

(No Model.)

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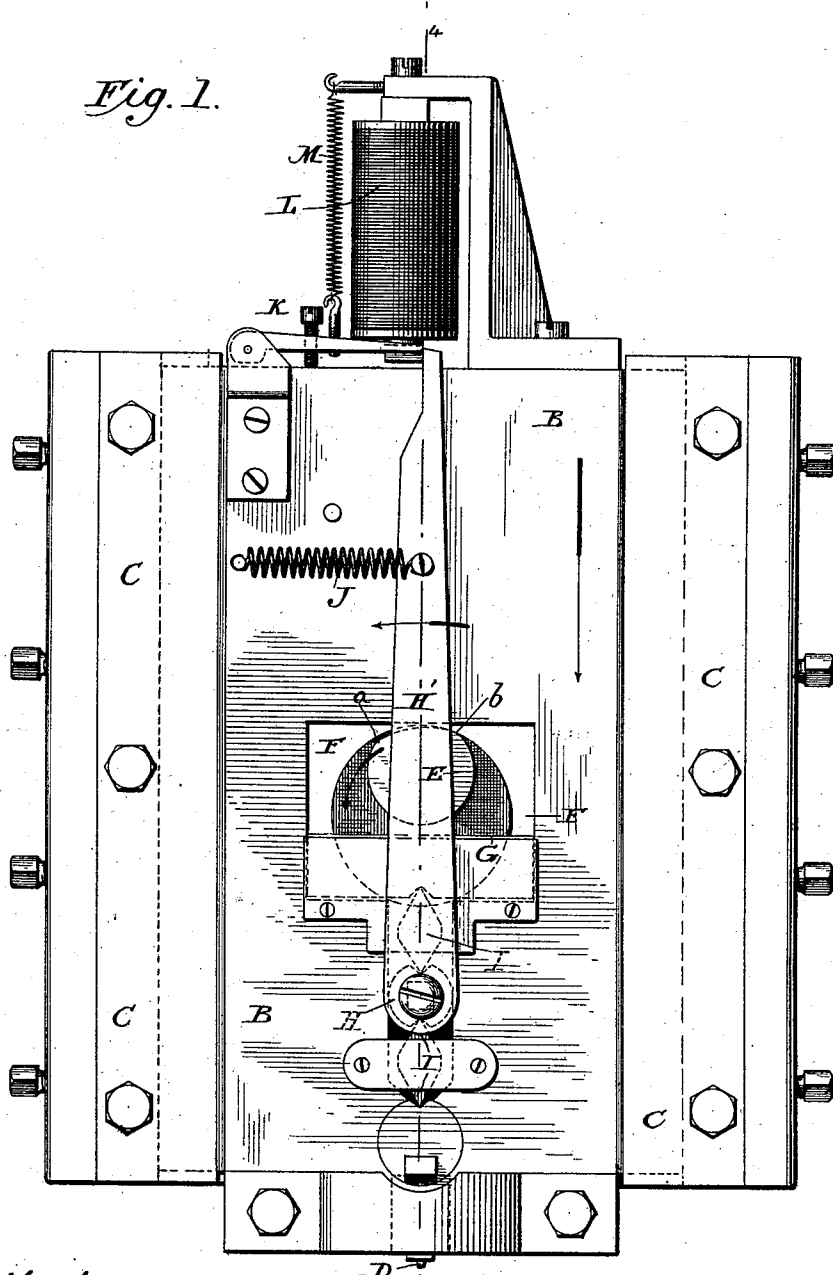
O. MERGENTHALER.

MECHANISM FOR ELECTRICALLY CONTROLLING STAMPING MACHINES, &c.

No. 376,541.

Patented Jan. 17, 1888.

Fig. 1.



Attest:

Sidney P. Hoelsingworth
W. R. Kennedy.

Inventor.

Ottoman Mergenthaler.
By his Atty.
Phil T. Dodge.

(No Model.)

5 Sheets—Sheet 2.

O. MERGENTHALER.

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Fig. 2.

