

C. W. DICKINSON.
TYPE SETTING MACHINE.

No. 174,901.

Patented March 21, 1876.

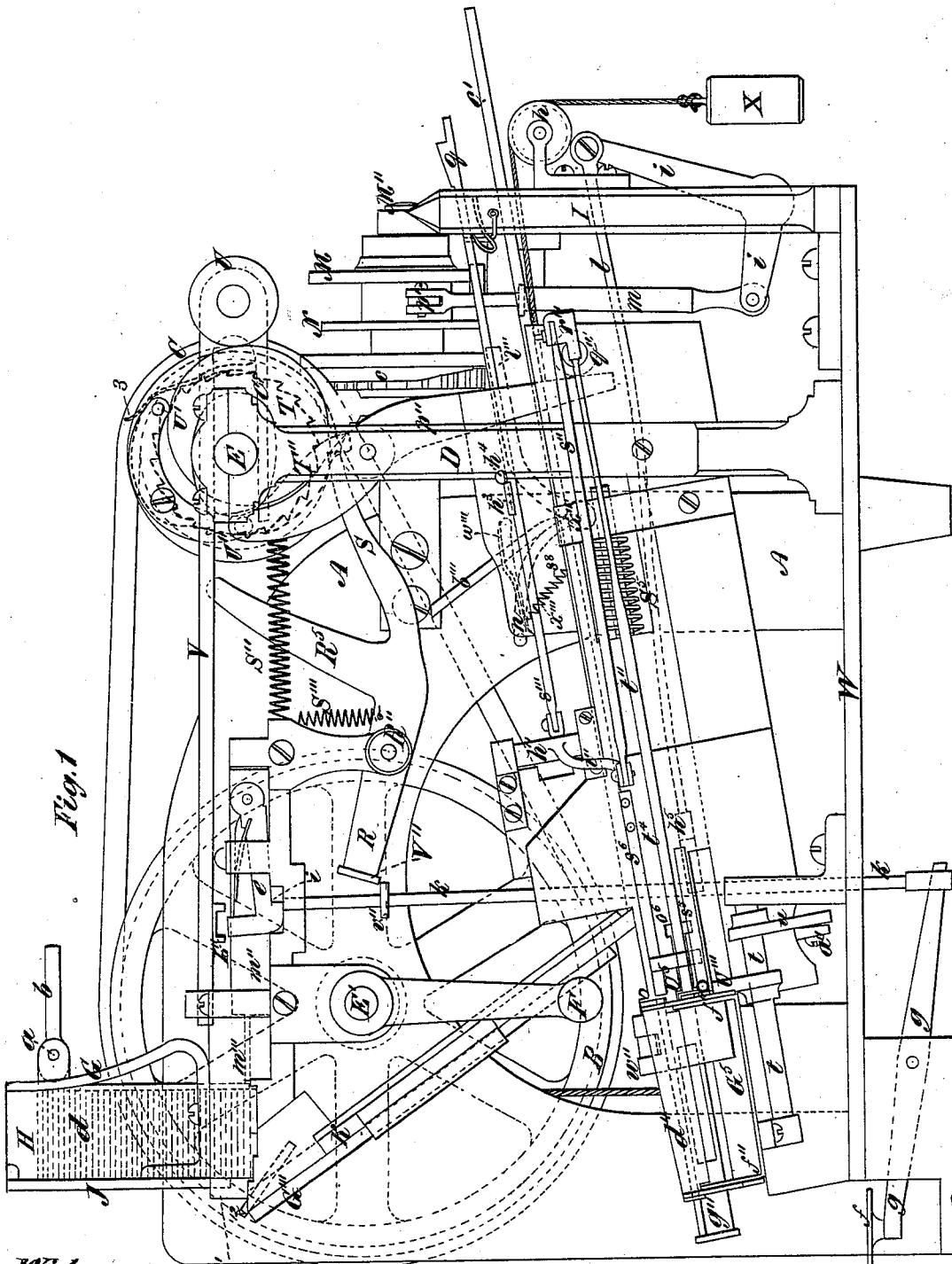


Fig. 1

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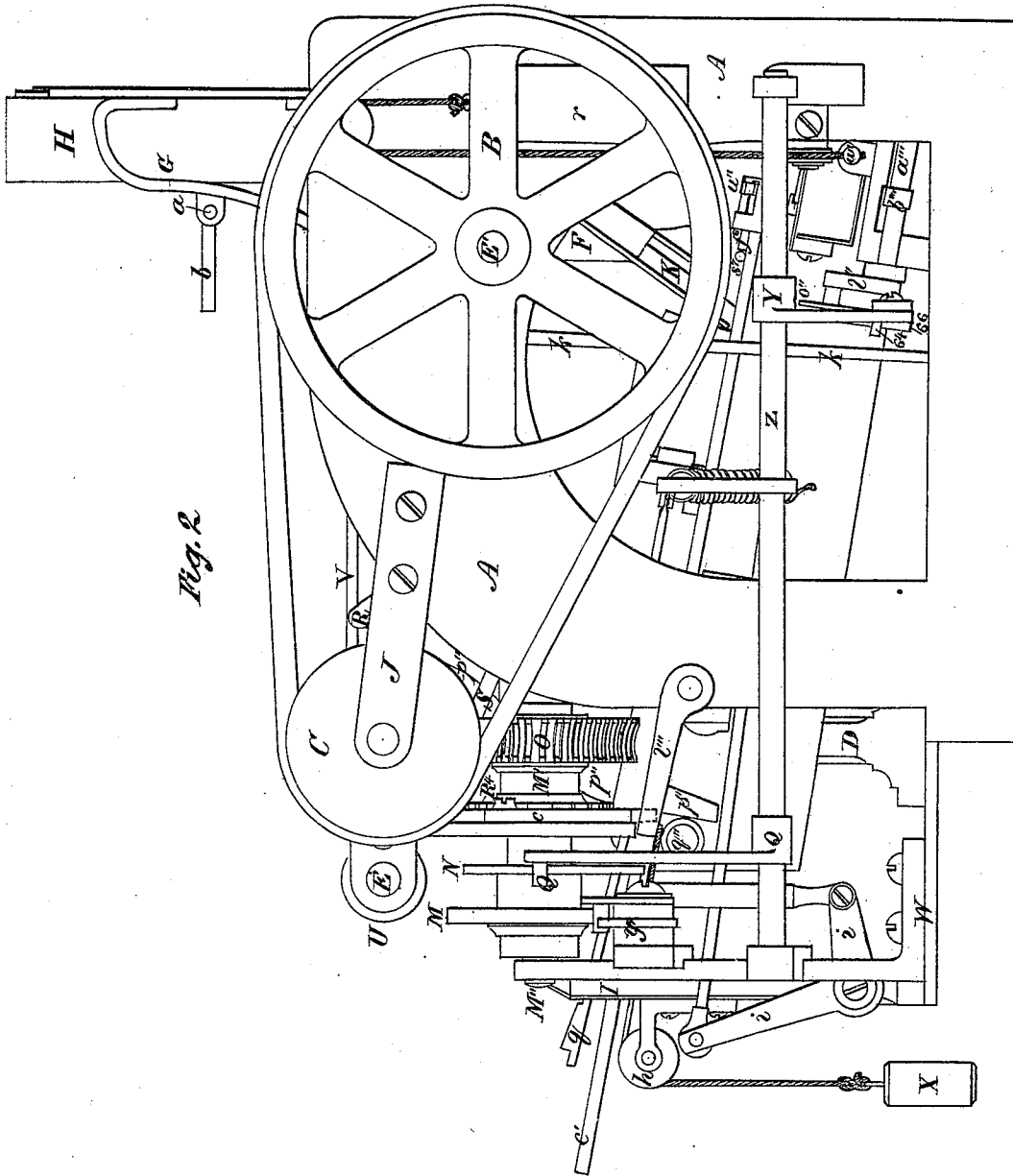


