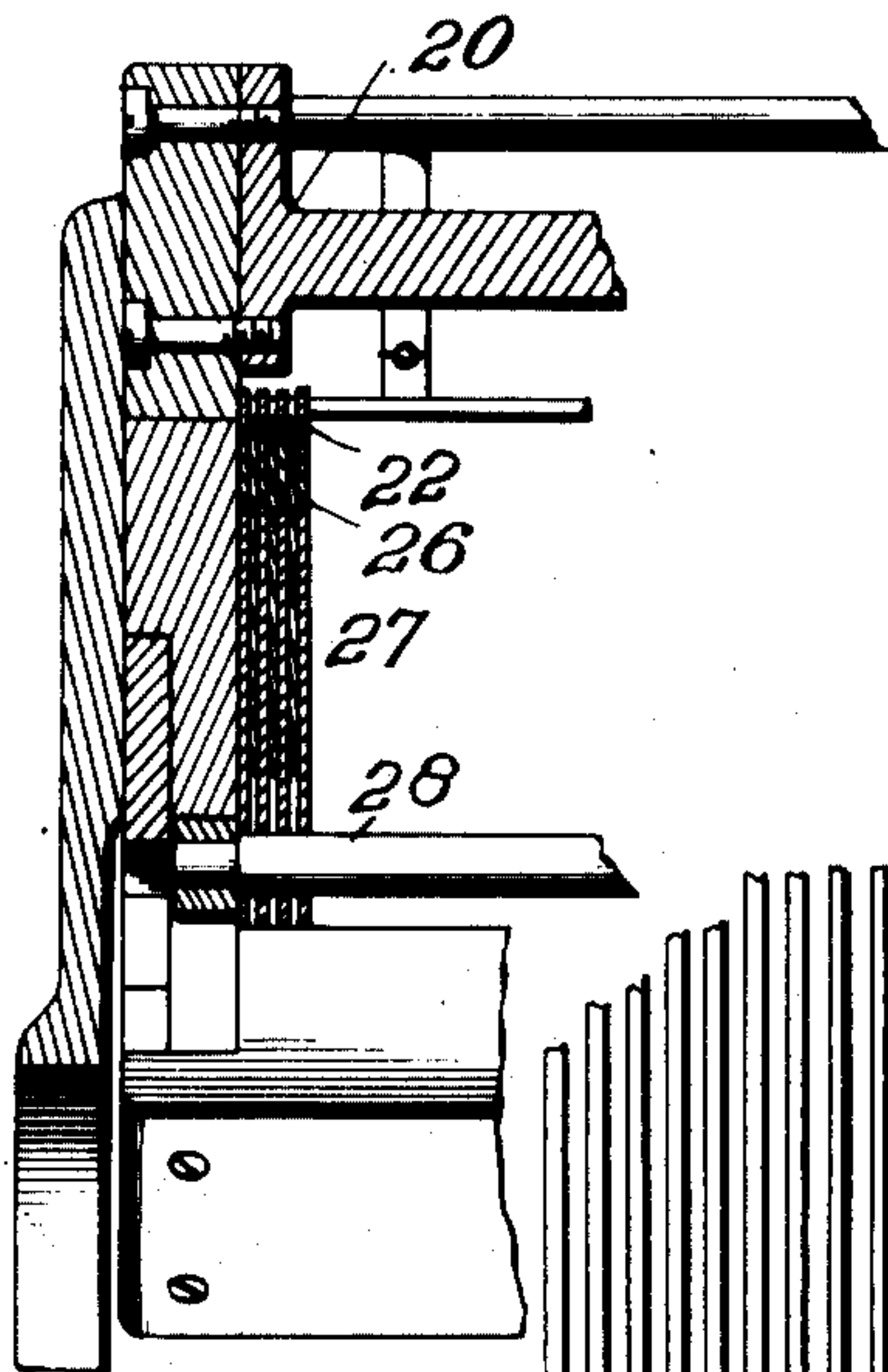


Fig. 10.

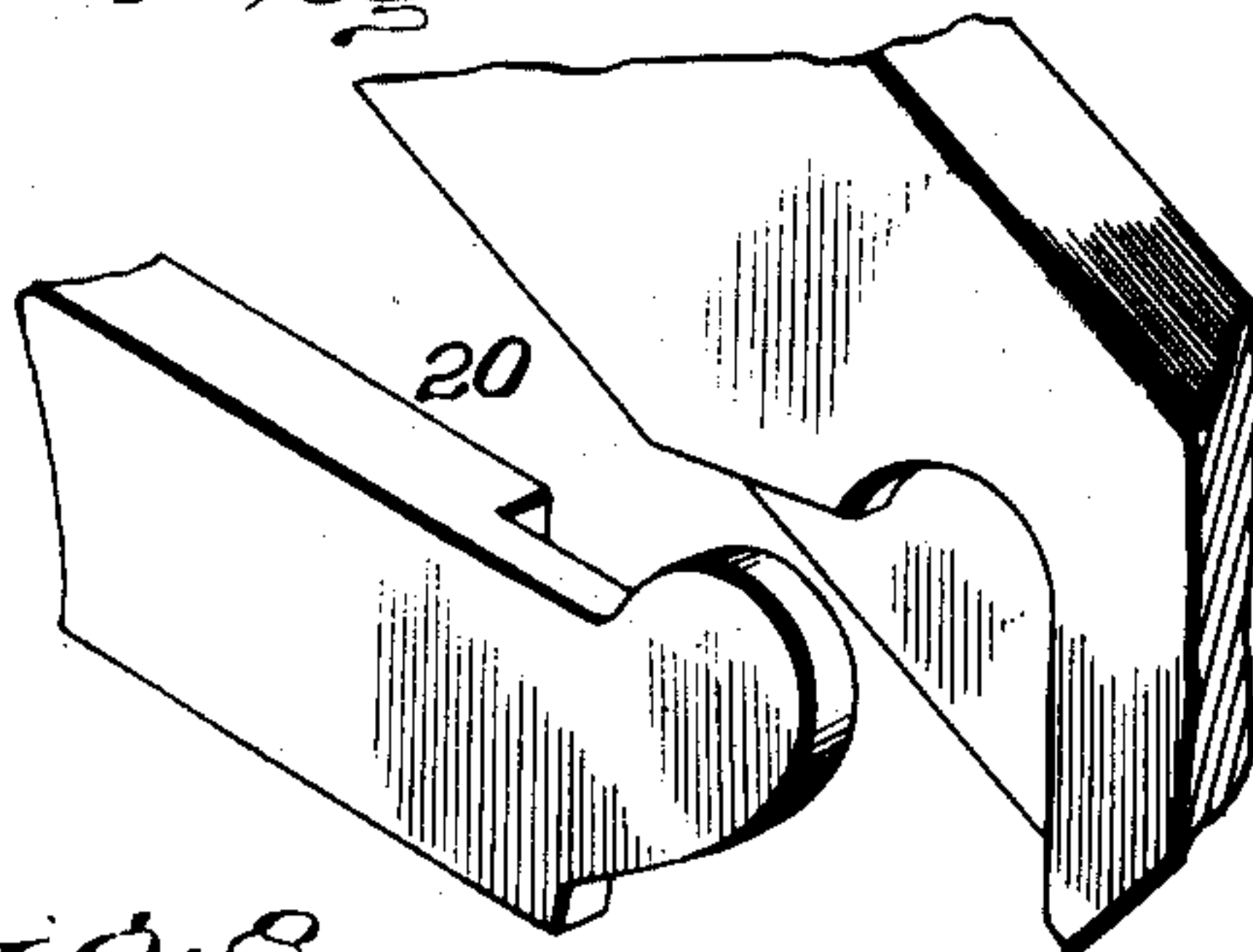


Fig. 8.

