Dec. 25, 1934. E. F. TRETBAR, JR 1,985,302

APPARATUS FOR KERFING BLOCKS FOR PRINTING

Filed March 9, 1932 4 Sheets-Sheet 1

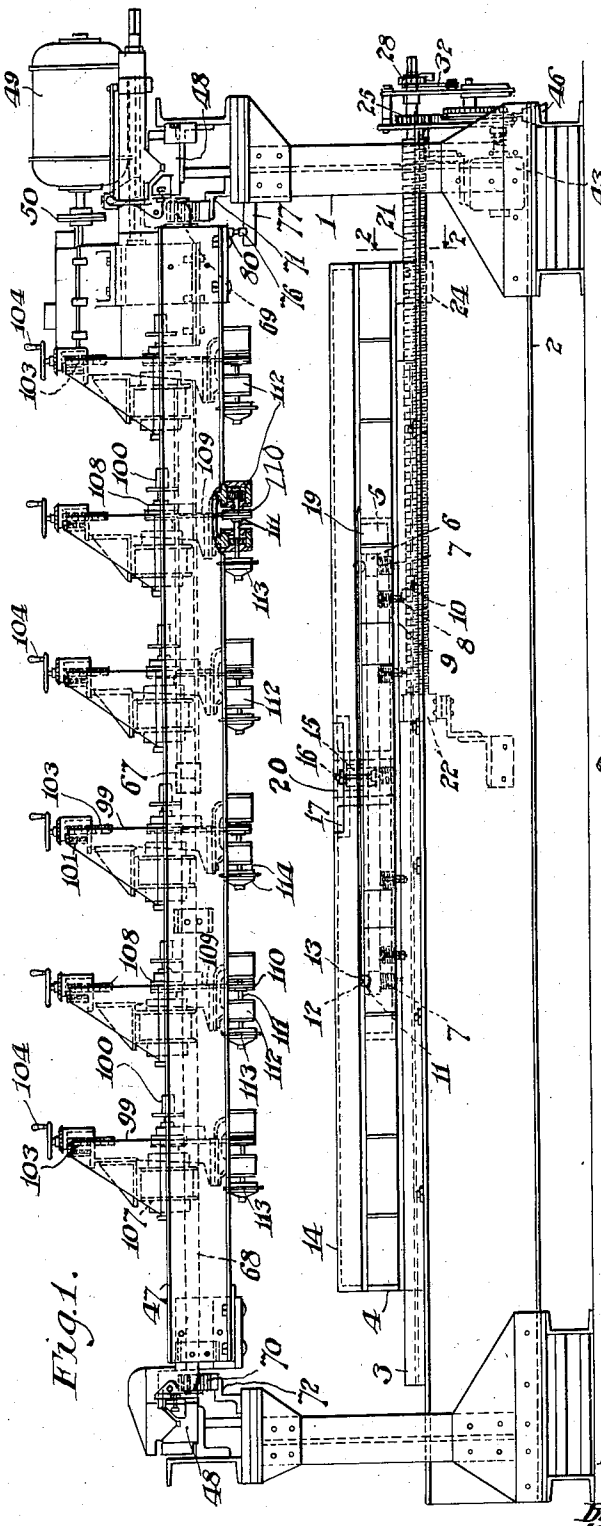


Fig. 1.

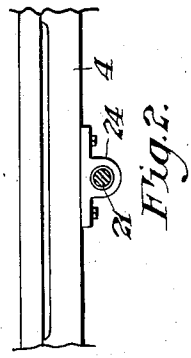


Fig. 2.

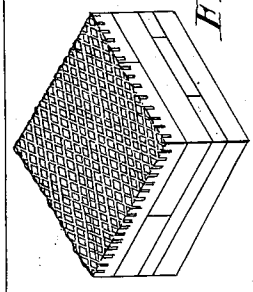


Fig. 4.

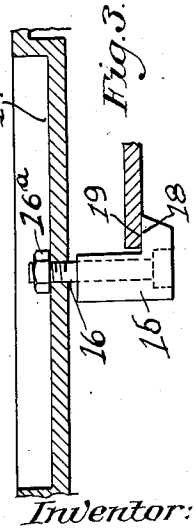


Fig. 3.

