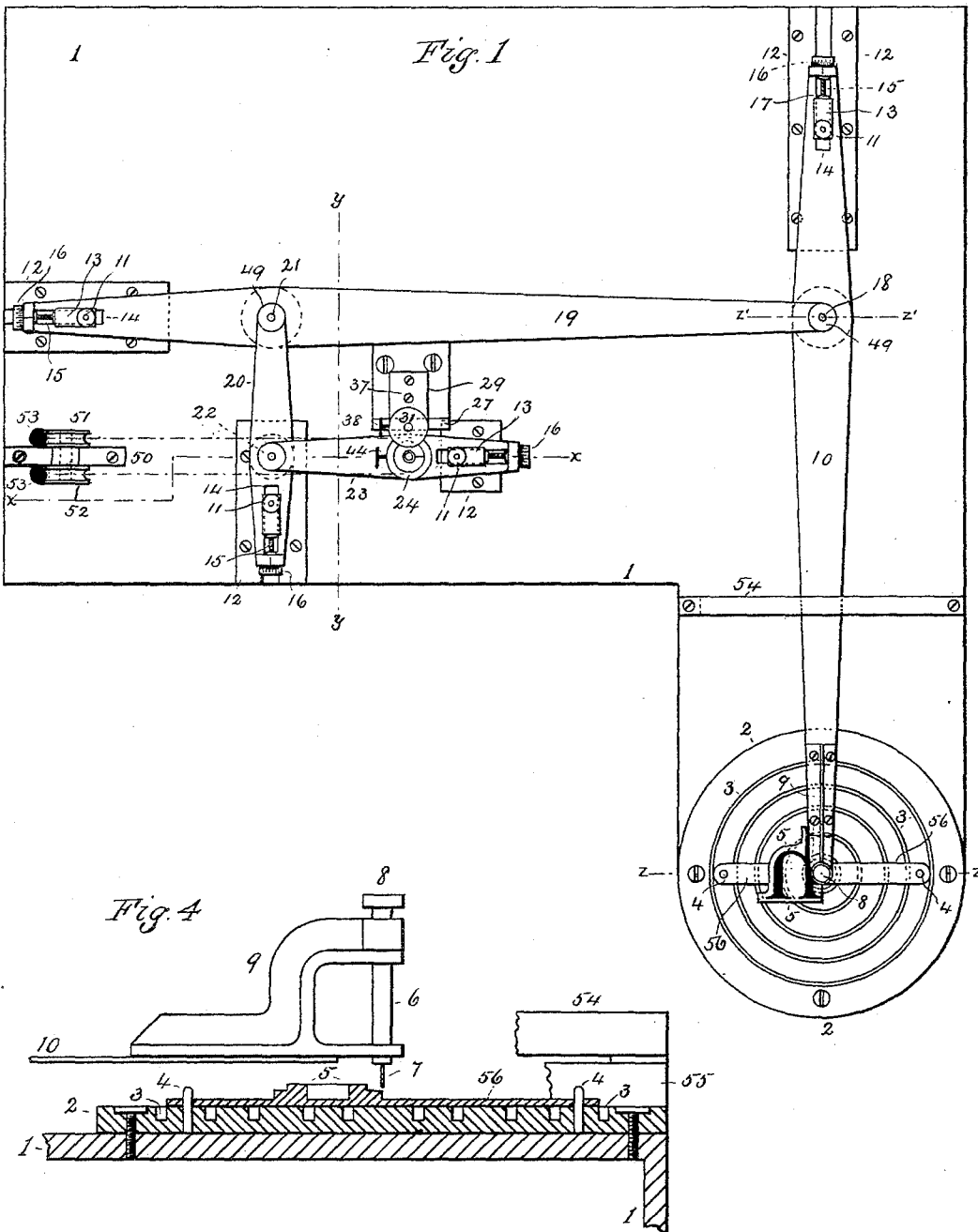


C. L. REDFIELD.
DIE CUTTING MACHINE.

No. 454,567.

Patented June 23, 1891.



