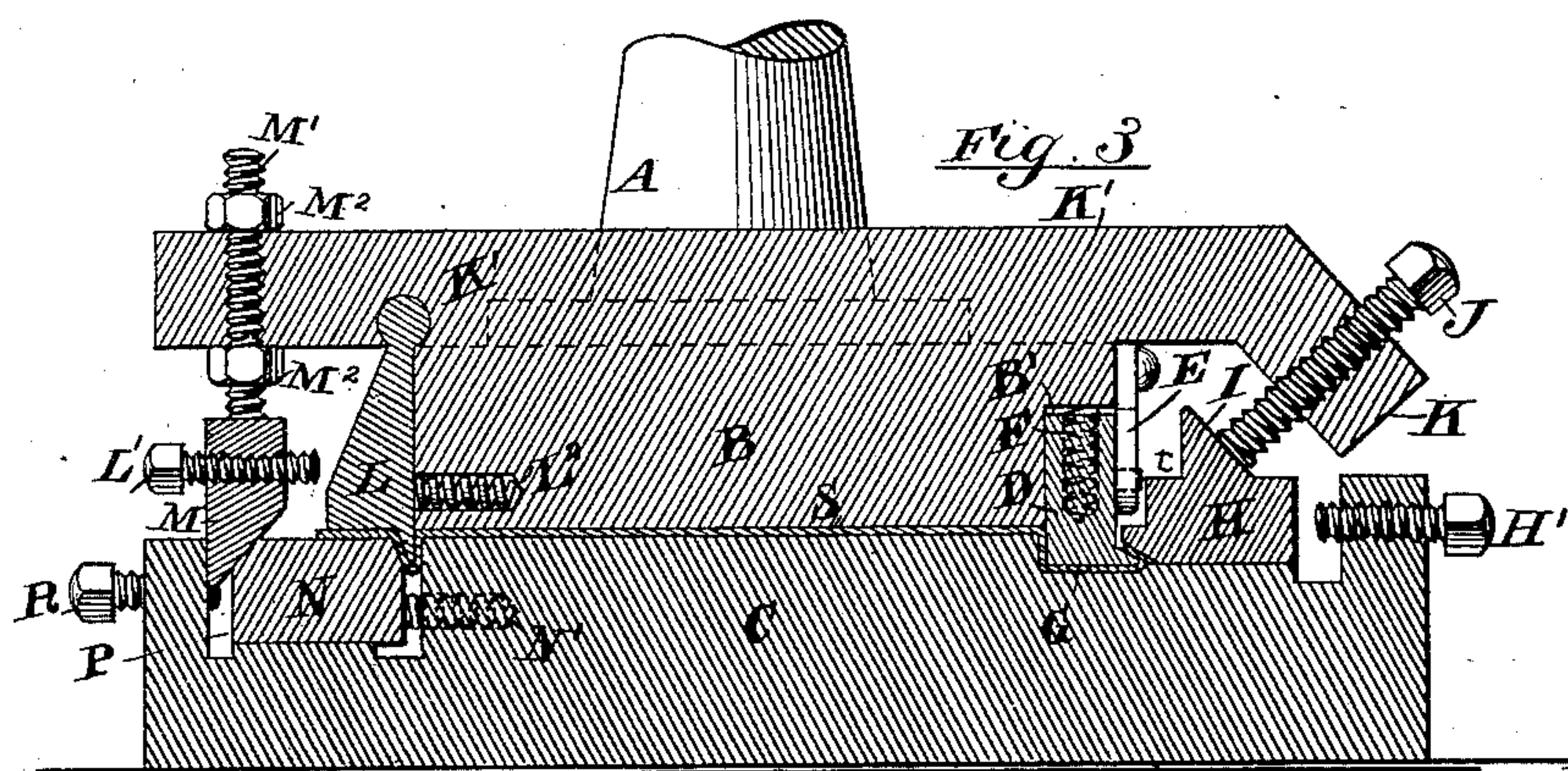
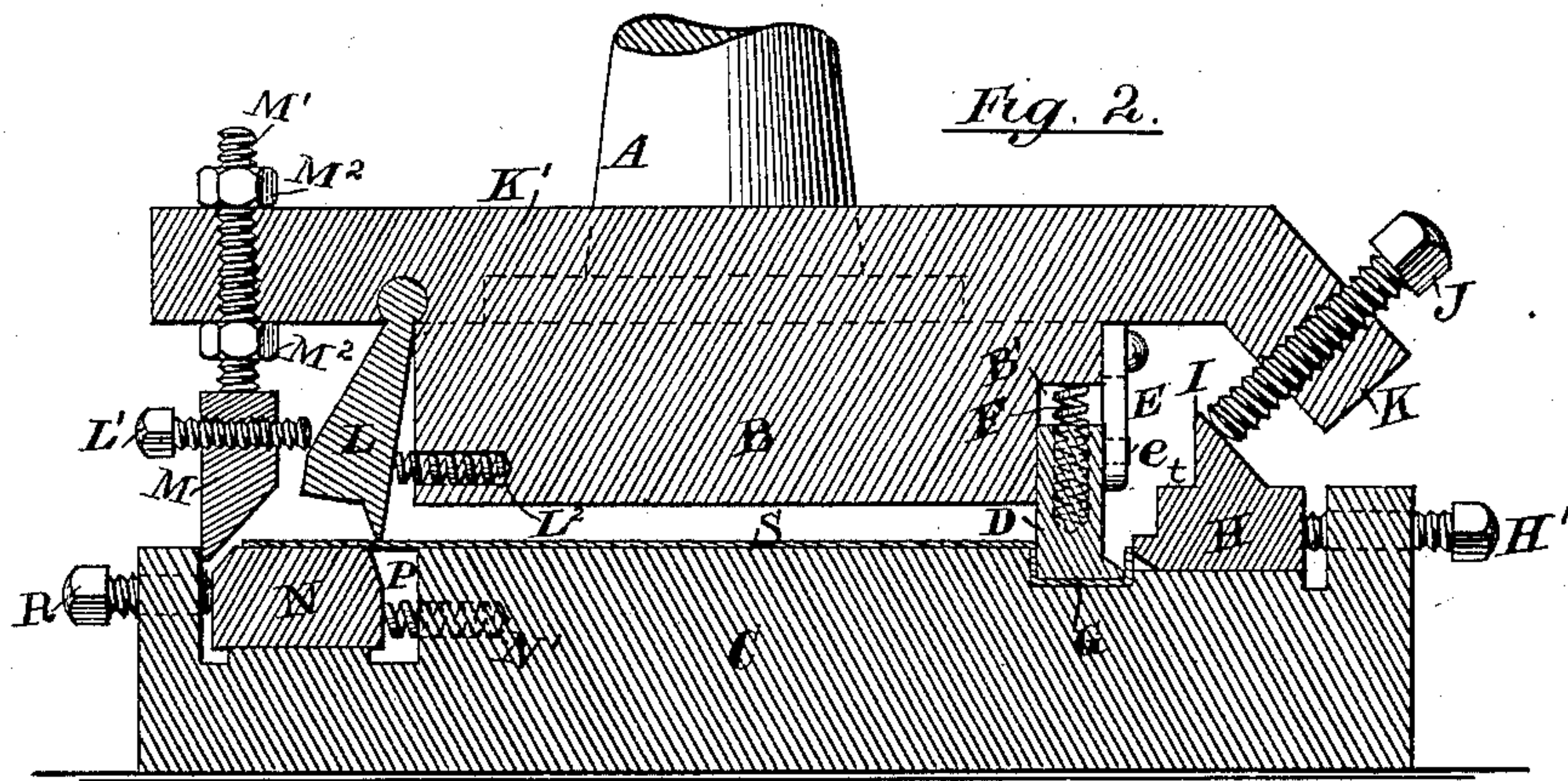