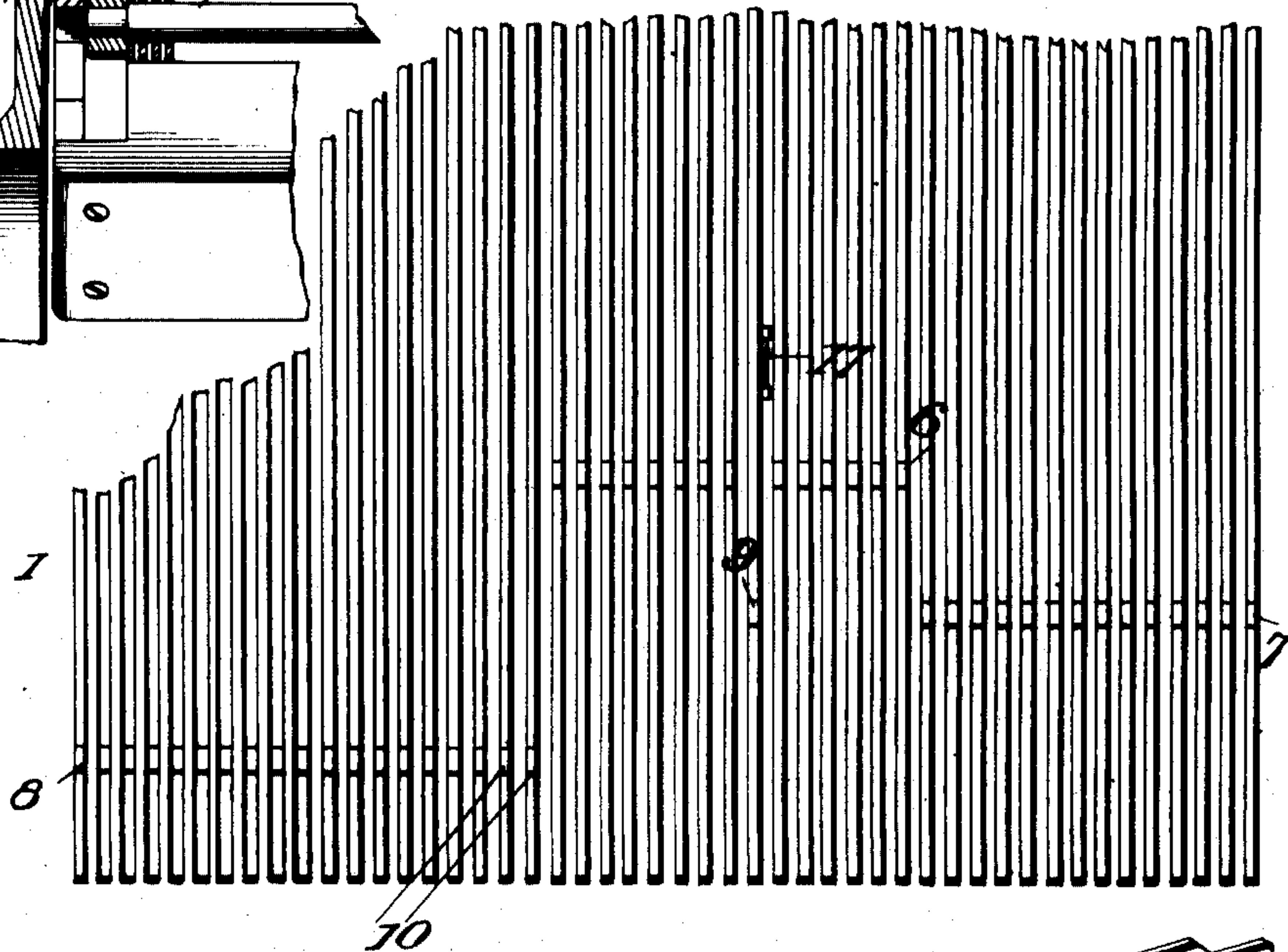


Fig. 11.