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APPARATUS FOR KERFING BLOCKS FOR PRINTING

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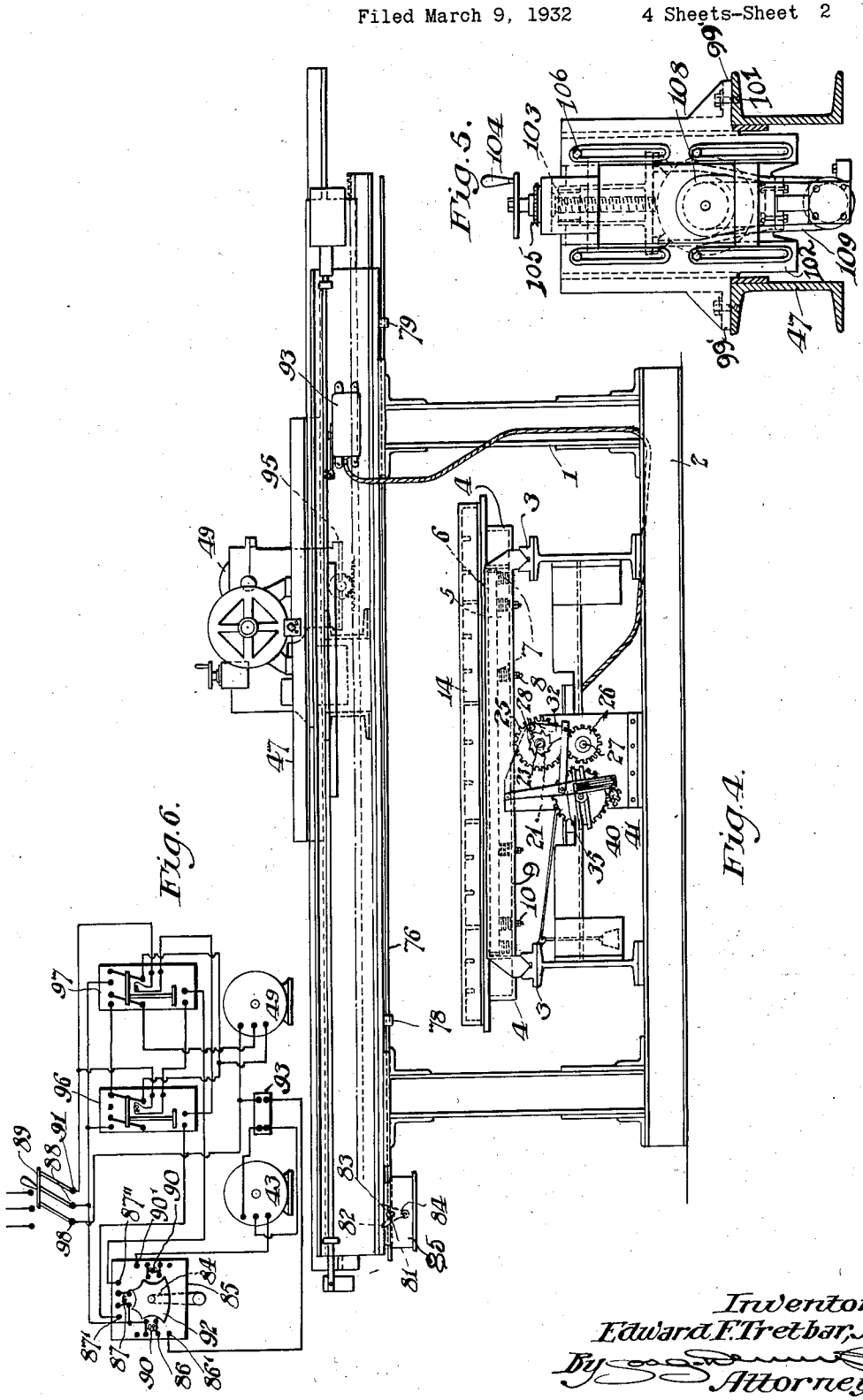


Fig. 4.

Fig. 6.

Fig. 5.