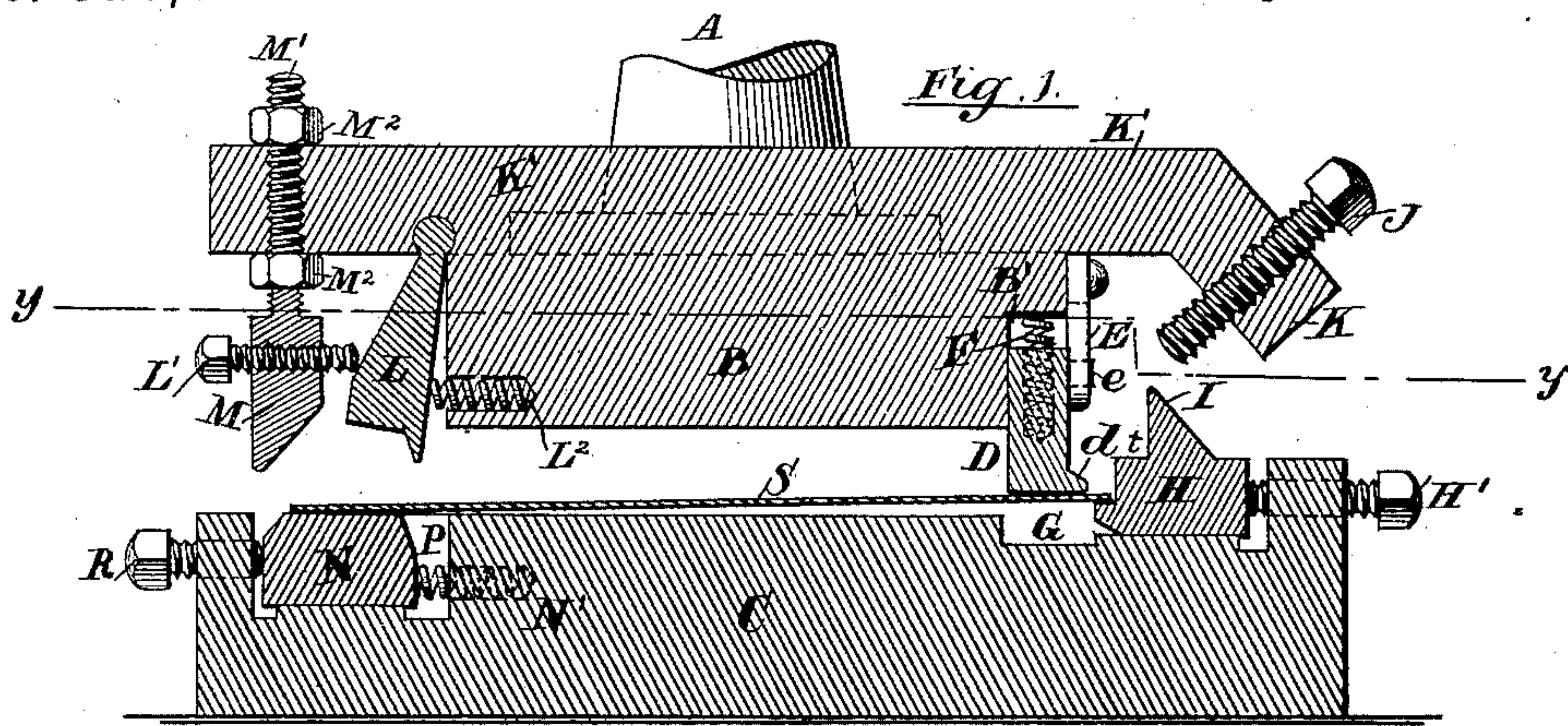


