March 17, 1953 C. C. BAKER 2,631,669

MATRIX TRIMMER

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Fig 5

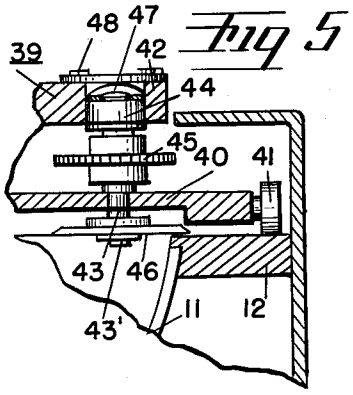


Fig 4

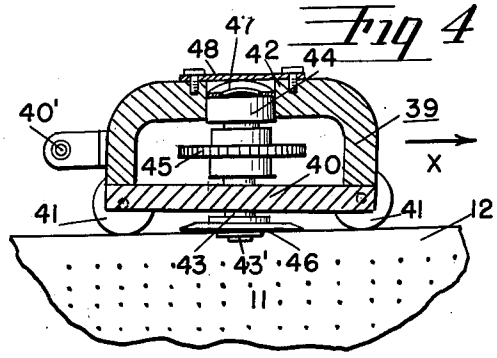


Fig 8

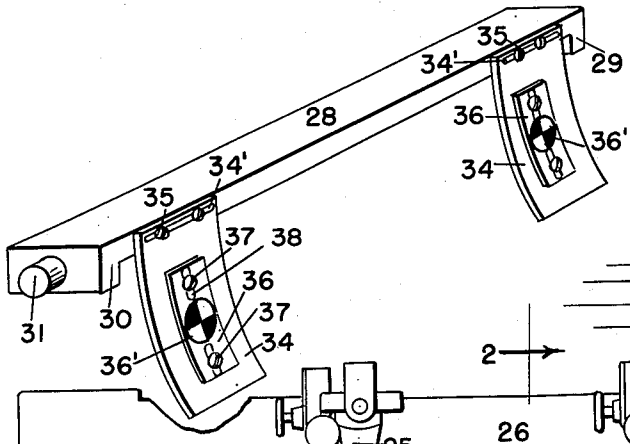
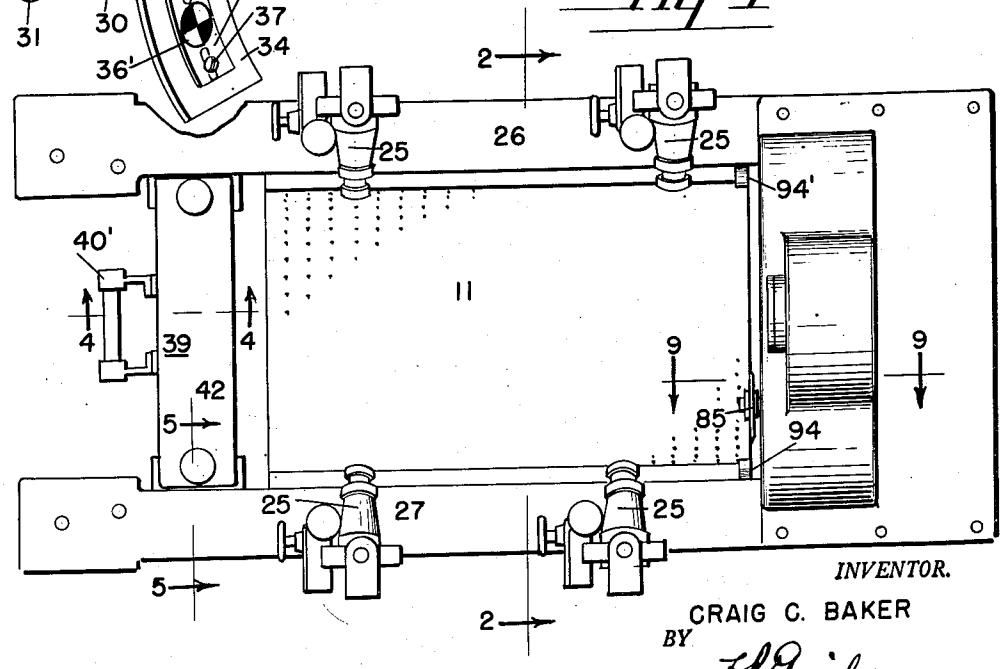


Fig 1



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March 17, 1953 C. C. BAKER 2,631,669

MATRIX TRIMMER

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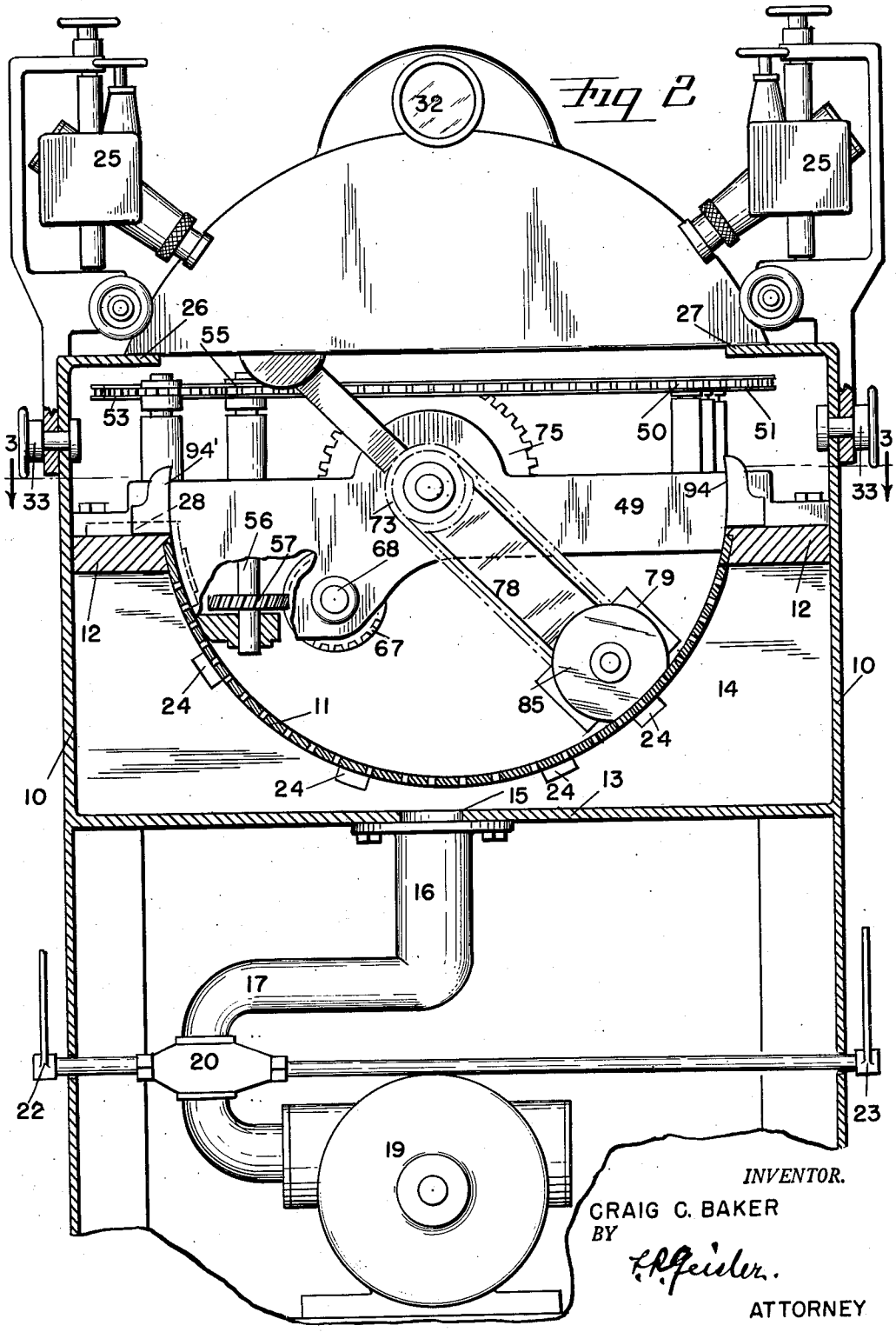
Fig 2



