(No Model.) 6 Sheets—Sheet 1.

O. MERGENTHALER.

MACHINE FOR PRODUCING TYPE MATRICES.

No. 344,974. Patented July 6, 1886.

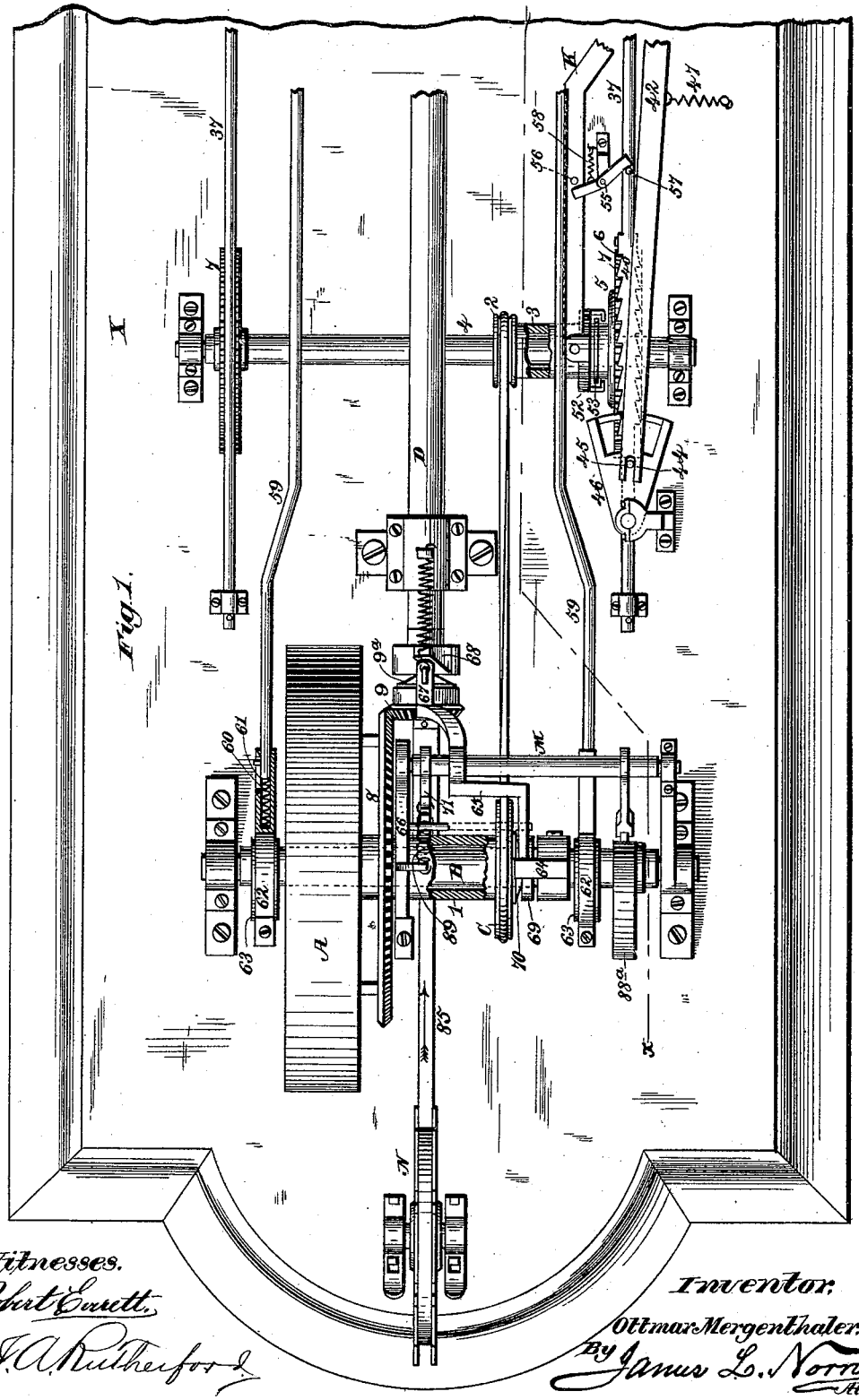

Fig. 1.

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(No Model.) 6 Sheets—Sheet 2.

O. MERGENTHALER.

MACHINE FOR PRODUCING TYPE MATRICES.

