(No Model.)

2 Sheets—Sheet 1.

J. H. CRAWFORD.

SPACING AND PUNCHING MACHINE.

No. 584,673. Patented June 15, 1897.

Fig. 1.

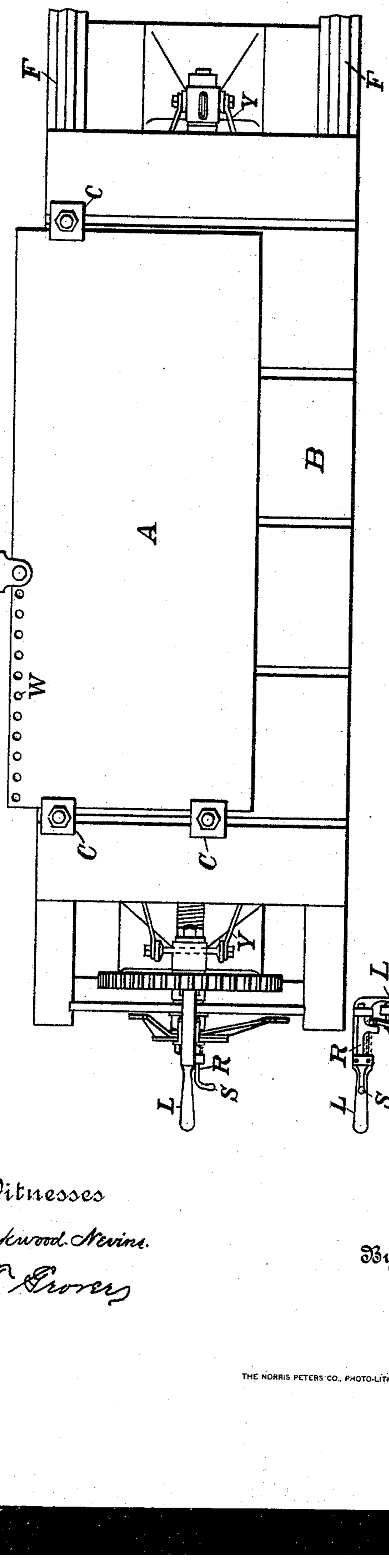
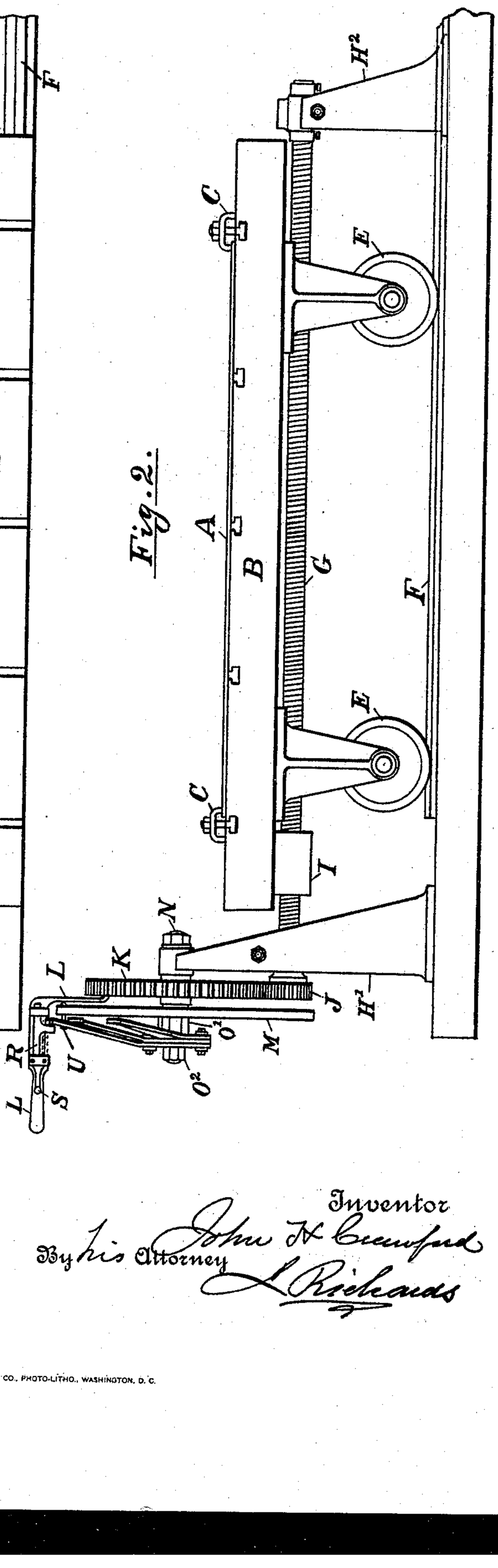