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APPARATUS FOR KERFING BLOCKS FOR PRINTING

Filed March 9, 1932 4 Sheets-Sheet 3

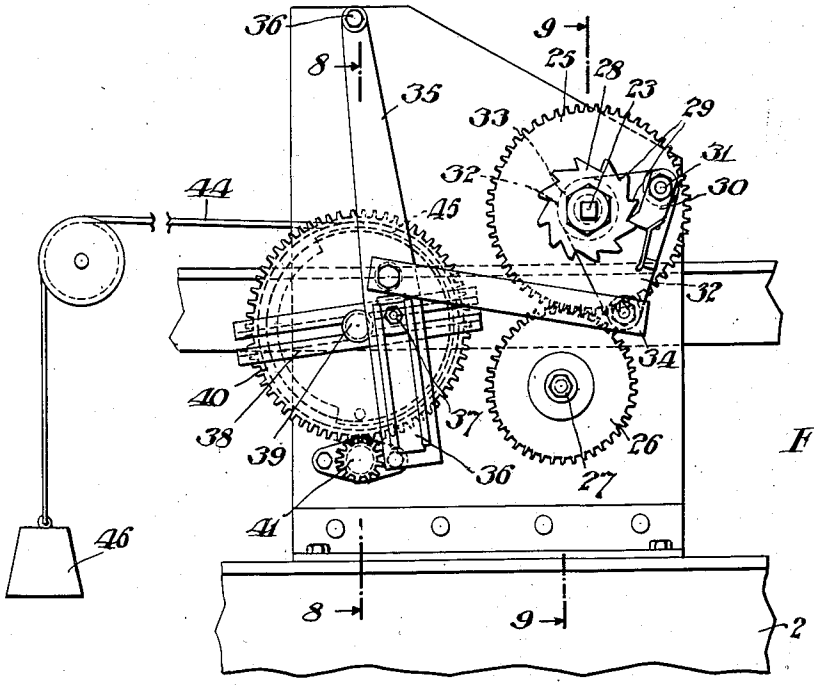


Fig. 7.

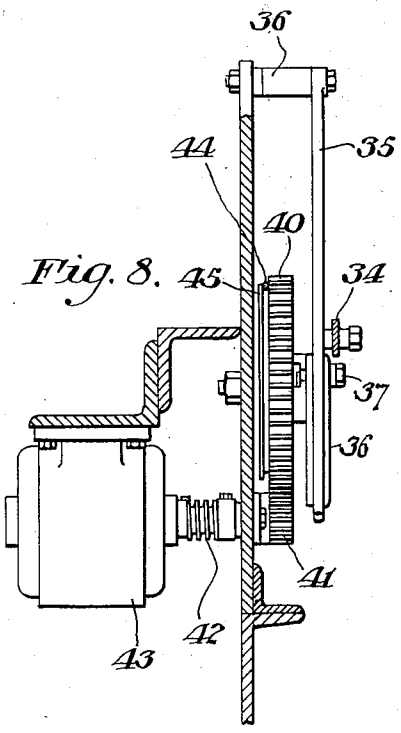


Fig. 8.

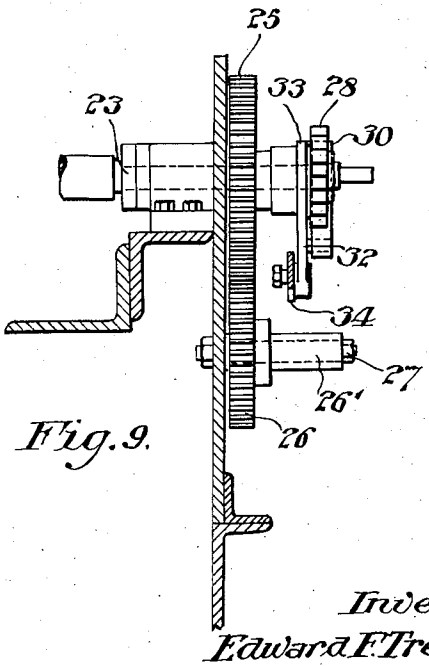


Fig. 9.

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APPARATUS FOR KERFING BLOCKS FOR PRINTING

Filed March 9, 1932 4 Sheets-Sheet 4

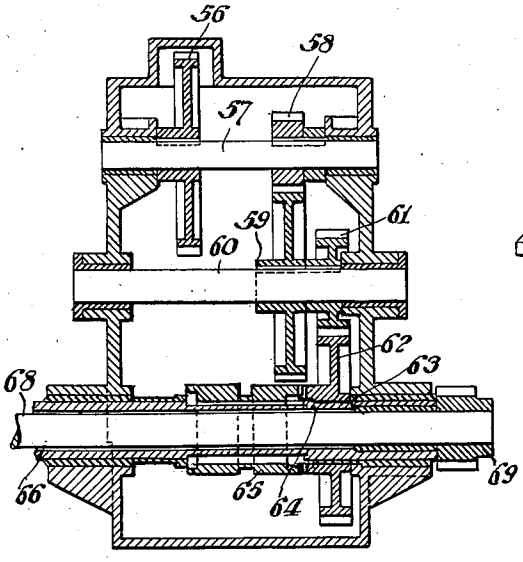


Fig. 11.