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MATRIX TRIMMER

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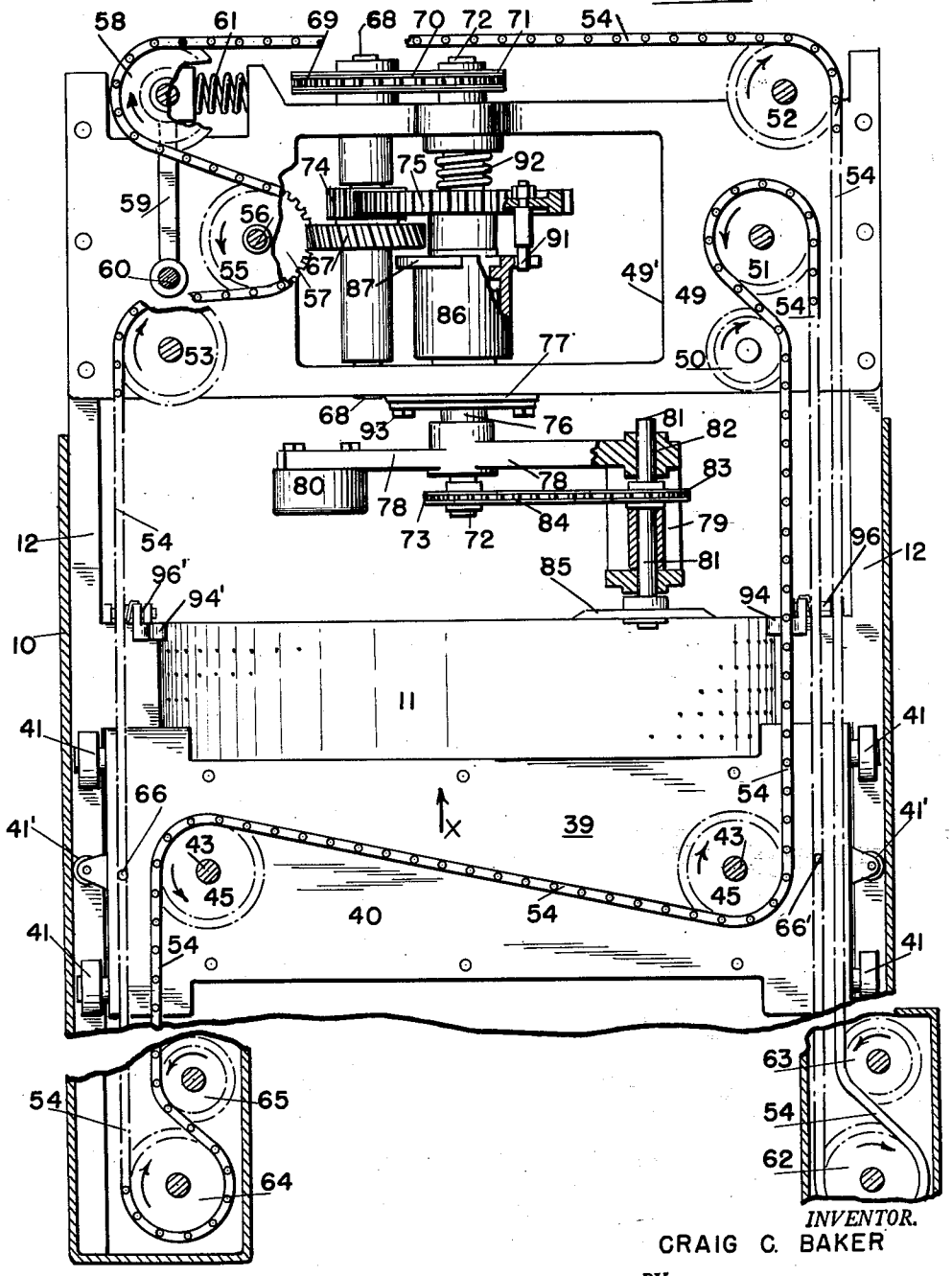
Fig 3