Fig. 2.



Witnesses
K. Cockwood Nevins.
W. F. Grover

Inventor
John H. Crawford
By his Attorney
L. Richards

(No Model.) 2 Sheets—Sheet 2.

J. H. CRAWFORD.

SPACING AND PUNCHING MACHINE.

No. 584,673. Patented June 15, 1897.

Fig. 4.

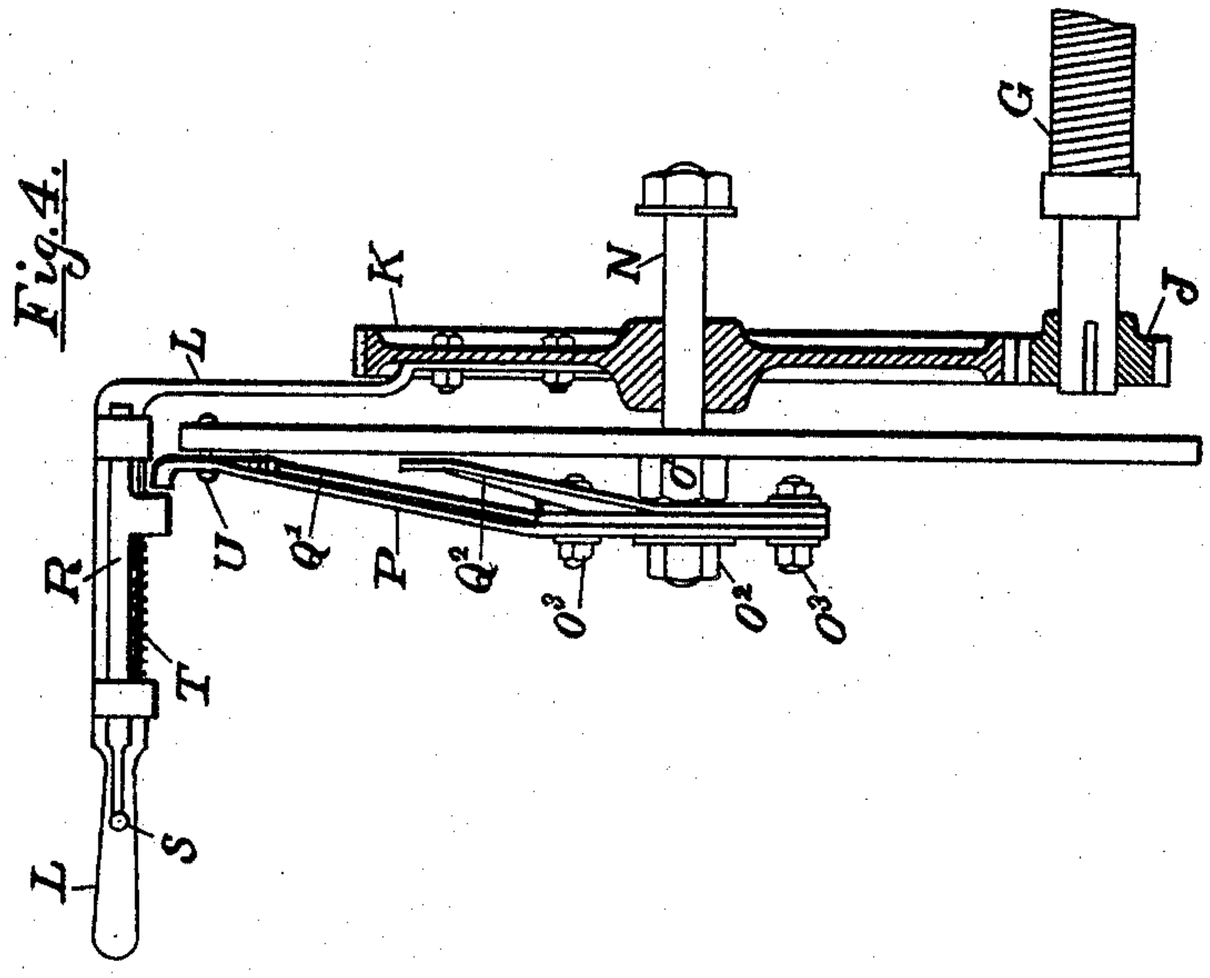
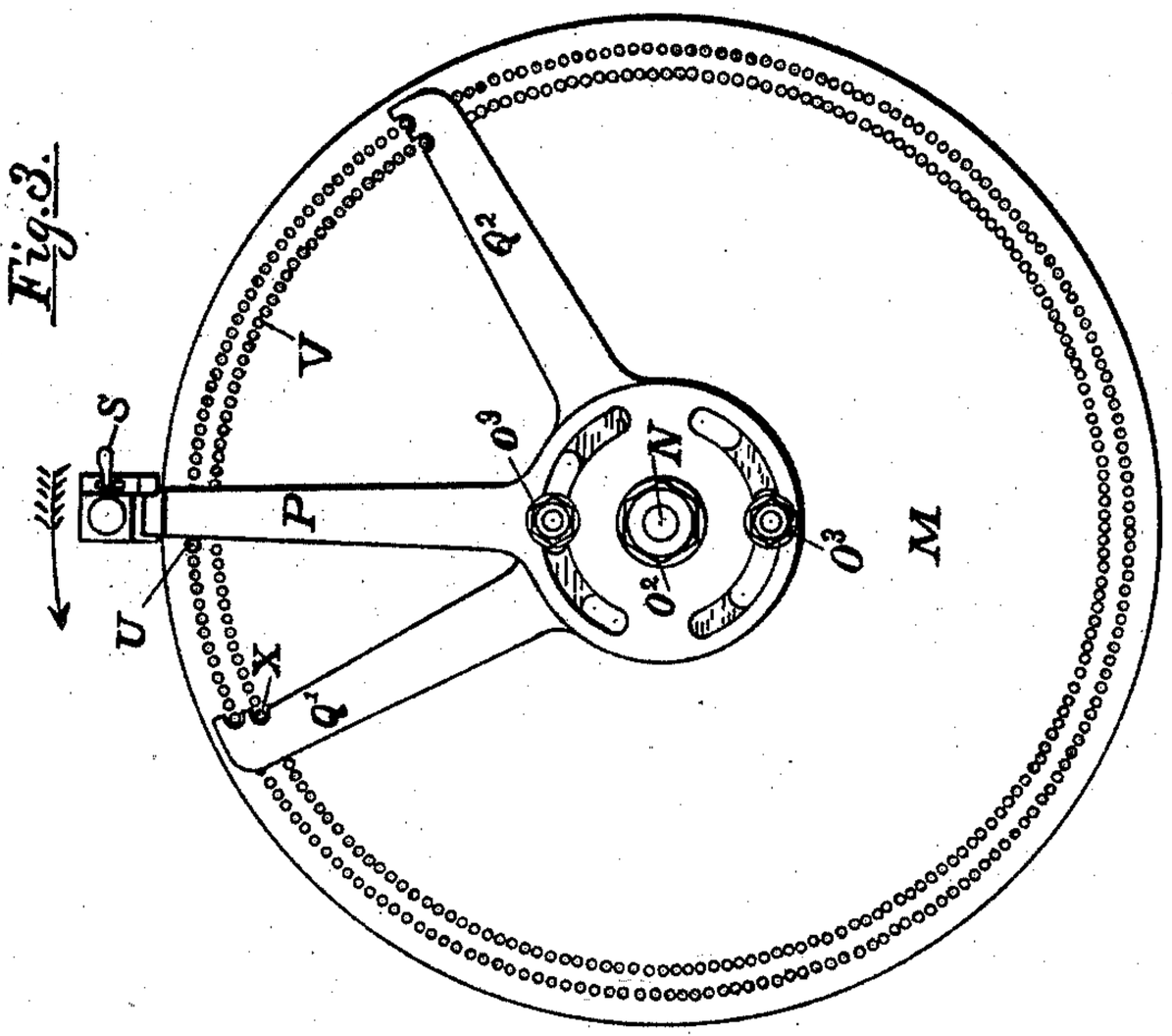