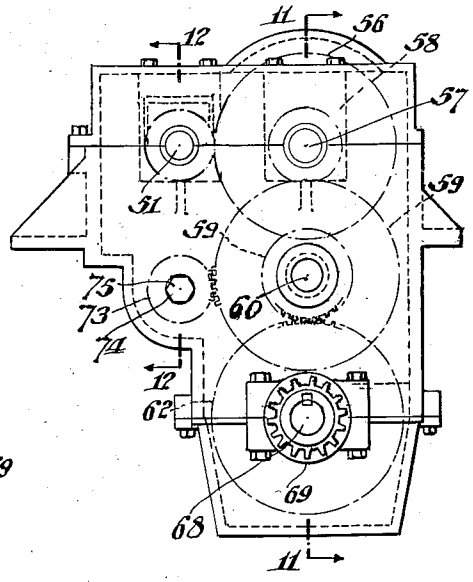


Fig. 10.

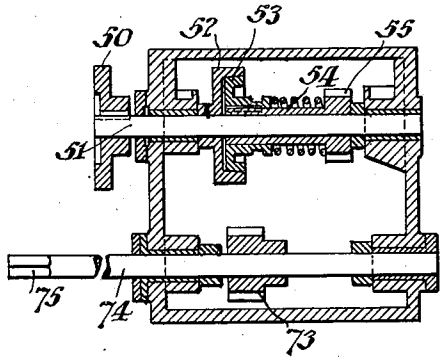


Fig. 12.

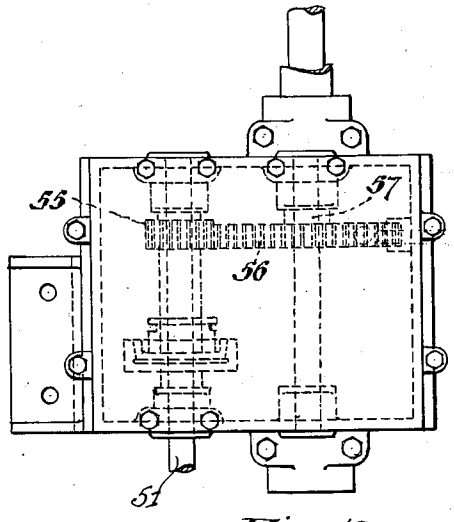


Fig. 13.

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Patented Dec. 25, 1934 1,985,302

UNITED STATES PATENT OFFICE

1,985,302

APPARATUS FOR KERFING BLOCKS FOR PRINTING

Edward F. Tretbar, Jr., Camden, N. J.

Application March 9, 1932, Serial No. 597,661

14 Claims. (Cl. 144—133)

My invention is an improved machine for kerfing blocks and rendering them suitable for use in printing.

A leading object of my invention is the provision or a machine of this type by which sets of kerfs can be simultaneously cut and spaced with absolute accuracy so that the final kerf of one set will be in exact parallelism with the first kerf of an adjacent set and spaced therefrom exactly the same distance as the spacing between the kerfs of either set or in proportion thereto.

A further object of my invention is the provision of means for cutting kerfs at any desired angle and to any desired depth, and for cutting kerfs transversely to one another without removing the work from the work table.

In the preferred embodiment of my invention, a work supporting table rotatable in a horizontal plane is mounted upon and may be clamped to a carriage reciprocable step by step in a horizontal plane. The step by step movement is preferably effected by means of an electric torque motor acting through gear and ratchet mechanism by which the movement of the carriage may be effected either in accordance with the metric system or in accordance with the so-called English or fractional inch system.

A series of saws are adjustably mounted upon a series of brackets supported by a carriage reciprocable transversely to the work supporting carriage, the carriage preferably being driven by a shaft to which power is applied intermediate its ends from a motor mounted at one end of the saw carriage. The reciprocations of the saw carriage control the actuations of the torque motor by which the step by step movement is given the carriage supporting work table; such step by step movements being given after each complete reciprocation of the saw carriage.

The characteristics and advantages of my improved apparatus will further appear from the following description and the accompanying drawings of a preferred embodiment of my improvements.