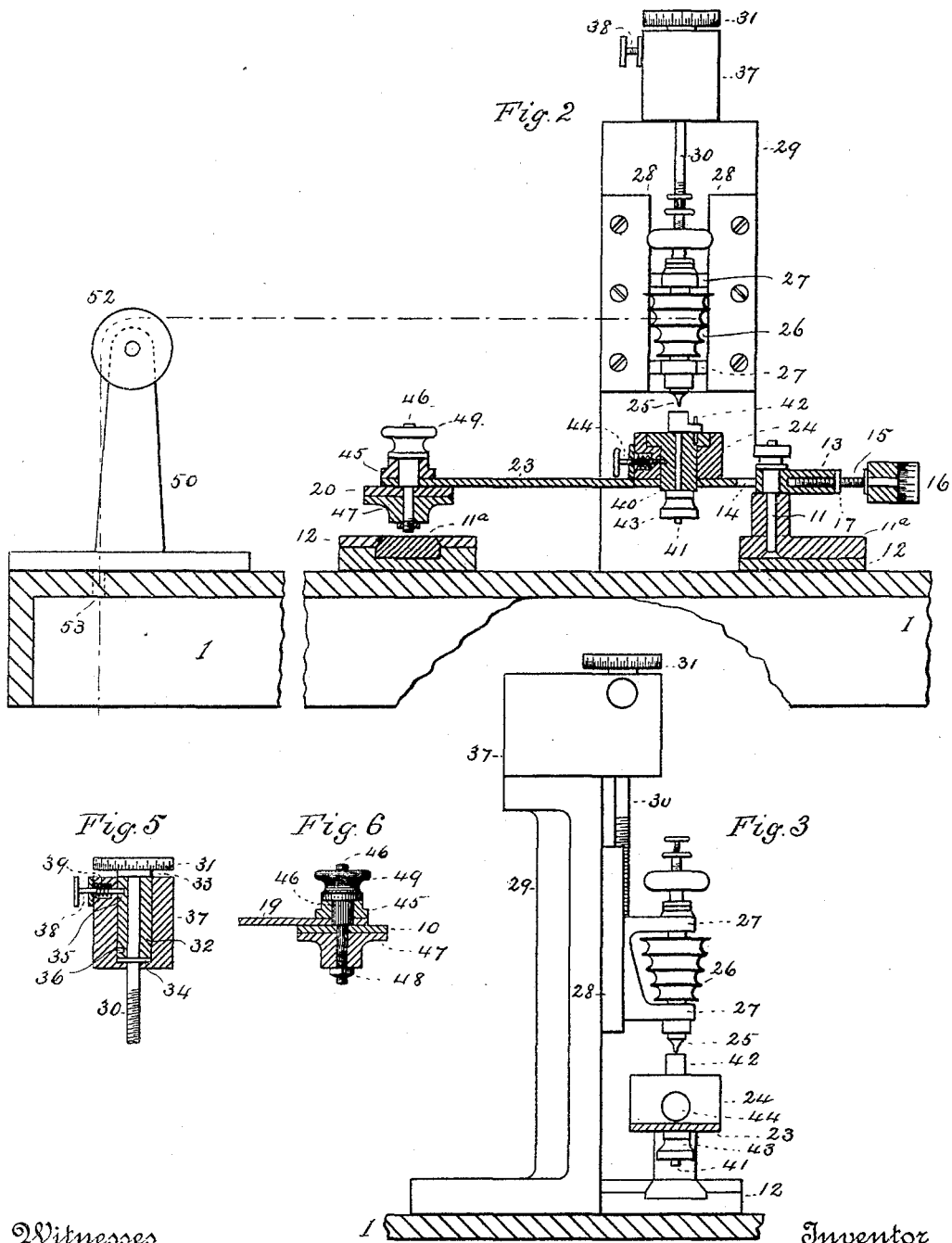
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Inventor
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 By *his* Attorney
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UNITED STATES PATENT OFFICE.

CASPER L. REDFIELD, OF CHICAGO, ILLINOIS, ASSIGNOR TO THE CHICAGO MATRIX MACHINE COMPANY.

DIE-CUTTING MACHINE.

SPECIFICATION forming part of Letters Patent No. 454,567, dated June 23, 1891.

Application filed July 19, 1890. Serial No. 359,305. (No model.)

To all whom it may concern:

Be it known that I, CASPER L. REDFIELD, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Die-Cutting Machines, of which the following is a specification.

My invention relates to devices for making a reduced copy of a pattern; and it has for its object the production of a machine that will cut profile characters of any desired form, and more especially type-dies having shoulders partially surrounding their faces.