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MATRIX TRIMMER

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Fig. 6

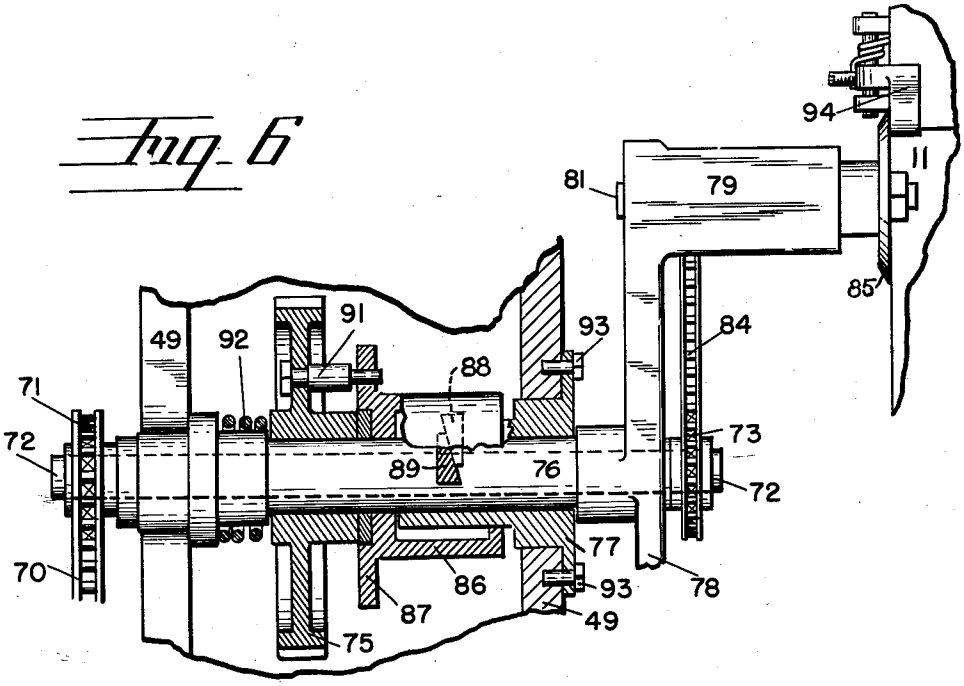
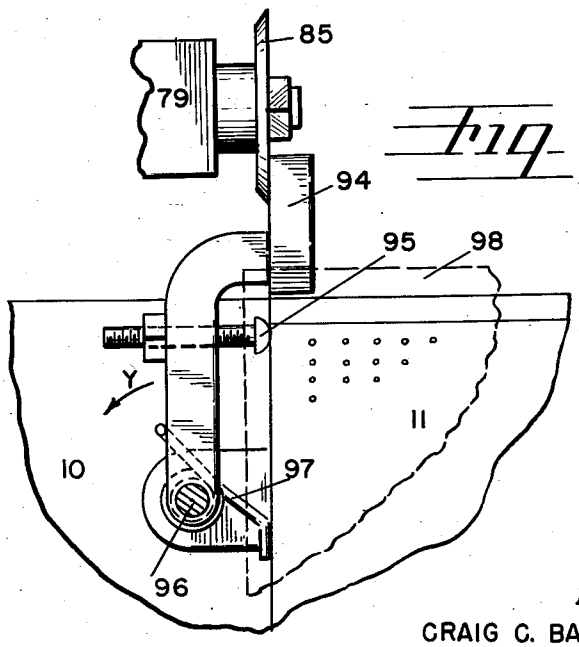


Fig. 9



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MATRIX TRIMMER

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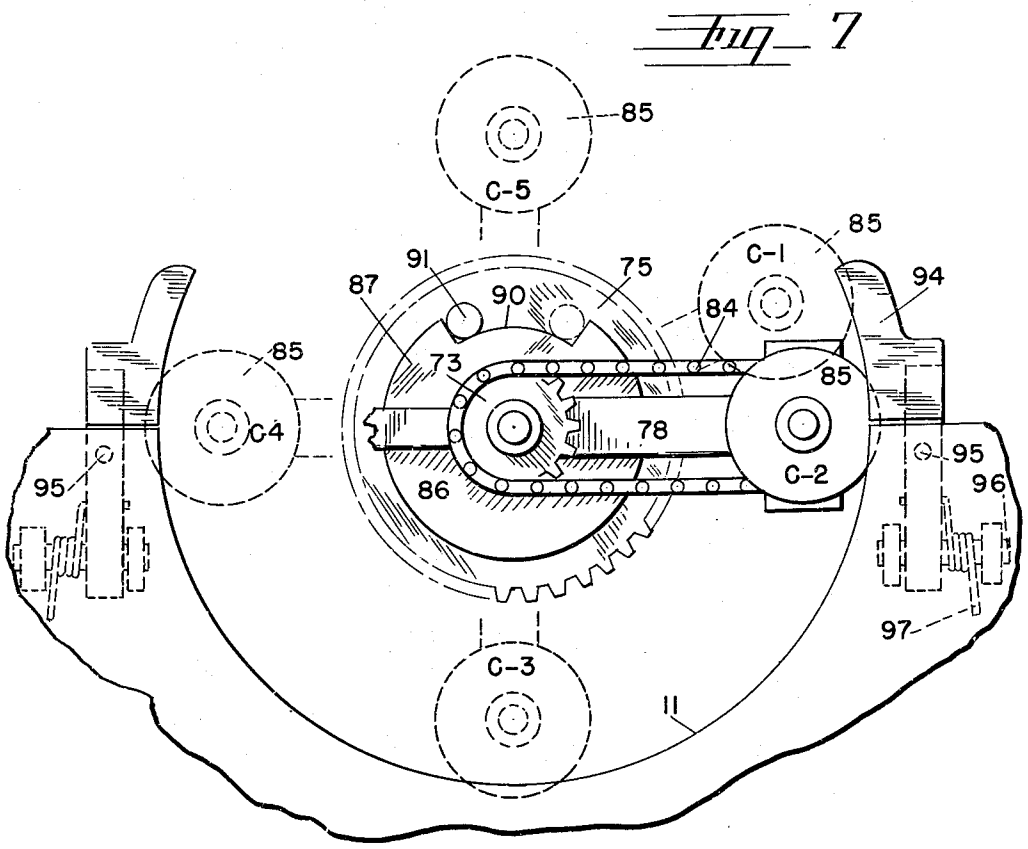
Fig. 7



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Patented Mar. 17, 1953 2,631,669

UNITED STATES PATENT OFFICE

2,631,669

MATRIX TRIMMER

Craig C. Baker, Whittier, Calif.

Application February 3, 1951, Serial No. 209,285

14 Claims. (Cl. 164—73)

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This invention relates in general to the trimming of the edges of matrices to be used in the casting of stereotype plates for cylindrical newspaper presses and the like and more particularly, relates to matrix trimming in cases where one or more color plate matrices are required to correspond to the master matrix just as stereotype plates are required to correspond to the master plate. When such color plates are used it is absolutely necessary that these plates very accurately coincide with each other and with the master plate for, as will be readily appreciated, if one of the plates should be out of registration by the smallest fraction of an inch, the complete printed sheet will show a marred or blurred effect. In order that the corresponding stereotype plates may be so cast as to be set in absolutely accurate corresponding position on the cylindrical press it is necessary that the matrices from which they are cast have their edges trimmed exactly to correspond to each other so that the edges of the plates will then exactly correspond similarly.

An object of this invention is to provide an improved matrix trimmer in which the edges of a matrix can be trimmed accurately and easily according to predetermined marginal spacing.

Another object of this invention is to provide an improved matrix trimmer in which three edges of the matrix, namely the three edges which will correspond to the top and bottom and ring gauge lateral sides of the printed page, can be trimmed simultaneously as desired.

Another object of this invention is to provide an improved matrix trimmer in which a matrix can be trimmed to fit closely into the casting box so that there will be no possibility of the matrix moving in the casting box during the casting operation, or of the matrix becoming twisted or "cocked" as sometimes occurs when matrices are trimmed by conventional methods.

While various means have previously been employed for trimming an edge, or edges, of a stereotype matrix while the matrix is being held flat, nevertheless when the trimming is performed in this manner the results are not sufficiently accurate for matrices for color plates for cylindrical presses due to the fact that the subsequent curving and drying of a trimmed matrix will result in some slight change in its final size. Accordingly a further important object of the present invention is to provide a matrix trimmer in which the matrix will be trimmed while held in the same curved and final position as it is when the stereotype plate is cast, and in which

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all the trimming of the matrix can be performed in a single operation.