Fig. 2

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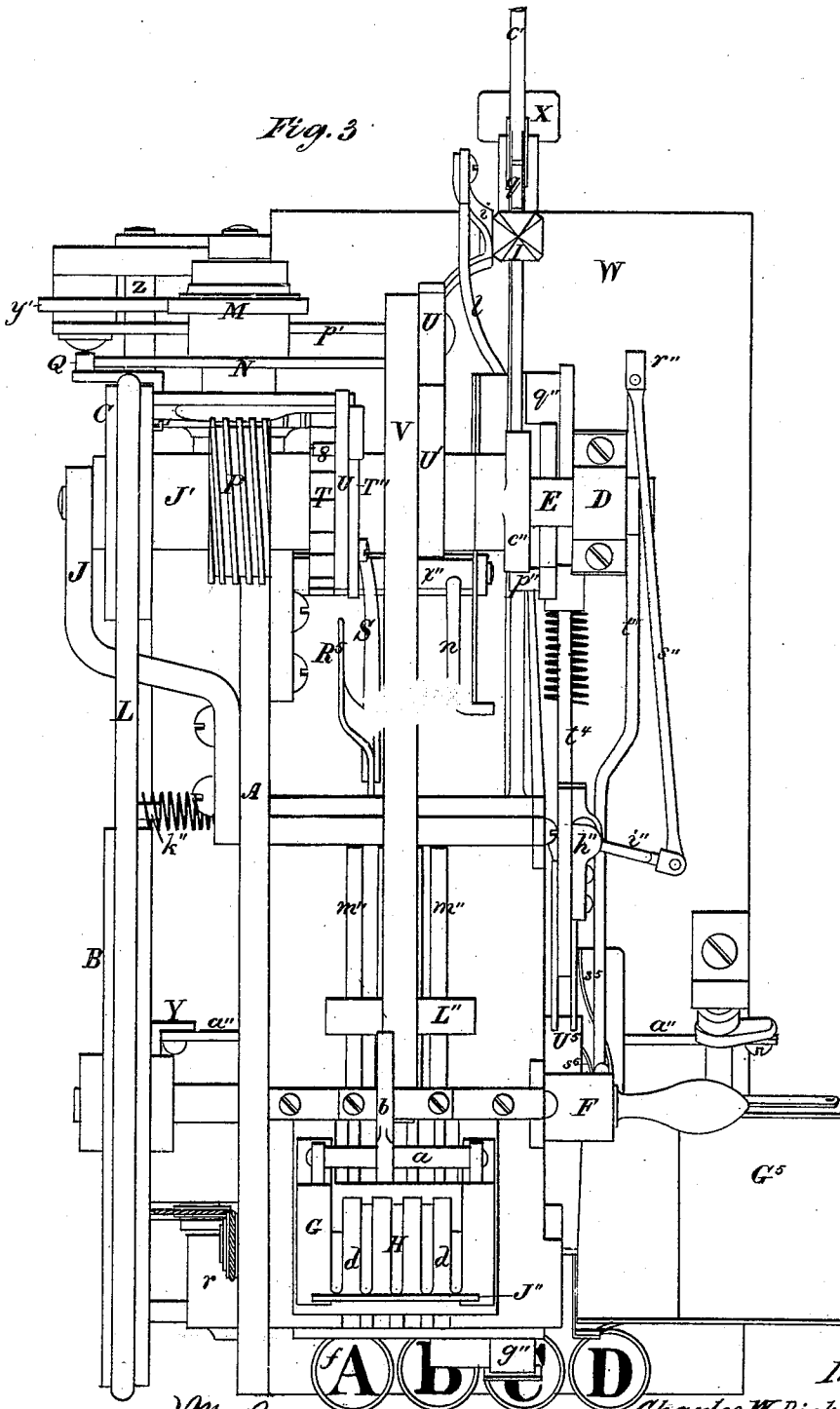
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Fig. 3