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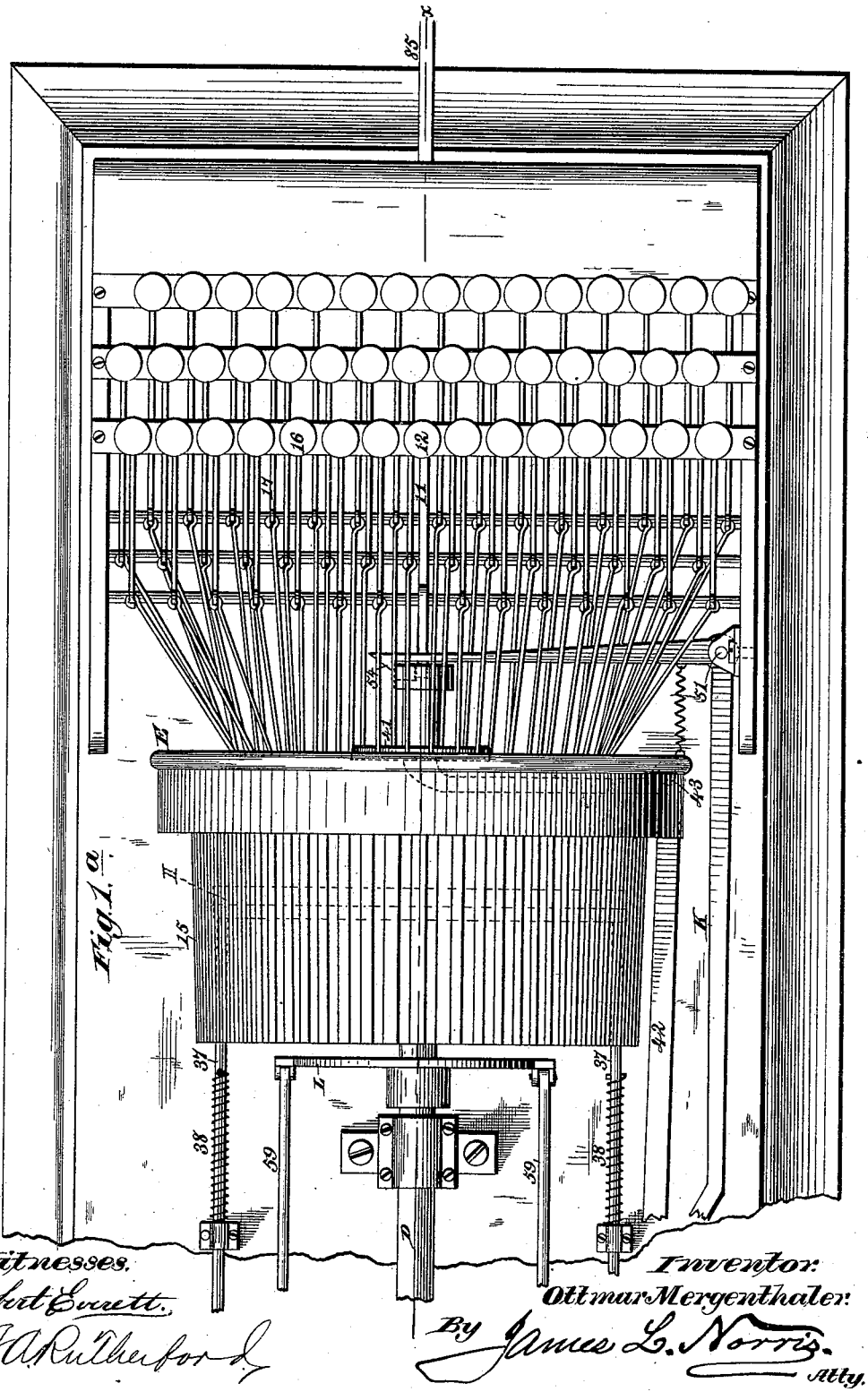

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N. PETERS. Photo-Lithographer, Washington, D. C.

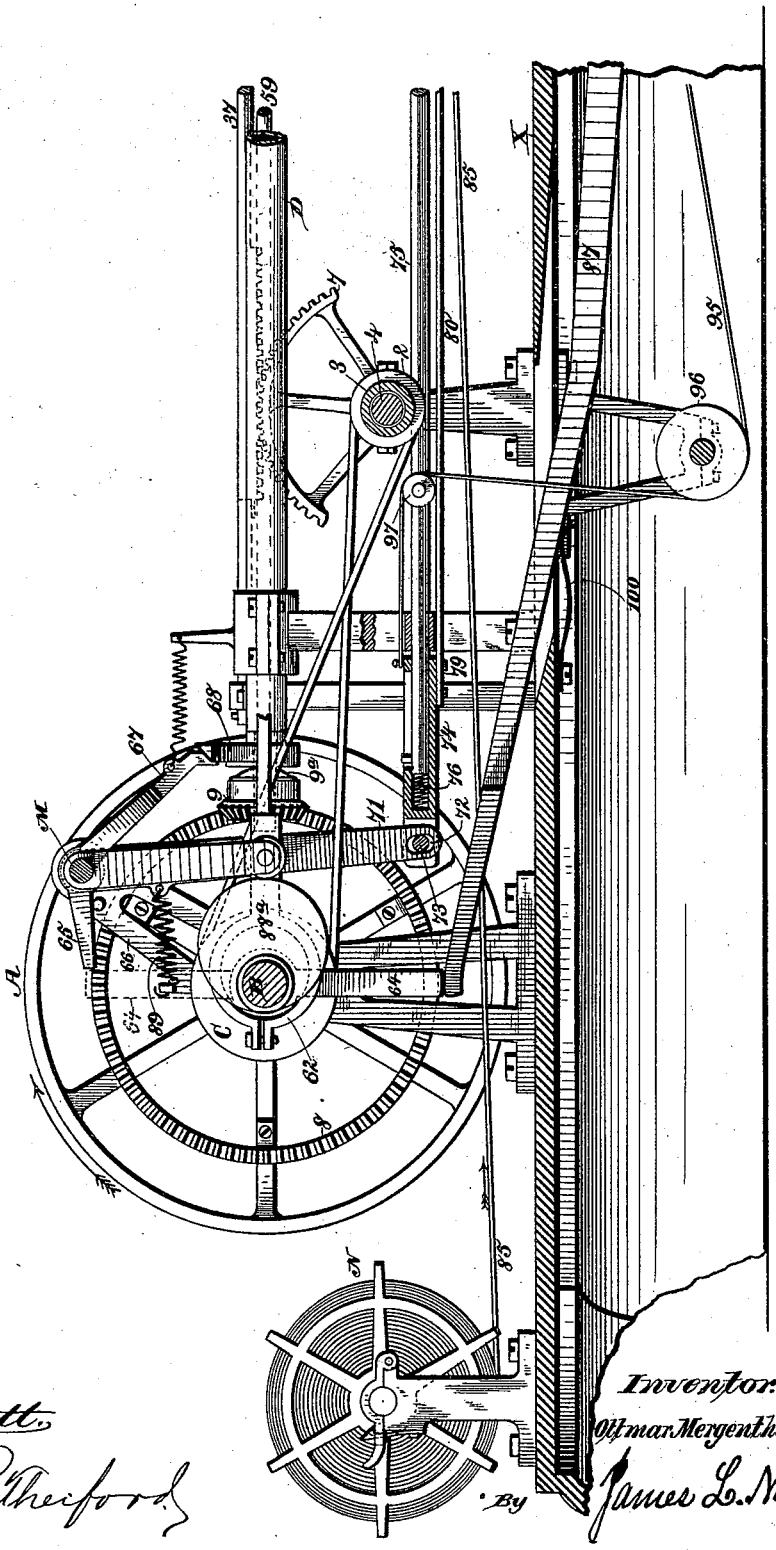
(No Model.) 6 Sheets—Sheet 3.

O. MERGENTHALER.

MACHINE FOR PRODUCING TYPE MATRICES.

No. 344,974. Patented July 6, 1886.

Fig. 2.