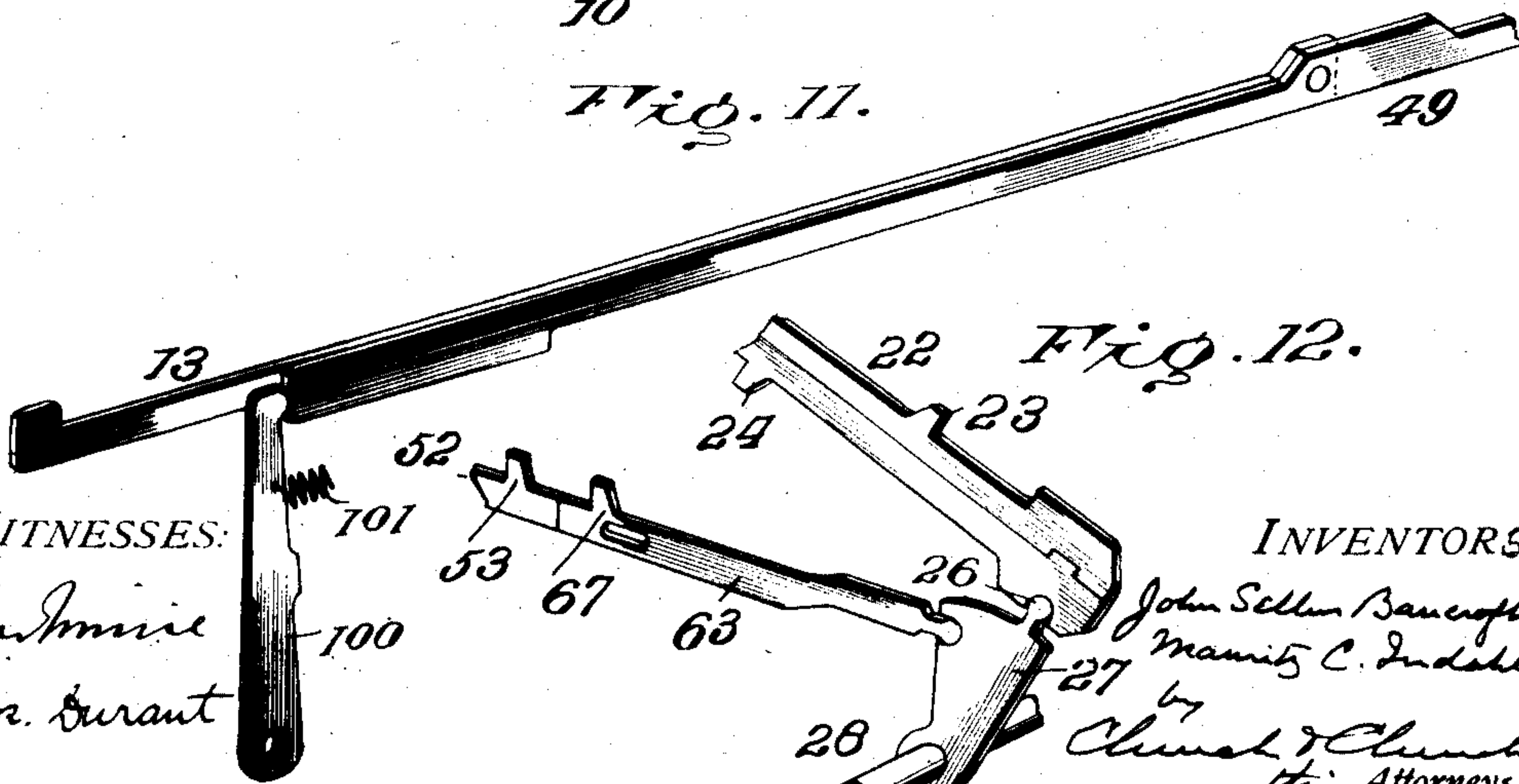


Fig. 12.

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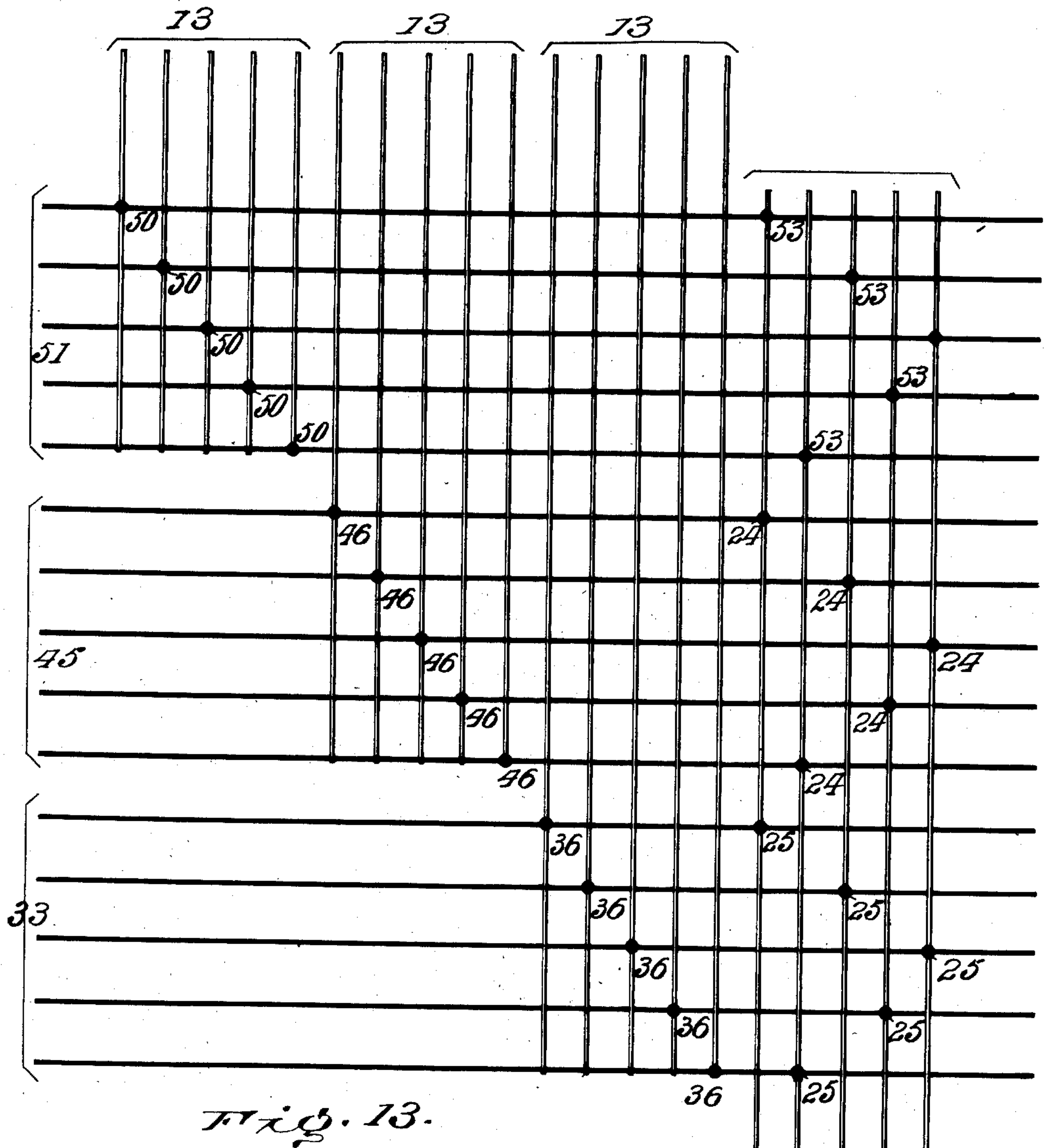
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7 SHEETS—SHEET 7.



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RECORD-STRIP COMPOSING-MACHINE.

No. 883,377.

Specification of Letters Patent.

Patented March 31, 1908.

Application filed March 29, 1904. Serial No. 200,559.

To all whom it may concern:

Be it known that we, JOHN SELLERS BANCROFT and MAURITZ C. INDAHL, both of Philadelphia, in, the county of Philadelphia, State of Pennsylvania, have invented certain new and useful Improvements in Record-Strip Composing-Machines; and we do hereby declare the following to be a full, clear, and exact description of the same, reference being had to the accompanying drawings, forming a part of this specification, and to the figures and letters of reference marked thereon.