In the accompanying drawings, Figure 1 is a plan of the machine; Fig. 2, a partial section on the line $x x$ of Fig. 1; Fig. 3, a section on the line $y y$ of Fig. 1; Fig. 4, a section on the line $z z$ of Fig. 1, with the tracing-arm swung at a right angle to better show the construction. Fig. 5 is a detail of the mechanism for raising and lowering the cutting-tool, and Fig. 6 a detail (a section on the line $z' z'$ of Fig. 1) of the pivoting devices for the levers.

In said drawings, 1 designates the bed-plate, which has at one end a pattern-table 2, provided with a series of concentric grooves 3 and dowel-pins 4 for holding a pattern 5 in place. A tracing-pin 6, having a small end 7 and a head 8, is supported in a frame 9, attached to one end of a long lever 10, the end being free to swing over the pattern-table 2. The other end of the lever 10 is connected to a pivot 11, fixed in a cross-head 11^a, sliding in guides 12. The pivot 11 is not fastened directly to the lever 10, but to a block 13, that is adjustable in a slot 14 in the lever by means of a fine-threaded screw 15, having a graduated head 16. On the screw is a jam-nut 17 for holding it in place when adjusted. The free end of this lever is supported and guided between horizontal guides 54 and 55.

On the lever 10, intermediate the fulcrum and tracing-pin, is a pivot 18, to which is connected one end of a lever 19, that extends horizontally at right angles to the former lever. This lever is similar to the prime lever and has its outer end pivoted and provided with like means for supporting and adjusting its fulcrum. A third lever 20, at right angles to the second lever, is pivoted thereon at a point 21, and has its outer end pivoted by de-

vices similar to those provided for the other levers. This lever is of the same form as the others, but is shorter.

At a point 22 on the lever 20 is pivoted the end of a fourth lever 23, of the same form and length as the lever 20, and having its other end connected to like fulcrum devices. The fulcrums of all the levers are thus made capable of sliding and are adapted to be adjusted with nicety.

The lever 23 carries at a point corresponding with the pivotal point 22 on the third lever a work-holder 24. Over the center of the work-holder is a cutting-tool 25, driven by a lathe-head 26, that is supported on a frame 27 in guides 28 on a standard 29. The frame 27 is vertically adjustable by means of the screw 30, which has a graduated head 31. The upper end of this screw has a bushing 32 around it, held in place by two collars 33 and 34. In one side of the bushing 32 are two holes 35 and 36, one near each end. This bushing with its collar is held in a socket in a bracket 37, that is supported on top of the standard 29. In the side of the bracket 37, in line with the hole 35, is a dowel-pin 38, held in place by a spring 39. This pin prevents the bushing from turning or rising while the lathe-head is being adjusted or while the tool is cutting. By pulling out the pin 38 and raising the lathe-head by hand until the hole 36 is opposite the pin 38 the tool may be kept clear of the blank, so that it can be easily removed from the work-holder.

In the work-holder 24 is a bushing 40, through the center of which is a hole to receive a stem 41 of the blank 42, which is firmly held in position by the nut 43. In the bushing 40, at one side of the center, is a dowel-pin 44, that keeps the blank from turning while being cut.

The manner in which the levers are pivoted at each of the points 18, 21, and 22 is as follows—*e. g.*, the levers 10 and 19, as in Fig. 6: On the end of the lever 19 is a round block 45, fastened to it to provide a longer bearing for the pin 46 than the thickness of the lever itself would afford. A similar block 47 is fastened at the under side of the lever 10 for the same purpose, and a comparatively long bearing-surface is thus afforded the pin 46. A

nut 48 is screwed on the lower end of the pin 46, so as to make it rigid in the lower lever. A knurled nut 49 is screwed down to a shoulder on the upper end of the pin 46, so that the lever 19 can move freely around the middle portion of the pin without binding when the nuts are tightened.

The levers 10, 19, 20, and 23 are so arranged that when the tracing-point 6 is over the center of the pattern-table 2 the cutting-tool is over the center of the blank-holder 24. One of the exterior tracing-grooves 3 represents on an enlarged scale the circumference of the blank on which it is intended to cut the desired character, so that when the tracing-point 6 follows this groove the cutting-tool follows around the edge of the blank, touching without cutting it. The pattern is placed on the table in the exact relative position in respect to the center of the table and of the concentric grooves that it is desired the character should have on the face of the blank relative to its center. To facilitate this placing of the pattern, the two dowel-pins 4 are put in the pattern-table, and when the pattern is once set holes are drilled in wings 56, attached to the pattern, to correspond with these holes. If desired, the pattern-table may have graduations marked thereon and the pattern can be set by the graduations.