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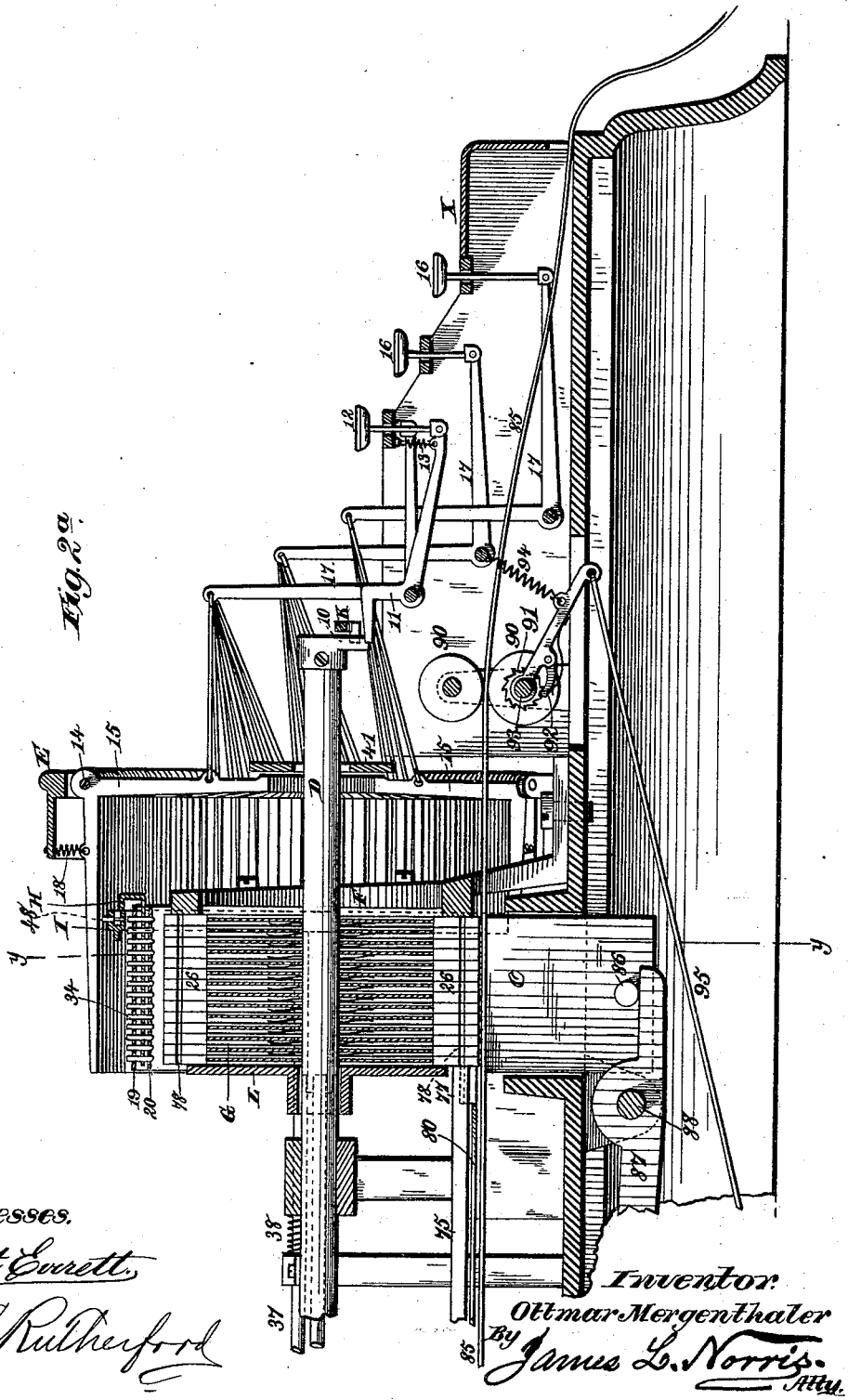
(No Model.) 6 Sheets—Sheet 4.

O. MERGENTHALER.

MACHINE FOR PRODUCING TYPE MATRICES.

No. 344,974. Patented July 6, 1886.

Fig. 2a.



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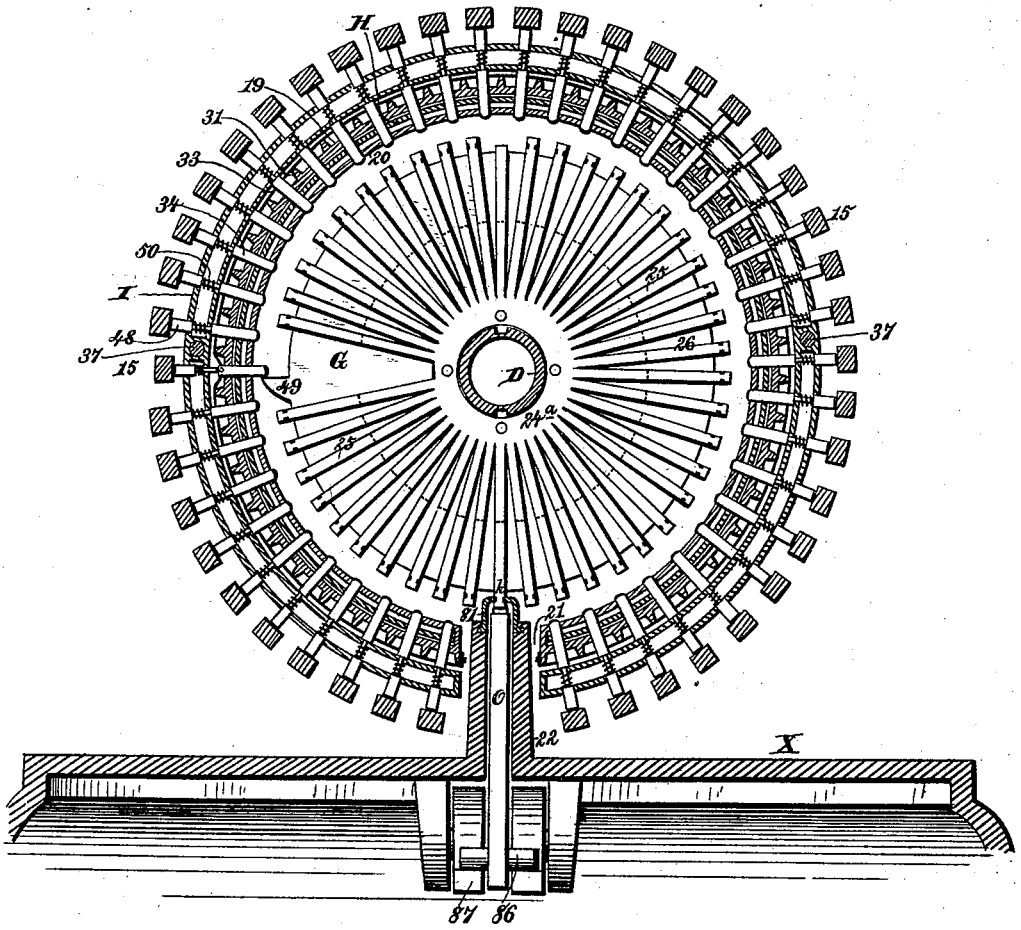
MACHINE FOR PRODUCING TYPE MATRICES.

