(No Model.) 3 Sheets—Sheet 1.

C. SEARS.

MACHINE FOR MAKING LINOTYPES.

No. 489,503. Patented Jan. 10, 1893.

Fig 10.

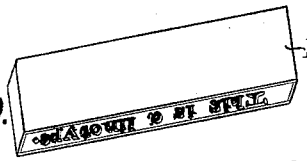

Fig 9.

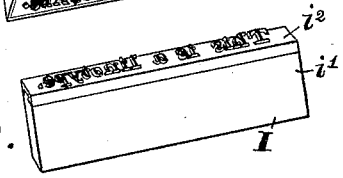

Fig 1.

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(No Model.) 3 Sheets—Sheet 2.

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Fig 6.

Fig 4.

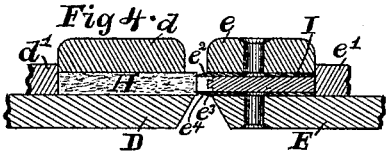

Fig 5.

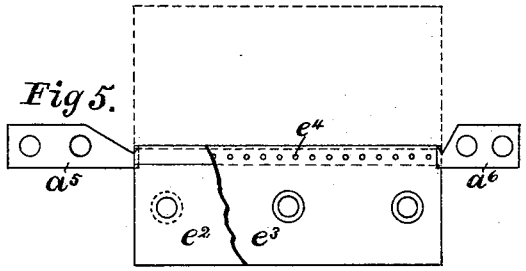

Fig 7.

Fig 8.

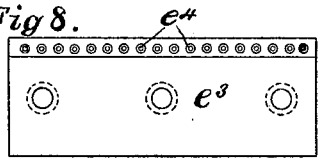

Fig 2.