This invention relates to a record-strip or controller perforating mechanism for use in connection with type casting, setting and similar machines wherein the dimensioning of the type is controlled by measuring perforations independent of the selecting or centering perforations and acting through a separate selecting or dimensioning mechanism to determine the body widths of the type, after the manner disclosed in Patent No. 770,253 dated Sept. 20, 1904, and it has for its principal objects, first, to provide competent means for producing the dimensioning elements or perforations forming a component of each complete type signal, by the employment of a system or series of signal producing devices, such as punches, separate from and independent of the positioning system or series, but so related and connected therewith that any one of the series of keys corresponding with the characters contained in the die case, irrespective of its location in the key bank or of the location of its matrix in the die case, may be coupled with any member of the dimensioning system, thereby eliminating dimension and location as controlling factors in the arrangement of characters both in the keybank and in the die-case; second, to utilize the independent dimensioning system for the production of the measuring elements of the justification signals; third, to adapt the keyboard for use in connection with different sets or fonts of type of varying dimensions by providing a removable and interchangeable permutation or control mechanism intermediate the keys and the selecting devices of the dimensioning system; fourth, to provide a control mechanism for the punch motor with a motor actuating device and a trip therefor, the latter set by the punch motor

and released by the keys in such manner that the resistance of the trip alone has to be overcome in starting the punching operation, thereby diminishing the load on the key action; fifth, to provide an actuating and control mechanism common to the series of signal producing devices or punches and comprising a motor, punch selecting devices, and means for energizing the motor, the two latter so connected with the keys that the depression of any one of the latter will select the punches pertaining thereto, place the same in operative relation to the motor, and start the latter in motion, and by and during the movement thus inaugurated, the key will be automatically disconnected from the starting devices and so retained until the cycle of movements of the punches has been completed and the key retracted, thereby not only diminishing the amount of resistance to be overcome in moving the key and its connections, and insuring the action of the selected punches, but preventing the duplication of the signal should the key, for any reason, remain depressed; and, sixth, to improve, both generally and in detail, the construction and operation of the parts and mechanisms going to make up the complete machine. To which end the invention consists in the several constructions, arrangements and combinations hereinafter fully described, the novel features being particularly specified in the appended claims.

In the accompanying drawings—Figure 1 is an end view, partly in section showing the arrangement of the keyboard, interponent and motor systems as applied to a known form of punching mechanism. Fig. 2 is a partial longitudinal section on the line $x-x$, Fig. 1, showing the arrangement of the transmitter and permutation series pertaining to the dimensioning and one of the positioning systems of the interponents, most of the parts in rear of the section being omitted to prevent confusion. Fig. 3 is a top plan view of the transmission devices for the other positioning system. Fig. 4 is a view in perspective of the connection between a group of keybars and one of the series of transmitter bars. Fig. 5 is a side elevation of the transmitting and permutation elements, intermediate each key bar and the three interponents controlled thereby, the frame being omitted. Fig. 6 is a top plan view of a por-

tion of the permutation bars of the dimensioning system, and the actuators therefor, illustrating the distribution of the contact members. Fig. 7 is a side elevation of the motor control mechanism and the actuator therefor. Fig. 8 is a front elevation of the punch bars showing the arrangement of the off-sets or actuating shoulders with which the interponents cooperate. Fig. 9 is a section on the line $y-y$, Fig. 1. Fig. 10 is a perspective view of one of the hinge joints for the keybank frame. Fig. 11 is a view in perspective of the valve actuator. Fig. 12 is a view in perspective of the connection between the key bars and the actuator for the permutation bar of the dimensioning system. Fig. 13 is a diagrammatic view illustrating the permutation system of control between key bars and interponents.

The same numerals indicate like parts in the several figures.

With the exception of the mechanism controlling the selection and operation of the punches the machine with which the invention is shown associated, by way of illustration (other adaptations being permissible and contemplated) is substantially that of Patent 654,115, dated July 17, 1900, with the improvements of Patent No. 828,449, dated August 14, 1906, embodied therein, that is to say, it is equipped with the following mechanisms, viz., a series of punches disposed transversely of the paper and cooperating with fixed dies to form the signal perforations; a paper feed for intermittently advancing the paper; a line measuring mechanism; and registering and indicating mechanisms showing the amount of space remaining in the line and the justification keys or fraction appropriate to the line as composed.

It will suffice, for present purposes, to merely designate the connections by which said mechanisms are operated or controlled, such as the series of punch bars 1 for the punches; the actuating rod 2 for the paper feed; the cam bar 3, for the escapement devices; the series of stop bars 4 for admeasuring successive advance movements of the line measuring and indicating devices; and the actuating rod 5 for shifting the justification indicator each time the signal for the justifying space type is formed.

In the prior machine there were thirty-one punch bars and corresponding punches divided into three groups of which latter two groups of fourteen each represented progressive movements of the die-case in each of two directions on intersecting lines, for centering any one of the matrices, while the remaining group of three included the justifying space type and the two justification designating punches. The matrices of the casting machine were arranged in rows of progressively increasing space value, and the movement or positioning of the die-case in one of its two

directions of motion effected a dimensioning of the mold corresponding to the space value of the row containing the selected matrix.

The improvement of Patent No. 770,253 of Sept. 20, 1904, divorced the dimensioning from the centering action, and provided a separate dimensioning mechanism controlled from special signals or perforations in the record strip, and it is for the production of these special dimensioning perforations in connection with the appropriate positioning perforations that this machine is especially designed, although many of its features are applicable to the prior system. To this end the number of punch-bars is increased by the number of sizes to be dealt with, less one (the latter being preferably represented by a fixed stop on the casting machine, indicating the maximum throw of the adjusting devices) and, accordingly, in the machine illustrated and which is designed to deal with eighteen type sizes or degrees of adjustment there is added a group of seventeen punch-bars, making forty eight in all. It is obvious that a greater or lesser number of these added dimensioning punch bars may be employed, as occasion requires.

Each punch bar is provided with an off set or shoulder in position to be engaged by its interponent when the latter, by the action of the keys, is interposed between said shoulder and an actuator common to all the punch bars and guided to reciprocate parallel with and in proximity to said punch-bars, as will presently appear.

For convenience the off-sets on the series of punch-bars are arranged in groups, preferably three, at different levels, two of said groups representing position and the third dimension. Thus in the preferred arrangement, and as illustrated in Fig. 8, the fourteen off-sets 6 of the upper group are applied to the punch-bars representing movements in one direction, the fourteen off-sets 7 of the intermediate group, to the punch-bars representing movements in a transverse direction, and the off-sets 8 of the lower group, to the punch bars representing dimension. In addition, the punch bar bearing off-set 9 of the intermediate group, represents a justifying space type, and those bearing off-sets 10 of the lower group represent the justification designating punches.

The actuator for reciprocating the punch-bars is in the form of a plate 11 guided to reciprocate longitudinally of the punch-bars, and provided with three transverse openings 12 for the reception of the off-sets on the punch-bars.

The openings 12, one for each group of off-sets, are wider than the latter, so that when the actuator is retracted the upper wall or walls will engage the top of the off-sets, to retract the punch-bars, leaving a space below equal to or exceeding the throw of the actua-

tor and adapted to receive selecting devices, such as interponents 13, through which the forward movement of the actuator may be transmitted to any one of the punches.