Fig. 3.



Witnesses

K. Lockwood Nevins.

W. P. Grover

Inventor

John H. Crawford

By his Attorney

J. Richards

UNITED STATES PATENT OFFICE.

JOHN H. CRAWFORD, OF SAN FRANCISCO, CALIFORNIA, ASSIGNOR TO WILLIAM H. TAYLOR, OF SAME PLACE.

SPACING AND PUNCHING MACHINE.

SPECIFICATION forming part of Letters Patent No. 584,673, dated June 15, 1897.

Application filed August 12, 1896. Serial No. 602,575. (No model.)

To all whom it may concern:

Be it known that I, JOHN H. CRAWFORD, a citizen of the United States, residing at San Francisco, county of San Francisco, and State of California, have invented certain new and useful Improvements in Spacing and Punching Machines; and I hereby declare the following to be a full, clear, and exact description of the same, reference being had to the accompanying drawings, forming a part of this specification.

My invention relates to machines for spacing and punching rivet-holes in plates, such as are used in making boilers, pipes, or other riveted work of curved or cylindrical form where the plates are lapped and the pitch or space between the rivets is different for the inner and outer plates.

My improvements consist in a machine having a traversing carriage on which the plates to be punched are fastened moved longitudinally by a screw and nut, the revolutions of the screw and movement of the carriage or the pitch of the rivet-holes being determined by a dividing plate or scale provided with the required stops and indices.

My invention also includes a peculiar construction of such machines whereby a main frame is dispensed with and is replaced by a railway on which the plate-holding table or carriage moves and independent standards to support the mechanism that moves and controls the table, which will be particularly pointed out and explained in the description to follow and with the aid of the drawings herewith forming a part of the specification.

Figure 1 is a plan view of a spacing and punching machine, and Fig. 2 a side elevation of the same made according to my invention. Fig. 3 is an enlarged front or flat view of the index or dividing plate and its accessories; and Fig. 4, an edge view, partially in section, of the graduating or spacing elements of the machine.

Referring first to Figs. 1 and 2, A is a plate to be punched mounted on a carriage B and held by the clamps C, so as to be traversed in front of a punching-machine at D.

The word "punching" is herein used generically and includes drilling, which is the well-known equivalent of punching in this art.

The carriage B is supported on truck-wheels E E, that run on the ways F, and is moved by a screw G, journaled in the stands H′ H², as seen in Fig. 2. The screw G passes through a nut I, attached to the bottom of the carriage B, and is provided at its end with a toothed pinion J, into which meshes the tooth-wheel K. The wheel K is turned by a crank L, and its revolutions bear a relation to the pinion J and the pitch of the screw G that produces a definite and predetermined movement of the carriage B for each revolution or partial revolution of this wheel K and the crank L. If, for example, the wheel K has twice as many teeth as the pinion J and the pitch of the screw G is one inch, then one revolution of the crank L produces two inches of movement of the carriage B. It will be understood, however, that these proportions are not essential, except that the revolution of the crank L should, for convenience, bear some definite relation to standard dimensions in inches or other lineal scale and that the pinion J may be changed for longer or shorter pitch the same as the screw-gearing of a lathe.