In the drawings, Fig. 1 is a part sectional side elevation of a kerfing machine embodying my improvements; Fig. 2 is an enlarged fragmentary detail on the line 2—2 of Fig. 1; Fig. 3 is an enlarged fragmentary sectional view showing clamping means for securing the rotary work table against rotation on its carriage; Fig. 4 is an end view of the machine shown in Fig. 1; Fig. 5 is an enlarged front elevation of one of the saw units; Fig. 6 is a diagrammatic wiring diagram by which the operations of the work carriage and saw carriage are controlled and correlated; Fig. 7 is an enlarged elevation of mechanism for effecting step by step movement of the work carriage; Fig. 8 is a fragmentary sectional view on the line 8—8 of Fig. 7; Fig. 9 is a fragmentary sectional view on the line 9—9 of Fig. 7; Fig. 10 is an enlarged detached end elevation of mechanism used in reciprocating the saw carriage; Fig. 11 is a transverse sectional view on the line 11—11 of Fig. 10; Fig. 12 is a transverse sectional view on the line 12—12 of Fig. 10, and Fig. 13 is a top plan view of the mechanism shown in Fig. 10 and Fig. 14 is a fragmentary section of a printing block kerfed by my improved machine.

As illustrated in the drawings, a frame 1 has longitudinal beams 2 which support V-shaped rails 3 forming slideways for a reciprocable carriage or table 4. The carriage 4 contains a recessed portion 5 in which is mounted a ring 6 normally supported by springs 7 by which the table is biased toward its upward position. Bolts 8 are connected with the ring 6 and extend through certain of the springs and through the web 9 of the carriage 4. (Figs. 1 and 4.) Lock nuts 10 fixed on the respective bolts limit the upward movement of the ring 6 while permitting movement thereof downward by compressing the springs 7.

The ring 6 contains a circular raceway 11 for the antifriction balls 12 which engage a complementary groove or raceway 13 in a table 14 adapted to rotate over the carriage 4. Clamps 15 are supported on bolts 16 and nuts 16a (Figs. 1 and 3) depending from depressed portions 17 in the periphery of the revoluble table 14. The clamps 15 have projecting lips 18 adapted to engage beneath a flange 19 of the reciprocating carriage 4 so that by rotating the nuts 16a and drawing the lips 18 tightly against the flange 19 the rotary table may be locked against rotary movement on its pivot or center pin 20 carried by the reciprocating carriage 4.

The sliding carriage 4 is reciprocable step by step by means of a worm or lead screw 21 (Figs. 1, 2, 4, 9) having cylindrical ends journalled in bearings 22 and 23. A bronze nut 24 is fixed to the table 4 and contains a thread complementary to the thread on the lead screw 21 which passes through the nut and by its rotation reciprocates the table 4. The lead screw is rotated a distance sufficient to effect a desired longitudinal movement of the table 4 by means of registering mechanism connected therewith. This registering

mechanism is preferably adjustable to effect movements of the lead screw and consequently movements of the reciprocable table either in accordance with the metric system or the so-called English system of measurements by fractions of an inch.

The registering mechanism (Figs. 1, 4, 7, 8, 9) consists of a gear 25 fixed to the screw 21 and meshing with a gear 26 revoluble on a stub shaft 27 for communicating a step by step movement when feeding of the table in accordance with the metric system is desired. When it is desired to feed the table in accordance with the so-called English system, a ratchet 28 is fixed to the shaft 21 and has its teeth 29 engaged by a dog 30 pivoted on a pintle 31 carried by the triangular arm 32 having a hub 33 loosely sleeved on a collar or hub of the ratchet 28. The arm 32 is pivotally connected through the link 34 with a fulcrummed arm 35 (Figs. 7, 8, 9) depending from the pivot 36 fixed on the frame. The lower end of the lever 35 contains a slot 36 in which is engaged a slide 37 carried by a split eccentric bar 38 adjustably fixed to the shaft 39 of a gear 40 meshing with a pinion 41.

The pinion 41 (Figs. 7, 8) is operated through a spring 42 by a torque motor 43 when the circuit thereof is closed as hereinafter described. A cable 44, wrapped around a sheave 45 and connected with the counterweight 46, restores the mechanism to its initial position after each operation of the torque motor.

When it is desired to operated the carriage in accordance with the metric system, the ratchet 28 and arm 32 are removed from the end of the work 21 and journalled upon the collar 26' (Fig. 9) of the gear 26 and splined relatively thereto so that instead of the ratchet mechanism acting directly upon the screw 21 it acts through the gears 26 and 25. It will be understood that by providing ratchets having different numbers of teeth and suitably adjusting the eccentric 37, the distance travelled by the reciprocable table 4 at each operation of the torque motor 43 may be varied as desired when using either the metric system or English system of measurements.

A saw carriage 47 (Figs. 1, 4) is reciprocable on the grooved rails 48 carried by the top of the frame 1 and moves in a direction transverse to the direction of movement of the carriage 4.