C. B. COOPER.

DIE FOR CORRUGATING SHEET METAL.

No. 318,088.

Patented May 19, 1885.



Witnesses:

George H. Bott
J. W. Spencer

Inventor

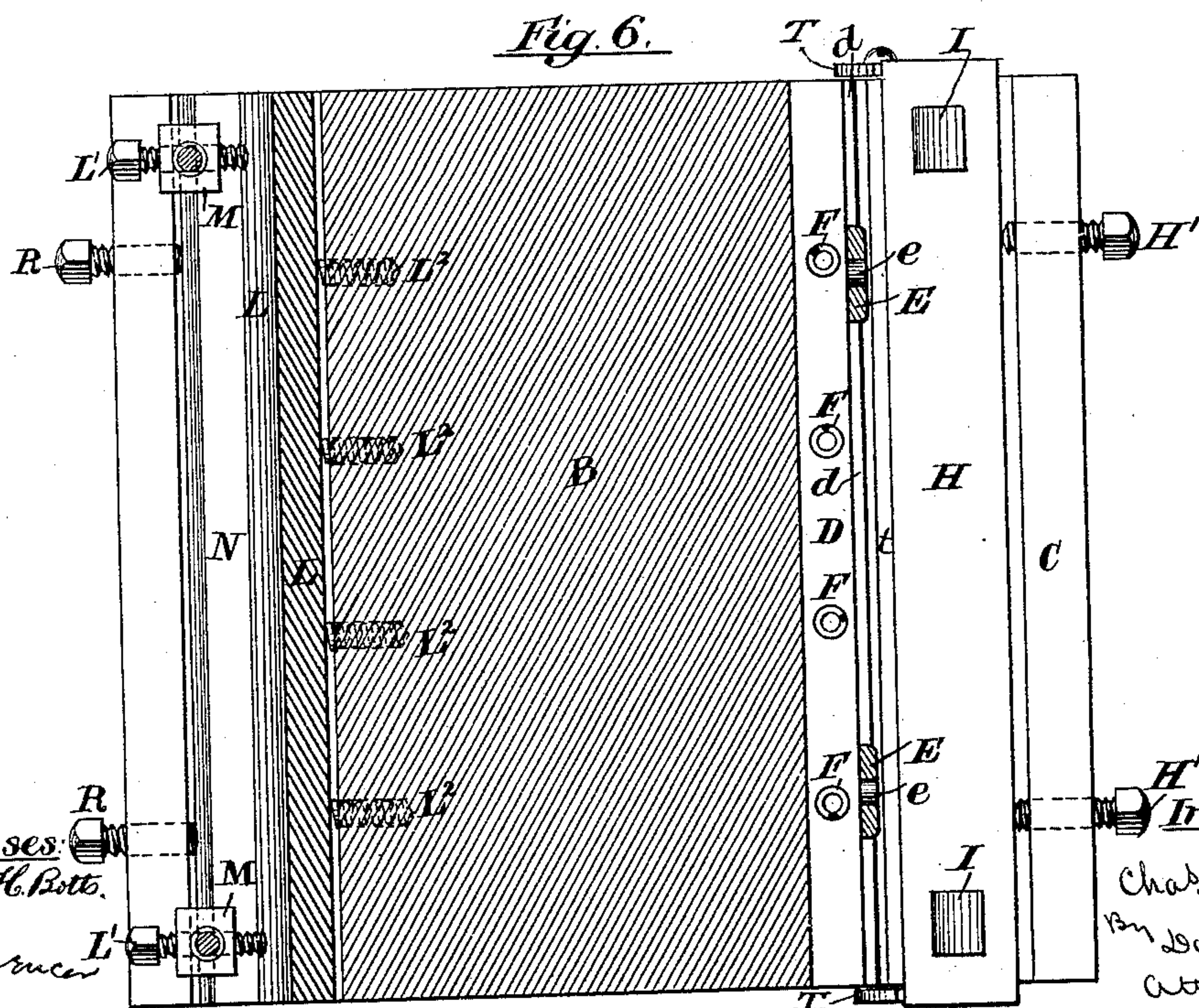
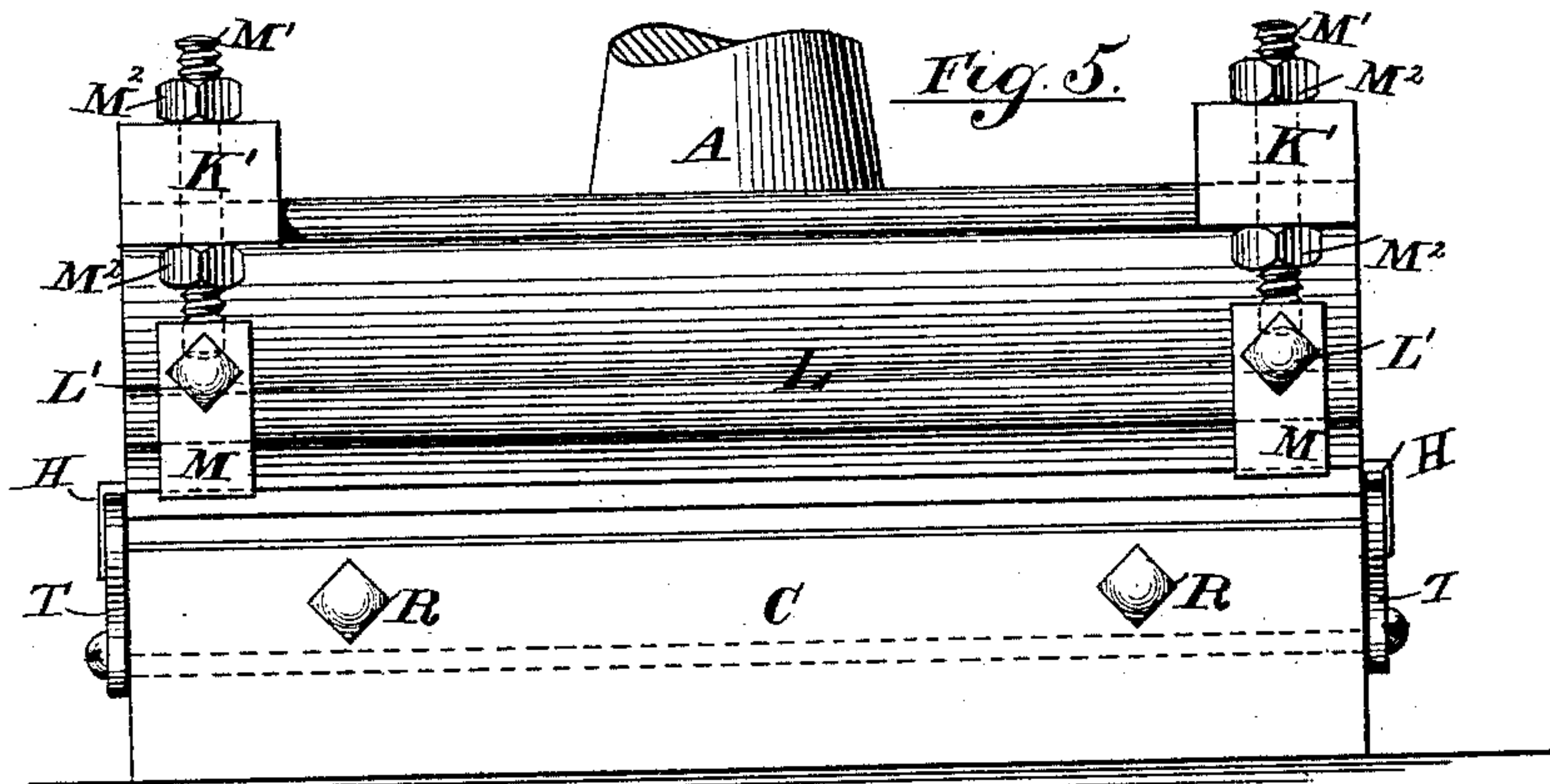