ON LINE 2-2

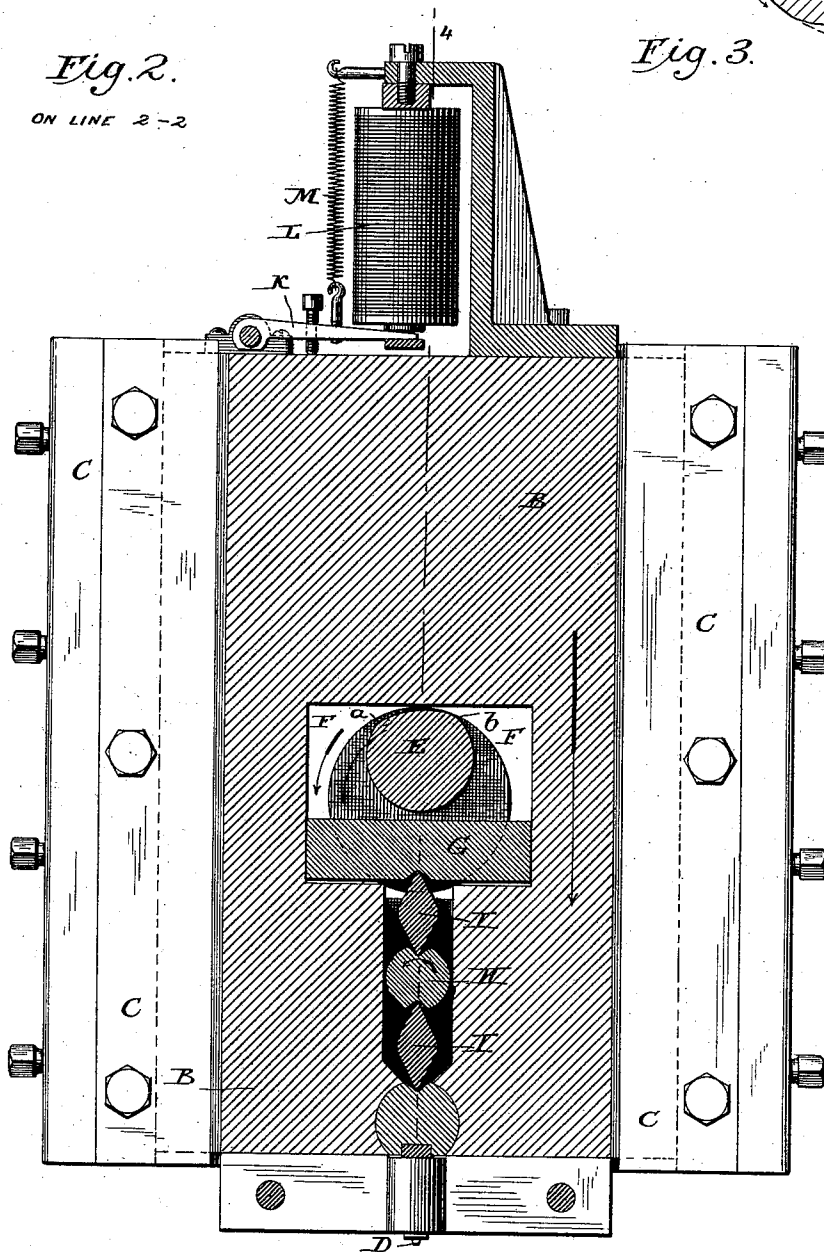
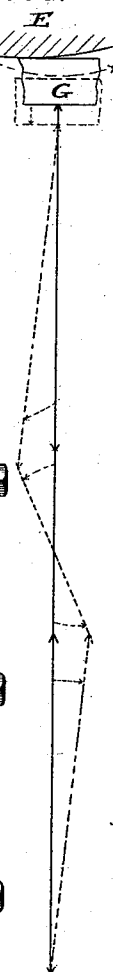
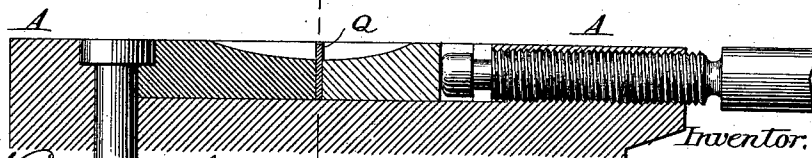


Fig. 3.



Attest:

Sidney Hollingsworth
Chas. W. Kennedy.



Ottomar Mergenthaler
By his atty.
Phil. T. Dodge

(No Model.)