5 The actuator 11 is connected, through rod 14 and lever 15, with the cam bar 3 of the escapement devices; each of the dimensioning punch bars is connected by a lever 16 with one of the series of stop-bars 4; and the
10 paper feed rod 2 is also connected to the actuator, so that whenever the latter is reciprocated the paper feed and escapement will be operated and the space value of the dimensioning punch-bar will be registered.

15 The justification space punch-bar, designated by off-set 9, is also connected by lever 17 to rod 5, for advancing the indicator each time a space type perforation is formed.

The interponents 13, one for each punch-
20 bar, are arranged in three groups, to correspond with the location of off-sets on the punch-bars, and each consists of a bar with its free end resting upon a support 18* in proximity to and in line with one of the
25 openings in the actuator 11 and opposite the corresponding off-set of its punch-bars, the other end of said bar being pivotally supported at a point remote from the actuator and connected to suitable means, such as
30 hereinafter described, for advancing its free end into the opening in the actuator and between the latter and the off-set on the punch bar, so that when thus interposed it will follow the motions of the actuator and
35 drive the punch-bar forward, to perforate the paper.

According to the scheme of the present embodiment it is required that for each complete type signal, other than those representing matrices along the two margins of the
40 die-case three perforations shall be made, two for position and one for dimension, and in the exception, two perforations, one for position in one direction (the other direction
45 being determined by the fixed stop) and one for dimension. In addition, the signal for justification includes a designating perforation associated with a dimensioning perforation.

50 Each complete signal is represented by an individual key, the latter acting, through appropriate selecting mechanism, to advance into operative position the selecting devices or interponents of the punches representing
55 the signal appropriated to each key, and in this connection it may be stated that the interponents stand normally with their engaging portions removed from the path of the actuator, or off-sets, or both, and in position
60 to be advanced into operative relation with the actuator and punch bars only when said members are retracted, the actuator, when advanced, serving as a lock-out to prevent engagement of the interponents at any other
65 time.

As represented in the drawings the keybank shown contains two hundred and eighty six keys in the form of levers 18, the latter arranged in thirteen parallel rows of twenty-two each, the increased number, as
70 compared with the prior machines, representing different space values accorded the same type, such as spaces, quads, dots, dashes etc.

The keys of each row are pivotally mounted upon one of a series of rods 19 supported
75 in a frame 20, the latter standing at an angle and being preferably connected at or near its front edge to the main frame by separable pivot joints, (Figs. 1 and 10) and sustained
80 in working position by ledges 21 or other bearings on the main frame. This is to enable the frame 20 and the parts carried thereby to be tilted forward or removed for repair
85 or to permit ready access to the interior mechanism. For a like purpose said frame 20 is formed in two horizontal sections, with the keys supported upon the upper section,
90 so that the keybank, as a whole, may be detached without disturbing the other mechanisms.

Beneath the key levers is arranged a series of longitudinally movable key bars 22 each provided with a shoulder 23 in position to be engaged by one only of the key levers. These
95 key bars are preferably formed in two or more separable sections, the one carrying the actuating element or shoulder 23, and the other a permutation element, represented by a lug or lugs 24, and two transmitting
100 elements, represented by lug 25 and pivot bearing 26.

The series of key bars are supported to reciprocate in guides on the upper surface of the lower section of the frame 20, and access
105 is had to them by the removal of the upper section of said frame, and the front or lower end of each key bar is supported upon one of a series of links 27 pivotally mounted upon a
110 rod 28 carried by frame 20. Upon frame 20 and disposed longitudinally thereof in sequence is a series of transmitters or levers 30 each provided with a cross-head 31 spanning the lugs 25 of a group of key-bars, as shown
115 in Fig. 4. The series of key bars is thus divided laterally into groups each controlling and being represented by one of the levers 30. Each lever 30 in turn controls one of the upper groups of interponents 13, as follows:—Supported in guides in frame 32,
120 the latter detachably secured to the main frame, is a series of longitudinally movable bars 33, (Fig. 3) each furnished with a shoulder 34 opposite its corresponding lever 30. Beneath these bars 33 are a series of rock
125 shafts 34* which, for compactness, are disposed in two sections arranged end to end and supported in cross pieces 35 of frame 32. Each rock shaft is provided with an arm 36 connected to one of the bars 33, and with a
130

second arm or bail 37 to which the rear end of one of the upper groups of interponents is pivotally attached.

5 Springs 38 or equivalent means are applied, preferably to the bars 33, for retracting the latter and the interponents controlled thereby, while shoulders 39 engaging the frame serve as stops for positioning the parts when retracted. Thus any or all of the series of key bars acting upon one of the levers 10 30 may be utilized for producing the positioning perforation of the series represented by the punch whose interponent is coupled with said lever.

15 The second series of positioning punches, represented by the off-sets 7 and intermediate series of interponents is controlled through the permutation elements or lugs 24 of the series of key bars, as follows: Opposite the series of key-bars are arranged a series of longitudinally movable bars 40 equal 20 in number to the positioning punches of this series, and each connected, through its lever 41 and link 42, to one arm of a lever 43, the other arm whereof is pivotally attached to the interponent bar pertaining thereto. Thus each bar 40 represents one of the series of interponents which engage off-set 7. Springs 44 connected to levers 43 serve to re- 25 tract the interponents and connections.

30 Between the series of bars 40 and the series of key bars and extending transversely thereof are a series of transmitters 45 in position to be engaged by the permutation lug 24 of any key bar and in turn engaging lug 35 46 on any of the bars 40, so that any key bar of the series may, in addition to its connection with the first mentioned series of positioning punches, be at the same time coupled with any one or more of the second series of 40 positioning punches by properly locating its lug 24 so as to actuate the appropriate interponent. The transmitters are preferably in the form of rods or bails carried by shafts 47, the latter pivoted in the end pieces of the 45 lower section of frame 20.

The third or dimensioning series of punches, represented by off-sets 8, is coupled to the key bars through an intermediate permutation system or device, organized and 50 applied in such manner that it can be quickly removed and replaced, for inspection, repair or exchange, as when the set is changed. With this end in view each interponent 13 of the lowermost series is pivoted to one of a series of bars 49, the latter mounted in guides on the main frame to reciprocate horizontally. Each bar 49 is furnished with a 55 shoulder 50 in position to engage one of a series of transmitters 51 extending transversely of the bars 49, so that any one or more of the latter may thus be coupled with any one or more of the transmitters. Opposite the bars 49 is a series of permutation bars 60 52 each provided with a selecting shoulder 53

opposite one of the transmitters 51, whereby any one of said bars 52 may be coupled with any one or more of the interponent bars through the transmitters. The transmitters 51 are preferably pivotally supported, as 70 upon shafts 54, and the permutation bars 52 are guided and supported upon a frame 55 removably applied to the main frame, as by interlocking guides 56, so that it, together with the permutators, can be readily withdrawn or inserted, thus permitting the per- 75 mutators to be arranged or a different series to be substituted, as when fonts of different dimensions are to be employed. This detachable permutation member might constitute a single structure, but it is preferably 80 formed in two or more sections, as indicated in Fig. 2, and in order to position and retain the permutation bars during removal or insertion they are provided with two shoulders 85 57 engaged by a spreader in the form of two rods 58 each supported by spring arms 59 on a shaft 60 carried by frame 55. Between the arms 59 is a cam shaft 61, also carried by frame 55 and provided with a handle 62. 90 When in normal position rods 58 are held retracted or away from their respective shoulders 57; but when it is desired to remove or insert the permutators the cam shaft is turned and the rods are thereby separated and caused to engage shoulders 57 and 95 bring all the bars 52 into line.