No. 344,974. Patented July 6, 1886.

Fig. 3.



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(No Model.) 6 Sheets—Sheet 6.

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MACHINE FOR PRODUCING TYPE MATRICES.

No. 344,974. Patented July 6, 1886.

Fig. 4.

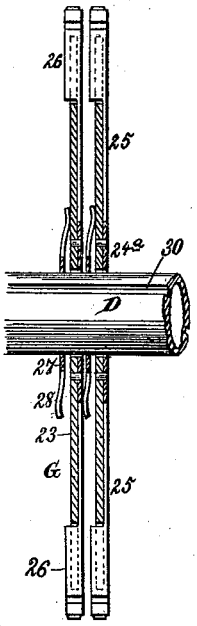


Fig. 6.

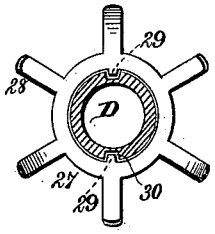


Fig. 5.

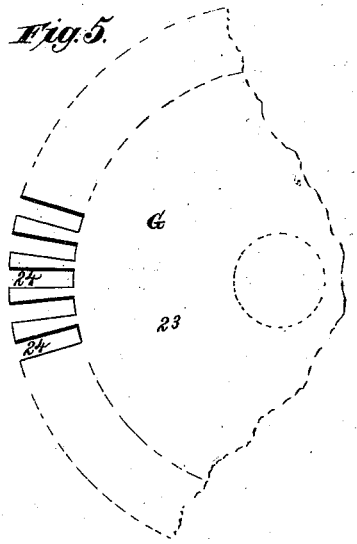


Fig. 7.

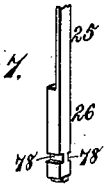


Fig. 8.

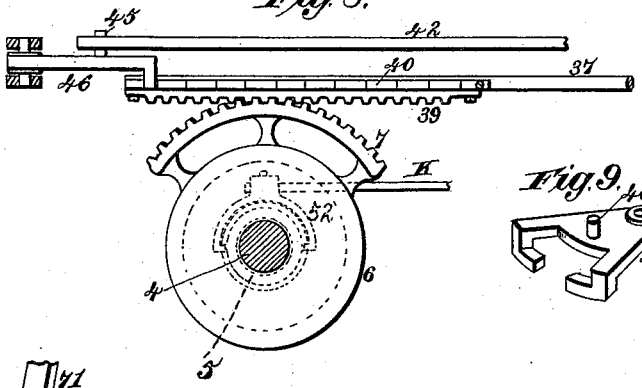


Fig. 9.

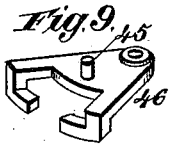
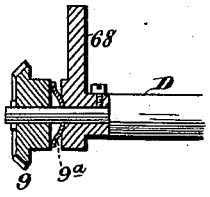


Fig. 10.



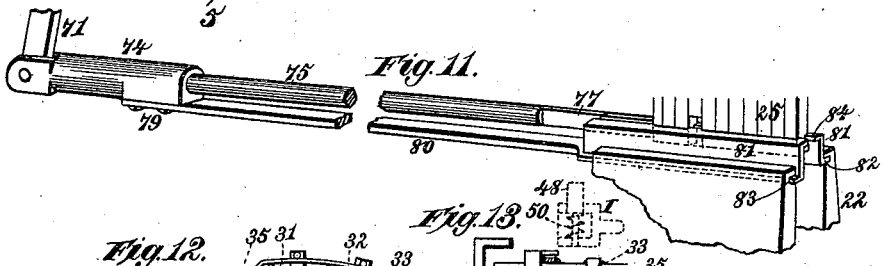


Fig. 12.

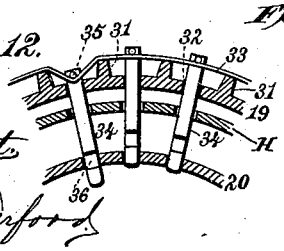
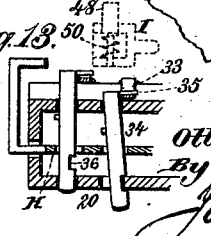


Fig. 13.



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UNITED STATES PATENT OFFICE.

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MACHINE FOR PRODUCING TYPE-MATRICES.

SPECIFICATION forming part of Letters Patent No. 344,974, dated July 6, 1886.

Application filed March 15, 1883. Renewed April 25, 1881. Again renewed April 24, 1886. Serial No. 200,084. (No model.)

To all whom it may concern:

Be it known that I, OTTMAR MERGENTHALER, a citizen of the United States, residing at Baltimore, in the State of Maryland, have invented new and useful Improvements in Machines for Producing Type-Matrices, Printing, &c., of which the following is a specification.

My invention relates to a machine for producing impressions from type upon paper or other pliable or plastic surfaces, whereby a stereotype mold may be obtained direct; and the novelty consists in the construction and arrangement of parts, as will be more fully hereinafter set forth, and specifically pointed out and indicated in the claims.