5 Sheets—Sheet 3.

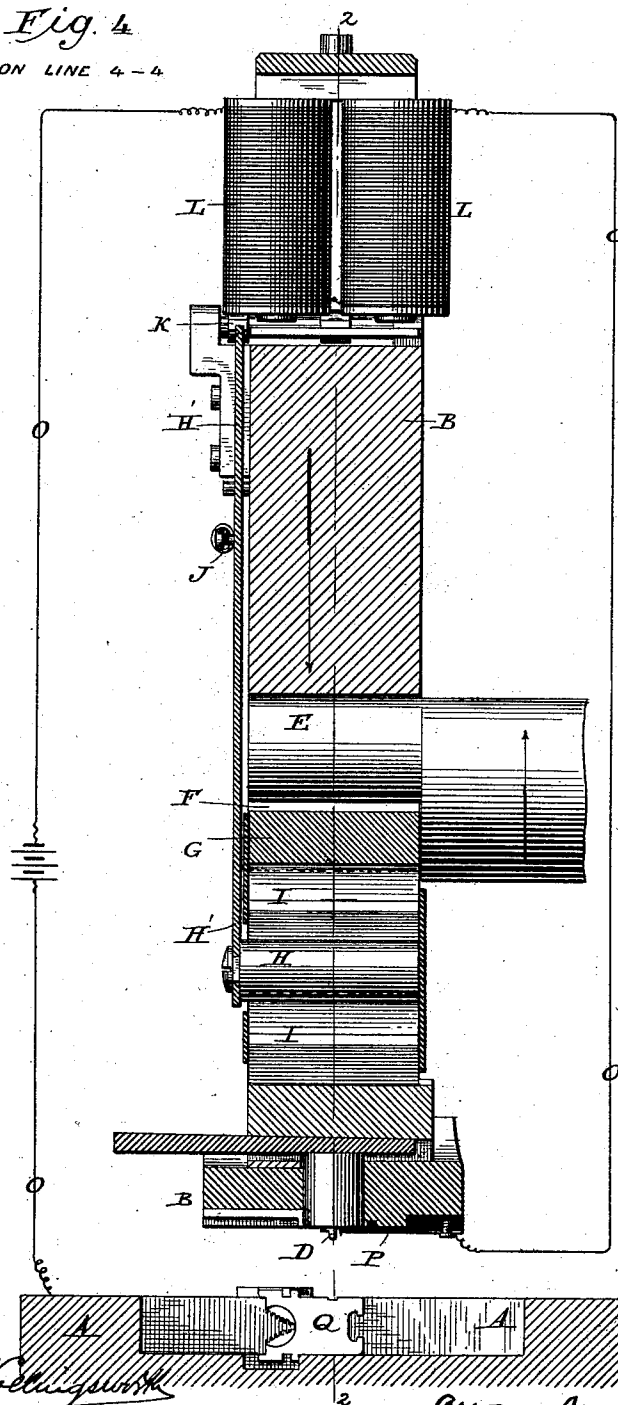
O. MERGENTHALER.

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Fig. 4
ON LINE 4-4



Attest:

Samuel P. Hollingsworth
Chas. R. Kennedy,

Inventor:

Ottomar Mergenthaler
By his atty.
Phil. F. Dodge

(No Model.)

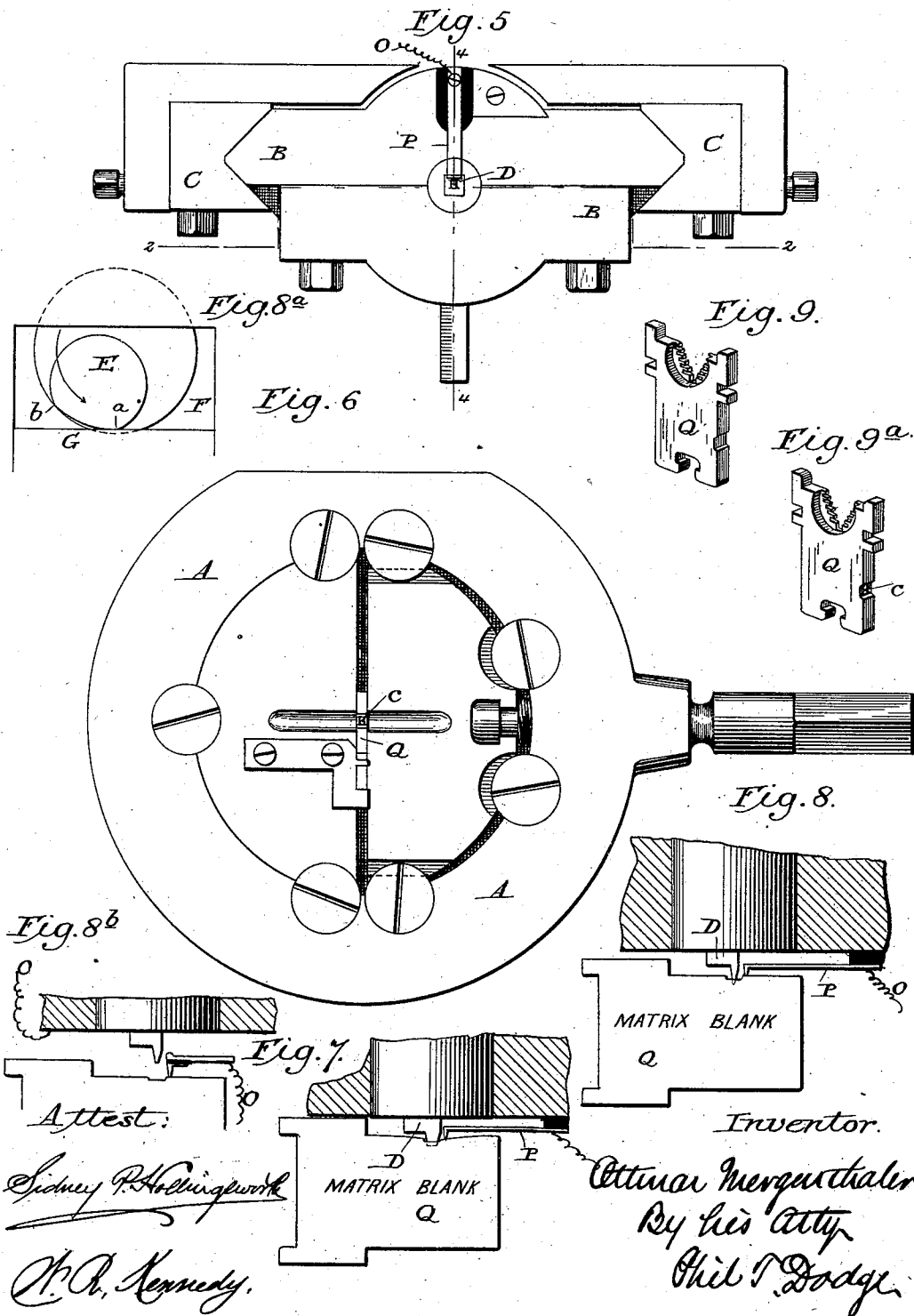
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O. MERGENTHALER.