A still further object of this invention is to provide a matrix trimmer which can be set for trimming a plurality of corresponding matrices successively, so that the resulting trimming of the matrices can be made to correspond very accurately.

Another object of this invention is to provide an accurate means to detect any inaccuracies in the register of the mats caused by unequal shrinkage, or by mis-register in the forms from which the mats are molded.

An additional object is to provide a separate guide which can be used in connection with this matrix trimmer, when desired, to facilitate the setting of the trimmer for predetermined positioning of the matrix to be trimmed.

The above indicated objects and other advantages I attain by providing a matrix trimmer with means for holding the matrix in the same curved position during the trimming operation as the matrix will be caused to occupy during the subsequent casting of the stereotype plate; by providing a movable carriage on the trimmer with cutting means arranged to trim two lateral edges as the carriage moves over the matrix; by providing additional cutting means for trimming a third edge of the matrix simultaneously; by providing special aligning and positioning guides and means for the matrix; and, in general, by constructing and arranging the various parts of my trimmer in the manner hereinafter described with reference to the accompanying drawings.

In the drawings:

Fig. 1 is a top plan view of the entire matrix trimmer;

Fig. 2 is a vertical section, drawn to a larger scale, taken on line 2—2 of Fig. 1;

Fig. 3 is a foreshortened plan section of the entire matrix trimmer taken on a horizontal plane below the top deck of the trimmer and thus on a plane indicated by the line 3—3 of Fig. 2, with some portions broken away for clarity;

Fig. 4 is an enlarged fragmentary section on line 4—4 of Fig. 1;

Fig. 5 is an enlarged fragmentary section on line 5—5 of Fig. 1;

Fig. 6 is an enlarged fragmentary section corresponding in part to Fig. 3;

Fig. 7 is a fragmentary diagrammatic elevation taken from the right of Fig. 6 and illustrating the operation of the end cutter in Fig. 6;

Fig. 8 is a perspective view of a special guide setting bar adapted for use with my trimmer; and

Fig. 9 is a fragmentary vertical section taken on line 9—9 of Fig. 1, but drawn to a larger scale, illustrating the operation of the movable supports.

My matrix trimmer comprises an outside housing or cabinet indicated in general by the reference character 10 (Figs. 2 and 3). A curved or semi-cylindrical, perforated matrix-supporting stationary plate 11 (shown most clearly in Fig. 1) is mounted within the upper portion of the housing, the upper side edges of the perforated plate 11 being secured to horizontally-extending horizontal rib bars 12 (Fig. 2) mounted inside the housing 10.

A horizontal partition 13 (Fig. 2) forms the bottom of an upper vacuum chamber extending below the perforated plate 11, and a pair of transversely-extending vertical plates 14, one of which is shown in Fig. 2, connect the respective ends of the perforated plate 11 with the bottom partition 13 and with the side walls of the housing and thus complete the inclosure for the vacuum chamber. An opening 15 in the partition or chamber bottom 13 is connected to an air exhaust pipe 16 leading to an air exhaust device indicated in general by the reference character 19 in Fig. 2, and which device includes a motor-driven air exhaust fan. The pipe 16 is equipped with a shut off valve 20 operated by the control levers 22 and 23 extending from opposite sides of the housing 10, so that manual operation of either lever, when the air exhaust device is turned on, will cause air to be drawn from the vacuum chamber below the perforated plate 11.

When a matrix is to be trimmed it is set in place on the perforated plate 11 and valve 20 is then opened so that the exhaust of air in the chamber below the perforated plate 11 will create vacuum suction whereby to hold the matrix firmly in place during the trimming operation. Preferably electric heating elements 24 (Fig. 2) are mounted on the under side of the perforated plate 11 so that the matrix can be kept heated during the trimming operation. A vacuum indicator 32 is connected with the chamber in order that the operator will know that sufficient vacuum suction is being maintained to hold the matrix securely in place while the trimming is being done, and thus avoid any possibility of inadvertent moving of the matrix out of place during the trimming operation.

The housing 10 is provided with a pair of top side deck plates 26 and 27 (Figs. 1 and 2). A plurality of focusing light assemblies or projectors, as indicated in general by the reference character 25 (Figs. 1 and 2), are adjustably mounted above the decks 26 and 27 in any suitable manner, there being two such focusing light assemblies on each side in the particular form of my trimmer illustrated in the drawings. The purpose of each of these projectors is to project cross hairs in a small field of focused light whereby the projected cross hairs indicate an exact predetermined point at the opposite side on the matrix, and when such points have been established and the lights set, the subsequent matrices can in turn be set in exactly the same position on the perforated plate 11 by bringing the corresponding points for each matrix exactly into registration with the fixed projected cross hairs of the corresponding projectors. These projectors are mounted on the trimmer housing so that their positions can be adjusted longitudinally along the housing to a slight extent by means of mounting screws 33 (Fig. 2) extending through horizontal slots in the housing walls, and other customary adjustments are provided for each projector enabling the same to be moved on a horizontal axis and on a vertical axis for the proper positioning of the cross hairs. Such adjustments in themselves are well known and need not be here described.

A carriage indicated in general by the reference character 39 (Figs. 1, 3, 4 and 5), extending transversely across the top portion of the housing 10 and thus above the perforated plate 11, and movable in a direction parallel to the top side edges of the perforated plate, includes a main bottom plate 40, supported at each end on a pair of wheels 41, which ride on the side horizontal rib bars 12. A U-shaped cover plate 42 is mounted on the top of the bottom carriage plate 40 and a handle 40' is secured to the front wall of the cover plate 42. Horizontal guide wheels 41' (Fig. 3) are mounted respectively at the ends of the main bottom plate 40 and are adapted to bear against the adjacent side walls of the housing.

A pair of stub shafts 43 (Figs. 3, 4 and 5) extend downwardly through bearings near each end of the bottom carriage main plate 40. The upper ends of these stub shafts are mounted in suitable bearings 44 (Figs. 4 and 5) provided in the cover plate 42. A sprocket wheel 45 is keyed on each of the stub shafts 43 between the bottom main plate 40 and the cover plage 42 in the carriage. A rotary cutter disc 46 is keyed on the bottom end of each stub shaft 43 below the bottom of the carriage and is held in place by a suitable nut 43' threaded on the end of the stub shaft. As shown in Fig. 5, these stub shafts 43 are so located in the carriage 39 and with respect to the side rib bars 12 that the rotary cutter discs 46 will extend a slight distance over the inner top edge of the side rib bars 12 and thus over the parallel side edges of the curved perforated plate 11 at each side.