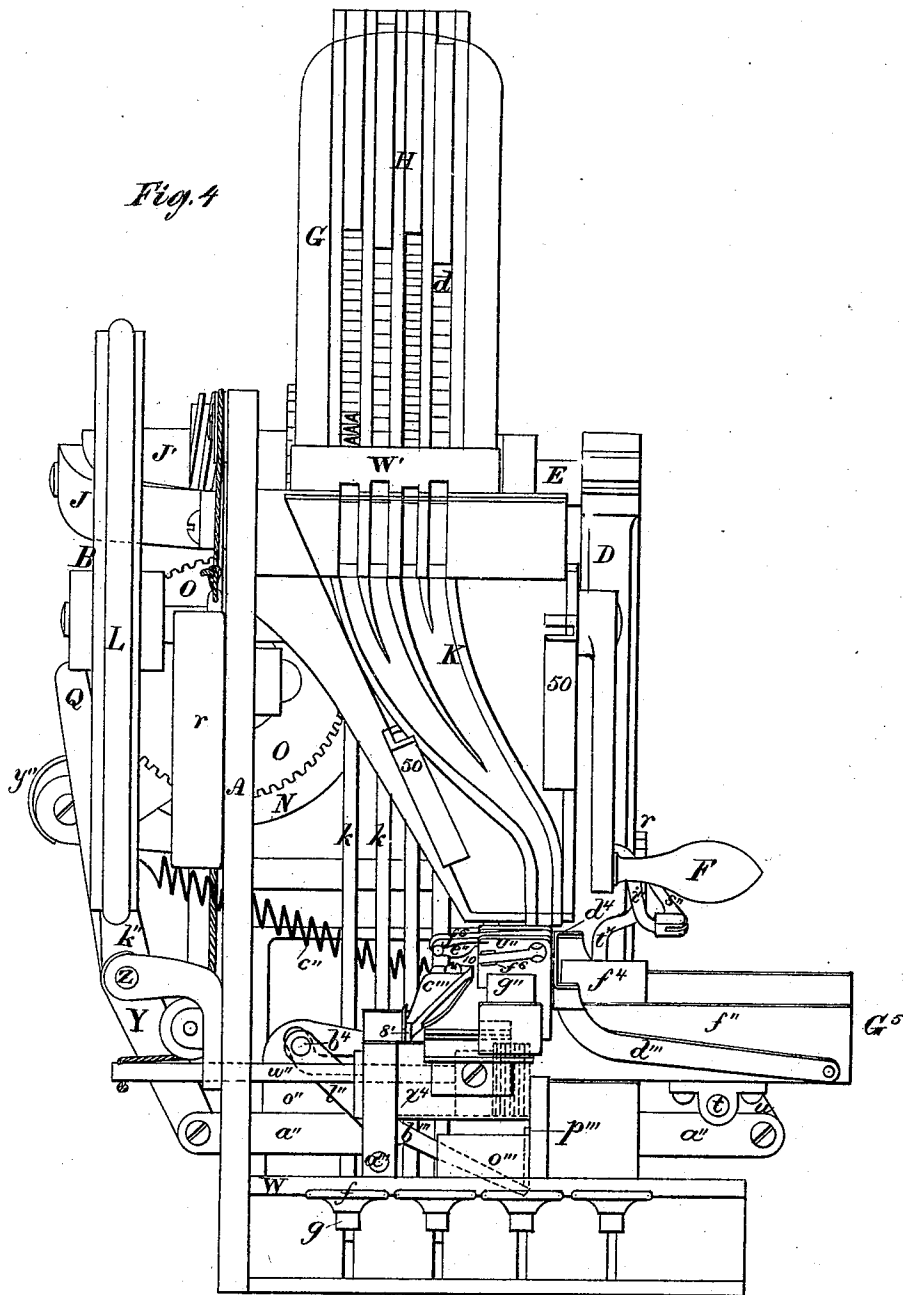
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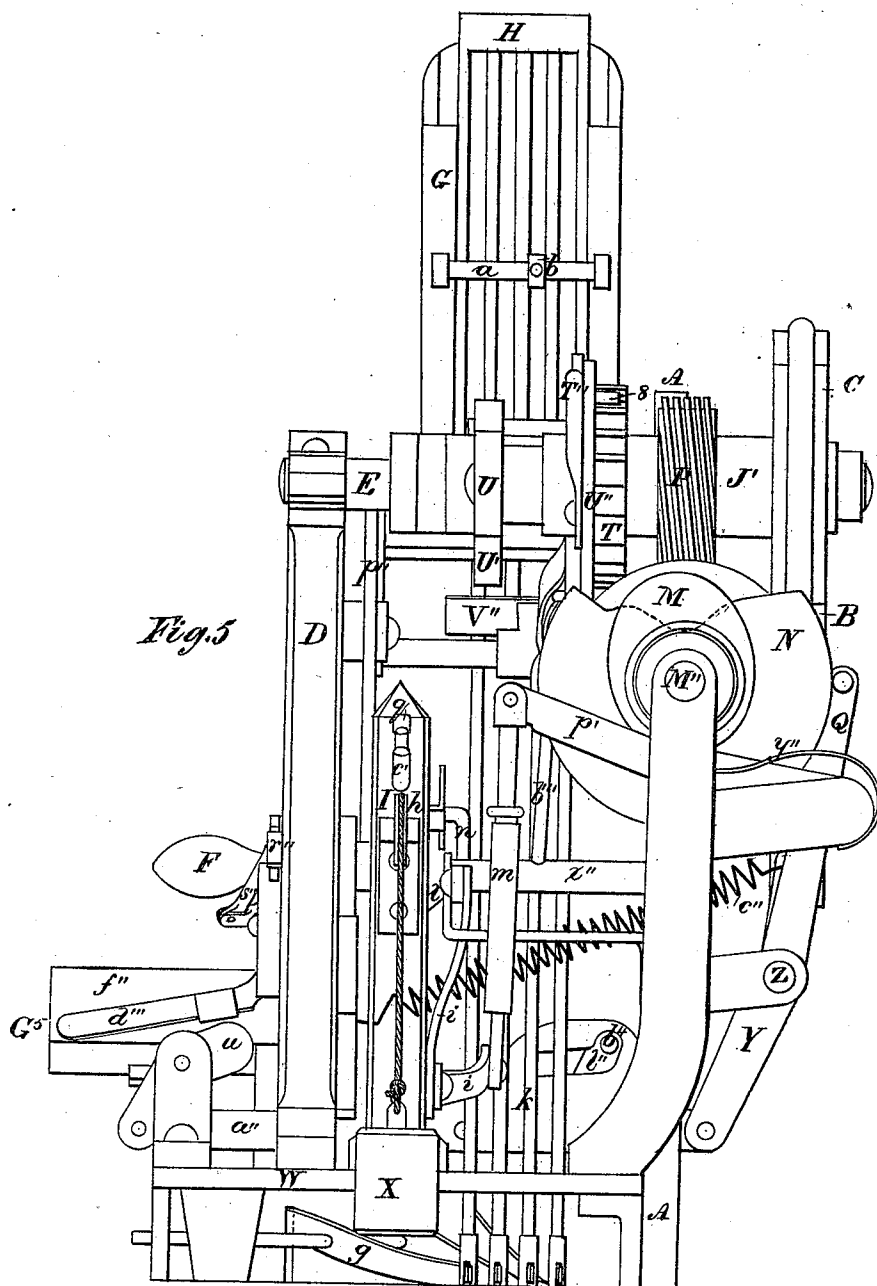
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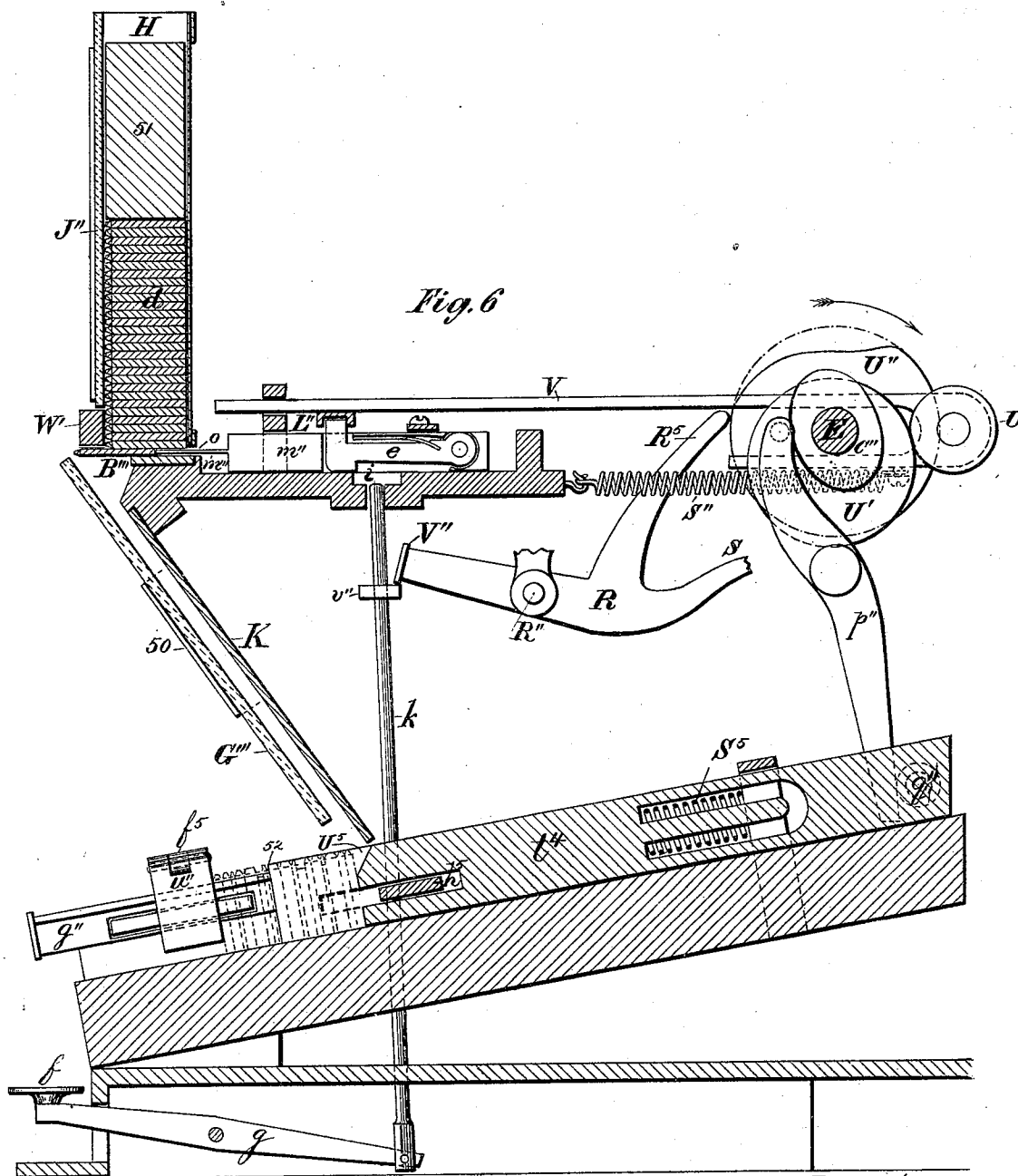
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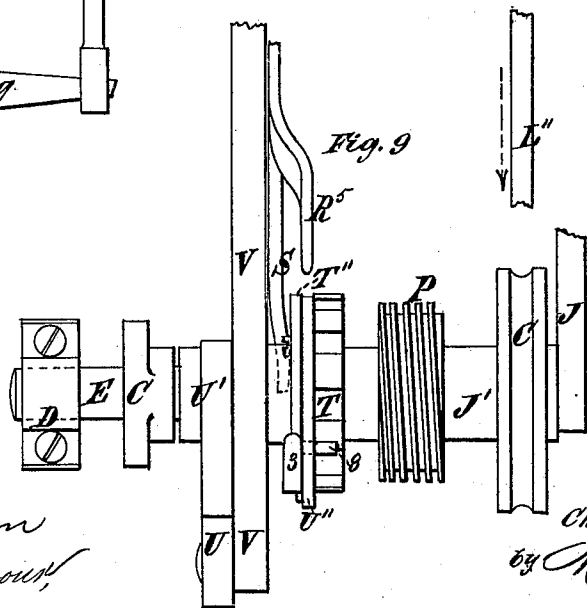
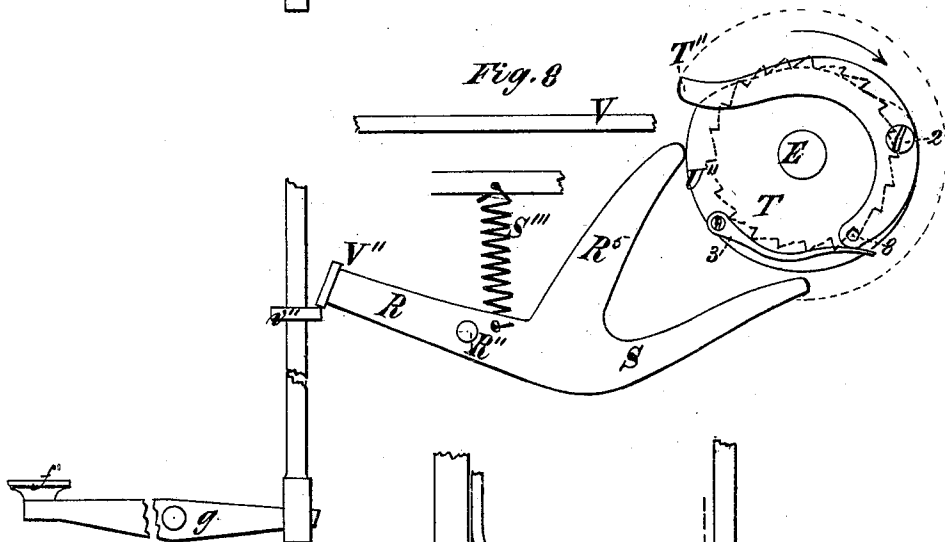