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(No Model.)

5 Sheets—Sheet 5.

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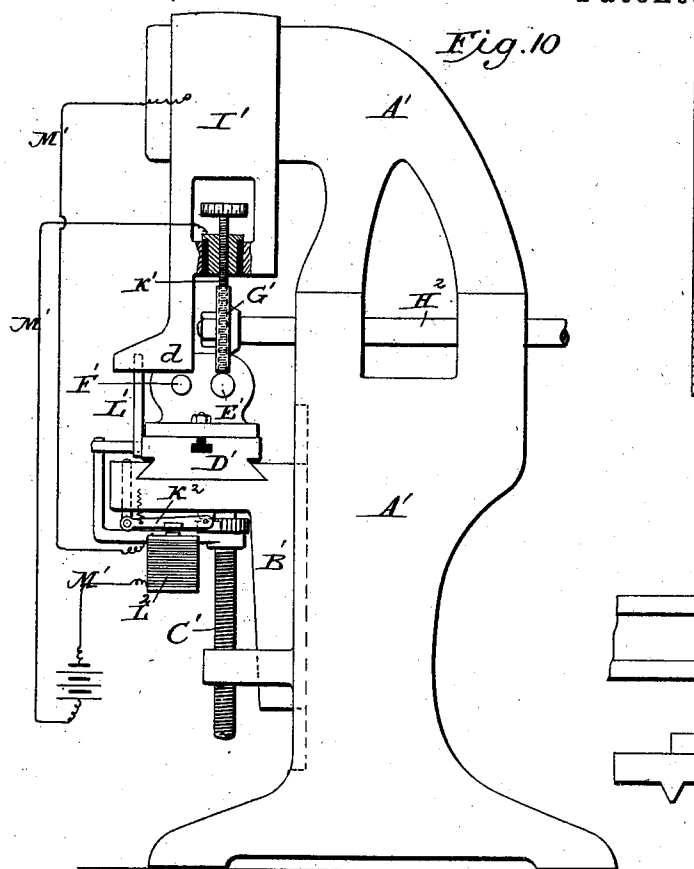


Fig. 10

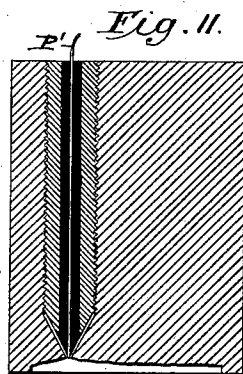


Fig. 11.

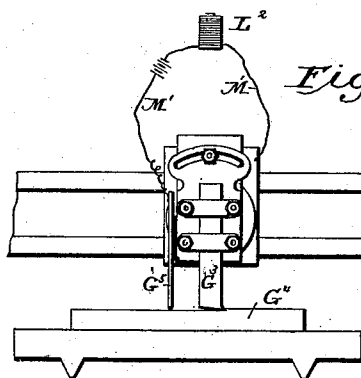


Fig. 13.