Referring now to the dividing or spacing mechanism, and especially to Figs. 3 and 4, the dividing-plate M is mounted rigidly on the stud N and held by the nut O′, the stud N being fixed in the top of the standard H′, as seen in Fig. 2.

On the end of the stud N, outside the nut O′ and mounted loosely on the stud N, is the stop-bar P and one or more gages or indicating-arms Q′ Q², two being shown in Fig. 3, one of which is used for forward and the other for backward indications. These three members P Q′ Q² are adjustable in their relative positions and are all clamped together when adjusted by the screw-bolts O³, as seen in Fig. 3. The central arm P acts as a stop for the crank L, which abuts against it by means of a sliding latch R, that can be drawn back and disengaged, as seen in Fig. 4, by means of a handle S, and is shot forward when released by a coil-spring at T.

The arm P is stopped by a pin U, inserted in the holes V in the plate M, its position being moved forward or back for each revolution of the crank L or for each hole punched, unless the desired pitch between the rivet-

holes is produced by one complete revolution of the crank L, in which case the pin U and arm P remain in one position. This, however, seldom occurs, as will presently be explained.

The holes V in the plate M are spaced at equal distances on a circular arc or arcs and, as before said, so that the divisions will bear some definite fractional ratio to the pitch of the traversing screw G in inches. Thus if the said pitch is one inch, as before supposed, one entire revolution of the crank L will produce two inches of movement in the carriage B, and if there are two hundred divisions in the outer circle a movement of the said crank-arm L the distance of one division will move the carriage B one two-hundredth part of the above-named space or one one-hundredth of an inch. In this case the stop-arm P is set by the stop-pin U at a distance of one hole in the outer circle from the starting-point in the direction of the arrow.

If there are two rows of the holes V, as seen in Fig. 3, and each row contains two hundred holes staggered in position, then each hole in the outer row would represent a movement of one one-hundredth of an inch of the carriage B and the plate A, or, using the holes alternately in the outer and inner row, then the graduation of pitch between the rivet-holes W would be .005 of an inch for each hole.

Suppose, for example, that it is desired to punch a plate with a space or pitch of 2.095 inches between the centers of the rivet-holes. This would call for one complete revolution of the crank L, equal to two inches pitch and .095 of an inch additional, attained as follows: If the crank L is standing as seen in Fig. 3, the latch R engaging the bar P for a starting-point, the pin U should be advanced nine and a half holes either way, as the carriage B may be required to move forward or back, counting on the outer row; but as the outer row of holes is not divisible by nine and a half the pin is inserted in the hole of the inner row standing between the ninth and tenth of the outer row, which will represent the .095 of an inch required in addition to the two inches produced by one complete revolution of the crank L.

In setting the machine for a particular pitch of rivet-holes more or less than two inches the screws O^3 are loosened and one of the index-arms Q′ or Q^2 is set to indicate the distance. The pin U has to be moved ahead or back each time, so as to indicate and thus avoid counting the holes and to guard against mistakes. Starting in the position seen in Fig. 3 and moving in the direction of the arrow, the pin U is withdrawn and moved to the hole at X. The latch R is then drawn back by the handle S and disengaged from the arm P and the handle L is turned around one complete revolution until the latch R again engages the arm P. Then this arm is moved forward with the crank L until it stops against the pin U, so the handle will have made 1.0475 revolutions to produce the 2.095 inches movement of the carriage B, as before explained. At the same time the arm or index Q′ or Q^2, being connected with the arm P, has advanced a like distance—that is, over nine and a half holes of the outer circle—and indicates where the pin U must be inserted for the next movement. The setting will next be in the outer circle of holes and then in the inner circle, alternating when the division is 2.095 inches or for any distance requiring division to the two-hundredth part of an inch. The two indices Q′ Q^2 are required to operate each way, so that holes can be spaced and punched when the table B is moving either to or from the stand H′, thus avoiding the loss of time in running the table B back without working after a row of holes is punched in one side or end of the plate.