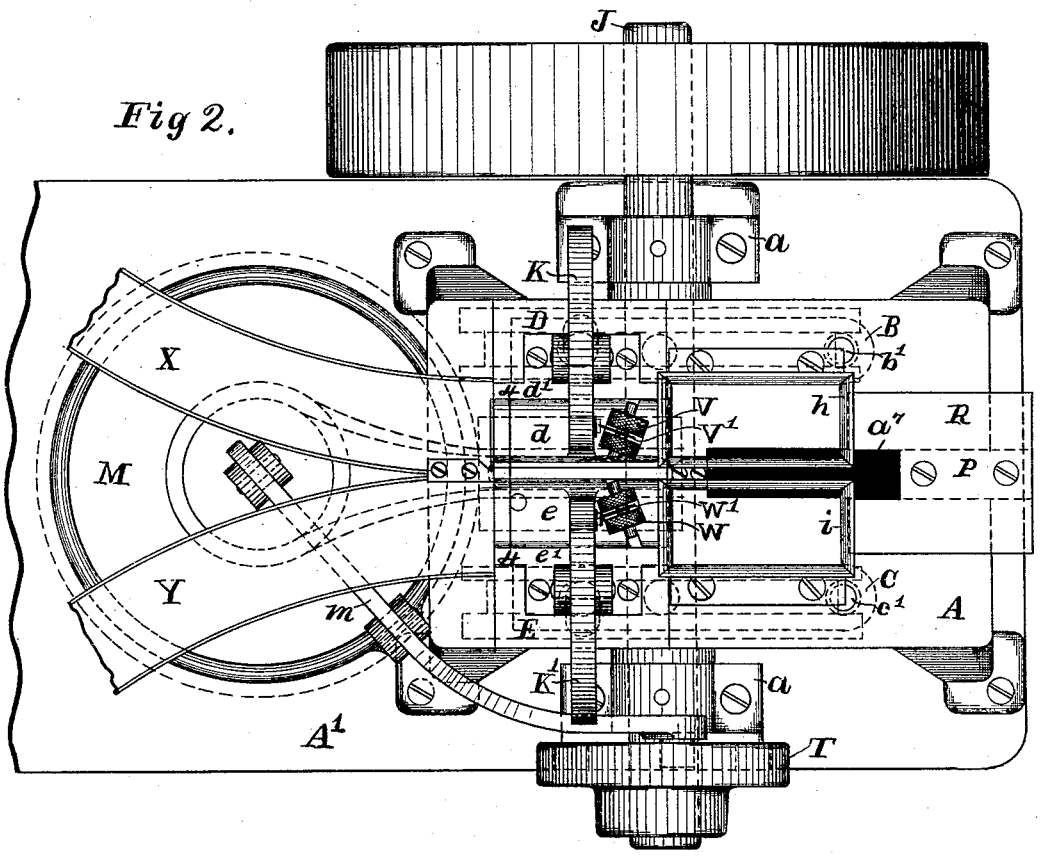

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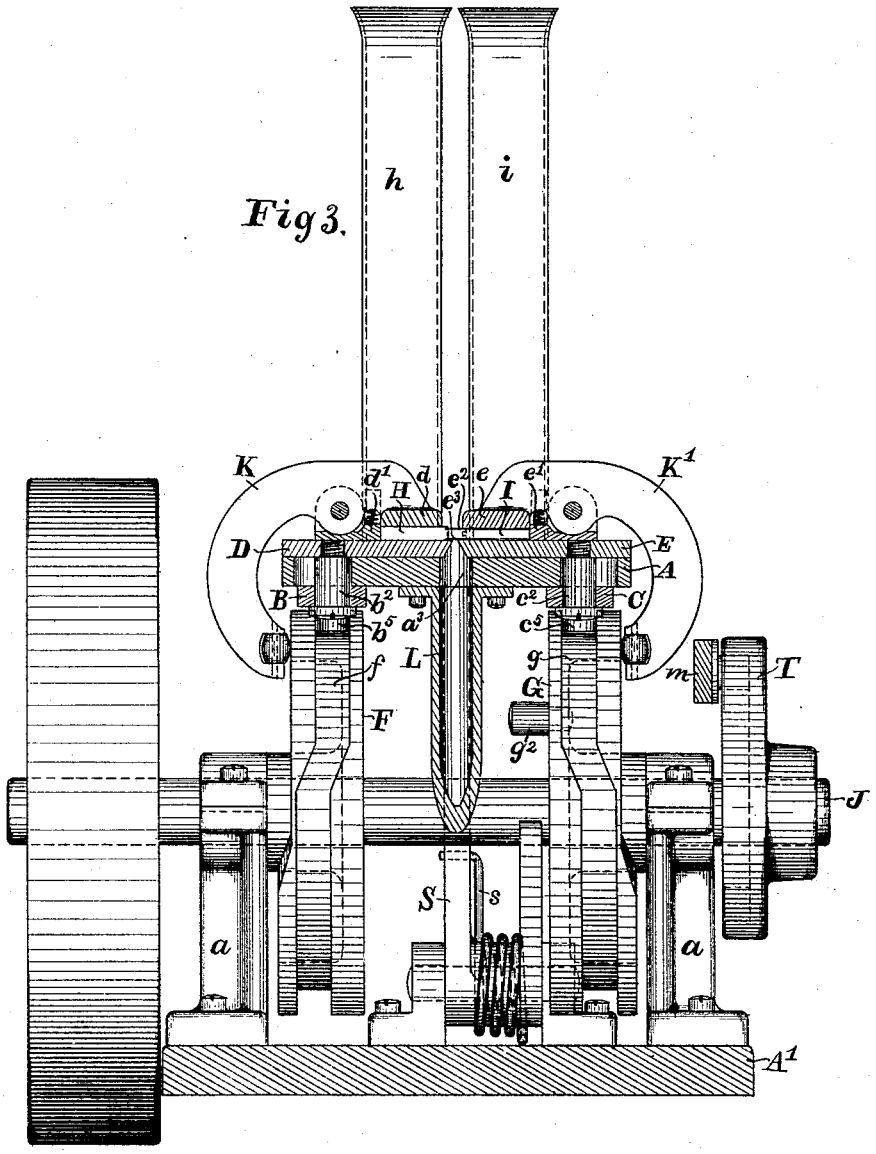
Fig 3.



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UNITED STATES PATENT OFFICE.