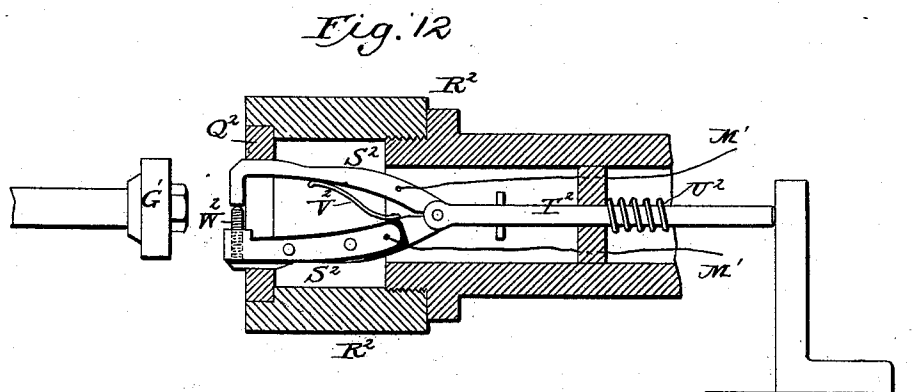


Fig. 12

Attest.

Clarence P. Hollingsworth
W. A. Kennedy.

Inventor.

Ottmar Mergenthaler
By his Atty.
Phil. T. Dodge

UNITED STATES PATENT OFFICE.

OTTMAR MERGENTHALER, OF BALTIMORE, MARYLAND.

MECHANISM FOR ELECTRICALLY CONTROLLING STAMPING-MACHINES, &c.

SPECIFICATION forming part of Letters Patent No. 376,541, dated January 17, 1888.

Application filed May 28, 1887. Serial No. 239,723. (No model.)

To all whom it may concern:

Be it known that I, OTTMAR MERGENTHALER, of the city of Baltimore, and State of Maryland, have invented certain Improvements in Mechanism and Means for Electrically Controlling Stamping Machines, &c., of which the following is a specification.

This invention is intended for use wherever it is required to indent, punch, stamp, cut, grind, or otherwise form or shape objects or articles of any kind with precision, of exact dimensions, or in strict conformity with a model or standard, and its object is to secure the automatic and instantaneous stoppage of the stamping, cutting, or grinding action at the proper time.

The invention consists, essentially, in combining with the machine an electro-magnetic mechanism to effect its stoppage, this mechanism including and being governed by a circuit-controlling device, which is in turn governed in its action by contact with the object undergoing formation.

By means of my invention I am enabled to do away with that high degree of skill and constant attention now required on the part of the workmen in doing accurate work by machine-tools; to secure an accuracy and uniformity of work which is not attainable when the stoppage of the machine is dependent on the volition of the operator; to drive the machine at high speeds without danger of carrying the operations beyond the proper point, and to overcome entirely those errors and variations which commonly occur from wear of the bearings, yielding of the metal, abrasion of the tool, and other causes familiar to the mechanic.

As my invention was primarily designed for use in the formation of type-matrices, which require to be made with extreme accuracy as regards the depth of the character or matrix proper, I have illustrated in the accompanying drawings all the details of a machine adapted to this purpose, and have also shown, for the purpose of illustrating the scope of the invention, applications of the same to machines for other purposes.

Figure 1 represents a front elevation of a punching or stamping press fitted for the production of type-matrices. Fig. 2 is a transverse vertical section of the same on the line 2 2 of Fig. 4. Fig. 3 is a diagram illustrating the action of the cam-relieving devices. Fig. 4 is a vertical section on the line 4 4 of Figs.

1 and 2. Fig. 5 is a bottom plan view of the sliding head and its adjuncts. Fig. 6 is a top plan view of the bed-plate. Figs. 7 and 8 are side elevations of the punch or die, the circuit-controlling finger, and the matrix-blank upon which they operate. Fig. 8^a is a diagram illustrating the action of the devices for advancing the punch at a decreasing speed. Fig. 8^b is a modification of the parts shown in Figs. 7 and 8. Figs. 9 and 9^a are devices, showing the blank before and after the impression of the character or matrix proper therein. Fig. 10 is an end elevation, partly in section, showing a grinding-machine with my improvement applied. Fig. 11 is a vertical section showing the mode of applying the conductor or contact-finger to a die for stamping coin and for similar purposes. Fig. 12 is a side elevation, partly in section, showing my invention incorporated in a machine for the internal grinding of rings, tubes, &c. Fig. 13 is a view illustrating the application of my invention to a metal-planing machine.