When a matrix is placed on the perforated plate 11, and held securely against the plate 11 by vacuum suction, the movement of the carriage 39 from the front to the rear of the trimmer will result in the discs 46 (which are rotated by means later described) trimming the corresponding edges of the matrix. The side rib bars 12 and the side edges of the perforated plate 11 thus provide cutting bars for the cutter discs 46. Preferably, as shown in Fig. 4, the bottom carriage plate 40 slopes slightly in a forwardly direction (the axles for the forward wheels 41 being set slightly higher in the bottom plate) so that the stub shafts 43 will not be exactly vertical, but will have a very slight inclination from the vertical so that as the carriage 39 is moved from the front to the rear of the trimmer, in the forward direction indicated by the arrow x in Fig. 4, the rotary cutter discs 46 will bear on the rib plates 12 where the cutting or trimming of the matrix takes place. This not only facilitates the cutting but also enables the rotary cutter discs to a certain extent to be self-sharpening.

In order to hold the rotary cutter discs 46 against the top faces of the respective rib bars 12 as the trimmer is used, I provide a spring 47 above the bearing for the top end of each stub shaft 43 to exert a downward pressure on the stub shaft. The spring 47 is held under compression between the top of the bearing 44 and a circular plate 48 set on the top face of the cover plate 42 of the carriage, the circular plate 48 extending over the bearing for the upper end of the stub shaft 43 and being secured in place by screws.

A sprocket chain, arranged and mounted in a

manner to be explained later, engages the sprocket wheels 45 so that movement of the carriage 39 above the perforated plate 11 will at the same time cause the sprocket wheels, and with them the stub shafts 43 and cutter discs 46, to be rotated in a predetermined direction in order to facilitate the cutting or trimming action performed on the respective edges of the matrix by the beveled knife-like peripheral edges of the cutter discs 46.

In the rear portion of the housing 10 a transversely-extending bracket 49 (Figs. 2 and 3) is supported at each end on the rib bars 12. The bracket 49 is cast in the shape shown in Figs. 2 and 3 so as to provide mountings for certain horizontal and vertical shafts, to be described, and has an open center portion or well 49' (Fig. 3). As shown in Fig. 3, the bracket 49 is spaced at a distance back from the rear edge of the perforated plate 11 and thus is spaced from the rear wall of the vacuum chamber located below the perforated plate 11.

Bearing sleeves are mounted in the bracket 49 for rotatably supporting the vertical shafts for idler pulleys 50, 51, 52 and 53 (Fig. 3) around which idler pulleys a sprocket chain 54 passes. This sprocket chain 54 also passes around a sprocket wheel 55 secured to the upper end of a vertical shaft 56 mounted in suitable bearings within a sleeve which is supported in the bracket 49. A helical gear 57 is keyed to the lower end of the shaft 56. A chain tightening pulley 58 is mounted at the end of an arm 59 which in turn is pivotally supported at the other end on a stub shaft 60 secured in the bracket 49. A coil spring 61, engaging the free end of the arm 59, urges the arm 59, and therewith the pulley 58, into chain-tightening position.

The sprocket chain 54, as shown in Fig. 3, passes around a pair of idler pulleys 62 and 63 at one side of the forward end of the trimmer and around a similar pair of pulleys 64 and 65 at the opposite forward end of the trimmer. The endless chain 54 is secured to bolts or pins 66 and 66' on the carriage 39. This arrangement of chain, sprockets and carriage restrains the carriage and keeps it perpendicular to the side rails during its travel. A portion of the sprocket chain 54 passes around the two sprocket wheels 45 on the carriage 39, which sprocket wheels 45, as previously described, are keyed to the shafts of the rotary cutter discs 46 (Figs. 4 and 5).

From Fig. 3 it will now be apparent that as the carriage 39 is manually moved from the front to the rear of the trimmer, thus in the direction indicated by the arrow x on the carriage, the sprocket chain 54, with the chain ends secured to the carriage at 66 and 66', will be caused to move, and will in turn cause rotation of the pulleys and sprocket wheels around which the chain 54 passes. The resulting direction of movement of the sprocket chain and resulting rotation of the sprocket wheels and pulleys are indicated by the various other arrows in Fig. 3. In other words, as the carriage 39 is moved from the front of the trimmer towards the rear, the rotary cutter discs 46 (Figs. 4 and 5) will be rotated with the sprocket wheels 45 (Fig. 3) in the direction indicated and thus rotated in the proper direction for trimming the edges of the matrix, at the opposite top edges along the perforated plate 11. This is an important feature in my matrix trimmer.

The helical gear 57 (Figs. 2 and 3) rotated by the sprocket wheel 55, meshes with a helical gear 67 which is keyed to a horizontal shaft 68 mounted in suitable bearings in the bracket 49. A sprocket pulley 69 (Fig. 3) keyed to the end of the shaft 68, is connected by an endless sprocket chain 70 to a sprocket pulley 71 keyed on the corresponding end of a parallel shaft 72. Thus rotation of the shaft 68 produces rotation of the shaft 72, the latter being rotated more rapidly due to the relative sizes of the connected sprocket pulleys 69 and 71 as indicated in Fig. 3. A second sprocket pulley 73 is keyed to the opposite or forward end of the shaft 72.

A sleeve 76 (Figs. 3 and 6) extends around the shaft 72, the sleeve 76 being rotatably supported in bearings, one of which is mounted in bracket 49 and the other is mounted in a second sleeve 77 as shown in Fig. 6. Thus the shaft 72 is rotatable within the sleeve 76 and the sleeve 76 is rotatable in the support bearings in the bracket 49 and in the bearing in sleeve 77. Sleeve 76 is constrained to rotate on its axis but the bearings allow a slight axial movement of sleeve 76 and also of shaft 72 which is carried with it. Chain 70 is loose enough to permit a slight misalignment of sprocket 71 and sprocket 69 when this movement occurs. The reason for this axial or longitudinal movement will be explained presently. A cross arm 78 is secured to the outer end of the sleeve 76. A U-shaped bracket 79 is mounted firmly at one end of the cross arm 78 and a counterweight 80 is mounted at the opposite end of the cross arm.

A shaft 81 is mounted in suitable bearings 82 in the cross arm 78 and in the U-shaped bracket 79. A sprocket pulley 83 is keyed to the shaft 81 and is connected by an endless sprocket chain 84 with the sprocket pulley 73. A rotary cutter disc 85 (similar to the cutter discs 46, Figs. 4 and 5, previously described), is also keyed to the outer end of the shaft 81. From the description thus far, and with reference to Fig. 3, it will be apparent that rotation of the shaft 72 results in rotation of the cutter disc 85 through the intermediary of the sprocket pulleys 73 and 83 and their connecting sprocket chain 84.