When in position each permutation bar 52 stands opposite one of a series of actuators 63 the latter supported and guided on the 100 main frame and coupled separately to one of the key bar links 27, through which latter the motion of the key lever is transmitted to any one or more of the series of dimensioning punches. 105

The permutation actuators 63 are preferably connected by open pivot sockets to links 27 on a line slightly above the axis of the hinge joint of frame 20 and each is provided with a back stop 64, so that when 110 frame 20 is tilted back the actuators will be held in alinement while the links 27 are withdrawn therefrom, the open pivot connection permitting this action.

It is to be observed that the ornamental 115 cover or frame 65 surrounding the key-bank is detachable and is designed to be removed before frame 20 is tilted up and further that said frame is provided with a suitable bail or handle 66 to facilitate manipulation. 120

It remains to explain how any key in addition to selecting its punches will, with promptness and certainty, inaugurate the action of the motor devices for the punch actuator 11 and be automatically disconnected 125 by the motor as the punches are advanced. The arrangement of devices for this purpose is best seen in Figs. 1, 7 and 11. Each permutation actuator 63 is provided with a shoulder 67 in position to engage a 130

transmitter 68, the latter interposed between said shoulder and a shoulder 69 on a trip rod or connection trip 70. This rod 70 is preferably arranged in series with the inter-

5 ponent rods or carriers 49 and carries a pivoted section 71 whose free end stands normally within opening 12 of the punch actuator 11.

Each interponent rod 49 as well as the 10 trip rod 70 is engaged by one of a series of levers 100 each provided with a retracting spring 101 and operating to return the bar to normal position (Figs. 1 and 11).

The actuator is provided with one or more 15 (preferably two) motor pistons 72 working in cylinders 73, the latter communicating through a pipe 74 with the port 75 of a valve chest 76.

The interior of said valve chest is in com- 20 munication with a suitable pressure supply and contains a valve 77 adapted to alternately uncover port 75 and place the latter in communication with an exhaust port 78. The valve rod 79 extends through stuffing 25 boxes in the valve-chest in line with and between two arms 80 mounted upon shafts 81 and provided with a motor such as spring 82, tending at all times to force said arms together upon the valve rod.

Each shaft 81 carries an arm 83 in position 30 to be engaged by one of two latches 84, 85, the latter held to operative position by spring pressure. Latch 84 is provided with a link 86 held between guides in position to be engaged by the hinged section 71 of the 35 valve rod when the latter is advanced. Latch 85 is provided with a pin or shoulder 87 in position to be engaged by a projection or arm 88 carried by a resetting and tripping 40 bar 89 the latter guided to reciprocate as on pins on arms 83, and connected to one arm of a lever 90 the other arm whereof is connected to the actuator 11.

When the apparatus is in the normal or 45 inactive position valve 77 is at one end of its stroke and covers ports 75 and 78, thereby opening exhaust to the motor cylinders; while arms 80 are held apart, against the pressure of the motor spring, by the engage- 50 ment of latches 84, 85, with arms 83.

Whenever any one of the keys is depressed trip rod 70 is advanced, and, acting through link 86, tilts latch 84 to release arm 83, whereupon arm 80 instantly advances and 55 drives valve 77 to the opposite end of its stroke, thus uncovering port 75 and admitting pressure to the motor cylinders. With the release of arm 83 the immediate control of the key terminates as the upward move- 60 ment of the actuator withdraws rod 70 from link 86, hence continued pressure thereon is unnecessary and of no avail; nor can a second key be effectively operated until the return of the actuator, first, because its 85 interponents cannot be advanced to position,

being locked out by the actuator plate, and, second, because the valve rod 70 has been withdrawn from link 86.

As the actuator plate 11 advances (rises) its movement is communicated through 70 lever 90 to bar 89 carrying arm 88. The interval between the end of the slot in said bar and the pin on arm 83 controlled by latch 84 is so proportioned relatively to arm 88 and the shoulder 87 of latch 85 that the 75 former engages first to force arm 83 back and reengage it with latch 84, thereby restoring the initial power of the spring, and immediately thereafter arm 88 engages shoulder 87 80 and tilts latch 85, thereby releasing its arm 83, whereupon the arm 80 connected therewith is advanced and the valve shifted thereby cutting off pressure and opening the exhaust. This last mentioned action takes 85 place when the punching has been effected, and the return of the actuator 11 again restores the tension of the motor spring by causing the end of slot in bar 89 to bear 90 against the pin on arm 83 and retract the latter until reengaged by its latch 85, as in Fig. 7, thus bringing the parts back to initial position.

The paper feed mechanism of the prior machine is so organized that the feed move- 95 ments take place upon the return or descent of rod 2, after the manner of the feed mechanism of Patent No. 674,362 of May 21, 1901, instead of during the up-stroke as in Patent No. 654,115, and in order that the paper may 100 not advance immediately the actuator 11 begins its descent and while the punches are projecting therethrough provision is made for delaying the feed movement until the punches shall have been fully withdrawn, as 105 by forming rod 2 in sections and interposing a yielding coupling or compression box 98, whose spring is superior to the paper feed spring, the parts being so adjusted that the holding pawl will engage and the upper section 110 of rod 2 be thus locked against further upward motion just before the punches reach the paper, after which the spring will yield during the further motion of the actuator, holding the upper section of rod 2 and the 115 feed mechanism in *statu quo* until the punches are withdrawn from the paper, by the recession of the actuator, and the spring in the coupling has expanded so as to permit the upper section of rod 2 to follow the lower section thereof. 120

The operation of the machine will be readily understood. The assignment of characters, etc., on the keybank having been determined upon the permutation systems are so 125 arranged that each key shall select and operate the three interponents controlling the punches designating the position and dimension of the type assigned thereto.

The capacity for distribution is illustrated in the diagram, Fig. 13, wherein the first five 130

vertical lines represent keybars 22, and the next ten interponents pertaining to five positions in each of two directions, and the last five, dimension. The three groups of five lines each extending transversely of the interponents and keybars, represent lines of communication or transmitters, and the points of intersection of said vertical and transverse lines, possible connections. The dots at the intersection of the lines are selected connections, representing, as to one set of interponents, the grouping of key bars, as to another, the disposition of the permutation lugs 24 or 46, and as to the third, the arrangement of selecting shoulders 50 or 53.