Referring to Figs. 1 to 9, A represents the stationary bed-plate of a punching or stamping press; B, the vertically-reciprocating head mounted in suitable guides, C, and carrying at its lower end the punch or die D, fixed firmly therein; E, an eccentric or wrist carried on one end of a horizontally-revolving shaft and extending into a horizontal slot, F, in the sliding head, so that as it revolves it moves the head upward and downward in a manner familiar to every mechanic. This wrist, instead of being made of circular form, as usual, is flattened or made eccentric on the side farthest from the axis of rotation. This flattened portion, extending from *a* to *b*, has but a slight "lift," or, in other words, recedes from the axis of rotation very slightly between the points *a* and *b*. This flattened portion is so located that it comes into action—that is to say, bears upon the bottom of the slot F, to effect the depression of the head and punch—at a time when the punching action is nearly completed, or, in other words, when the punch has nearly reached its lowest point. Its object and effect are to diminish the downward speed of the punch toward the close of its action, so that, although the speed of the driving-shaft may continue, the punch will be moved very slightly, and thus time afforded for the stopping devices to act, as hereinafter more fully explained. The lower side of the

slot, on which the wrist acts in depressing the punch, is formed by a plate, G, capable of a slight vertical motion, and is supported by a hard-metal plate, I, bearing on a rock-shaft, H, which is passed through a vertical slot in the head and supported in its turn by a second plate, I, having a solid bearing at its lower end in the head. The plates I are made of great strength and extremely hard and provided with knife-edges at the two ends. They are seated, as shown, in V-grooves in opposite sides of the rock-shaft H and in corresponding grooves in the head and the plate G. When the punch is in action, the shaft is turned to the position shown in Fig. 2, so as to bring the four points of bearing in one vertical line, thereby sustaining the plate G in its elevated position, so that the wrist or eccentric, acting thereon, will force the slide and punch to their lowest limit of movement. By giving the rock-shaft H a slight rotation, so as to throw the bearing-points out of line, as illustrated by the dotted lines in Fig. 3, the plate G is permitted to sink within the slide, and as this vertical movement is equal or substantially equal to the lift of the wrist between the points *a* and *b* it follows that, although the wrist continues its rotation, the slide and punch are relieved from downward pressure and permitted to stop.

It is the purpose of my electrical connections to thus relieve the parts instantly when the punch has entered the blank to the proper depth. To secure this action I attach rigidly to the front of the rock-shaft H an upright arm or lever, H', connected to a spring, J, mounted on the slide and tending constantly to turn the arm and shaft, so as to relieve the punch from downward pressure. A finger, K, pivoted on top of the slide, may be engaged with the end of lever H' to hold the parts in operative position, as shown in Fig. 1. An electro-magnet, L, attached to an arm on top of the slide, serves when charged to attract the detent-finger K, or an armature thereon, and thus release the lever H'. A spring, M, is attached to the finger K to carry a portion of its weight, and thus render the device more sensitive.

From the coil of the magnet a conductor, O, is extended in one direction to a battery or other electric generator, and thence to the metallic bed of the press, and in the other direction to a conducting-finger, P, secured to and insulated from the slide B. The inner end of this finger lies adjacent to the punch or die D, and is accurately adjusted, so that its under surface stands above the lower face of the die a distance exactly equal to the depth of the impression in the matrix required. It is of prime importance that this finger P shall be properly fixed and adjusted with reference to the die, since it is the relation of their two faces that controls the depth of the impression and determines the instant when the punching operation shall stop.

In the drawings, Q represents a matrix-blank

in the edge of which it is required to indent a letter or character, as shown at *c*, Fig. 9. Before the indenting operation the blank presents the appearance shown in Fig. 9.

The operation is as follows: The blank being firmly fixed in position in the bed-plate directly under the punch, and the lever H' being locked in the position shown in Fig. 1, the driving shaft is turned in the direction indicated by the arrows, whereupon its wrist E, acting on the plate G, carries the slide and the punch downward, forcing the punch into the upper edge of the blank, the conductor P being at the same time carried with the punch toward the blank. As the indentation of the punch approaches the predetermined limit, portion *a b* of the wrist comes into play, and the descent of the punch becomes extremely slow. As soon as the punch has reached the proper depth, the finger P comes in contact with the surface of the matrix, thus closing the electric circuit, whereupon the magnet, lifting the detent K, releases the lever H', which is instantly moved by the spring J, so as to prevent the further descent of the punch. Owing to the exceedingly slow speed of the punch at the time this action occurs and to the arrangement of the stopping devices, the stoppage is practically instantaneous. Between the time that the finger P encounters the matrix and the time that the punch ceases its descent there is no appreciable increase in the depth of the indentation.

In the formation of the matrices herein shown, which are intended for use in a type-founding machine such as shown in Letters Patent No. 347,629, granted to Ottmar Mergenthaler on the 17th day of August, 1886, a variation of one-thousandth of an inch is highly objectionable, and a variation of three-thousandths inadmissible. By means of mechanism organized as above I am enabled to produce with rapidity matrices varying from each other less than one-thousandth of an inch in depth.