CHARLES SEARS, OF CLEVELAND, OHIO.

MACHINE FOR MAKING LINOTYPES.

SPECIFICATION forming part of Letters Patent No. 489,503, dated January 10, 1893.

Application filed December 10, 1891. Serial No. 414,634. (No model.)

To all whom it may concern:

Be it known that I, CHARLES SEARS, a citizen of the United States, residing at Cleveland, in the county of Cuyahoga and State of Ohio, have invented certain new and useful Improvements in Machines for Making Linotypes, of which the following is a specification.

My invention relates to the production of linotypes, that is to say single types each of which bears on its printing edge all of the characters which are to appear in a single line of printed matter.

Several machines adapted to produce linotypes have been devised in which independent matrices, each bearing a character, are assembled in line, after which a mold box is moved against said assembled matrix line which closes the open edge of the mold box, and molten metal is injected into the mold, thereby producing the linotype. The Mergenthaler linotype, and the Rogers typograph are machines, now well known, of this general character. But with these machines and with all other machines, for casting a linotype, with which I am acquainted, the entire linotype,—body and printing edge, is cast at one time. In order that these linotypes may be cast successfully, the mold must be so warm that it will not prematurely chill the molten metal and thus prevent the proper filling of the mold. For this reason, and for the additional reason that the linotype contains quite a large body of metal, the hardening of the said metal takes a long time, by comparison with my method hereinafter described; and, clearly, the linotype must be hardened before it can be removed from the mold and the matrices distributed. In all machines which assemble matrices, the loss of time due to this cause is, in the aggregate, large; and it is especially serious in machines like the Rogers typograph, in which the assembling operation must cease until the linotype is cast and the matrices distributed. So also the loss of time which results from the necessity for using a warm mold into which the molten metal is injected and the waiting for the large body of metal composing the type to cool, is serious and very objectionable in cases where the linotypes are cast from a specially prepared matrix, as for example the wood matrix described and claimed in my prior patent No. 446,930, dated February 24, 1891.

The primary object of my invention is to save time in the manufacture of linotypes, although other obvious advantages result from the use of the invention. The saving in time results from the employment of a very small quantity of metal which is injected into a cold mold,—said mold containing a previously prepared hard body or slug, and being in contact at its open edge with the line matrix, whereby the printing characters and a thin integral backing are cast against, and attach themselves to, said slug. The smallness of the space to be filled by the molten metal and the forcing of the metal, simultaneously, through numerous small orifices into this space are both important factors which make it possible to fill the space instantaneously and before any part of the molten metal so sets and hardens as to prevent the filling of the said space, while, at the same time, the quantity of metal employed is so small that it becomes hard and ready to be removed as soon as the mold is filled.

Referring now to the drawings, Figure 1 is a side elevation of my machine, to be hereinafter described, with which my improved method may be practiced. Fig. 2 is a plan view of the same. Fig. 3 is an end view, partly in section at the point indicated by line 3—3 of Fig. 1. Fig. 4 is a sectional view on line 4—4 (seen in Fig. 2) through the matrix and its holder, slug and its carrier, when the matrix and slug have been moved close and parallel to each other, and the space between them has been inclosed. Fig. 5 is a top view of the slug carrier,—the upper clamp thereof being partly broken away—and the means for closing the ends of the space between the matrix and slug. Fig. 6 is a side view of the same parts. Fig. 7 is a transverse sectional view (enlarged) of the lower knife-edged plate of the slug carrier. Fig. 8 is a plan view of said plate. Fig. 9 is a perspective view of the completed linotype. Fig. 10 is a perspective view of the wood matrix with which this machine is especially adapted to be used.

The frame of the machine shown consists of a top plate A, a base plate A′ and the connecting standards *a a*, in which the driving shaft J is journaled. Upon the upper side of

the top plate A two hoppers h and i are secured, the first adapted to hold the prepared wood matrices H and the other adapted to hold the prepared slugs I. The length of the slug I (which may be of type metal, or any other suitable metal) is equal to the length of the desired line. The thickness of the slug is equal to the height of the letters plus the "leading" or the space desired between the lines. The width of the slug is so much less than the height of the type, that when the printing characters and their connecting backing is cast thereon, the resulting linotype is type high. The matrix H is a trifle longer and thicker than the slug, for reasons which will hereinafter appear. Its width is immaterial, provided it fits the matrix holder.