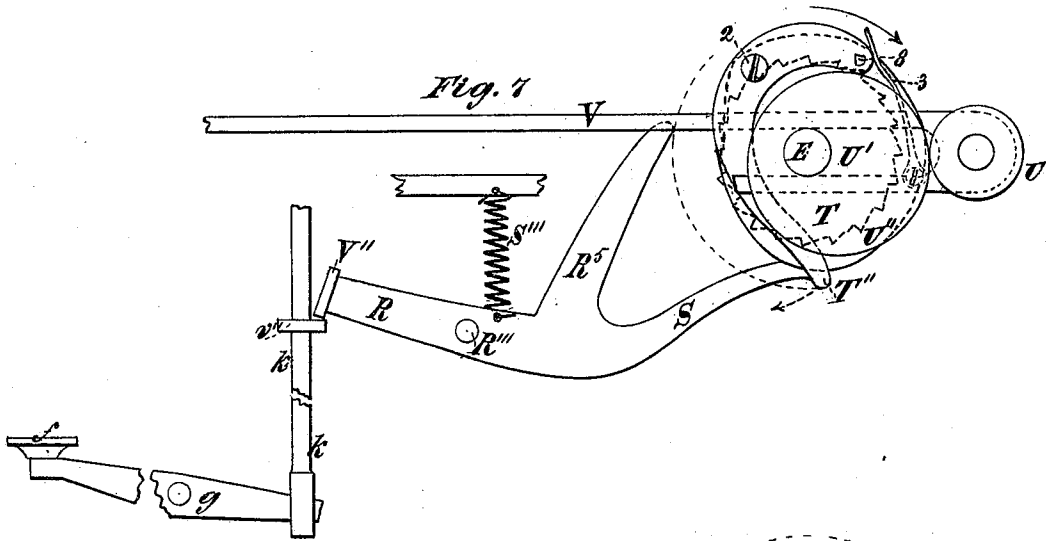
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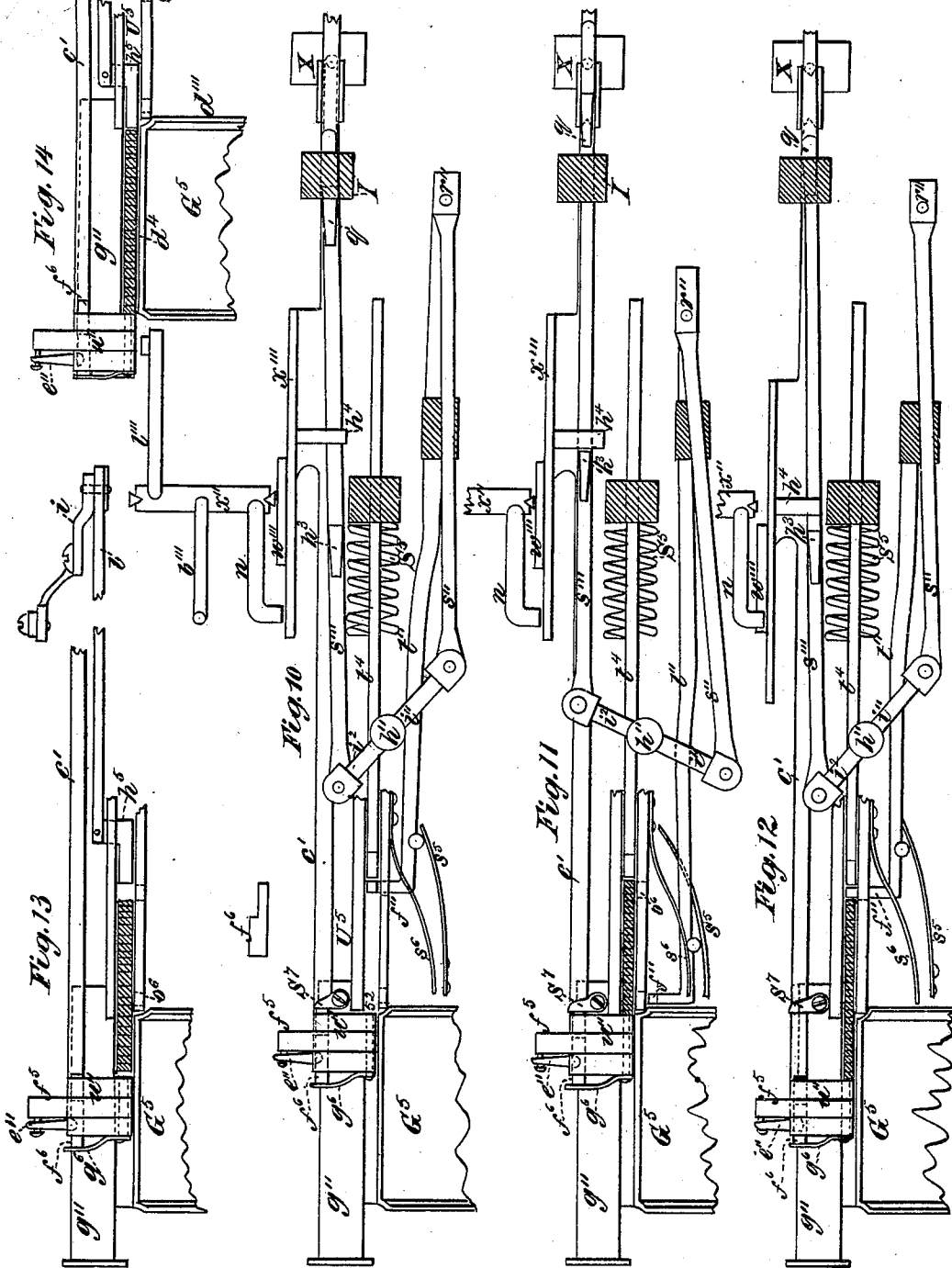
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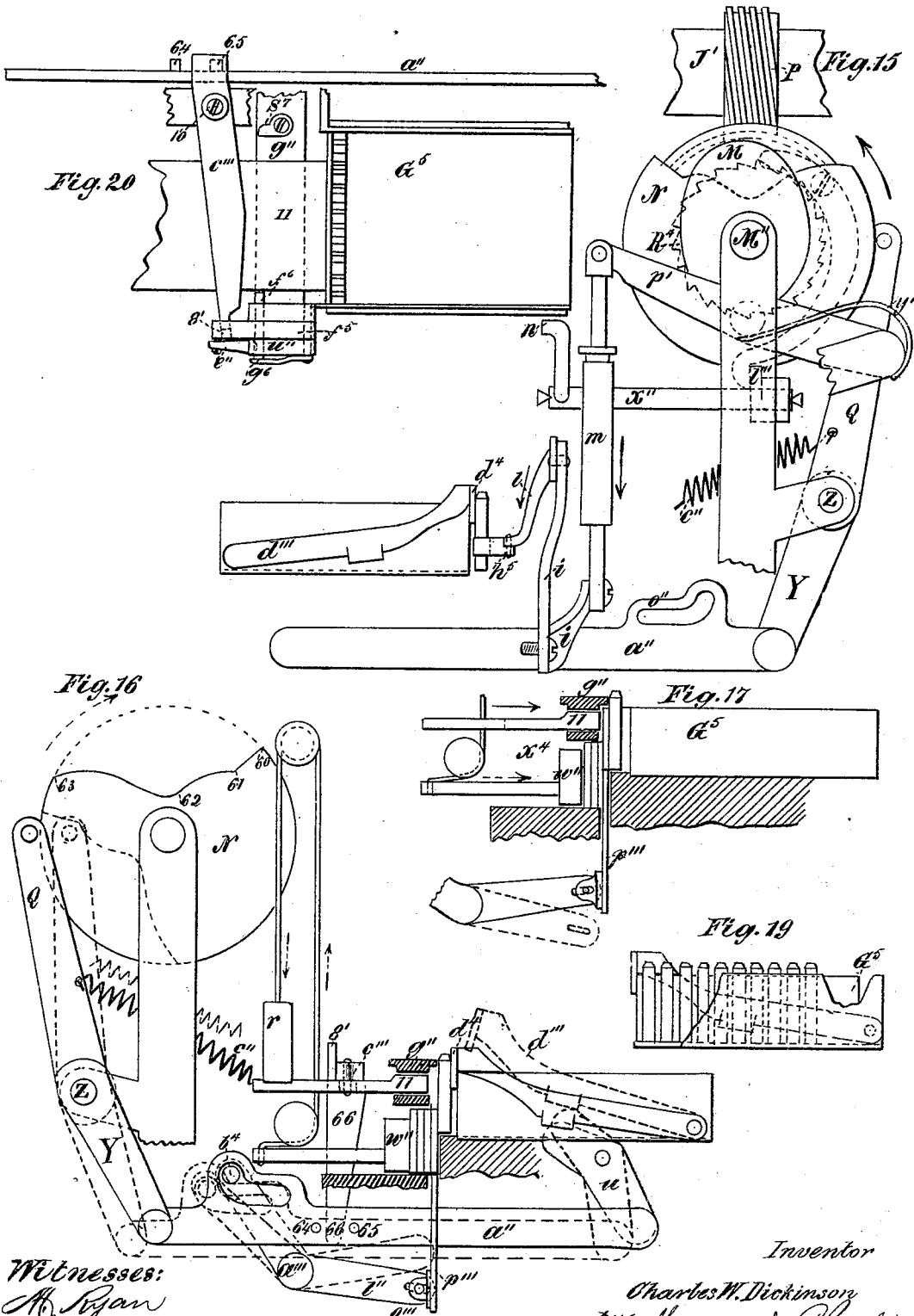
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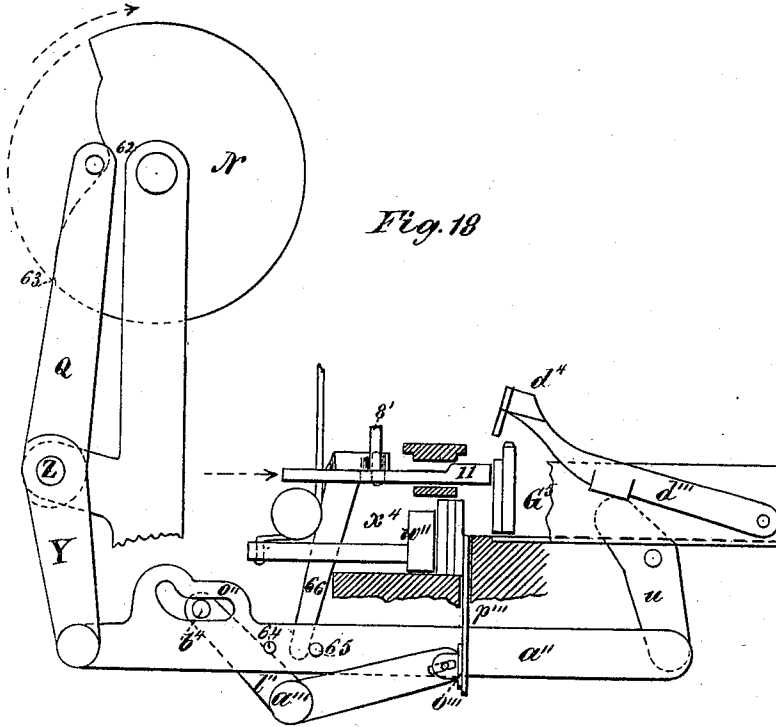