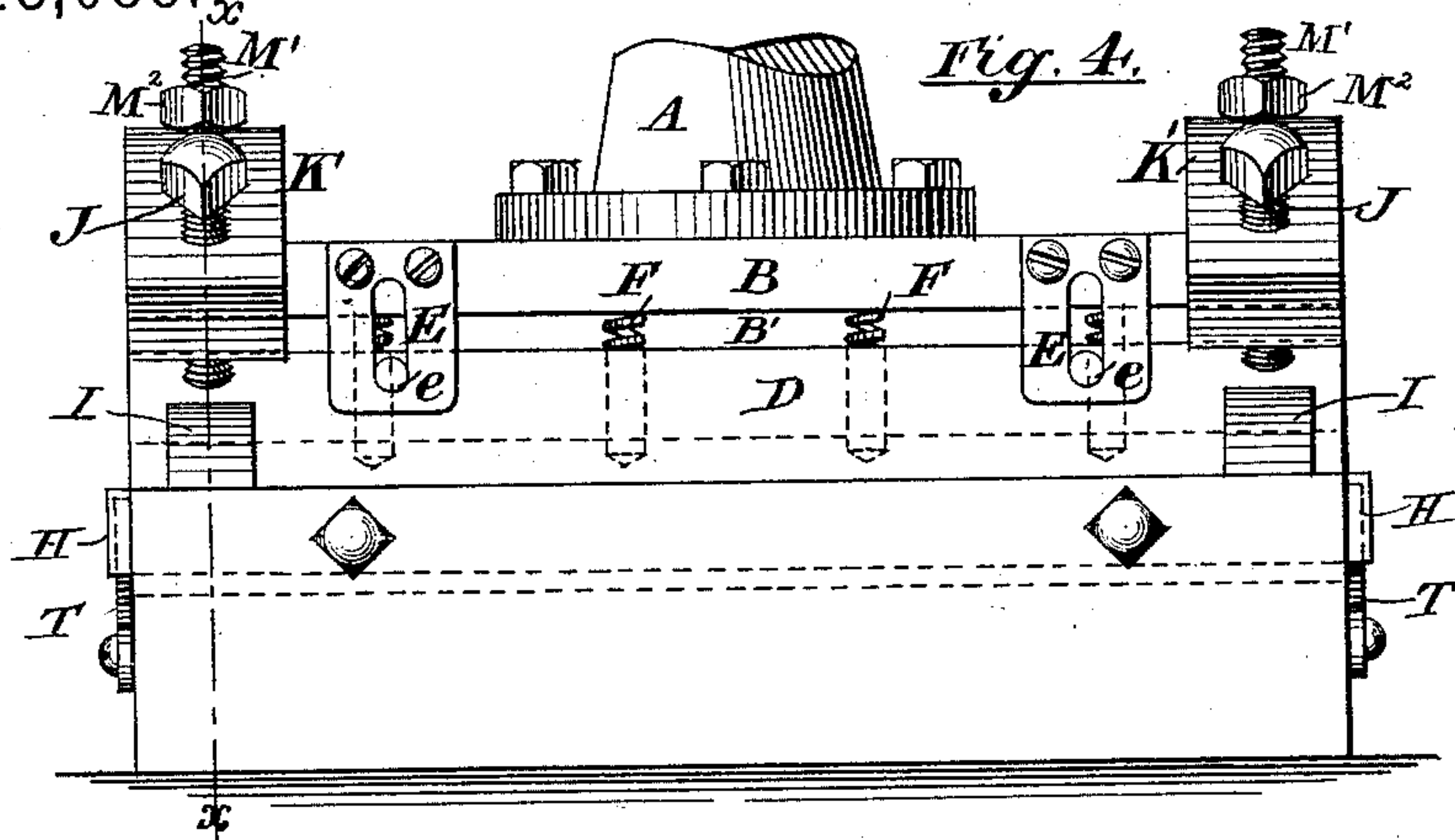
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No. 318,088.