The object in general of the invention is to avoid the work of the compositor, and the heavy expense in type by means of a mechanical machine, through the employment of which the molds or matrices are produced direct in the machine without the aid of compositors, and without any further stock of type than those contained in the machine.

The specific objects of the invention, among others, may be briefly said to be to produce a machine which shall be capable of having a series of disk type-wheels arranged in such relation to each other as to present any given type in each disk at a point where the impression is to be taken, the particular type in each case being determined by a series of keys, each bearing a design corresponding to one of the types on each of the keys; to provide means for automatically shifting the designating levers from one disk where the proper letter or figure has been designated to the next disk in the series; to provide means for automatically pressing the designated types together, and locking them until the impression has been automatically taken, and then releasing them for a subsequent operation; to produce means for automatically causing the return of the designating apparatus after the impression of certain types has been taken, in order that other types may be designated and arranged at the point where the impression is taken for a subsequent operation; to provide means for automatically bringing the several types designated on the several disks into a line, and locking them until an automatically-operating platen shall have pressed the paper or other surface to the face of the designated types, and then automatically releasing the entire series.

To these ends the invention consists, essentially, in the mechanisms and combinations of mechanisms fully illustrated in the accompanying drawings, which form a part of this specification, and in which—

Figures 1 and 1^a on Sheets 1 and 2 represent a top plan view of the device necessarily broken in each sheet. Figs. 2 and 2^a are longitudinal sections taken on the line $x\,x$ of Figs. 1 and 1^a. Fig. 3 is a transverse section taken on the line $y\,y$ of Fig. 2^a. Fig. 4 is a detail section showing the type disks, the shaft upon which they are loosely hung, and the intervening spring-friction spiders. Fig. 5 is a detail view of one of the type-disks showing the radial recesses therein which receive the type. Fig. 6 is a detail showing the spring-friction spider having the spring arms projecting alternately and the key-projections for locking it to the shaft. Fig. 7 is a detail perspective of one of the type-arms. Fig. 8 is a detail of the segment and rack-bar and some of their connections. Fig. 9 is a detail perspective of the oscillating pawl. Fig. 10 is a detail of the connecting-gear on the main shaft and its friction connection therewith. Fig. 11 is a detail perspective of the means for compacting and locking the designated types. Figs. 12 and 13 are detail sections of the type-pins, their concentric bearings, and the elastic band which exerts a constant force to hold the pins out of operation, one of the pins being shown as locked in position and in the act of designating one of the types.

Referring to the drawings, in which similar letters of reference indicate like parts in all the figures, A designates the drive-wheel, hung rigidly upon a sleeve, 1, which in turn is loosely hung upon a shaft, B, journaled in proper standards, as shown. The wheel A and its sleeve have belt or other connection with a suitable motor, and revolve constantly when the device is in operation. The sleeve

carries a pulley, C, which connects with a pulley, 2, on a sleeve, 3, fitted loosely on a transverse shaft, 4, and carrying a friction-disk, 5, which bears against a disk, 6, carrying a segmental gear, 7, the purposes of which will be made known hereinafter.

Rigid with the drive-wheel A is a beveled gear, 8, which gear is in constant mesh with a beveled pinion, 9, the latter being adapted to transmit motion to the main shaft D, journaled longitudinally in the frame X by means of a concavo-convex friction-disk, 9^a, located between the body of the pinion 9 and the end of the main shaft D. On the opposite end of the shaft D is an arm, 10, and pivoted in the main frame X, just back of the key-board, is a bell-crank, 11, operated by a key, 12. A key-spring, 13, serves with a constant force to hold the inner arm of the bell-crank lever 11 against the arm 10 of the main shaft, and thus lock said main shaft against rotation, the friction-disk 9 riding idly on its bearings; but when the spring-force of 13 is overcome by the operator depressing the key 12, the said arm of the lever 11 liberates the arm 10, and the friction-disk 9 operates to revolve the main shaft D one full revolution, or until the said arms again abut to lock the shaft D against further movement.

E designates a stationary drum furnishing pivotal bearings at 14 for a series of bell-crank levers, 15, in number corresponding to different symbols upon a series of type disks, which will presently be described, and with the keys upon the key-board. The keys 16 are provided with symbols corresponding to the symbols upon the type disks, and said keys may be arranged in any convenient and approved manner, each key connecting with its appropriate bell-crank lever, 17, and each lever 17 connecting with its appropriate lever 15, and a spring, 18, serving with a constant force to hold its appropriate lever, 15, at a position of rest until its force is overcome by the depression of the corresponding key. For convenience hereinafter the levers 17 will be designated as "key-levers," and the levers 15 as "pin-levers."

F designates a stationary circular frame, to which is secured a cylindrical frame composed of an outer cylinder, 19, and an inner cylinder, 20, the two being arranged at a distance apart and concentric to each other. This frame is not an absolute cylinder, as at its lowest point it is reversed to form a recess, 21, in which is located a platen-guide, 22, which will be described.

I provide a series of type-disks, G, which are loosely hung on the shaft D. Each type-disk is composed of a sheet-metal disk 23, having radial rectangular recesses 24, formed in its outer portion, as shown in Fig. 5. Secured to this disk 23 is a disk, 24^a, of thin metal, having a series of radial arms, 25, in number corresponding to the symbol-keys, (see Fig. 3,) and to the end of each arm 25 is secured an appropriate type, 26, the said type being adapted to be received in its appropriate recess 24. Thus arranged, the type will have lateral play due to the flexibility of the arms 25, but will each be held securely in its relative position by the arms of the disks 23, which arms form the recesses. The type-disks thus formed are hung loosely upon the shaft D, within the frame F, and between each adjacent pair of disks I locate spring-friction spiders 27, having radial spring-arms 28 and inwardly-projecting ribs 29, which engage in longitudinal grooves 30, formed in the main shaft D. These spiders are hung upon the shaft D alternately with the type-disks, the arms 28 being bent in alternately-opposite directions when thus arranged, the projections 29 having formed engagements in the grooves 30, the spiders are forced to revolve with the shaft D, and the spring-arms 28—say six in number—bear three at equidistant points upon one type-disk, while the remaining three bear similarly upon the type-disk on the opposite side.