Fig. 18

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UNITED STATES PATENT OFFICE.

CHARLES W. DICKINSON, OF WASHINGTON, D. C., ASSIGNOR TO SAMUEL W. GREEN, OF BROOKLYN, AND SAID GREEN ASSIGNOR TO EDWARD N. DICKERSON, OF NEW YORK, N. Y., TRUSTEE FOR HENRY A. BURR.

IMPROVEMENT IN TYPE-SETTING MACHINES.

Specification forming part of Letters Patent No. **174,901**, dated March 21, 1876; application filed August 15, 1872.

To all whom it may concern:

Be it known that I, CHARLES W. DICKINSON, of Washington, in the District of Columbia, have invented certain Improvements in Machines for Setting Type, of which the following is a description and specification:

The object of my invention is a type-setting machine which will set up type in a line, letter by letter, as the keys upon a key-board are successively touched, and which will make up the matter in column as it is set up. The machine as exhibited in the accompanying drawings may be divided into two parts, which are capable of being used independently of each other, and which constitute a perfect type-setting machine when brought into co-operation, as hereafter more fully explained. The first part of the invention performs the office of separating single types from separate rows of types in a case in which they have been placed, and arranging them in a line properly composed for making up into a column; and the second part of the invention relates to the apparatus for automatically making up into a column the line of type which has been set by the setting apparatus.

The drawings which illustrate the invention and accompany this description are shown in ten sheets.

Figure 1 is a side elevation of the machine from the right side as the operator sits before it. Fig. 2 is an elevation of the machine from the opposite side. Fig. 3 is a plan of the machine looking upon it from the top. Fig. 4 is a front elevation of it. Fig. 5 is a rear elevation. Fig. 6 is a longitudinal detail section. Figs. 7, 8, and 9 are views of the plunger-rod and its actuating mechanism in different positions of their operation. Figs. 10 to 14, inclusive, are views of the line-forming mechanism in different positions of its operations. Figs. 15 to 20, inclusive, are views of the column-forming mechanisms in different positions of their operation.

The frame of the machine is marked A and W, and the various permanent stanchions for supporting the working parts are marked D, I, J, and G. The form of these permanent

stanchions is only material as it enables them to support the working parts in their various relative situations, and may be arranged to suit the constructor. The driving-wheel B, with its shaft E' and crank F, is shown as mounted upon the frame of the machine; but in practice it would probably be dispensed with, and the machine be driven by a belt taken from a pulley driven in the ordinary way in which machinery is operated.

The same letters indicate like parts in the various drawings.

In the drawings, H represents a case of types, which is composed of parallel channels or grooves deep enough and wide enough to each contain a single row of types of any required size. These types are arranged so that they lie upon each other, side upon side, with their faces to the operator. In Figs. 1, 4, and 6, *d* represents the types in such a case. The drawings show only four rows or channels of types; but it is apparent that any required number may be worked together in the machine therein exhibited. This case is supposed to have been filled by a type-distributing machine; but it may be filled by hand, if so desired. When a type-distributing machine is used in combination with the type-setting machine, the case is so constructed as to fit both machines, so that the same case may be moved from one machine to the other as it is alternately filled and emptied. In Fig. 1 this case H is shown as clamped into position by the clamp *b* which is worked upon the shaft *a*, and is supported by the brackets G. The case H being thus introduced behind the guide-bar W', has the lower extremity of the open front ends of its type-channels closed thereby, and a glass-plate, J'', resting upon this guide-bar W' and against the stanchions G, Fig. 3, against which the case H bears, reaches to the top of the channels, and with the guide-bar W' completely covers the front ends of the said type-channels; and as the operator sits in front of the machine with this glass plate before him, he is enabled to observe the amount of type left in the channels of the case as he operates the machine. The bottom ends of the channels in the case as it stands

upright are covered by a plate, B''' , Fig. 6, of a length equal to the width of the case H , and extending from the back end of the case or foot of the types toward the face of the types, about half their length, which prevents them from falling out of the case as it is turned up on end, and upon this plate the types in the case are supported. Through the back of the case, and immediately above this bottom-plate, is a slot, o , large enough to permit a plunger, m''' , to pass through it in the operation of expelling the lowest type in the channel. The guide-bar W' , which extends lengthwise across the lower front end of the type-case H , is recessed or slotted, as in Fig. 4, in front of each channel in said case to a height just sufficient to allow one only of the appropriate type to pass out when thrust forward by the plunger m''' in a manner hereafter to be described. The case, thus constructed, being set up in the machine, the opening at the bottom of each channel will coincide with a slot in the guide-bar W' , and will be in the line of motion of a plunger, m''' , of which there are as many as there are channels in the type-case. The type-plunger is composed of a narrow tongue of steel or other metal, supported upon and making part of a slide, m'' , so arranged in the machine that it can move forward far enough to expel a type from the bottom of the case and be brought backward far enough to be withdrawn from the case, so that the row of type, which may be pressed by a metal slug, will fall down to the bottom of the channel, supplying continually, so long as the type lasts, a single type at the bottom of each channel, to be expelled as required.

The operation of expelling a type is as follows: Each slide m'' carries a tumbler, e , pivoted to it so as to have a short vibration. This tumbler, when held by its spring in a notch, i , in the frame of the machine, locks its slide m'' , as shown in Fig. 1, which is its position of rest; and when it is desired to bring a slide into action, its tumbler is engaged with a moving clutch-bar. This clutch-bar is shown at L' , Figs. 1, 6, and 3, in elevation, section, and in plan. It has a groove in it transverse to the line of motion of the slides, and is long enough to reach over any number of slides that may be employed in the machine, as in Fig. 3. It is connected by the sliding rod V with the roller U , which runs upon the cam U' on the main shaft E of the machine. This cam U' is an ordinary eccentric circle, giving a crank-reciprocating motion to the sliding rod V and the clutch L' , and may be substituted by a crank. The sliding rod V with its roller U is drawn forward by the spiral spring S'' , which holds the roller U in contact with the cam U' , and as the cam revolves causes the rod V with the clutch-bar L' to move forward toward the front of the machine as far as the eccentricity of the cam will permit, and as the shaft revolves the cam carries the whole apparatus backward again to the position shown in Fig. 1. When this sliding rod

V is moved backward and forward as described, if a tumbler, e , is in the position shown in Fig. 1, no effect will be produced upon the slide m'' , to which it is attached; but if a tumbler, e , is raised, as shown in Fig. 6, so that its projecting upper end enters into the groove in the clutch-bar L' , the movement of the clutch will be communicated to the slide m'' carrying that tumbler e , which will be moved forward to the extent of the movement of the clutch, which is far enough to make the plunger m''' enter the slot o in the bottom of the channel of the case, and drive out a type far enough to effect the purpose intended. The keys of the machine used to indicate the letters are marked f , and are at one end of levers g ; at the other end of each lever g is a vertical rod, k , resting upon and connected with the lever g , the upper end of which rod reaches the bottom of the tumbler e , and when the key f is pressed downward by the finger the tumbler e is elevated and engages with the clutch-bar L' , as in Fig. 6, for the purpose above described. The hollow driving-shaft J' , which revolves around the main shaft E , is in constant revolution, but the cam U' is not moving with it until it is desired to expel a type and a key has been depressed, when it revolves once and comes to rest until a key is again touched. The way in which that effect is produced is as follows:

The cam U' , (see Figs. 7, 8, 9,) is fast on the main shaft E , which also carries the clutch-wheel U'' . This clutch-wheel U'' is in running contact with the ratchet-wheel T , which latter is fast on the hollow shaft J' , which revolves around the main shaft E , and is constantly driven by the pulley C . The clutch-wheel U'' may be engaged with the ratchet-wheel T by means of a pawl, T'' , which is centered at 2 on the clutch-wheel, and is armed at one end with a toe, 8, which projects through a mortise in the clutch-wheel, overlies the teeth of the ratchet-wheel, and may be forced into contact with said ratchet-wheel by means of a spring, 3, Figs. 1 and 7, for that purpose, when the other end of the pawl T'' is liberated from the prong S , in a manner to be hereinafter described. The lever R , which carries on one end a plate, V'' , branching at right angles and overlying the disks v'' on the rods k , vibrates around a center, R'' , and has two prongs upon it, S and R^S , and is held up in the position shown in Figs. 1 and 7 by the spring S''' . In this position one end of the pawl T'' bears against the prong S , and thus the toe 8, Fig. 7, is supported out of engagement with the ratchet-wheel T , thus permitting the shaft J' and the ratchet-wheel it carries to revolve freely without actuating the shaft E , from which the setting mechanism is operated. As the ratchet-wheel T revolves, it will only actuate the clutch-wheel U'' so long as the toe 8 of the pawl T'' is engaged with the ratchet-wheel T , during which time the end of that pawl is revolving with the shaft; but when the revolution of the clutch-

bottom end of the type has been driven off from the front edge of the bottom-plate B''' of the case. At that moment the type is supported with one end resting on the upper edge of the glass plate G''', and with the other end resting on the bottom-plate B''', and as the plunger m''' drives it still further forward, the bottom end drops over the edge of the plate B''', and the type falls with its bottom or foot downward, and with its side resting upon the surface of the glass plate G''', down which it slides freely to the race below. By this operation the type is kept with the bottom or foot down, and the same side against the plate all the way from its position in the case till it reaches the race U⁵, in which the line is composed. (See Fig. 10.)

In Fig. 1, the type marked 12 is shown in the act of falling out of the case, and before it has reached the inclined surface of the glass plate. Its outward or face end is resting its flat side upon the edge of the glass plate, which being straight, keeps the type from turning as it falls. When the plunger is driving out the type, the friction on its surfaces produced by the weight of the superincumbent row of types, and of slugs 51, which may be used also in the case-channels to press down the types, prevents the type which is being forced out from flying out under the rapid impulse given to it by the plunger, and when the face-end reaches the support of the glass plate, and the bottom end of the type is moved far enough to fall off from the edge of the plate B''', the weight of the column of type upon it, suddenly permitted to descend, gives the moving type an impulse which carries down its bottom end into the position shown at 12, and so prevents it from being driven out of the machine end-wise across the edge of the glass plate.

When the types drop off from the lower extremity of the glass front-plate above described, they fall into a race just wide enough for a line of type, and as each type falls into the race it is pushed forward by a follower, so as to make room for the next type which may fall. This race may be extended, and curved out of the way of the finger-board of the machine, and a line of type may be pushed out into and through such a channel to any length desired, all that is needed being a slug of metal in the channel, against which the type may rest and be kept upright. If it is desired to have the type delivered in a continuous line, to be made up by hand afterward, a groove or "stick" may be made in manner suggested, and when it is filled it may be removed, and an empty stick replaced, so as to receive the matter as it is set up; but if it is desired to make up the matter into column and lead it, this apparatus will perform that office automatically.

Upon the main shaft E is a double cam, C'', which gives two vibrations at a single revolution to the lever p. This cam may be made to give a greater number of vibrations if so

desired, and it may be made to rotate with the shaft J' continuously, or only when the cam U' is in action. The object of this cam is to give a reciprocating motion to a follower, t⁴, which pushes the line along as the types are fed in, and any arrangement connected with the prime mover of the machine that will give such a vibrating motion to that follower will answer the purpose. This follower is drawn backward by the lever p'', operating on the pin or roller q'', which is attached to the follower by a pivot, and it is driven forward by the spiral spring S⁵, which holds the roller q'' in contact with the lever. The front end of this follower enters the type-race U⁵, Fig. 10, and reaches far enough, when in its advanced position, to pass by the delivery-aperture of the guiding apparatus formed by the glass plate and back plate, and when it is withdrawn leaves an opening in the race large enough for the type to fall into as it drops off from the lower edge of the glass plate. In advancing once this follower pushes the line of type as far as it goes, and when it advances again, if no new type has been dropped into the race, it produces no further effect upon the type already there; but if a type has been dropped in, whatever may be its thickness, the follower pushes the entire line along a distance equal to the thickness of that type. This type-race ends at 52, where the type are delivered out of it into a galley, G⁵, Figs. 10 to 14. As the type are pushed out of the race by the follower, they press against the vertical surface of the slide-rest u'', which is as wide as the race, and at right angles to the bottom of the galley. This slide-rest u'' is held against the advancing type by the weight X, which is connected with the slide-rest by the rod c', which moves with the slide-rest, and which operates on other parts of the machine, to be described. The slide-rest has also a friction-clutch, f⁵, in it, by which it is made to adhere to the bar g'', on which it slides, with friction enough to prevent the weight X from drawing it backward after it has been pushed forward by the line of type driven by the follower, as before described. This friction-clutch is so arranged that at a certain time and manner, hereafter to be described, it is temporarily released, so that the weight X will draw the slide-rest u'' up to the position shown in Figs. 1, 10, and 11, and when it reaches that position the friction-clutch will again seize the bar and come into action, and will continue to act until it is again suspended for the purpose of returning the slide-rest to its original position. This friction-clutch f⁵ is simply a lever hung in the slide-rest u'', and forming a part of the top of that rest, but capable of being pressed down upon the bar g'', on which the slide-rest moves. Its lower surface in contact with the bar should be armed with leather. A spring, e'', one end of which is firmly fixed in the slide-rest u'' and the other end of which is pressed downward on a pin in the end of the friction-

wheel has brought one end of the pawl T' into contact with the prong S, the other end of the pawl carrying the toe 8 is lifted out of engagement with the ratchet-wheel, and the clutch-wheel U'', along with the eccentric cam U', with which it is connected, is stopped, the ratchet-wheel and hollow shaft revolving without interruption. When a key is pressed, at the same time that the tumbler *e* is engaged with the clutch-bar L'', the lever R is raised by the disk *v''*, which projects from the rod *k*, and the prong S on the end of the lever R is depressed, as in Fig. 8, and consequently releases the pawl T'', whose toe 8 is then forced by the spring into engagement with the ratchet-wheel T. The effect of this movement is to couple the ratchet-wheel T with the eccentric cam U' and set the latter in revolution, which will be kept in action, and will, through the sliding-rod V, expel as many type of the denomination whose key is touched as there are revolutions of the clutch-wheel while the finger is kept upon the key; but if the finger is removed from the key immediately, but one type will be expelled, and the lever R will be returned to its normal position, and the ratchet-wheel T and cam U' will be uncoupled as follows: The upper prong R⁵ of the lever R is moved with the lever, and as the key elevates one end of the lever at *v''* the end of the prong R⁵ approaches the periphery of the clutch-wheel U'', upon which a projection or cam is placed, which, coming into contact with the end of the prong R⁵, forces back the lever so as to bring the prong S into position for engaging the pawl and stopping it at the end of a single revolution. In doing this it also forces down the rod *k* and raises the key *f* under the finger, and consequently but one letter will pass, unless the finger be pressed down again upon the key after it has been raised by the action of the machine to its ordinary position as described.

In front of the machine, and below the type-case, is the guiding apparatus for conducting the types into the race where the line is to be composed. (See Figs. 4 and 6.) This apparatus consists of an inclined back-plate K, fixed to the frame of the machine, upon which partitions are set up a little higher than the thickness of the thickest type, to form conducting-grooves for the types. There are as many of these grooves in the back-plate as there are channels in the case used on the machine, and they are arranged so as to lead the type all into one single passage-way at the bottom of the back-plate, and immediately over the race or channel into which the types are to be dropped. Fig. 4 shows this arrangement of partitions for four denominations of type, but the number may be increased, and suitable arrangement made for larger numbers of denominations of type. A glass plate, G''', is slipped in and held against the partitions by suitable clamps, 50, and becomes the bottom to the whole series of grooves, making each groove a complete closed channel. Sup-

ported upon the surface of this inclined glass plate, the types readily slide down to their destination, and the channels thus made lead the separate types one by one to the common passage, out of which they all pass from this inclined guiding apparatus. It is not necessary that a letter ejected from the case should travel the whole distance of its channel upon the inclined glass plate and reach the race before another letter can be ejected; but although two or more letters may be upon their way from the case to the race at the same time, they will arrive at the race in the same order in which they are ejected from the case.