A large gear 75 is keyed and pinned to sleeve 76 and meshes with pinion gear 74 (Fig. 3) keyed on the shaft 68. Thus rotation of the shaft 68 also produces rotation of the gear 75 which produces rotation of the sleeve 76 and the cross arm 78. Since shaft 72 is driven from shaft 68 by sprocket and chain and sleeve 76 is driven from shaft 68 by a gear set, they rotate in opposite directions, and also shaft 72 is driven faster than shaft 68, and sleeve 76 is driven slower than shaft 68. Therefore shaft 72 turns several revolutions counterclockwise as viewed in Fig. 3, while cross arm 78 turns one revolution clockwise. The slight axial motion of sleeve 76 described above causes gear 75 and pinion gear 74 to move slightly out of alignment. However, this motion is but a small portion of the face width of the gears and therefore they do not come out of mesh. Because of this motion it is essential that gears 75 and 74 be of the straight tooth spur gear type.

A coil spring 92 (Fig. 6) engages gear 75, urges gear 75 and all related parts, namely sleeve 76, cross arm 78, and cutter disc 85, as well as shaft 72 which is constrained to move with sleeve 76 by sprockets 71 and 73, to move toward the perforated plate 11. This spring maintains a pressure between cutter disc 85 and the semi-cylindrical cutting edge at the inner end of the plate 11. Cross arm 78 is bent slightly to bring the

leading edge of cutter disc 85 into contact with the semi-cylindrical cutting edge of plate 11, thus duplicating the cutting and self-sharpening action of cutters 46 (Fig. 4). The combination of sprockets and gears connecting the cutter discs 46 and cutter disc 85 are such that they produce the same relative motion between cutter disc and cutting edge.

A third sleeve 86 (Figs. 3 and 6) is mounted on the outside of sleeve 77. Sleeve 77 is fastened to bracket 49 by means of screws 93. Pairs of engageable cam elements, one such pair being shown at 88 and 89 in Fig. 6, have their members in each pair so mounted on the outside of the inner sleeve 77 and on the inside of the outer sleeve 86 respectively, and so arranged, that the outer sleeve when rotated approximately one half revolution in the clockwise direction, will rise on the cam surface and contact gear 75. Further rotation of sleeve 86 will move sleeve 86, gear 75, sleeve 76, cross arm 78 and cutter disc 85 away from the semi-cylindrical cutting edge 11, compressing spring 92. This movement is just sufficient to move cutter disc 85 out of contact with semi-cylindrical cutting edge 11 just as cutter disc 85 finishes trimming the edge of the matrix. Sleeve 77 is rotatably adjustable by loosening screws 93. Sleeve 77 is adjusted so that cutter disc 85 will move away from the semi-cylindrical cutting edge 11 after finishing its cut but before it runs off the matrix support 94.

The sleeve 86 has an annular flange 87 at its inner end. This flange has a short arcuate groove 90 (Fig. 7) adapted to engage a pin 91 (Figs. 3 and 6) carried by large gear 75. After a short rotation of gear 75 and related parts, pin 91 engages flange 87 and sleeve 86 rotates with gear 75, causing the axial motion described above.

As will be apparent from Figs. 1, 2 and 3, the rotary cutter disc 85 is so arranged as to trim the curved inner end of the matrix, while the matrix is held in position on the perforated plate 11. The manner in which the cutter disc 85 is automatically operated and controlled is an additional special feature of my invention. When a matrix 98 (Fig. 9) is in position to be trimmed, the edges protrude beyond the cutting edges of plate 11 and the inner corner of the matrix, where the trimming of the inner end is to start, is unsupported. This short section of matrix must be supported or the matrix will be torn by the rotating cutter disc 85 as it starts the cut. Also cutter disc 85 must be supported in line with the edge of plate 11 or the spring 92 (Fig. 6) will move the cutter over until it will strike the corner of plate 11 when the cutter starts downward. To support the two inner corners of the matrix 98 two movable supports 94 and 94', one of which is shown in Fig. 9, are located on the two top inner corners of plate 11. These supports are pivoted respectively on shafts 96 and 96' fastened to the housing 10 (Figs. 3 and 4). A coil torsion spring 97 (Fig. 9) maintains each support in position while an adjustable stop 95 allows the support 94 or 94' to be brought into alignment with the semi-cylindrical cutting edge of plate 11.

At the beginning of the trimming operation the matrix to be trimmed is set in desired predetermined position on the perforated plate 11 and is secured firmly thereon by vacuum suction. The cutter disc 85 will be in the position indicated by C1 in Fig. 7, and, as shown in Fig. 9, will be in engagement with the corresponding movable support 94. The pin 91 of the gear 75 (Fig. 7) by which the flange 87 of the outer sleeve 86 is rotated will be in the full line position at the left end of the slot 90. The carriage 39 (Fig. 3) will be at the front end of the trimmer. With the manual moving of the carriage 39 by the operator from the front end of the trimmer toward the rear, producing movement of the chain 54 and connecting sprocket wheels in the manner previously described, the cutter discs 46 will be rotated and caused to pass along the respective top lateral edges of the perforated plate 11, and start to trim the two corresponding lateral edges of the matrix. The cutter disc 85 will simultaneously be rotated (in counter-clockwise direction as viewed in Fig. 2) while its support arm 78 will be moved clockwise, moving the cutter disc 85 down the movable stop 94 until it starts to cut the matrix. As the cutter disc 85 (Fig. 7) progresses it moves off the movable support 94 and onto the edge of plate 11 as indicated by full line position C2. Continued motion of the carriage 39 advances cutter disc 85 to position C3. Near this point, pin 91 of gear 75 engages right end of slot 90 in flange 87. Outer sleeve 86 and gear 75 now rotate together and cam elements 88 and 89 (Fig. 6) are brought toward each other. Cutter disc 85 continues to cut along the semi-cylindrical cutting edge of plate 11 and finally leaves the edge of plate 11 and moves onto the other movable support 94' (Fig. 3) on the left top edge of plate 11 where cutter disc 85 completes its cut through the overhanging edge of the matrix. Outer sleeve 86 has continued to rotate through this cycle of cutting action and at some point after cutter disc 85 has finished its cut, but before it runs off movable support 94, the cam elements 88 and 89 (Fig. 6) come into engagement and compress spring 92 moving cutter disc 85 a sufficient distance toward the rear of the machine to cause the cutter disc 85 to clear the movable support 94'. The carriage 39 (Fig. 3) has completed about two-thirds of its total forward motion when cutter disc 85 reaches point C4 in Fig. 7. As the carriage 39 (Fig. 3) continues its forward motion toward completion of trimming the lateral edges of the matrix, cutter disc 85 continues to move toward the top of its swing toward point C5 (Fig. 7) and because of the engagement of cam elements 88 and 89 (Fig. 6), cutter disc 85 moves further toward the rear. As the carriage 39 (Fig. 3) approaches the end of its travel, the rear edge of the carriage 39 strikes the movable supports 94 and 94' causing them to rotate on their shafts 96 or 96' (Fig. 9) against their springs 97 in the direction of the arrow Y (Fig. 9), swinging the supports 94 and 94' rearwardly and out of the way of the cutters 46 (Figs. 4 and 5) as these cutters are completing the lateral trimming of the matrix. Since cutter disc 85 has moved into the region of position C5 (Fig. 7) the carriage 39 (Fig. 3) can pass beneath cutter disc 85 without interference. Positive stops (not shown) prevent the carriage 39 from traveling further toward the rear of the machine than is necessary to complete the lateral trimming of the matrix.