A reversible motor 49 mounted on the carriage 47 has its shaft connected by a coupling 50 with transmission mechanism contained in a housing and comprising a shaft 51 (Figs. 10, 12, 13) having fixed thereto a clutch cup 52 complementary to the spring pressed clutch cone 53 splined on the sleeve 54. The sleeve 54 has formed thereon a pinion 55 which meshes with a gear wheel 56 fixed on the shaft 57 (Fig. 13). A pinion 58, fixed to the shaft 57, meshes with a gear 59 fixed to the shaft 60, on which shaft is also mounted a pinion 61 meshing with a gear 62 journalled on the sleeve 63 (Fig. 11). The hub of the gear 62 is provided with clutch jaws 64 adapted to coact with jaws of a clutch sleeve 65 splined on the sleeve shaft 66 which is secured by a coupling 67 (Fig. 1) to the shaft 68. Pinions 69 and 70 are fixed to the shaft 68 and mesh with the teeth of the racks 71 and 72 carried by the frame and reciprocate the carriage 47 backward and forward.

The carriage 47 may be operated manually by means of a pinion 73 (Figs. 10, 12) meshing with the gear 59 and having its shaft 74 projecting from the transmission housing and provided with a hexagonal end 75 for the attachment of a suitable handle.

The reciprocation of the carriage 47 by the motor 49 is controlled (Figs. 1, 4) by a reciprocable bar 76 mounted in suitable brackets 77 on the frame adjacent to the transmission housing and containing a series of apertures for the attachment of stops 78 and 79 at desired points along the length of the bar 76. A stud or finger 80 (Fig. 1) depending from the transmission housing substantially in line with the axis of the saws hereinafter described shifts the bar 76 by engagement with the stops 78 and 79, which are so positioned as to regulate the length of the desired travel of the carriage 47.

The bar 76 has connected therewith an arm 81 adapted for engaging the yoke arms 82 and 83 projecting from a handle 84 of a master switch 85. This master switch 85 has spring switch blades 86 and 87 (Fig. 6) connected with a negative terminal 88 of a cut-out switch 89 and a spring switch blade 90 connected with a negative terminal 91 of the cut-out switch 89. The spring switch blades are operable through a suitable cam 92 by the handle 84 to control the flow of current to the torque motor 43 through the limit switch 93 (Fig. 4) operated by the flange 95 on the transmission housing, and to the reversing motor 49 controlled by contactors 96 and 97 of standard construction. The circuits are completed by suitable conductors connected with the terminal 98 of the cut-out switch 89.

When the carriage 47 is traveling toward the left (Fig. 4), the switch blade 86 is in contact with the terminal 86', and the switch blade 90 is in contact with the terminal 90', but flow of current through the torque motor 43 during the greater part of the travel of the carriage toward the left is prevented by the open limit switch 93, the latter being automatically opened upon the disengagement thereof by the flange 95. The switch 87 is in contact with the terminal 87', which permits the flow of current through the contactor mechanisms to cause the contactor 97 to pass current to the motor 49 in a direction causing the continued movement of the carriage to the left.

When the pin 80 on the transmission casing engages the stop 78 to shift the rod 76 and throw the handle 84 of the master switch, the blades 86 and 90 (Fig. 6) are disengaged from the contacts 86' and 90', and the switch blade 87 is disengaged from the terminal 87' and engaged with the terminal 87''. In this position of the switch, no current can flow through the torque motor even when the limit switch 93 is closed by the flange 95, but current is supplied to the motor 49 through the contactor 96 to continue the rotation of the motor 49 in a direction causing the movement of the carriage 47 to the right. As the carriage 47 approaches the right hand limit of movement, (Fig. 4) the flange 95 engages an arm of the limit switch 93 and closes the contacts thereof a short time before the master switch 85 is thrown by the engagement of the finger 80 with the right hand stop 79. As soon as the master switch is thrown by the engagement of the finger 80 with the stop 79, the contacts 86 and 90 engage the contacts 86' and 90', and as the limit switch 93 is at this time closed by the flange 95, current is supplied to the torque motor 43 to cause one revolution thereof and advance the registering mechanism and work table one step through the mechanism previously described. Simultaneously with the operation of the torque

motor, the blade 87 is disengaged from the contact 87'' and reengaged with the contact 87' to reverse the motor 49 and again start it rotating in a direction which will move the carriage 47 toward the left.