It will be understood that the reason for employing two or more circles of holes instead of a single one is to provide space without making the holes too near together or the disk-plate M too large in diameter and that further division can be attained by providing additional circles of holes. Two rows of two hundred holes each will, however, answer for the requirements in ordinary practice.

The holes and movable pin U can be substituted by notches or a rack for a tangent-screw on the periphery of the disk-plate M and be a substantial equivalent of the spacing-holes V, but less convenient in use.

It will be understood that the top of table B can be made of any suitable form, size, or strength adapted to the work and can be furnished with any of the known means of clamping suitable for the purpose. In Figs. 2 and 3 I have shown the well-known bolt-grooves supplied with T-headed screw-bolts and nuts and curved clamping-plates C.

Y Y are brace-rods to give rigidity to the standards H′ H^2 and are omitted in Fig. 2.

It will thus be seen that the various elements of the machine are so constructed and arranged that no main frame is required and that the various parts are all light, segregable for transportation, and may be erected at a moderate cost.

Having thus described the nature and objects of my invention, I claim—

1. In a plate punching and spacing apparatus, a table traversing on parallel lines, provided with clamping means for holding the plates, a revoluble screw for traversing the table, a fixed nut on the table engaging with the screw, a fixed crank-shaft, a movable crank-arm mounted on said crank-shaft and connected with the said screw by a train of gears, a fixed disk borne on said crank-shaft, divided into equally-spaced graduations by a series of perforations arranged in one or more circles concentric with the crank-shaft, a stop-pin engaging one of the said perforations, a radial stop-bar, movably mounted

concentrically with the crank-shaft, radial indicating arms or gages Q' Q² adapted to be set adjustably to indicate the position of the stop-pin, and means for clamping the said stop-bar and the said indicating-arms together, substantially as specified.

2. In a plate punching and spacing apparatus, the combination of the traversing table B, provided with clamping means, parallel ways F, parallel screw G, revoluble in fixed bearings, fixed nut I on table B engaging with said screw G, pinion J, gear-wheel K, crank L, fixed perforated disk M, stop-pin U, and spring stop-latch R, all substantially as specified.

3. In a plate punching and spacing apparatus, the combination of the traversing table B provided with clamping means, parallel ways F, parallel screw G, revoluble in fixed bearings, fixed nut I on table B engaging with said screw G, pinion J, gear-wheel K, crank L, fixed perforated disk M, stop-pin U, spring stop-latch R, radial stop-bar P, radial indicating arms or gages Q' Q², and clamping means O³, substantially as specified.

4. In a plate punching and spacing apparatus, the movable plate-supporting table B, the screw G, gear connections, and the crank-handle L for turning the said screw, provided with the slip-latch R, to engage the arm P and move the same over the face of the dividing-disk, all substantially as specified.

5. In a plate punching and spacing apparatus, the combination of the movable plate-holding table B, screw G, crank L, perforated plate or disk M, movable stop-pin V, and radial arm P, substantially as specified.

6. In a plate punching and spacing apparatus, the combination of the traversing table B, leading-screw G, gears J K, crank L, radial arm P, perforated disk M, stop-pin V, and adjustable indices Q' Q², all substantially as and for the purposes specified.

7. In a plate punching and spacing apparatus, the combination of the traversing table B, leading-screw G, crank L, gear connections J K, perforated dividing-disk M, radial arm P, sliding latch R, index-bars Q' Q², and stop-pin V, with the parallel ways F, fixed supports H' H², fixed crank-shaft N, and clamping-bolts O³, all substantially as and for the purpose specified.

In testimony whereof I have hereunto affixed my signature in the presence of two witnesses.

JOHN H. CRAWFORD.

Witnesses:
JAMES L. KING,
W. T. GROVER.