It becomes obvious that the relation between the motion of the cutter disc 85 and the carriage 39 is critical and must be worked out carefully to prevent moving parts from interfering with each other in their motions.

As the carriage 39 is now started on its return to the front of the machine, movable stops 94 and 94' are returned to their original position

by their springs 97 (Fig. 9) and relocate themselves against their adjustable stops 95. Outer sleeve 86 (Fig. 7) remains in its final position until sufficient rotation of gear 75 moves pin 91 to the left end of slot 90 (as viewed in Fig. 7). During this rotation of cutter disc 85 from a position near C5 to a position near C4, the cutter remains at its maximum rearward position since there is no motion between cam elements 88 and 89 (Fig. 6).

Continued return motion of carriage 39 (Fig. 3) now causes additional rotation of arm and cutter disc 85. Since in moving from a position near C4 (Fig. 7) towards C3, sleeve 86 rotates with gear 75, the cutter starts to move toward the front of the machine due to the relative motion between cam elements 88 and 89 (Fig. 6). Near the position C3 (Fig. 7) there has been sufficient forward motion of cutter disc 85 to allow it to again contact the semi-cylindrical cutting edge of plate 11. The cam elements 88 and 89 (Fig. 6) move further away from each other during further motion, allowing spring 92 to maintain a pressure between cutter disc 85 and semi-cylindrical cutting edge of plate 11.

When the carriage 39 (Fig. 3) is fully returned to its initial position, cutter disc 85 again assumes position C1 (Fig. 7) and pin 91 is in the full line position shown at the left in slot 90. Thus with my improved matrix trimmer, constructed substantially as illustrated and described, the three edges of the matrix are trimmed simultaneously during the short interval required for moving the carriage rearwardly on the trimmer.

At the conclusion of the trimming, the vacuum suction is shut off, the trimmed matrix is removed from the perforated plate 11. The trimming of the matrix is accomplished while the matrix is held exactly in the same curved position as it will be held in the subsequent casting of the stereotype plate thus insuring a higher degree of accuracy in the size of the trimmed matrix, and, if desired, the matrix can be kept heated by the heating elements 24 (Fig. 2) during the positioning and trimming of the matrix.

The setting of the matrix in desired predetermined position on the perforated plate 11 is done with the aid of the projectors 25 (Fig. 1) previously mentioned. When a predetermined marginal spacing is to be maintained at one edge, for example, at the top of the final printed page with a series of matrices, I have found that considerable time can be saved in the setting of the projectors by the employment of an adjustable guide bar on the top edge of the perforated plate 11. Such a guide bar is shown by itself in Fig. 8, and its position on the trimmer for the setting of the projectors is indicated by the broken lines (Fig. 2).

Referring to Fig. 8, the guide bar consists of a main bar-like member 28 adapted to rest on a rib bar 12 (Fig. 2), and having downwardly-extending flanges 29 and 30 at each end adapted to extend over the outer faces of the end walls of the vacuum chamber for the perforated plate 11. Preferably a spring-pressed engagement of element 31 is mounted in the end of the member 28 to insure the guide being held securely in place during the setting operation.

A pair of curved locating plates 34 are secured to the inner edge of the member 28 near each end and extend down over the adjacent portion of the perforated plate 11. These locating plates 34 are each secured to the member 28 by a pair of screws 35 which pass through an elongated slot 34' in the top of each locating plate so as to permit some lateral adjustment of the locating plate to take place. Each locating plate 34 has a cut-out portion over which an adjustable indicator 36 is placed and which is secured to the locating plate 34 by top and bottom screws 37 extending through slots 38 so as to permit some up and down adjustment of the indicator 36 on the plate 34. Each indicator 36 carries a circular marker 36' having the customary horizontal and vertical cross diameter lines so that the center points of the marker can easily be seen, the circular marker 36' being formed of opaque material and set in an aperture in the indicator 36. Any suitable material may be used in alternate quadrants to give contrast, thus enabling the center point of the marker to show up even more clearly. When the guide bar is set in place and properly adjusted, with the circular markers 36' set at the desired distance below the top edge of the plate for the corresponding marginal spacing to be maintained above predetermined points on the matrices, the two opposite projector assemblies are then adjusted so that the cross hairs will be focused exactly on the center points of the circular markers 36', whereupon the projectors are locked in such position and the guide bar is then removed.

A number of minor modifications in the trimmer as described would be possible within the scope of my invention. It is not my intention to limit my invention except to the extent set forth in the claims.

I claim:

1. In a matrix trimmer, a matrix-holding plate having parallel side edges and an inner edge, said plate mounted in said trimmer, means for holding a matrix securely in set position on said plate, a carriage movable over said plate in a direction parallel to said side edges, a cutting element at each end of said carriage adapted to cut along said side edges of said plate respectively as said carriage is moved over said plate in said trimmer, and additional cutting means located beyond the inner edge of said plate in said trimmer, adapted to cut along said inner edge of said plate and actuated by the movement of said carriage, whereby the trimming of the matrix along both side edges and along the inner edge of said plate can take place simultaneously while the matrix is held in position on said plate.

2. In a matrix trimmer, a matrix-holding plate having parallel side edges and an inner edge, said plate mounted in said trimmer, guiding means for setting a matrix in exact trimming position on said plate, means for holding a matrix securely in position on said plate, a carriage movable over said plate in a direction parallel to said side edges, a rotary cutter disc at each end of said carriage adapted to cut along said side edges of said plate respectively as said carriage is moved over said plate, means for rotating said cutter discs, an arm located beyond the inner edge of said plate in said trimmer, said arm mounted to swing in an arc in a plane perpendicular to the side edges of said plate, a cutting element on said arm adapted to cut along said inner edge of said plate, and means for swinging said arm.

3. In a matrix trimmer, a curved, matrix-holding plate having straight parallel side edges,

focusing light assemblies mounted above said side edges and directing focused light to predetermined points at opposite sides on said plate for guiding the setting of a matrix in desired exact position on said plate, means for holding the matrix securely on said plate after the matrix has been properly positioned with the aid of said light assemblies, a carriage movable above said plate and the positioned matrix in a direction parallel to said side edges, a rotary cutter disc at each end of said carriage adapted to cut along said straight side edges of said plate respectively as said carriage is moved over said plate and matrix in said trimmer, and means, actuated by the movement of said carriage, for rotating said cutter discs.