The belt for operating the lathe-head runs over two idle-pulleys 51 and 52, that are mounted on a standard 50, and down through holes 53 in the table.

The operation of the mechanism is as follows: By taking hold of the tracing-pin and moving it around the contour of the pattern the direction and amount of all movements of the pin 6 will be transmitted to the blank in the holder 24 in the following manner: A movement of the tracer in a straight line from right to left, as along the line $z z$, will cause the point 18 to move a shorter distance from right to left, but in a curve which approximates the arc of a circle of large diameter. This curve will be transmitted to the point 21 in the form of a second curve of the same length; but because of the action of the lever 19 and the straight-line movement of the cross-head the curve will be much reduced in height and thus be nearer a straight line. The right-to-left movement of the point 22 and the length of the lever 20 are such that the curve made by the point 21 is transmitted into a practically straight-line movement of the point 22, which movement is in turn transmitted to the blank in the work-holder. In the same way a movement of the tracing-pin at right angles to the line $z z$ produces a curved movement of the point 21, and the movement is reduced in curvature at the point 22 and the curvature disappears in a straight line at the work-holder, and so with the movement of the tracer in other directions. Thus the tracer movements are reproduced on a reduced scale at the work-holder.

It will be obvious that by changing or ad-

justing the lengths of the first and second levers 10 and 19 to the same extent in the same direction the only effect will be to correspondingly enlarge or reduce the reproduction of the pattern. A similar result would follow with a like change of the third and fourth levers 20 and 23, and also of the first and fourth or second and third, provided the adjustment of each lever was proportioned to its length. If proportional and like adjustments of the first and third levers be made without disturbing the second and fourth, the effect will be to correspondingly increase or decrease the width of the reduced reproduction without changing its height, while if such changes are made in the second and fourth levers without disturbing the first and third the effect will be to change the height of the reproduction without affecting its width. In general, it may be said that changing the levers that are at right angles to each other effects a change in the scale of reproduction without changing its relative proportions, while changing any two of the levers that are parallel affects the scale of reproduction in one direction without affecting it in the other. This capability of changing the proportions of the reproductions is of especial advantage in cutting dies for a matrix-making machine in which it is desired to have the characters correspond to printer's type. For example, the "pica em," which is one-sixth of an inch square, being taken as a standard, its quantity is divided into twelve "points," and all sizes of type are made so that the height of body shall become definite number of such points. In a matrix-machine each movement of the matrix material is some multiple of a definite quantity, and to obtain this quantity the width of the pica em is divided into a certain number of units (dependent upon the size of the type) and each character is made up of a definite number of these units—that is, the height of characters is measured in points, the point being one seventy-second of an inch, and the width of a character is measured in "units," the units being always some fraction of a pica em and a constant fractional portion of each character. Thus the letter *a* is always four units in width, and the size of the character depends upon the length of these units and is also a fractional portion of a pica em. Matrix-machines are usually made so that they will feed the matrix material any required number of units; but these units are always of the same length.

To illustrate the application of the present mechanism to the cutting of dies for a matrix-machine, let it be supposed that the matrix-machine is to print from any one of three sizes of dies, as minion, brevier, and bourgeois, and that the length of the unit is one-tenth of a pica em. As these sizes of type are respectively seven, eight, and nine points high, and as any character always has a width of units of definite length, (*a*, for example, which has a width of four units,) it follows

that the dies for this purpose must represent the "fat" or extended "minion," a medium brevier, and the "lean" or condensed bourgeois. To accomplish this on the machine a pattern is made of the exact form it is required that the brevier type shall be, and the machine is so constructed that when set in its medium adjustment it will make an exact reduced reproduction of this pattern, which will produce a medium brevier. The second and fourth levers are then adjusted so as to reduce the height of the reproduction the proper amount without changing the width, and the fat minion may thus be cut. The levers may then be changed so as to increase the height of the cut the proper amount, and the lean bourgeois may be cut. It will be apparent that by changing the first and third levers instead of the second and fourth fat and lean bourgeois can also be cut from the same pattern; and it will be further apparent that by a proper adjustment of all the levers the medium and lean characters of any-sized type can be cut from one set of patterns.