The cylinder 19 is provided upon its outer surface with longitudinal ridges 31, and between the ridges 31 the said cylinder is perforated at 32 to correspond radially with perforations made in the inner cylinder, 20. A band, 33, of rubber or other elastic material, is stretched across the ridges and arranged at one side of each circumferential row of holes. Pins 34, which I will designate as "stop-pins," operate through the cylinders 19 and 20, and each pin is provided with an arm, 35, which arm is adapted to rest upon the outer surface of the band 33 about midway between the adjacent ridges 31. The perforations in the inner cylinder, 20, are slightly larger than the pins, and each pin 34 is provided with a recess, 36. As the pin 34 is forced toward the center of the shaft D in a radial line the arm 35 bears upon the rubber band 33, and as this band is stretched between two of the ridges the tendency is to tilt the pins 34, so that their recesses 36 will receive the edges of the perforations in the inner cylinder, 20, and lock the pins in that position. The pins 34 also pass loosely through a trip-cylinder, H, and as this cylinder is forced in one direction by means yet to be described, all the pins which have locked in (see Figs. 3, 12, and 13) will be released, when the action of the several bands 33 will promptly carry them back to their normal position.

I designates a movable ring, hung on rods 37, which slide in proper guides in a direction parallel with the main shaft D, springs 38 serving to hold them with a constant force in the direction of the key-board, or toward the front of the machine. Each of these rods 37 is provided, near its end upon its lower surface, with a rack, 39, which is engaged by a segmental gear, 7, one of which carries the disk 6, which is rigid with the shaft 4, and one of them, in addition to the rack 39, has a rack, 40, provided on either edge, arranged so that a tooth upon either rack 40 will be opposite

the center of the space between two teeth of the rack upon the opposite side, and constructed so that the space between two adjacent teeth on either rack 40 will be equal to the space between the center of one pin 34 and the center of the next adjacent pin.

A movable ring, 41, is arranged concentric to the shaft D, and located so that the depression of any of the keys will bring the inner arm of either of the pin-levers, 15, against its inner surface and force it toward the key-board. This action will tilt a crank-lever, 42, upon its pivot 43, and by reason of its free end having a jaw, 44, which receives a pin, 45, upon a double pawl, 46, the said pawl is disengaged from the inner rack 40.

It will be understood that the constant tendency of the movable ring I, by reason of the springs 38, is toward the key-board, and that the action of the frictional connection between the disks 5 and 6 is to overcome these springs and force the rings in the opposite direction, as would be the case but for the action of the double pawl and its connections, as described. The spring 47 serves to hold the pawl 46 engaged with the inner rack-bar 40, and the ring I is locked. As soon as a key 16 is depressed, one of the levers 15 forces the ring 41 in a direction to tilt the lever 42, and said lever, acting on the double pawl, disengages it from the inner rack 40, and the friction connection 5 and 6 forces the ring I against the action of the springs 38 until the other jaw of the pawl engages the outer rack, when the ring I is again stopped. As soon as the pressure of the key is released, the spring 18 forces the lever 15 out of contact with the ring 41, and the spring 47 tilts the lever 43 back until the pawl 46 again engages the inner rack 40. This ring I at each of its complete strokes, as just described, passes the distance between one of the stop-pins 34 and the next adjacent stop-pin, and the said ring is provided with perforations and pins 48 to correspond with the number of pins 34, and the operation of this part of the machine will be briefly described as follows, referring to Figs. 2ª, 1, and 3: The operator, let it be supposed, wishes to arrange the types for a sentence commencing with "K." He first depresses the key 16, having a symbol corresponding to "K," which action tilts the corresponding key-lever, 17, through which the corresponding pin-lever, 15, is tilted until the horizontal arm thereof has forced the corresponding pin, 48, against the "K" stop-pin 34. This latter pin is forced inward against the influence of the band 33, (see Fig. 12,) and by the action of said band is tilted until it is locked. (See Fig. 13.) Each type-disk is provided with a stop, 49, (see Fig. 3,) and as soon as that stop 49 strikes against the "K" pin 34, the letter "K" is in its position at the mouth of the platen-box 22, as will be seen by running the alphabet back from the stop 49 in Fig. 3. The action of bringing that disk in the position shown in Fig. 3, however, is not performed at this stage, and I will continue the description with the "K" stop-pin locked. The action of the lever 15 has, through the lever 42 and pawl 46, released the rod 37, and as soon as the stop-pin has been locked and the key has returned to its position, the lever-pin 48 has been forced quickly back to its normal position by the action of its spring 50; the friction between the disks 5 and 6 has operated to force the ring I to the next adjacent type disk, where it is locked by the pawl 46, as influenced by the spring 47. The letter "K" now having been designated, and the parts all having returned to their normal positions, except that the ring I is adjusted over the succeeding annular row of stop-pins, the machine is ready for as many similar subsequent operations as there are type-disks, or until as many stop-pins are locked inward, and as many letters designated as are needed. It now being desirable to locate the several designated letters in a line opposite the mouth of the platen-box 22, the key 12 is depressed. This action, through the lever 11, releases the arm 10 of the main shaft D, the friction-disk 9ª operates to revolve the shaft D, and all the type-disks turn with said shaft until one after another the stops 49 on the several disks abut against the stop-pins, as seen in Fig. 3, and the several letters designated by such pins are brought to one point, the friction-connections 27 28 compelling all the disks to turn with the shaft D until each is stopped by its abutting against a stop-pin. As soon as the shaft D has made one full revolution, which is all that is required to bring all the disks into contact with the stop-pins, the arm 10 again strikes the stop-lever 11, and the friction-disk 9ª acts idly on the shaft D, which again assumes a position of rest. The friction-contact between the disks 5 and 6, as has been stated, is sufficient to overcome the force of the springs 38, and as the ring I and its connections have made their complete stroke I provide means for allowing said springs 38 to relieve the ring I in order that it may operate similarly in relation to the stop-pins and type-disks to designate other letters and combinations of letters. To this end, K designates a bell-crank lever pivoted to the side of the frame X at 51, and carrying upon its free end a grapple or fork, 52, which operates behind a collar, 53, to force the friction-disk 5 out of contact with the disk 6. Upon the other end is formed an incline, 54, against which the arm 10 of the shaft D strikes when the shaft D is near the end of its revolution. As this arm 10 rides up this incline 54, the lever K tilts or rocks on its pivot 51, and disengages the friction-disk 5 from its bearing on the friction-wheel 6. To provide that no considerable friction shall retard the action of the springs 38, a trip-lever, 55, rests under a pin, 56, on the lever K until said lever is struck by a pin, 57, on the rod 37 as the ring I passes back to its normal position, a spring, 58, forcing the lever 55 back for subsequent similar operation. As soon as