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UNITED STATES PATENT OFFICE.

CHARLES B. COOPER, OF NEW YORK, N. Y.

DIE FOR CORRUGATING SHEET METAL.

SPECIFICATION forming part of Letters Patent No. 318,088, dated May 19, 1885.

Application filed May 22, 1884. (No model.)

To all whom it may concern:

Be it known that I, CHARLES B. COOPER, of the city, county, and State of New York, have invented a new and useful Improvement in Dies for Pressing Sheet Metal; and I do hereby declare that the following is a full and exact description thereof, reference being had to the accompanying drawings, and to the letters of reference marked thereon, making a part of this specification.

My invention relates to an improvement in the construction of dies for bending or corrugating plates of tin or other sheet metal, and the object thereof is to lessen the strain upon the fiber of the metal in the operation of bending it, so as to diminish the liability of fracture and permit the use of a less expensive grade of sheet metal in the manufacture of various articles requiring a corrugation or folding of the plate, and especially in the manufacture of metallic shingles.

It consists in the combination, in a die suited for use with a spring-actuated yielding presser-plate carried by the punch of the die to enter a counterpart recess in its forming-block, of a second swinging presser-plate hinged to the punch to enter later, and with a lateral yielding movement, a second shaping-recess in said forming-block, so that the metal sheet to be bent is permitted to move and give during the formation of the folds or corrugations therein without being stretched or strained during the process.