When any key is depressed three interponents 13 are advanced between the actuator and their punch-bars, thus coupling the latter up for action, and at the same time the valve rod is advanced to operate latch 84, but this action does not take place until after the interponents have reached operative positions.

As the latch escapes from its arm 83 the valve is at once thrown by its motor spring to admit pressure to the punch motor, and the actuator being driven forward causes the selected punches to perforate the paper and disconnect the key from the valve controlling devices. As the actuator reaches the extreme of its forward movement, the valve is shifted to cut off pressure and open the exhaust, whereupon the parts are retracted by gravity or otherwise and the valve actuating devices are reset to initial position.

The forward movement of the actuator is transmitted to the paper-feed mechanism, and to the escapement devices of the registering mechanism, and the space value of the punch-bar belonging to the dimensioning series controls the advance of the measuring devices through the stop-bar connected therewith.

The arrangement of the interponents in different banks or tiers instead of in the same plane is a matter of convenience, as conducing to a more compact arrangement of the mechanism but the number of interponents in each group, as well as the assignment of functions to the several groups is a mere matter of choice or expediency and is subject to variation.

The connections for operating the interponents for the space-type punch-bar is the same as for the other punch-bars of the intermediate series with which it happens to be associated, and the connections for the interponents of the justification designating punches represented by the offsets 10 are in all respects similar to those of the dimensioning interponents with which they happen to be associated, the interponents being so set or arranged that the individual numbers or the two series of justification keys will be coupled with the interponent of one offset 10

and one of the interponents of the dimensioning group, the lugs 23 and 24 of their key bars being omitted, as no positioning perforations are required for the justification signals.

Having thus described our invention what we claim as new and desire to secure by Letters Patent, is:—

1. In a punching machine such as described, the combination of the following elements, to wit; a series of punch bars divided into groups of which two represent position and one dimension; an actuator; a series of selective interponents; one for each punch bar; a series of selective actuating devices for the interponents of each group of punch bars, and a series of keys each coupled to the selective actuating devices of the three groups to control an interponent in each of said groups.

2. In a punching machine such as described, provided with a series of punch bars divided into groups representing position and dimension, and a series of keys and selective devices controlled thereby for bringing into action individual members of both groups of positioning punch bars, and in combination therewith the following elements, to wit; an actuator; a selective interponent for each punch bar of the dimensioning group; and a permutation system of transmitting devices intermediate said interponents and the keys, whereby the dimensioning elements of the signals corresponding to given keys may be varied.

3. In a punching machine such as described, the combination of the following elements, to wit; a series of punch bars divided into groups; an actuator for the punch bars; a series of selecting interponents, one for each punch bar; a series of keys; and a selective actuating mechanism, intermediate the interponents and keys and comprising a series of key bars, a series of transmitters, each coupled to a group of key bars and to one of the interponents pertaining to one group of punch bars and two series of permutation devices intermediate the keybars and the interponents pertaining to the remaining groups of punch bars.

4. In a punching machine such as described, the combination with a plurality of groups of punch-bars and a series of controlling keys of a selective actuating mechanism including the following elements, to wit; an actuator; a series of interponents, one for each punch bar; a series of transmitters each coupled to an interponent of one group of punch bars; two independent permutation systems each coupled with or controlling the interponents of separate groups of punch bars, and a series of keybars, one for each key, individually coupled with the two permutation systems and in groups with each of the series of transmitters.

5. In a punching machine such as de-

scribed, provided with groups of punch bars representing different qualities or movements, a series of interponents, one for each punch bar, an actuator, and a series of controlling keys, and in combination therewith, a selective control system or mechanism comprising the following elements, to wit; a series of transmitters separately coupled to the interponents of one group of punch bars; two series of bars the individual members whereof are coupled to the interponents of the two remaining groups of punch bars; two series of transmitters, one for each of said series of bars the individual members whereof are adapted for connection with any bar of its series; a series of keybars, one for each key, means for separately connecting the key bars in groups to the respective transmitters of the first named series, and means for separately connecting each keybar to any transmitter of the two remaining series.

6. In a punching mechanism such as described, the combination of the following elements, to wit; a plurality of groups of punch bars; an interponent for each punch bar; an actuator common to all the punch bars; a series of keys; a keybar for each key; an interponent actuating section or portion detachably connected to each keybar; a series of transmitters each coupled with an interponent of one group of punch bars and engaged by a plurality of said keybars; a permutation mechanism controlling all the interponents of a second group of punch bars and in turn controlled by the actuating section of any of the series of keybars; a second permutation system controlling all the interponents of the third group of punch bars; and a series of permutation bars, forming part of this last named system, the individual members whereof are coupled to the series of keybars.

7. In a punching machine such as described, the combination of the following elements, to wit; a series of punch bars separated into three groups by the disposition of their off-sets or engaging surfaces; an actuator; a series or group of interponents for each group of punch bars; a motor and control devices therefor; a permutation actuating mechanism for the members of each group of interponents; and a series of keys each coupled with the members of the three permutation mechanisms and with the motor control devices.

8. In a punching mechanism such as described, the combination with a series of punch bars, selecting devices therefor and a motor driven actuator, of the following elements, to wit; a series of keys, an actuator coupled to each key; and a removable permutation mechanism intermediate the punch bar selecting devices and the series of actuators.

9. In a selecting mechanism for punching

machines such as described, the combination with punch bar selecting devices and a series of control keys therefor, of an actuating mechanism intermediate the keys and selecting devices and containing permutation elements supported by a movable frame.

10. In a punching mechanism such as described, the combination with the keys and punch bar selecting devices, of a detachable permutation system or mechanism.

11. In a punching machine such as described, the combination with the series of punch bars, an actuator therefor and a series of interponents, one for each punch bar, of a series of control keys connected to said interponents through a permutation mechanism detachably connected therewith and supported upon a removable frame.

12. In a punching machine such as described, the combination with a series of punch bars divided into groups representing position and dimension, respectively, and actuating and selecting devices therefor, of a series of keys separately coupled with the punch bars of the positioning groups and with the punch bars of the dimensioning group through a detachable permutation mechanism.

13. In a punching mechanism such as described, provided with a series of punch bars divided into groups representing position and dimension, an actuator, and a series of selective interponents, and in combination therewith the following elements, to wit; a series of keybars; each provided with a key; a series of transmitters each engaging a plurality of keybars and coupled to an interponent of one group of positioning punch bars; a permutation mechanism coupled to the interponents of the other group of positioning punch bars and including a series of bars, a transverse series of transmitters engaging said bars, and selective shoulders on the keybars; a series of actuators one for each keybar and coupled therewith; a permutation mechanism intermediate said actuators and the interponents of the dimensioning group of punch bars including two series of bars and a series of transmitters; a motor for the actuator provided with control devices; and means for actuating said control devices from said series of actuators.