Pivoted to the under side of the top plate by means of the bolts b' c' are the swinging arms B C. In the upper side of the top plate A are formed transverse ways or channels, in which the matrix holder and slug carrier travel. The arm B is slotted longitudinally, as shown by the dotted lines in Fig. 2; while the plate A is slotted transversely, as shown in Figs. 2 and 3. A pin b^2 passes through the slots in the arm B and top plate A, last above referred to, and is connected with the bottom plate D of the matrix carrier. The arm C and the top plate A just above it are similarly slotted, and a similar pin c^2 passes through said slots and is connected with the bottom plate E of the slug carrier.

Keyed or otherwise secured to the driving shaft are the two disks F and G, which have cam grooves f g in their faces, in which grooves the lower ends of the pins b^5 c^5 project,—which pins are secured to the arms B and C respectively. When the shaft revolves the arms B and C are caused to oscillate upon their pivots by reason of the engagement of the pins b^5 c^5 in said cam grooves.

The oscillation of the arms B C causes the plates E and D to move toward and from each other.

Pivoted to the plate D is a bent lever K, one end of which lies over the plate D and is connected with a clamping plate d. The other end of the lever K lies against the side of the disk F which is in the form of a cam. A similar lever K′ is pivoted to the plate E and is connected at one end to the clamping plate e, while its other end bears against the side of the disk G.

d' represents a shoulder upon the plate D against which the bottom edge of the matrix rests. The plate E is provided with a similar shoulder e' against which the bottom edge of the slug rests. Secured to the top of the plate E is a thin steel plate e^2 equal in length to the linotype to be formed; and secured to the under side of the clamping plate e is a similar plate e^3. The outer edges of both these plates are sharpened, thereby forming knife edges. The meeting edges of the plates D and E are cut away beneath the slug, thereby forming a slot between them approximately as long as the slug. Directly beneath the slot between these plates D and E is a slot a^3 in the plate A.

Bolted to the plate A so as to discharge into said slot a^3 is the spout L of the melting pot M, through which the molten metal is forced from said melting pot, in the manner hereinafter described.

The plate e^3 is provided with numerous small jet openings e^4 directly over the slot between the two plates D and E.

a^5 represents a plate, equal in thickness to the thickness of the slug, which is attached to the plate A. a^6 is another similar plate also attached to the plate A. The distance between the proximate ends of these plates is exactly equal to the length of the linotype. Each of these plates is provided with a sharpened knife edge, which faces the matrix when the same is in its holder. The plates E e^2 on one side, the plate e e^3 on the opposite side, the two end plates a^5 a^6 together with the shoulder constitute the mold within which the line slug is held during the casting operation, and the open face of said mold is closed by the line matrix, as hereinafter described.

a^7 represents a transverse slot through the plate A through which passes a block P. To the upper side of said block, a pusher plate R is attached, which plate is adapted to slide under the lower edge of the hoppers h and i and to engage with and push out of said hoppers the lowermost matrix and slug therein contained. A bent lever S is pivoted to the bottom plate A′. One arm of this lever extends upward, and a pin p which is secured to the block P passes through a slot in this arm of the lever; the other arm of the lever extends to a point where it will be engaged with a pin g^2 on the disk G, as the shaft revolves, thereby moving the arm of the lever so engaged downward. The spring s is arranged to move the lever in the contrary direction when the movement of the pin permits it.

The melting pot M contains a pump by means of which the molten metal is forced through the spout L and thence through the jet openings e^4 into the mold,—that is to say the inclosure space between the matrix and the slug. The specific construction of this pump is not material to the invention. Any suitable pump may be employed. Pivoted to the top of the melting pot is a lever m by means of which the pump piston is operated. The outer arm of this lever is provided with a pin which engages in a cam groove in the face of the disk T which is rigidly secured to the driving shaft J. This cam groove (shown more clearly in Fig. 1) is quick acting, and only about a quarter of the time of one revolution is required to operate the lever m through its entire range of motion,—that is to say the motion which forces the metal into the mold and withdraws the surplus.