It consists, also, in the combination, with the swinging presser-plate, of a sliding bar fitted to move laterally in the recess entered by the swinging plate, and which is actuated by one or more wedge-shaped blocks carried with said presser-plate by the punch, all as hereinafter fully described.

In the accompanying drawings, Figures 1, 2, and 3 are transverse sections of my improved die, all taken on line *x x* of Fig. 4, but which illustrate, respectively, different operative positions thereof, Fig. 1 illustrating the same when the two sections of the die are separated, Fig. 2 when they have engaged one portion of the sheet of metal, and Fig. 3 when they are fully closed. Fig. 4 is a side view from the right of Fig. 1; Fig. 5, a similar view

from the left, and Fig. 6 a horizontal section on line *y y* of said Fig. 1.

A represents the follower of an ordinary power-press to which my invention is applied; B, its upper section or "punch," attached in any suitable manner to the follower A, and C the lower section or "former," attached firmly to the bed-plate of the press.

The punch or upper section of the die is constructed of a solid plate or block, B, (see Fig. 6,) larger than the sheet-metal blank to be bent or corrugated. A rectangular recess, B', (see Figs. 1 and 4,) cut along the edge of one side of this punch-block to extend from end to end thereof, so far reduces the width of its inner face that it corresponds to the width between the grooves or corrugations to be formed in the sheet-metal blank. Within this lateral recess B', along the edge of the punch-block, a movable presser-plate, D, of the same length, is fitted and held by means of brackets E E, Fig. 4, made fast to the projecting edge of the punch-block to extend therefrom parallel with the inner face of the recess, so that the presser-plate D may play in the recess under said brackets, the plate being limited in its movement and properly guided and confined by means of pins *e e*, projecting therefrom through slots in the brackets, as clearly illustrated in Fig. 4. The plate D is forced outward to project beyond the face of the punch-block B as far as its pins and slots will permit by means of a series of springs, F F, interposed between its upper edge and the upper side of the recess in which it moves, the springs being inserted in sockets in said upper edge, by which they are retained in place. The outer edge of the face of the plate D is formed with a projecting flange, *d*, (see Fig. 1,) whose lower face coincides with that of the plate as a continuation thereof, and whose upper side is made sloping, so as to form an angle more or less acute with the lower face. The inner face of the lower section or former C, of the die corresponds to and is parallel with the inner face of the punch. A longitudinal recess, G, Fig. 1, is formed in the face of the former, at one side thereof, in line with the flanged presser-plate D. It is made wider than the lower face of

said presser-plate, of the same length, and of a depth equal to the depth of the corrugation or depression required in the sheet-metal plate. The face of the former C is cut down, outside of the recess G, nearly to the level of the bottom of said recess, to a width sufficient to allow the play thereon of a bar, H, (see Figs. 1 and 6,) coequal in length with the presser-plate D, and whose inner edge is beveled off on the under side at an angle the counterpart of that of the upper side of the flange d, so that its inclined face shall be parallel with the inclined face of the flange, which it will overlap when closed toward it. An inclined face-lug, I, is formed upon the upper face of the bar H at each end thereof, and a set-screw, J, is inserted to bear against it through an offset, K, formed upon the end of a transverse bar, K', which is secured upon or formed integrally with the upper side of the punch-block B at each end thereof. (See Figs. 4 and 5.) The offset K at the end of each bar is formed at an angle with the bar, so that the screw J will project through said offset at about a right angle with the inclined face of each lug, I, whereby as the punch or outer section, B, of the die approaches the opposite section or former, C, the end of the screws working against the inclined faces of the lugs will force the bar H toward the flanged presser-plate D, and cause the inner edge of the bar to overlap the flange d of the plate, as shown in Fig. 3. The bar H when released is forced outward automatically by means of spring T T at each end thereof, said springs being fitted to the ends of the former C to bear against the ends of the bar, (see Figs. 4, 5, and 6,) and the bar is adjusted by means of set-screws H' H' led through the upper outer edge of the former-plate C, to bear against the side of the bar H. (See Figs. 1 and 2, &c.) A second presser-plate, L, of a length equal to the length of the punch-block B, is pivoted at either end in the transverse bars K' K' (see Fig. 5) to swing in front of, and against the side of the block opposite to that upon which the presser-plate D is fitted. This plate L is adapted to swing inward against the side of the punch-block B, and is made deep enough to project beyond the inner face of said block to an extent equal to the depth of the corrugation or groove required to be formed thereby in the sheet-metal plate, and its edge is beveled outwardly and is otherwise shaped to correspond with the form in transverse section of the groove required to be formed thereby in the blank. (See Figs. 1 to 3.) Wedge-blocks M M are suspended outside of the swinging presser-plate L, at each end thereof, by means of threaded rods M' M', projecting therefrom through apertures in the ends of the transverse bars K' K', which are made to extend out for the purpose beyond the outer edge of the punch-block B, and each wedge-block is adjusted and secured, by means of nuts M² M², upon its rod on each side of the supporting-bar K'. Set-screws L' L' are led