the ring I and rods 37 are thus liberated from the action of the friction-disks 5 and 6, the springs 38 reassert themselves and throw said ring and its connections back to the position shown in Fig. 2ª, at which point the said ring strikes the trip-cylinder H, and a short stroke of said cylinder disengages each of the designating stop-pins 34 from its locked position, and the rubber bands force them back into their normal position. Before the impression is taken it is necessary that the types should be pressed close together compactly in line and held firmly in such position. To this end I employ a circular reciprocating head, L, to which are connected two longitudinal bars, 59, the rear ends of which act against springs 60, located in sockets 61 in clamps 62, which embrace cams 63 upon the shaft B. Rigid with the shaft B is an arm, 64, which at one point of its revolution abuts squarely against a pawl, 65, which is loosely hung on a rock-shaft, M, journaled in standards 66, and carries an arm, 67. An arm, 68, upon the rear end of the main shaft D is arranged to strike this arm 67 just before it finishes its revolution—that is to say, after said shaft D has arranged all the designated types in line—and this action of the arm 68 releases the pawl from the arm 64, thus releasing the shaft B. Between a collar, 69, on the shaft B and the end of the sleeve 1, on which the drive-pulley A is hung, is located a spring friction-disk, 70, and this disk operates idly upon the collar 69 of the shaft B until the arm 64 has been liberated by the pawl 65, when, by reason of the friction, the shaft B revolves. As this revolution of the shaft B is being made, the cam action forces the rods 59 and head L against the type-disks to bring them close together, and at the same time a lever, 71, having a slot, 72, in which operates a pin, 73, of a socket, 74, forces a longitudinal bar, 75, the rear end of which operates against a spring, 76, so that its forward end, 77, will strike the line of designated types, now located at the mouth of the platen-box 22, and force them compactly together. It is also necessary that the designated types should now be held against lateral displacement, and to this end each type is provided upon opposite sides with recesses 78. Secured at 79 to the socket 74 is a rod, 80, which passes approximately parallel with the bar 75, and is provided at its forward end with a frame, 81, having flanges 82, which slide in guides 83, formed in the platen-box near its mouth, and having also flanges 84, which slide in the type-recesses 78. It will thus be observed that at the same time the head L is forcing the type-disks together as a body the bar 75 is further forcing the particular types, which have been designated, together, and that the frame 81 has been simultaneously operated to hold the designated types in a locked position. (See Fig. 11.) As thus conditioned the machine is ready for taking the impression. For convenience, I describe the impression-receiving surface as of paper; but it is apparent that the kind of material is not important to the invention.

N designates a reel or roller carrying a tape, 85, which is adapted to be fed through the machine beneath the type at the mouth of the platen-box, and resting upon a platen, O, which operates loosely in the box or well 22. Under a pin, 86, on the platen O, rests the end of a power-lever, 87, pivoted at 88 to the frame X, its free end passing rearward and resting in the line or track of the arm 64. In the revolution of this arm 64 it acts upon the lever 87, the pivot 88 of which is arranged so as to multiply the power greatly to elevate the platen O, which movement carries the paper-tape 85 up against the line of designated types, now pressed and locked into a compact body, and takes the impression. As soon as this is done, the arm 64 has passed from the lever 87, the cam 88ª has changed position, the spring 89 retracts the rod 75 77 and holding frame 81, and the platen O falls by gravity to its normal position by reason of the spring 100 acting to throw upward the free end of lever 87, which correspondingly lowers the other end of the said lever where it engages the pin 86 of the platen. The tape 85 passes between feed-rollers 90, one of which is provided with a ratchet, 91, with which engages a pawl, 92, pivoted at 93 to the frame, and held forward by a spring, 94. To the free end of the pawl-arm is secured a cord, 95, which, passing rearward under a pulley, 96, and upward over a pulley, 97, is secured to the socket 74. As this socket 74 is forced forward, as just described, to compress the types, the rope or cord 95 is slackened and the spring forces the pawl 92 idly over the ratchet to take up said slack; but as soon as the impression has been taken and the socket 74 is passing rearward, the cord forces the pawl 92 into engagement with the ratchet, and the paper is fed forward a distance just equal to the space occupied by the compressed type, the parts being properly proportioned to that end.

It will be observed that the several movements described are automatic, and it must be understood that the several parts are proportioned and timed to effect the operations mentioned.

The voluntary acts of the operator may properly be said to consist of the manipulation of the keys to designate the types, and, second, the depression of the key 12 to set the machine in motion. The stop-pins lock and unlock automatically. The designated types are brought to a common point automatically. The types are compressed and locked automatically. The platen is operated automatically. The receiving-surface is fed to the type automatically, and the several parts return to their normal positions for similar subsequent operations automatically. These movements are timed so that the first action of the machine is to designate the types, the next to bring the designated types to the platen-box in a line, and at the same time, or as soon as

they are in line, to compress them compactly and lock them, then to retract the ring I and release the stop-pins, then to take the impression, then to feed for the next impression.

Modifications in details of construction may be made without departing from the principle or sacrificing the advantages of my invention, the essential features of which will be readily understood from the foregoing description, taken in connection with the drawings—as, for instance, a positive gear or clutch may be employed instead of the friction-disks 9^a and 70, and weights may be used in several connections instead of springs.

Having thus described my invention, what I claim is—

1. In a machine for producing impressions from type, the combination of a series of type-disks capable of rotation on an axis, with a series of keys corresponding to the type-symbols on the disks, and intermediate connecting mechanism, such substantially as described, whereby the disks are rotated to bring the designated type in line at a given point.