The operation of the mechanism hereinbefore described is as follows,—the wood mat-

rices H are placed in the hopper *h* with the edge in which the matrix is formed facing the hopper *i*. The previously prepared hard metal slugs I are placed in the hopper *i*. The edge of said slugs upon which the molten metal is to attach itself should be roughened or provided with tongues or grooves as the case may be, around or in which the molten metal may harden. I prefer to use a slug having a tongue on its edge, substantially as shown in Fig. 9. The shaft J is now set in revolution. The first action in the process of forming the linotype consists in operating the lever S so as to move the pusher plate R forward, thereby forcing the lowermost matrix and lowermost slug out of their respective hoppers and into their respective carriers,—that is to say between the plates E *e* and D *d* respectively. Mounted on the pressure plate *e* and extending through an opening in it are the obliquely set rollers V which are pressed down by the spring V′ which bears upon their axle. As the slug is being pushed between the plates E and *e*, these wheels, which have roughened edges, are revolved by the friction, and in their revolutions they force the slug against the shoulder *e′*. Similar wheels W, similarly formed and similarly pressed down by the spring W′ are mounted upon and extend through a pressure plate *d*, and force the matrix block against the shoulder *d′*. As the shaft continues to revolve the cam grooves *g* and *f* respectively swing the arms B and C upon their pivots. This causes the movement of the matrix holder and slug carrier toward each other. The knife edges of the plates e^2 e^3 are forced into the edge of the matrix block, and so also are the knife edges on the plates a^5 a^6, thereby inclosing the space between the matrix and slug. Just before the matrix and slug arrive at the position shown in Fig. 3,—that is to say nearest together, the cams on the edges of the disks F and G move the levers K K′ and cause the pressure plates *d* and *e* to press firmly down upon the matrix and slug respectively. Immediately after the space between the matrix and slug is closed, the cam T operates the lever *m* of the pump, the molten metal is thereby forced through the spout L and through the small jet openings e^4, thus completely filling the mold with molten metal. The quantity of metal necessary to fill the space is so small that, as before stated, it hardens almost instantly, and when the lever *m* is moved in the reverse direction, the surplus metal, still molten, is drawn back toward the melting pot. The continued revolution of the shaft causes the plates D and E to be moved apart, thereby separating the matrix block and linotype which has been formed. The clamping pressure upon the plates *d* and *e* is then released. The lever S is again rocked, and the pusher plate moved forward pushing in front of it a matrix block and a slug, into position between the plates D *d* and E *e* respectively, as before explained. These new matrix blocks and slugs push before them the matrix block last used and the linotypes formed into the slides X and Y respectively, by which they may be carried to any convenient and desired point.

The operations above described are performed automatically, and all the attendant has to do is to see that the machine runs correctly and that the hoppers are kept supplied. One of these machines is capable of forming linotypes about five times faster that the matrix blocks can be prepared.

The linotype produced in the manner above explained, consists of a previously formed metal body, having the printing characters i^2, and their connecting backing *i′* firmly attached to its edge.

I am aware that I am not the first to make a linotype having a hard body and an attached edge bearing the printing characters. The St. John patent No. 435,777, dated September 2, 1890 shows and describes such a linotype. I do not, therefore, claim that the article itself is new. The method proposed by St. John for forming said linotype is, however, entirely different from the method hereinbefore described.

As I have before stated, the machine herein shown and described is particularly adapted to be used in forming linotypes from matrices formed in the end fiber of wood blocks, but the machine may be easily adapted to form linotypes from any sort of matrices whether made in a single piece or formed from independent matrices assembled together in line.

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

1. In a machine for making linotypes, a mold, mechanism for automatically pushing a line slug into said mold, and mechanism for closing the face of said mold with a line matrix, combined with a melting pot, a pump, suitable connections between said pump and the mold, and mechanism operating the slug-feeding mechanism, the mold-closing mechanism, and the pump, substantially as and for the purpose specified.