The beams of the carriage 47 have mounted thereon a plurality of saw units each (Fig. 5) comprising a bracket or head 99 which is adjustable along the beams by a micrometer adjustment 100 (Fig. 1) and may be clamped in desired position by bolts 101 passing through slightly elongated slots in the flanges 99' of the brackets or heads 99. Each bracket has mounted thereon a slide 102 movable in guides in the heads 99 and vertically adjustable by means of a screw 103 journalled in the bracket and threaded in the slide. The screw is provided with a hand wheel 104 and with a graduated dial 105 coacting with a suitable indicator on the head to indicate the elevation of the slide. When the slide has been adjusted to a desired elevation it is clamped in place by bolts 106 passing through elongated slots in the slide and threaded into the head. The slide carries a motor 107 (Fig. 1), and a pulley 108 on the motor shaft is connected by a belt 109 with a pulley 110 fixed to the spindle 111 journalled in antifriction bearings 112 depending from the slide.

Each spindle 111 has fixed thereto a saw or other suitable cutter 113 clamped in position between suitable disks 114. The saw motors are preferably connected in parallel in a circuit containing a main switch (not shown) and individual switches for the respective motors so that they may be concurrently or individually controlled.

From the foregoing description it will be understood that in kerfing a printing block such as is illustrated by way of example in Fig. 14, the block is secured to a holder which is firmly attached to the table 14. The table is then rotated on its axis to position the block at a desired angle to the planes of the cutters or saws 113, which are preferably of relatively small diameter. When the reversible table 14 has been so positioned the nuts 16a on the bolts 16 are drawn up so as to clamp the lips 18 of the jaws 15 against the flange 19 of the reciprocating carriage 4 so as to lock the table 14 against rotary movement.

The carriage 4 is then moved on its rails 3 to the extreme right hand position (Fig. 1) by rotating the worm or lead screw 21 by attaching a suitable handle to the squared end of the lead screw. Should there be any variation in the distances of the saws 113 from one another, the brackets 99 are adjusted by means of the micrometer adjustments 100 so that when the kerfing is completed the last kerf of one saw will register with the first kerf of the next saw or be spaced therefrom a distance exactly equal or proportionate to the spacing between the kerfs made by any one saw.

The depth of the cut to be made by the saws is regulated by adjusting the slides 102 vertically by means of the hand wheels 104 and then clamping the slides in position.

When current is turned on the motor 49 acts through the mechanism described to translate the carriage 47 (Fig. 4) while the saws 113 are cutting parallel kerfs across the block. When the carriage 47 has moved the desired distance, which has been predetermined by the positioning of the stops 78 and 79, the master switch 85 is thrown as previously described and the movement of the carriage 47 is reversed to carry the saws back through the kerfs which they have just cut and clear any detritus therefrom.

When the carriage 47 again arrives at its starting position and before it begins a second movement, the torque motor 43 revolves and acts through the mechanism described to cause the pawl 30 to advance the ratchet 29 one notch, thereby rotating the shaft 21 a desired distance to move the carriage forward one step as a result of the engagement of the shaft thread with the nut 24 on the carriage. A series of ratchets 28 may be provided having different numbers of teeth. By the use of a ratchet having a desired number of teeth, any desired movement of the carriage 4 may be effected. The same set of ratchets may be used to give different spacings by sleeving them on the hub 26' to give metric measurements, or by adjusting the throw of the cranks to give fractional parts of the measurement for which the ratchet is designed.

The reciprocation of the carriage 47 and the step by step movement of the carriage 4 is continued until the whole or any desired portion of the block has been kerfed, and, due to the construction and operation specified, the kerfs are equally spaced throughout the block.

When a series of parallel kerfs have been completed, the table 14 may be shifted on its axis so as to permit the cutting of a second series of kerfs at any desired angle to the series of kerfs first cut without removing the block from the table.

My improved apparatus while of general utility is particularly adapted for kerfing printing blocks on which a series of duplicate designs are formed in relief before kerfing and the character of the cutting tool may be varied with the variations in the character or composition of the block to be cut.

Having described my invention, I claim:

1. In apparatus of the character described, a work table, means for moving said work table step by step and comprising a pawl and ratchet mechanism, a fulcrumed lever connected with said pawl and ratchet mechanism, a crank adjustably connected with said lever, and a motor for operating said crank, the motor being affected by means moving its movable element oppositely to the movement of the element by its controlled motor-actuating force.

2. In apparatus of the character described, a work table, means for moving said work table step by step and comprising a screw, pawl and ratchet mechanism connected with said screw, a fulcrumed lever connected with said pawl and ratchet mechanism, a motor to rock said pawl and ratchet mechanism in one direction and means for actuating the motor and rocking said pawl and ratchet mechanism in a reverse direction and resetting said torque motor in a position for actuation.