In practice it has been found that the matrix-blanks (commonly made of brass) yield appreciably under the pressure of the die, dies representing the broad-faced characters of the alphabet having a greater tendency to depress the metal than those having narrower faces, and that in consequence of this difference and of the yielding of the metal adjacent to the point where the punch acts variations as great as seven one-thousandths of an inch will occur, although the punches may be adjusted with extreme accuracy and the press made of great strength. It is also found that variations from two to six thousandths of an inch frequently occur in the use of the same punch under the same adjustments in blanks of the same size, due to a difference in the hardness or elasticity of the blank. It is further found that the expansion and contraction of the press, the difference in the fluidity of the lubricants employed, and other things of apparent insignificance will so far

affect the operation of an ordinary punching-press dependent upon the exact adjustment of its parts that the necessary uniformity of the indentation is unattainable thereby.

5 It will be understood that under my organization, with the contact-finger arranged in close proximity to the punch, it is wholly immaterial to what extent the parts may spring or yield, and to what extent the adjacent surfaces of the blank may sink under the pressure of the die, since the finger maintaining its relation to the lower face of the die will insure the stoppage when the impression is of the proper depth and not before.

15 In operating with large punches it will frequently happen that the straight upper edge of the die will sink adjacent to the punch, as shown in Fig. 7, a distance of from two to three one-thousandths of an inch, the metal reacting and assuming its straight form again as the punch is withdrawn. When this occurs, the finger falling downward with the punch, as shown in said figure, insures an indentation of the proper depth.

25 It will of course be understood that in matrices of this character it is absolutely necessary that the bottom of the indentation or matrix proper shall be at a definite distance below the upper edge or margin of the matrix-body; hence the importance of having the contact-finger located in close proximity to the punch.

35 While it is preferred to have the finger fixed in its relation to the punch, it is manifest that the construction shown in Fig. 8^b may be substituted. In this figure the conducting-finger, having a definite vertical thickness, springs downward and rests immovably on the upper edge of the matrix before the punch reaches the proper depth. At the instant the proper depth is reached the upper side of the finger comes in contact with the punch or punch-holder, and thus completes the circuit. It will be perceived that this is a mere inversion of the arrangement represented in the preceding figures.

45 While I prefer to employ the wrist or crank pin in connection with the sliding head to carry the punch or die, and to employ the particular devices shown as a yielding or adjustable connection between the wrist and slide, it is to be understood that the invention is applicable to slides or heads operated by other known means, and that the rock-shaft and its supporting-plates may be replaced by any other equivalent devices, which will admit of the head being relieved from the forward pressure of the head or other actuating device.

60 I will now refer to Fig. 10, which illustrates the application of my improvement to an ordinary form of grinding-machine, such as is employed for the production of twist-drills, round rods, or equivalent articles of cylindrical form.

55 A' represents a frame or standard; B', a bracket mounted on its front and arranged to

slide vertically under the influence of the lifting-screw C'.

D' is a horizontally-reciprocating bed 70 mounted on the bracket, connected with suitable operating mechanism, and provided with horizontal centers or supports to maintain in a horizontal position the rod or blank E', which it is required to reduce, and also with 75 centers or supports to sustain a second rod or model, F', which it is required to duplicate.

G' represents a grinding-wheel carried by a spindle, H², mounted in bearings in the main frame, the wheel being arranged to act upon 80 the surface of the finger E' as the latter is carried to and fro thereunder by the reciprocation of the bed D' in a manner familiar to every mechanic.

I' represents a vertical slide in the top of 85 the frame, provided on one side with a foot, d, to bear on the model or pattern F', and on the other side with a vertical screw, K', to bear on top of the blank E'. The reciprocating bed carries on one side a horizontal bar, 90 L', which, moving beneath the slide I', holds the same in an elevated position until the bed reaches the end of its movement, when the beveled end of the bar, passing beneath the slide, permits it to descend. The screw K' is 95 so adjusted at the beginning of operations that, encountering the blank E', it will limit the descent of the slide and prevent the foot d from encountering the pattern F' until the blank is reduced to the proper size. When 100 this occurs, the slide is free to descend until the screw bears upon the blank and the foot d bears upon the pattern. The screw K' is insulated from the slide and is connected with a conductor, M', leading thence to a battery 105 or other electric generator through an electromagnet, L, and thence to the slide I', as shown. The magnet actuates a pivoted lever or finger, K², which will be in turn connected in any suitable manner with the usual mechanism for 110 throwing the machine out of action. These devices, which may be of ordinary construction, form no part of my present invention, and, being understood by every mechanic, need not be detailed herein.

115 The operation is as follows: The blank, moving to and fro, is gradually reduced by the wheel G'. As the bed carrying the blank completes its movement in one direction and at no other time, the bar L' permits the head 120 I' to descend until the screw K' meets the blank, which latter acts through the screw to limit the descent of the slide and its foot d. So long as the blank exceeds the proper size, the foot d will be held out of contact with the 125 pattern, but as soon as it is of proper diameter the screw and the foot are both permitted to make contact, the effect of which is to complete the circuit, whereupon the magnet instantly accomplishes the stoppage of the machine. 130

Fig. 11 represents a vertical section through an intaglio die, such as is commonly used for the formation of coin, the ornamentation of

watch-cases, lockets, and other similar articles.