What I claim is—

1. In a mechanism for transferring patterns and changing their scale, a system of levers pivotally connected to one another and pivoted to fulcrums movable with their levers but in fixed courses.

2. In a mechanism for transferring patterns and changing their scale, a system of levers pivotally connected to one another and pivoted to fulcrums movable with their levers but in fixed courses, and which are adjustable to vary the length of leverage.

3. In a mechanism for transferring patterns and changing their scale, a system of pivotally-connected levers, each of which is pivoted to an independently-adjustable fulcrum that has a rectilinear movement produced by an axial movement of its lever.

4. A pattern-transferring mechanism comprising pivotally-connected levers, each of which is also pivoted to a fulcrum that is constrained to move in a straight course, in combination with devices for independently adjusting each fulcrum to vary the length of its lever.

5. In a mechanism for transferring patterns and changing their scale, a system of pivotally-connected levers, each of which is pivoted to a sliding fulcrum having a rectilinear movement at a right angle to the movement of the fulcrum of the next lever of the series.

6. In a mechanism for transferring patterns and changing their scale, a system of pivotally-connected levers having their fulcrums on moving pivots whose courses are straight and in sequence are at angles and in alternation are parallel to one another.

7. In a mechanism for transferring patterns and changing their scale, a series of pivotally-connected levers, each of which in normal position is at right angles to the next of the series, and each of which is pivoted to

a fulcrum that is moved by its lever in a course parallel to the line of the normal position of the lever.

8. In a transfer and reduction mechanism, a system of oscillating levers pivoted to fulcrums that move in fixed courses, whereby the movements of the free end of the prime lever are transmitted in reduced extent to a point intermediate the pivotal points of the final lever.

9. A transfer and reduction mechanism comprising a system of connected levers having fulcrums movable in fixed courses, in combination with means for adjusting the fulcrums to vary the extent of the reduction without changing the position of either pattern or blank.

10. A transfer and reduction mechanism comprising a system of connected levers having adjustable fulcrums arranged to move in fixed courses, and providing means for shifting the fulcrums to vary the width without affecting the height or the height without affecting the width of the reproductions, substantially as set forth.

11. In a reducing mechanism having a system of connected levers fulcrumed on pivots that move in fixed courses, graduated adjusting devices for shifting the fulcrums to vary the extent of the reductions.

12. In a transfer and reduction mechanism, a system of connected levers fulcrumed on pivots that slide in fixed courses, the prime lever being adapted to follow a pattern and the final lever carrying a blank-holder, substantially as set forth.

13. A transfer and reduction mechanism consisting of four connected levers, each attached to a separate pivot that moves in a fixed course, and each lever being independently adjustable as to its length, substantially as set forth.

14. In a transfer mechanism, fixed guides and a cross-head therein carrying a pivot-pin, a lever having one end connected to said pin and the other to another lever, a blank carried intermediate the pivotal connections of the former lever, a pattern, and means, substantially as described, for producing a reduced copy of the pattern on the blank.

15. A rotary cutting-tool, a blank thereunder carried by a vibrating lever, a sliding cross-head providing a pivot for one end of the lever, a second lever providing a pivot for the other end of the former lever, and a series of pivoted sliding levers for moving the blank-holding lever to present the blank to the tool, substantially as set forth.

16. A rotary cutter, a blank-holder, a pattern, a tracer, and a system of pivotally-connected sliding levers for transmitting to the tool-holder movements corresponding in direction but reduced in extent made by the tracer around the pattern.

17. In a die-cutting machine, a die-blank, a rotary cutting-tool, a character-pattern and a table therefor, a tracer, and a system of piv-

otally-connected levers having fulcrums moving in fixed courses, whereby the tracer movements about the pattern will be repeated by the blank about the tool.

5 18. In a die-cutting machine, a die-blank, a rotary cutting-tool, a character-pattern and a table therefor provided with means for holding the pattern eccentrically, a tracer, and a system of pivotally-connected sliding levers
10 for causing the movement of the tracer about a pattern placed eccentrically on the table to present the blank in like eccentric position to the cutter.

19. In a die-cutting machine, a work-holder

consisting of a fixed shell, a removable bush- 15
ing therefor, and a spring-catch for holding said bushing in place, substantially as set forth.

20. In a die-cutting machine, a blank, a rotary tool for cutting it, an adjustable holder 20
for supporting the tool, and a screw having a graduated head for adjusting the holder, substantially as set forth.

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