3. In apparatus of the character described, a work holder, a saw carriage reciprocable across the top of said work holder, a plurality of uniformly spaced cutters supported by said saw carriage, means for reciprocating said saw carriage, and means for automatically advancing said work holder when said cutters are disengaged from work on said work holder to a position to effect a new series of cuts spaced from the cuts of a previously cut series by the distance of the work-carriage step.

4. In apparatus of the character described, a work carriage, means for moving said carriage step by step, a work table rotatable on said car-

riage, a saw carriage reciprocable transversely to the direction of movement of said work carriage, a plurality of uniformly spaced cutters carried by said saw carriage, means for adjusting the elevation of said cutters on said saw carriage, motor mechanism for reciprocating said saw carriage, separate motor mechanism for moving said work carriage step by step, switching mechanism operable by said saw carriage at each limit of its movement for controlling both of said motor mechanisms and switching mechanism operable by said saw carriage at only one limit of its movement for further controlling said second named motor mechanism.

5. A kerfing machine comprising a base, a turnable work support reciprocably diametrally movable on said base, a cutter support reciprocably movable on said base across and at right angles to the path of reciprocable movement of said work support, a series of rotatable cutters on said cutter support for equal relative spacing and adjustable toward and away from said work support, means for actuating said cutter support, and means automatically responsive to actuation of said cutter support for actuating said work support to another cutting position whereby said cutters cut a new series of kerfs in which an end kerf is spaced from an end kerf of a previous series equal to a space between adjacent kerfs of a series.

6. In apparatus of the character described, a carriage, a plurality of spaced rotary cutters, means for reciprocating said cutters relatively to, and across the top of, said carriage, and means for advancing said carriage by steps equal to a division of the space between the cutters, and between the reciprocations, of said cutters.

7. In apparatus of the character described, a work carriage, means for effecting step-by-step movement of said work carriage and comprising a screw, a saw carriage reciprocable across the top of, and transversely to the direction of movement of, said work carriage, a plurality of spaced saws, and means controlled by the reciprocation of said carriage for giving a step-by-step movement to said screw for moving the work carriage a distance constituting a divisor of the spacing between said saws.

8. The combination with a work carriage and means for moving the carriage step-by-step including a screw, a gear fixed to the screw, a second gear meshing with said first gear, a reversely movable drive element, and means including a pawl-and-ratchet device selectively connectible between either of said gears and said drive element.

9. A cutting machine comprising work and cutter supports, a plurality of equally-spaced cutters on the cutter support, means for effecting relative cutting movement between said supports, and means for actuating said work support and controlling it to move a distance equal to a division of the space between successive cutters directly to a new position for effecting a subsequent series of cuts parallel to the cuts of said first cutting movement.

10. A cutting machine comprising work and cutter supports, a plurality of cutters on the cutter support, means for effecting relative cutting movement between said supports, and means controlled to directly move the supports relatively by a distance equal to a division of the space between successive cutters to a new position for effecting subsequent cuts.

11. In combination, a movable work carriage, a cutter carriage reciprocably movable across the path thereof, spaced cutters on the cutter carriage, means for moving the work carriage and successively moving the cutters relative to cuts previously made by a distance equal to a division of the space between the cutters, said means comprising a screw, a ratchet mechanism connected to the screw and a motor including means biasing its movable element oppositely to movement effected by its actuating force, and means operable by the reciprocations of the cutter carriage controlling said actuating force.

12. In combination, a movable work carriage, a cutter carriage reciprocably movable across the path thereof, spaced cutters on the cutter carriage, means for moving the work carriage and effecting a new position of one of the cutters relative to the work offset from a cut previously made by a distance equal to a division of the space between the cutters, said means comprising an electric motor, a switch controlling a circuit of the motor, means comprising an electric motor for reciprocating the cutter carriage, a switching mechanism operable by the reciprocations of the carriage for controlling the circuits of said motors, and a switch controlling the circuit of said first motor during a portion only of movement of the cutter carriage.

13. A cutting machine comprising work and cutter supports, cutting means on said cutter support capable of effecting spaced cuts, and means responsive to relative movement of the supports for effecting relative movement between the supports by a distance equal to a division of the space between said spaced cuts.

14. A cutting machine comprising work and cutter supports, cutting means on said cutter support capable of effecting cuts spaced a given distance apart, and means responsive to relative movement of the supports for effecting relative movement between the supports by a given distance, one of said distances being equal to a division of the other.

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