2. In a machine for making linotypes, a mold having a plurality of small openings through one side thereof, mechanism for automatically pushing a line slug into said mold, and mechanism for closing the face of the mold with a line matrix, combined with a melting pot, a conduit through which molten metal may be forced from the melting pot to and through said small openings in the mold, a pump for forcing the molten metal through said conduit, and mechanism operating said slug-feeding mechanism, mold closing mechanism and pump, substantially as and for the purpose specified.

3. In a machine for making linotypes, a movable matrix carrier, a movable slug carrier, two receivers for holding the matrices and slug respectively, feeding mechanism

whereby said matrices and slugs are fed one by one to their respective carriers, the knife-edged plates of the slug carrier, and the end plates a^5 a^6, combined with a melting pot, a conduit adapted to conduct melted metal from the melting pot to and to discharge it into the space between the matrix and slug, a pump, a driving shaft and suitable connections between the shaft and the movable parts herein named whereby the same are operated, substantially as and for the purpose specified.

4. In a machine for making linotypes, a movable mold adapted to contain a metal line slug less than type high, mechanism for automatically feeding said slugs one by one to said mold, and mechanism for moving said mold against a line matrix, combined with mechanism for injecting molten metal into said mold, mechanism for automatically ejecting from the mold the linotype thereby formed, and a driving shaft by which said movable parts are operated, substantially as and for the purpose specified.

5. In a machine for making linotypes, a transversely movable matrix holder, a transversely movable slug carrier having top and bottom knife-edged plates, of which the bottom plate is provided with a plurality of jet openings, and mechanism suitably connected with a driving shaft for moving said matrix holder and slug carrier, combined with knife-edged end plates, an automatic feeding device, a melting pot, a pump, a conduit through which the molten metal may be forced by the pump from the melting pot to and through said jet openings, and a driving shaft operating the movable parts, substantially as and for the purpose specified.

6. In a machine for making linotypes, a transversely movable matrix carrier, a transversely movable slug carrier, each of said carriers having a bottom plate, and a top clamping plate, bent levers pivoted to said bottom plate and engaging with said clamping plates, a driving shaft, cams secured thereto which engage with and operate said levers, intermediate connections between the said shaft and said two carriers whereby they are moved toward and from each other, means for inclosing the space between the slug and matrix when they are nearest, a melting pot, a pump, intermediate connections between said pump and shaft, and a conduit through which molten metal from said melting pot may be forced into the space between said matrix and slug, substantially as specified.

7. In a machine for making linotypes, a slug carrier consisting of a transversely movable bottom plate, a vertically movable clamping plate, and the knife-edged plate a^5 a^6, combined with the bent lever pivoted to said bottom plate and connected at one end to said clamping plate, a driving shaft and a cam engaging with the other end of said lever, substantially as and for the purpose specified.

8. In a matrix making machine, a matrix carrier, a slug carrier, and mechanism for moving them toward and from each other, combined with two receivers adapted to contain prepared matrices and slugs respectively, and automatic mechanism adapted to push one matrix and one slug from these receivers to their carriers respectively, means for inclosing the space between said slug and matrix when they are nearest, and mechanism adapted to inject molten metal into said space, substantially as and for the purpose specified.

9. In a machine for making linotypes, in combination a slug carrier having a bottom plate D provided with a shoulder d', and a clamping plate d, combined with an obliquely-set spring-pressed roller mounted on and extending through said clamping plate, and mechanism for feeding slugs between said plates, substantially as set forth.

10. In a machine for making linotypes, the combination of a movable matrix carrier, a movable slug carrier, two pivoted arms, and suitable connections between said arms and carriers, with a driving shaft, two cams secured thereto, and connections between said cams and pivoted arms, substantially as and for the purpose specified.

11. In a machine for making linotypes, the combination of a matrix carrier, a slug carrier and mechanism for actuating them with two receivers adapted to hold previously prepared matrices and slugs, a sliding pusher plate, a driving shaft, a bell crank lever operated by said shaft, and operating said pusher plate, substantially as and for the purpose specified.

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Witnesses:
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