2. In a machine for producing impressions from types arranged on type-disks, and in combination with a series of keys and levers corresponding to the type-symbols and connections, whereby any particular type may be designated, means, such substantially as described, for automatically assembling the designated types at a given point in proper relations for obtaining the desired impression, and means, such substantially as described, for automatically compacting and locking the designated types until the impression has been obtained.

3. In a machine for producing impressions from types arranged in type-disks, and in combination with a series of keys and levers corresponding to the type-symbols and connections, whereby any particular type may be designated at will, means for bringing the designated types together in a line, means, such substantially as described, for compacting and locking such designated types as thus arranged, and means, such substantially as described, for automatically forcing the impression-receiving surface against the designated types.

4. In a machine for producing impressions from types, and in combination with a series of keys, key-levers, pin-levers, and types arranged upon circular disks, a corresponding series of stop-pins adapted to designate the types, and means, such substantially as described, for bringing the designated types in a line at a given point.

5. In a machine for producing impressions from types, and in combination with a connected series of corresponding keys, key-levers, pin-levers, and pins, a corresponding series of stop-pins adapted to be automatically locked in the act of designating the types of which an impression is to be taken, and a series of type-disks, and with means, such substantially as described, for designating one type from each successive disk, and automatically bringing the designated types together at a given point.

6. In combination with a series of circular type-disks having stops, and perforated concentric cylinders 19 and 20, a series of stop-pins, 34, means, such substantially as described, for forcing said pins radially inward and for locking them automatically.

7. In combination with the independent type-disks G, a series of metal spiders having spring-arms projecting alternately in opposite directions, and adapted to serve with said disks.

8. In a machine for producing impressions from types, a series of type-disks having stops 49, combined with a corresponding series of stop-pins, and means, such substantially as described, for operating them.

9. A type-disk composed of a circular metallic disk having peripheral rectangular recesses to receive the types, and a metal disk having spring radial arms, the said arms carrying the types which rest in the recesses, and the two disks being secured together.

10. The independent type-disks G, composed of the disk 23, having peripheral recesses 24, the disk 24^a, having radial spring-arms 25, carrying the types 26, and the stops 49, constructed and adapted to serve substantially as described.

11. In a machine for producing impressions from types, the type-disks G, and main shaft D, having longitudinal slots 30, combined with the spiders 27, having spring-arms 28 and ribs 29.

12. The spiders 27, having radial spring-arms 28 projecting in alternately opposite directions, and having inwardly-projecting nibs 29, adapted to serve relative to the independent type-disks G and shaft D.

13. In a machine for producing impressions from types, and in combination with the disks G, cylinders 19 and 20, and stop-pins 34, a movable ring having pins adapted to engage one stop-pin opposite each type-disk, and the ring being adapted to be moved automatically from one series of stop-pins to the next succeeding series as soon as a type has been designed.

14. In combination with the type-disks G, stop-pins 34, key-pins 48, the keys and corresponding connecting-levers, the movable ring L, and means, such substantially as described, for operating it.

15. In combination with the perforated concentric cylinders 19 and 20, the former having longitudinal ridges 31, the elastic band 33, and the stop-pins having recesses 36 and arms 35.

16. In combination with the cylinders 19 and 20, and the pins 34, and elastic band 33, the trip-cylinder H, and ring I.

17. In a machine for producing impressions from types, and in combination with a series of stop-pins adapted to designate particular types, a trip-cylinder common to all such pins

and adapted to restore such of said pins as have been thus used to designate particular types to their normal positions simultaneously.

18. In combination with the stop-pins, the elastic band, and the ring I, the trip-cylinder H, and springs 38.

19. In combination with the ring I and its connections, the springs 38, the friction connections 5 and 6, and means, such substantially as described, for throwing such connections out of contact automatically.

20. In combination with the ring I, rods 37, and springs 38, the double pawl 46, lever 42, ring 41, levers 15, and friction-surfaces 5 6.

21. In combination with the ring I, springs 38, and friction devices 5 6 and their connections, the lever D, having arm 10, the bell-crank lever K, having fork 52 and spring 47.

22. In a machine for producing impressions from types, the combination of the main shaft having arms 10 and 68, the type-disks, a trip-lever, 11, and means, such substantially as described, for compressing the said disks and for operating the compressing devices.

23. The combination, with the shaft B, and means, substantially as described, for throwing it automatically into operative position, of the type-disks, and means, substantially as described, for compacting and locking the designated types thereof and automatically forcing the impression-surface against the designated types.

24. In combination with the main shaft D, having arms 10 and 68, and the shaft B, the lever 11, pawl 65, bar 64, the type-disks, and means, such substantially as described, for automatically forcing the impression-surface to the designated types.

25. In combination with the type-disks and shaft B, having cams 63 and 88^a, the head L, bar 75, and locking-frame 81.

26. In combination with the type-disks and shaft B, having cams 66 and 88^a and arm 64, the head L, bar 75, locking-frame 81, platen O, and lever 87.

27. In combination with the socket-arm 74 and feed-rolls 90, the ratchet 91, pawl 92, spring 94, rope 95, and pulleys adapted to serve with the impression-surface platen and type-disks.

28. In combination with the type-disks and designating means, such substantially as described, the platen O, and means, such substantially as described, for automatically operating it and the spring 100.

29. In combination with the type-disks and designating means, such substantially as described, the head L, and means, such substantially as described, for automatically operating it and the cushioning-springs 60.

30. In combination with the type-disks and designating means, such substantially as described, the bar 75, and locking-frame 81, and means, such substantially as described, for automatically operating it and the spring 89.

31. The combination of the type-disks, the head L, and means, substantially as described, for designating the types of the type-disks and automatically operating the said head, the spiders 27, and the cushioning-springs 60.

32. The main shaft D, drive-wheel A, and shaft B, with their connections, combined with the disks G, platen O, feed devices, head L, ring I, friction-disks 9^a, 70, and 5, and their connections.

33. In combination with the compacting means, the platen, the designating means, such substantially as described, the main shaft, and the type-disks, the lever 11, and key 12.

34. In combination with the stop-pins, the trip-cylinder, and movable ring I, the springs 38, band 33, and connecting devices.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

OTTMAR MERGENTHALER.

Witnesses:
JAMES L. NORRIS,
J. A. RUTHERFORD.