This construction of the guiding apparatus avoids the defects of previous constructions. If the guiding apparatus be made vertical, it is difficult to drop the letters properly into it, and their impetus is such as to batter them. If it is inclined, the surface on which the types slide must be hard and smooth, and they must be strictly confined on all sides. Types in actual use gather dirt from electrotyping, stereotyping, or letter-press printing, and the channels through which they pass will receive and accumulate this dirt, and become clogged so as to arrest the passage of the types, and, therefore, should be so made as to be easily and quickly cleaned. Channels with fixed bottoms are hard to clean, as their corners are not easily accessible. No practical use has heretofore been made of glass as a surface on which the type may slide, on account of the difficulty of forming guiding partitions upon it, as in an English patent, 1769-1860, where pins pass through holes in the glass bed-plate and hold glass strips which form partitions between the bed plate and a glass cover; but in the present construction three sides of the channels are permanently fixed to the machine, the bottom or fourth side being formed by the removable plain glass plate with its smooth, hard, unbroken surface. The operator can see the types as they slide down upon the inclined glass plane, and if by any accident the type should stick, he can at once observe it, and by simply removing the glass plate, the arrested types will fall out, when the plate can be immediately replaced and the operation proceed. This glass-plate has the advantage of having a smooth polished surface upon which the types readily slide, whereby the facility of the operation is very much increased; and from this hard and smooth surface, when the glass-plate is removed, the accumulating dirt can be easily and quickly wiped, and the exposed outer edges of the fixed partitions cleaned without the difficulty inseparable from getting into corners not readily reached.

When the plunger *m'''* expels a type from the bottom of the channel in the case H, the face-end of the type is driven forward far enough to rest on the upper rounded edge of the glass plate G''' before the opposite or

clutch f^5 , gives the necessary pressure thereto. The tension of this spring may be increased in manner well known until the friction that it creates is sufficient to prevent the slide-rest from being drawn back by the weight X so long as the friction-clutch is in operation. When this friction-clutch is lifted at its outer end against the tension of the spring, a bolt, f^6 , whose upper surface is properly recessed, is run under it by means of the spring g^6 , and it is held up thereby so as not to press upon the bar g'' . The other end of this bolt, passing through the slide-rest, projects beyond its inner face, and when the weight X draws the slide-rest up to the position shown in Figs. 1, 10, and 11, the projecting end of this bolt comes in contact with a stud, S', and the bolt is driven back, allowing the friction-clutch again to act, by which means the friction-clutch is alternately acting and suspended.

When a line of type has been deposited in the race and pushed down against the slide-rest u'' until there is enough to make one line of a column, the machine detaches this line and makes it up into a column in a galley in the following manner: When the slide-rest has been driven down by the accumulated type to a position about half way across the inner end of the galley G^5 , if that is the length of the line desired, there will be a line of type partly in the race and partly in the galley, one end of which is supported by the slide-rest, and the other end of which has been pressed by the follower t^4 , as already described. (See Fig. 12.) The problem then is to move this line of type lengthwise entirely out of the race into the galley, and afterward to move it sidewise out of the way of the next line which is to come in its place. To accomplish this purpose, another follower, h^5 , (see Figs. 1, 6, 13, 14, and 15), in addition to the one which has the reciprocating motion already described, is provided. The end of this follower h^5 , when at rest, comes only as far down the type-race as the end of the follower t^4 , when the follower t^4 is withdrawn to the utmost by the double cam C'' . It is mortised in the follower t^4 , and occupies a portion of the height of the race in which the follower t^4 is working, and the mortise in the follower t^4 is open at the front end for the purpose of permitting the follower h^5 to reach the line of type, when it is in its turn projected forward. This second follower h^5 is connected by the rod l with the bell-crank i , which is operated through the connecting-rod m by the lever p' , which is driven by the cam M on the shaft M'' . The lever p' is held in contact with the cam M by the spring y'' , so that it is returned by that spring after it has been pushed out by the cam. The manner in which this second follower is set in action is as follows: Upon the rod c' , which is connected with the slide-rest u'' , is a plate, x''' , which carries on its inner face a cam, w''' , whose office it is to set in action the apparatus for separating the line

and making it up in column. This cam is adjustable upon the rod c' at any desired point by a set-screw or similar means, according to the length of the line required. When the slide-rest has been forced down the desired distance, the point of the cam w''' comes in contact with the end of the lever n , which is attached to the rock-shaft x'' . Upon this rock-shaft x'' there is an arm b''' which moves with it. When the cam w''' has gone far enough to raise the lever n , the arm b''' will have been raised far enough to come under the prong S, as in Fig. 1, and to act as a detent to prevent a key from being depressed. The object of this is to suspend the setting apparatus while the line of type is being moved out of the race and brought into the galley. The lever l''' , on the end of the rock-shaft x'' , is thereby moved to release the pawl which connects the worm-wheel O on the hollow shaft M' with the cams M and N on the shaft M'' , in the same manner as already described for the clutch-wheel U'' and ratchet-wheel T on the main shaft E, Figs. 2 and 15. The worm-wheel O is in constant action, being fast on the hollow shaft M' , and is driven by the worm P on the shaft J' in the usual manner. It carries with it only a ratchet-wheel, R^4 , into which a pawl on the clutch-wheel c engages when the lever l''' is depressed, thereby liberating the end of the pawl and permitting its toe to take a tooth on the ratchet-wheel.

When the shaft M'' is thus coupled to the hollow shaft M' and begins to turn, carrying with it the two cams M and N, the operation of separating the line of types begins also, and in one revolution of the shaft M'' the line of type has been moved forward into the galley, leaded, and moved sidewise out of the way of the next line of type, in manner now to be described.

As the plate x''' , attached to the slide-rest rod c' , carries the cam w''' forward, said cam engages underneath the point of the lever n , which it raises, and with it, through the shaft x'' , the arm b''' , which it supports under the prong S, as before described. These positions of the lever n and arm b''' are maintained until the end of the lever n has passed off from the rear end of the cam w''' and been drawn again by the spring s^3 into the position shown in Figs. 1 and 10. The effect of this operation of the cam is, first, to stop the revolution of the shaft M'' , which is done by restoring the lever l''' to the position shown in Figs. 2 and 15; secondly, to remove the arm b''' from under the prong S, as in Fig. 1, so that the keys can be again operated, it being desirable to suspend the action of the machine only while a temporary rest is being brought into position to receive the type delivered into the race. While the rod c' is being drawn back again by the weight X into the position shown at Figs. 1, 10, and 11, the cam w''' permits the end of the lever n to pass above it through a spring-gate, or other analogous contrivance for switching off the motion of the cam, so

that when the return movement of the rod c' is finished, the cam w''' will again be under the end of the lever n . The action of the keys is thus suspended for the least possible time, and the shaft M'' cannot make more than one revolution while a single line of type is being deposited in the galley.

The first part of this operation of depositing a line of type is performed by the follower h^5 , driven from the cam M , through the intermediate bell-crank i , as already described. This follower forces forward the line of type, together with the slide-rest u'' , until the latter reaches the end of the bar g'' , at the end of the galley, as in Figs. 13 and 14, where the top of the line of type is supported on one side against the bar g'' , and on the other against the gage-bar d^4 , as in Figs. 16 and 17, the lower end of the line of type being supported against a "lead" and upon the bottom of the galley, as will be hereinafter described. This gage-bar d^4 is carried upon the two arms d''' , which are centered on pins on each side at the rear end of the galley, and which, by being elevated at the appropriate time, lift the gage-bar from the galley. When the line of type has been thus driven to the proper position in the galley, the cam N comes into operation upon the lever Q , Figs. 15, 16, and 18, which is fast on the rock-shaft Z , and pressed against the perimeter of the cam by a spiral spring, c'' , attached to the arm k'' , Fig. 2, causing the end of the lever Q to follow the curves of the cam N as it revolves. These curves are shaped so as to permit the end of the lever Q to move in and out during less than one-third of the revolution of the cam N . Pivoted on the arm Y , which is also fast on the rock-shaft Z , is a sliding bar, a'' , running across from the end of the arm Y to the end of the lever u . When the rock-shaft Z is vibrated by the lever Q , following the cam N , the lever u is moved so that it lifts the arm d''' , which carries the gage-bar d^4 , and by that means the gage-bar is raised out of the way of the line of type, which can then be pushed sidewise into the galley. On this sliding bar a'' there is a plate, o'' , in which a curved slot is cut, performing the office of a cam. This curved slot is shown in full and in dotted lines in Fig. 16, with the pin b^4 on the lever l'' resting in its upper end. The shape of this slot is such that as the bar a'' is withdrawn while the lever Q is traveling on the cam N from the point 60 to the point 61, the lever l'' , which is centered on the shaft a''' , is rapidly depressed at its upper end and elevated at its lower end, o''' . At its lower end it is attached to a thin plate of metal, p''' , as long as the width of the galley, and which is raised by the action of the lever l'' . Above this lever and below the plane of the bottom of the galley is a box, x^4 , in which strips of metal for separating lines of type in columns, technically called "leads," are placed. The follower w'' , driven by a weight, r , suspended by a cord over