4. In a matrix trimmer of the character described, a curved, perforated, matrix-holding plate having straight parallel side edges, a vacuum chamber connected with said perforated plate for holding a matrix securely in set position on said plate, a carriage movable above said plate in a direction parallel to said side edges, a rotary cutter disc at each end of said carriage adapted to cut along said straight side edges of said plate respectively as said carriage is moved over said plate in said trimmer, and a chain and pulley assembly, operated by the movement of said carriage, for rotating said cutter discs.

5. In a matrix trimmer of the character described, a curved, matrix-holding plate having straight parallel side edges and a curved inner edge, means for holding a matrix securely in set position on said plate, a carriage movable above said plate in a direction parallel to said side edges, a cutting element at each end of said carriage adapted to cut along said straight side edges of said plate respectively as said carriage is moved over said plate in said trimmer, additional cutting means located beyond the inner curved edge of said plate in said trimmer adapted to cut along said inner curved edge of said plate, and means, actuated by the movement of said carriage, for operating said additional cutting means, whereby the trimming of the matrix along both side edges and along the inner edge of said plate can take place simultaneously with the movement of said carriage while the matrix is held in position on said plate.

6. In a matrix trimmer of the character described, a curved, matrix-holding plate having straight parallel side edges and a curved inner edge, means for holding a matrix securely in set position on said plate, a carriage movable above said plate in a direction parallel to said side edges, a rotary cutter disc at each end of said carriage adapted to cut along said straight side edges of said plate respectively as said carriage is moved over said plate, an arm located beyond the inner curved edge of said plate in said trimmer, said arm mounted to swing in an arc in a plane parallel to said inner end of said plate, a cutting element on said arm adapted to cut along said inner curved edge of said plate, and means, actuated by the movement of said carriage, for rotating said cutter discs, and connected means for swinging said arm.

7. In a matrix trimmer of the character described, a curved, perforated, matrix-holding plate having straight parallel side edges and a curved inner edge, a vacuum chamber below said perforated plate for holding a matrix securely in set position on said plate, a carriage movable above said plate in a direction parallel to said side edges, a rotary cutter disc at each end of said carriage adapted to cut along said straight side edges of said plate respectively as said carriage is moved over said plate, spring elements holding said cutter discs in cutting engagement with said side edges of said plate respectively, an arm located beyond the inner curved edge of said plate in said trimmer, said arm mounted to swing in an arc in a plane parallel to said inner end of said plate, a rotary cutter disc on said arm similar to said cutter discs on said carriage and adapted to cut along said inner curved edge of said plate, and a chain and pulley assembly, operated by the movement of said carriage, for rotating said cutter discs and for swinging said arm, whereby the trimming of the matrix along both side edges and along the inner edge of said plate can be caused to take place simultaneously with the movement of said carriage.

8. A matrix trimmer of the character described including a curved, matrix-holding plate having straight parallel side edges and a curved inner edge, said plate mounted in said trimmer, guiding means for setting a matrix in exact trimming position on said plate, means for holding a matrix securely in predetermined position on said plate, a carriage movable over said plate in a direction parallel to said side edges, a cutting element at each end of said carriage adapted to cut along said straight side edges of said plate respectively as said carriage is moved over said plate in said trimmer, an arm located beyond the inner curved edge of said plate in said trimmer, said arm mounted to swing in an arc in a plane parallel to said inner curved edge of said plate, a cutting element on said arm adapted to cut along said inner edge of said plate, means for swinging said arm in synchronism with the movement of said carriage, and means in said arm swinging means for holding said cutting element on said arm in cutting engagement with said inner curved edge of said plate during the trimming of the matrix.

9. A matrix trimmer of the character described including a curved, perforated, matrix-holding plate having parallel side edges and a curved inner edge, said plate mounted in said trimmer, light projectors for setting a matrix in exact trimming position on said plate, a vacuum chamber connected with said perforated plate for holding a matrix securely in predetermined position on said plate, a carriage movable over said plate in a direction parallel to said side edges, a rotary cutter disc at each end of said carriage adapted to cut along said straight side edges of said plate respectively as said carriage is moved over said plate in said trimmer, an arm located beyond the inner curved edge of said plate in said trimmer, said arm mounted to swing in an arc in a plane parallel to said inner curved edge of said plate, a rotary cutter disc on said arm similar to said cutter discs on said carriage and adapted to cut along said inner curved edge of said plate, means, actuated by the movement of said carriage, for rotating said cutter discs, and connected means for swinging said arm.

10. A matrix trimmer of the character described comprising a curved, perforated, matrix-holding plate having parallel side edges and a curved inner edge, said plate mounted in said trimmer, light projectors for setting a matrix in exact trimming position on said plate, a vacuum chamber below said perforated plate for holding a matrix securely in predetermined position on said plate, a carriage movable above said plate in a direction parallel to said side edges, a rotary

cutter disc at each end of said carriage adapted to cut along said straight side edges of said plate respectively as said carriage is moved over said plate in said trimmer, an arm located beyond the inner curved edge of said plate in said trimmer, said arm mounted to swing in an arc in a plane parallel to said inner curved edge of said plate, a rotary cutter disc on said arm similar to said cutter discs on said carriage and adapted to cut along said inner curved edge of said plate, a chain and pulley assembly, operated by the movement of said carriage, for rotating said cutter discs and for swinging said arm, and means for holding said rotary cutter disc on said arm in cutting engagement with said inner curved edge of said plate during the trimming of the matrix.

11. The combination set forth in claim 5 with the addition of a pair of movable supports mounted in said trimmer at the two inner corners of said curved matrix-holding plate for supporting the corresponding corner portions of the matrix on said plate.

12. The combination set forth in claim 5 with the addition of a pair of movable supports mounted in said trimmer at the two inner corners of said curved matrix-holding plate for supporting the corresponding corner portions of the matrix on said plate, and spring elements normally holding said supports in desired position but permitting said supports to be temporarily pushed out of position when contacted by said carriage so as to move said supports out of the way of said cutting elements on said carriage.

13. The combination set forth in claim 6 with the addition of a pair of movable supports mounted in said trimmer at the two inner corners of said curved matrix-holding plate for supporting the corresponding corner portions of the matrix on said plate, means for adjusting the position of said movable supports, and spring elements normally holding said supports in desired position but permitting said supports to be temporarily pushed out of position when contacted by said carriage so as to move said supports out of the way of said rotary cutter discs on said carriage.

14. In a matrix trimmer of the character described including a curved, matrix-holding plate having straight parallel side edges, means for holding a matrix securely in position on said plate, and means for simultaneously trimming the edges of said matrix along said edges of said plate, light projectors adjustably mounted on said trimmer above the side edges of said plate for directing the setting of the matrix in exact desired trimming position on said plate, and a guide bar adapted to be temporarily placed on one of said edges of said plate for facilitating the adjusting of the light projectors above the opposite side of said plate in preparation for the setting of the matrix in position.

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