14. In a punching machine such as described, the combination with a series of punch bars, an actuator and selecting interponents controlled from a series of keys, of the following elements, to wit; a motor provided with a control valve; motor devices for shifting said valve; a detent or latch controlling said valve motor devices, and means for releasing or withdrawing said detent or latch by the movement of the keys.

15. In a punching machine such as described, the combination of the following

elements, to wit; a series of punch bars; an actuator provided with a motor; key controlled selecting interponents for the punch bars; a control valve for the actuator motor; 5 a motor mechanism for shifting said valve to start the actuator motor in action, provided with a latch; and a trip operatively connected to the keys and arranged to engage the latch, to release the valve shifting 10 mechanism, and in turn engaged by the actuator, to release said latch.

16. In a motor control mechanism for a punching machine such as described, the combination of the following elements, to 15 wit; an actuator provided with a motor; a control valve for said motor; a valve shifting mechanism including two valve operating arms or members; a motor device and restraining latches for said arms or members; 20 means for engaging one of said latches to permit the valve motor to shift the valve; and means coupled with the actuator and engaging the other latch, to permit the valve motor to reverse the position of the 25 valve.

17. In a motor control mechanism for punching machines such as described, the combination of the following elements, to wit; an actuator coupled with a motor the 30 latter provided with a control valve; valve shifting devices including two valve actuating members and a motor or spring tending to cause their movement in relatively opposite directions; a retaining latch for each of 35 said members; a trip for engaging one of said latches to bring into action its valve actuating members; and a tripping and restoring mechanism coupled with the actuator and operating to retract the previously re- 40 leased actuating member and withdraw the latch of the other valve actuating member.

18. In a motor control mechanism for punching mechanisms such as described, the combination of the following elements, to 45 wit; an actuator connected to a motor, the latter provided with a control valve; opposing valve shifting members provided with a connected motor or spring and retaining latches; a trip for engaging one of said latches, 50 to release its shifting member and energize the motor, said trip being engaged by the actuator and withdrawn from the latch during the forward movement of the actuator; a restoring and tripping device or mechanism 55 coupled with the actuator and provided with means for tripping the latch of the remaining valve shifting member and successively retracting both of said valve shifting members.

19. In a punching machine such as described, the combination to form a removable 60 keybank, of the detachable frame provided with pivot bearings for the key levers and a series of longitudinally movable keybars, the latter provided with open bearings or should-

ders for engagement with the various transmitting devices. 65

20. A keybank for punching machines such as described, comprising in combination a frame formed in two horizontal sections detachably secured together, a series of 70 key levers pivotally supported on the upper section, and a series of keybars supported in guides along the proximate faces of the two sections.

21. In a punching machine such as described, the combination with the main frame and the transmitting devices mounted thereon, including the series of transmitters and links coupled with the selecting inter- 75 ponents, of a keybank comprising a frame removably attached to the main frame and provided with a series of key levers and keybars the latter detachably connecting with said transmitters and links. 80

22. In a punching machine such as described the combination with the pivoted 85 links supported upon the main frame and connected with the actuators of a permutation system, of a keybank containing a series of key bars provided with open bearings for 90 engaging the links, and with its supporting frame pivotally attached to the main frame in proximity to said links.

23. In a permutation mechanism for punching machines such as described, the 95 combination of the following elements, to wit; a plurality of driving members, such as the actuator, of the dimensioning system; a plurality of driven members, such as the inter- 100 ponent bars, and a removable permutation mechanism provided with cooperating members for said driving and driven members.

24. In a permutation selecting mechanism for punching machines such as described, 105 the combination with a plurality of driving and driving members of a permutation system or mechanism removably applied and provided with two series of permutation bars with intermediate transmitters, and means for retaining said bars in position for 110 insertion or withdrawal.

25. In a permutation selecting mechanism for punching machines such as described, the combination of the following elements, to wit; a supporting frame; two opposed 115 series of permutation elements or bars; a series of transmitters intermediate said permutation elements and adapted to engage any one or more of either series; and means for positioning and holding said permutation 120 elements, to facilitate the insertion or removal of the mechanism.

26. In a permutation selecting mechanism for punching machines such as described, the combination of the following elements, 125 to wit; a movable supporting frame; a series of permutation elements or bars supported on said frame; oppositely movable

contact devices carried by the frame and engaging shoulders on the permutation elements, to aline the latter.

27. In a punching machine such as described the combination with a plurality of punches and selecting interponents therefor of a pivoted keybank provided with a series of keys and permutation devices for the interponents.

28. In a punching machine such as described the combination of the following elements to wit: a punching mechanism including a plurality of punches, an actuator, a series of interponents and a supporting frame work; a pivotally supported keybank provided with a series of keys and a permutation system; and coupling devices intermediate said permutation system and series of interponents of a character to permit the removal or swinging back of the keybank.

29. In a punching machine such as described the combination with punch selecting and controlling mechanism supported in fixed relation on the main frame, of a key bank therefor comprising a series of separately movable keys supported in a frame the latter pivotally connected to the main frame.

30. In a machine such as described provided with a series of keys and a series of designating devices, of a detachable and removable transmitting member comprising a series of associated connections for coupling individual keys and designating devices according to any prearranged plan, whereby, by a substitution of transmitting members, the control of designating members through the keys may be varied.

31. In an apparatus for the described purpose, the combination with a stem or punch bar, of a punch secured thereto, of a jack block or interponent in the plane of said stem or punch bar and adapted when brought into alinement therewith to be engaged by mechanism including a reciprocatory hammer bar for elevating the stem or punch bar and punch carried thereby, of means for bringing said jack block or interponent into such aline-

ment including a depressible key, and connections between said key and the before mentioned jack block or interponent, of devices for holding a sheet or web of paper to be perforated above the punch, and instrumentalities for advancing said web or sheet, said instrumentalities being brought into operation by the return movement of said mechanism for elevating the punch.

32. In an apparatus for the described purpose, the combination with a series of independently operable keys, of a movable punch for each key of the said series, of connections between each key and its punch by which the said punch is brought into operative relation with the actuating mechanism when the said key is depressed to designate a perforation, of mechanism for elevating said punch, said mechanism including a reciprocatory hammer bar, of means for holding and advancing a sheet to be perforated above the punch, said means including a feeding roll and a receiving roll, a ratchet wheel connected to said receiving roll and instrumentalities for turning said ratchet wheel and advancing said sheet, said instrumentalities being brought into operation on the return movement of the mechanism for elevating the punch.

33. In an apparatus for the described purpose, the combination with a series of independently movable perforating punches, of parts for acting upon said punches, of means for operatively positioning said parts on the striking of a key, of a reciprocatory device common to all for actuating any number of punches operatively related to the actuating mechanism, of means for moving said punch actuating device, means for holding a sheet to be perforated above the line of punches, the movement of said sheet being produced by the return movement of the aforesaid actuating device.

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Witnesses:

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