pulleys, presses these leads forward as the front one is lifted out of the box by the plate p''' . The bottom of this box has a slit in it to permit the plate p''' to rise through it. When it does rise, one of the leads, being on the top of it, is carried up with it so far that its upper edge is above the bottom of the galley and rests against an offset on the under face of the slide rest, as in Fig. 17, where it is held by the plate p''' , and forms a guide-surface for the lower end of one side of the line of types, the cam in the sliding bar a'' being so shaped as not to move the lever l'' while the bar is being withdrawn still further. When the lead has reached the position thus described, the lever c'' forces the plunger 11 against the lead which has just been elevated, and the line of type is thereby moved outward into the galley. This lever c''' is centered at 10, and has an arm, 66, hanging down, as seen in Figs. 16 and 20. On the sliding bar a'' are two pins, 64 and 65, between which the lower end of the arm 66 hangs, and through which the slide a'' vibrates the lever c''' . As the bar a'' is withdrawn, while the end of the lever Q is traveling from point 61 to point 62 of the cam N , one of these pins, 65, comes in contact with the arm 66 of the lever c''' after the lead has been raised in the manner described, and the lever c''' is brought forward, carrying with it the plunger 11, which presses against the lead and moves the line of type as described. At the same time the extreme end of the lever c''' , at S' , runs under the friction-clutch f^5 , and elevates it out of contact with the bar g'' , when it is caught up and held by the spring-bolt f^6 , in the manner already described, thus releasing the friction which holds the slide-rest u'' in any position where it may be left on the bar g'' . As the motion progresses the lever Q travels from point 62 to point 63 on the cam N , is again pressed outward, and the reverse of the movements last described occurs, the gage-bar is dropped into the galley and overreaches the line of type which has just been pushed forward, and bears upon the face of the lead which has been moved forward with the line of type, as in Fig. 19, the lead-elevating plate is lowered to its original position, and the column of leads is pressed forward by the follower w'' , the plunger which moves the line of type into the galley is withdrawn, and the weight attached to the slide-rest u'' , being no longer counteracted by the friction-clutch, draws the slide-rest into the position shown in Figs. 1, 10, and 11, where, coming in contact with the stud S^7 , the bolt which suspended the friction-clutch in the slide-rest is tripped from under that clutch, and the spring forces the friction-clutch into contact with the bar g'' , where it remains during the repeated operation until again elevated.

As considerable time is occupied in making the one revolution of the shaft M'' , which effects all these movements, it is desirable to so organize the machine that the setting ap-

paratus may continue to be operated while the movements last described are being performed; and I have arranged a part of this mechanism for the purpose of enabling the machine to be worked while the line of type is being put into column. In order to do this it is necessary to have a rest, against which the type can be driven by the follower as they are delivered from off the glass front plate into the race, and, as the slide-rest is not available for that purpose, a temporary rest must be substituted until the slide-rest has been returned to the position shown in Figs. 1, 10, and 11. This I accomplish by means of an apparatus which places a rest, f'' , in the race U^5 after the follower h^5 has driven out the line of type. The vibrating rock-shaft h'' is centered upon the frame of the machine, as shown in Figs. 10, 11, and 12, having two arms projecting in opposite directions. The rod s''' is attached to one of these arms z^2 , and the rod s'' is attached to the opposite arm i'' . On the rod s''' , at h^3 , is a projecting stop, and on the plate x''' , connected with the rod c' , is a pin, h^4 , which is in the same plane with the projection h^3 . As the rod c' moves with the motion of the slide-rest u'' , as already described, the pin h^4 comes in contact with the projection h^3 , and carries the rod s''' along with it, vibrating the rock-shaft h'' slowly. On the outer end of the rod s''' is the cam-projection q , passing through an opening in the stanchion I , and, when the rod s''' has been carried far enough to bring the cam-projection q into the opening through which the rod passes, the shape of that cam-projection depresses the rod s''' , and permits the pin h^4 to pass over the projection h^3 and release the rod s''' without carrying it any farther. In this position the rod s'' on the arm i'' has been carried in the opposite direction from that in which the rod s''' was moved, and as far. The rod s'' is connected, through a head, r'' , with a rod, t'' , at the end of which rod is a piece, projecting at right angles to the length of the rod, long enough to form a rest, f'' , against which the type may be supported. This rest can enter the race through an opening, o^6 , and, having entered it, closes the race, as in Fig. 10, so that the types falling into it will bear against this rest as they are forced down the race by the follower t^4 , carrying the rod t'' along with them. A spring, s^5 , presses upon a pin on the rod t'' , so that, when the rod t'' is carried by the advancing motion of the rod c' far enough to bring its projecting piece opposite the opening o^6 , the spring s^5 forces the projecting piece into the opening, where it performs the office of a rest for supporting the type, as in Fig. 12. In that situation the type may again be dropped into the race, and the follower t^4 , pushing them down, will carry this temporary rest f'' forward in the same manner as the slide-rest u'' would be carried if it were in action. When the rod t'' has been driven along toward the delivery end of the race, a spring, s^6 , set to press in the opposite direction from the spring

s^5 , is bearing against the pin on the rod t'' in a direction which tends to withdraw the temporary rest f'' from the race in which it is moving; but the opening into the race is so shaped that after the temporary rest has entered the race, and has begun to move along in it as the types are pressed against it by the follower, it cannot be withdrawn sidewise out of the race until it reaches the end of its allotted course. This result is effected by making the shape of the opening o^6 into the channel like the expanded letter **H**, and the shape of the temporary rest like the letter **T** turned upon its side, (thus, **┐**,) whose stem connects the cross-head to the rod t'' . The head of the rest enters the upper transverse slot of the opening at o^6 , and as the rest is moved downward the cross-head travels inside of the race, through the thin-metal wall of which the **H**-shaped opening is cut, and consequently the rest cannot be withdrawn till the cross-head of it reaches the lower transverse slot in the **H**-shaped opening. Meanwhile as the rest is slowly passing down the channel the spring s^6 is being gradually compressed by the pin on the rod, and as soon as the cross-head of the rest comes opposite the lower slot it is sprung out, as in Fig. 11, and the types are left to be supported by the slide-rest u'' , which, at this time, has been returned to a position to fulfill this function. In this situation the rod c' , again advancing as the line of type is fed in, carries with it the rod s''' , bringing back the temporary rest, to be again forced into the race to perform its office when the slide-rest has been taken away, as already described.

It is apparent that the various effective movements which are communicated from the prime mover to the different parts performing the various functions of this machine may be communicated through devices well known to mechanics, arranged in a great variety of positions, and having a great variety of forms.

The use of cams for communicating motions of any desired quality is well known, and there is nothing in this machine which is new, so far as the construction of cams and levers, considered by themselves, is concerned.

The invention involved in this machine consists in the new method by which types are taken out of a case and set up into a line, which new method is effected by a series of movements exhibited in the model and drawings, and also in the new method in which lines of type are made up into a column, which is also effected by movements of parts for the first time made available for this purpose in this machine.

The shafts and cams may be differently placed, and different forms and positions given to the levers and conducting-rods; but so long as the series of ultimate movements substantially similar to the movements shown in these drawings is performed upon instruments which operate on the type, there will be no material change in the principle of my invention.

What I claim as my invention is—

1. The front rest formed by the edge of the glass plate, substantially as described, for giving a support to the "face" end of the type as it is ejected from the case before the bottom end is disconnected from the line in the case, so as to hold the type from turning and secure its delivery with the proper side down, substantially as described.

2. A guiding apparatus consisting of a fixed inclined back plate, on which the type-grooves are formed, and a removable inclined plane of glass or similar smooth transparent substance, which completes the channels, and on which the types slide down upon one of their sides from the case to the race in which they are to be set, substantially as described.

3. A vibrating tumbler, substantially as described, in combination with the plunger, which expels the type, and with the reciprocating clutch, which gives motion to the plunger, so arranged that it will not engage with the reciprocating clutch until it is brought into connection by the action of the key pressed to set a type, substantially as described.

4. The combination of two followers, substantially as described, for pressing forward the line of type, which is fed into the type-channel by the conductor, one of which has a short reciprocating movement, and the other of which pushes forward the entire line out of the channel and into the galley when enough type has been set up to form a single line of a column, substantially as described.

5. In combination with the principal slide-rest, the temporary rest for supporting the type as they are moved down the channel during the time when the principal slide is out of action, substantially as described.

6. The combination of the slide-rest of the

machine with the apparatus for separating the line of type of the length required for a column, so that when the slide-rest has been moved far enough to form a line of the required length it will automatically set in action the second follower and the apparatus for making up the line into a column, substantially as described.

7. A type-setting apparatus the selecting mechanism of which is automatically locked while a single line of type is being moved out of the channel, in combination with a temporary rest which is brought into position to receive type, which may be conducted into the channel during the transfer of the forward line, substantially as described.

8. The combination, with an apparatus, substantially as described, for moving a line of type out of the race where it is formed into the galley, of an automatic apparatus for "leading" the line of type, and for moving it side-wise out of the track of the slide-rest, substantially as described.

9. A friction-clutch for so controlling the slide-rest that it is held pressed against its slide when moving in one direction, and is automatically liberated to run freely in the opposite direction, by means constructed and operated substantially as described.

10. The combination of a mechanism in which types are selected by keys with an apparatus which automatically makes up each completed line of types into column, substantially as described.

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Witnesses:

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