In applying my improvement to this device the press and all of its connections may be identical with those represented in Figs. 1, 2, and 3; but instead of the external contact-finger, P, I pass the conducting-wire P' through the die, insulating it therefrom and terminating it at the highest point in the cavity or recess of the die—that is to say, at the point into which the metal will last enter during the coining operation. The instant that the metal of the coin or other blank completely fills the die it will, by making contact with the conductor P', complete the circuit and stop the machine.

In Fig. 12, G' represents a rotary grinding-wheel on a horizontal spindle intended to grind out the interior of a ring, Q², to a predetermined size. This ring is secured to and carried by a revolving head or chuck, R², arranged to reciprocate in the direction of its axis in a manner commonly practiced and familiar to the skilled mechanic. An electro-magnet is applied as in the preceding figures, or in any other appropriate manner, to effect the stoppage of the machine, and the terminals of this magnet are introduced, as shown at M', through the arbor or mandrel and attached to two pivoted jaws, S², attached to a central sliding spindle, T², urged backward by a spring, U². A spring, V², tends to separate the jaws. An adjusting-screw, W², passed through one of the jaws to encounter the other, serves to limit their closing action, so that when they are brought together, closing the circuit, the distance between their outer surfaces will agree precisely with the internal diameter of the required ring. During the grinding operation the head and ring are moved to the left, the arms S² being drawn backward out of the ring, and the latter presented to the grinding-wheel. From time to time the chuck or spindle is moved backward from the grinding-wheel to the right, so as to present the ring Q² to the arms S². If the size of the opening is such that the ring, acting on the arms S², will force them into contact and close the circuit, the grinding action is continued. When, however, the opening acquires a size such that the arms S² may enter therein without meeting each other and closing the circuit, or, in other words, may enter and leave the circuit open, the machine is automatically stopped.

In Fig. 13 I have shown my stopping devices applied to an ordinary metal-planer to arrest its action in the event of the tool wearing away, so that it fails to cut to the depth for which it was adjusted. The magnet L², controlling the stopping mechanism, is mounted in a circuit, M', embracing the battery. The terminals of the circuit are connected one with the insulated contact-finger G³ and the other with the head or stock carrying the cutting-tool G³. G⁴ represents the metal under treatment. The contact-finger has its face arranged

slightly above the upper cutting-line of the tool. During the proper operation of the parts the finger is out of contact with the metal G⁴ and the circuit remains open. When the point of the tool is worn away so that it fails to cut to the proper depth, the surface of the metal G⁴ will be left sufficiently high to make contact with the finger G³, thus completing the work and stopping the machine.

Having thus described my invention, what I claim is—

1. In a metal punching or cutting mechanism, the combination of a punch or die, an adjacent finger located in fixed relation thereto, its end in rear of the punch-face a distance equal to the depth of impression required, and an electro-magnetic stopping mechanism having a controlling-circuit connected at one extremity to the punch and at the other to the finger, whereby the circuit is completed through the punch, the metal under treatment, and the finger when the punch is entered to the predetermined depth.

2. A head or slide carrying a punch or equivalent tool, mechanism to move said head, intermediate devices through which the operating mechanism acts to move the head, said device adjustable to permit the head to stop during the continued movement of the operating mechanism, a spring tending to adjust said intermediate devices to the inoperative position, a detent to hold the intermediate devices in operative position, an electro-magnet to release the detent, and a finger to control the magnet-circuit located in close proximity to the punch and in position to touch the blank when the die has entered the same to the proper depth.

3. The movable head, its operating-wrist, and the adjustable connection between the wrist and head, in combination with the lever to operate said connection, the spring to move the lever, the detent for the lever, and the magnet to actuate the detent, whereby the attraction of the magnet is caused to instantly relieve the head from the action of the wrist.

4. The slotted slide B and the actuating-wrist having one side, a b, made of diminishing lift, as described and shown, in combination with the electric mechanism, substantially as described, to effect the automatic stoppage of the slide during the action of said portion of the wrist.

5. In combination with a punching, boring, cutting, or equivalent machine, electro-magnetic devices to cause its stoppage, said mechanism embracing and being controlled by a contact device located near the tool and in position to act upon the blank or object under treatment.

In testimony whereof I have hereunto set my hand, this 8th day of March, 1887, in the presence of two attesting witnesses.

OTTMAR MERGENTHALER.

Witnesses:

MURRAY HANSON,
WILLIAM H. BERRY.