transversely through the wedge-blocks M, to bear against the swinging plate L and limit its outward play. Springs L² L² are interposed between the swinging plate L and the punch-block B, being fitted into recesses in said block, into which they are compressed when the plate L is forced in against the side of the block. (See Figs. 3 and 6.) A longitudinal forming-bar, N, equal in length to the lower section or former, C, of the die, is fitted to play transversely in a longitudinal recess, P, formed in the face of said former under the swinging plate L. The inner side of the recess is made to coincide with the side of the punch-block B, both being in the same plane. The upper corner of this forming-bar N is beveled off and shaped to form a counterpart of the bottom of the plate L, so that when the two are brought together their faces shall be parallel, and a space be left between them equal to the thickness of the sheet metal to be swaged. The forming-bar N is forced out from the inner side of the recess P in which it plays to the same distance as is the outer edge of the swinging plate L from the side of the punch-block B by means of springs N' N', interposed between the bar and said inner side of the recess, the springs being fitted into lateral recesses into which they are compressed when the bar is forced inward. (See Fig. 3.) The bar is forced inward, as required, by means of the beveled inclined edges of the blocks M M, forming wedges adapted to enter between the outer side of the bar N and the outer wall of the recess P. Its position when at rest is adjusted by means of set-screws R R.

In the operation of my device a sheet-metal plate, S, is inserted between the punch B and former C of the die, as shown in Fig. 1, its position being adjusted by means of an offset, t, in the bar H, and when so placed it may be confined by means of a spring (not shown in the drawings) bearing against its outer edge to hold it against said offset. Power being applied to the press, the punch B is made to close toward the former C. In this movement the lower face or foot of the presser-plate D will first strike and bear upon the sheet-metal blank S, the springs F F being powerful enough to cause the metal to bend without allowing the plate D to yield. By the continued movement of the press the plate S will be bent into the recess G, as shown in Fig. 2, before the second forming-plate, L, comes into contact with its opposite edge, thus allowing the metal to be freely drawn over so far as need be toward the plate D, and obviating the danger of straining or breaking the plate, which would occur were it confined. So soon as the first groove or corrugation is thus formed by the action of the plate D the lower edge of the second swinging plate, L, coming into contact with the sheet-metal blank, begins to bend it to form the second groove or corrugation. Evidently, if the swinging plate L was fixed in the position thereof against the side of the punch-

block B, which is illustrated in Fig. 3, and the sections of the die were then forced together upon the blank to be bent, the consequent strain on the sheet of metal, whose opposite edge is confined at D, would have a tendency to cut or break it. To obviate this the lower edge of the plate L is thrown out by the springs $L^2 L^2$, so that it first strikes the sheet-metal blank S at such a distance from the inner edge of the recess P, into which the blank is to be bent, (see Fig. 2,) that as the plate L moves into the recess it takes up and folds in with it sufficient slack metal to obviate all strain or tension upon the central portion of the blank. As the plate L closes into the recess it is forced in toward its inner margin by the simultaneous transverse inward movement of the bar N, produced by the action of the wedge-blocks M M. As the bar N moves inward the bar H on the opposite side of the die is also forced inward by the pressure of the screws J J against the inclined surfaces I I. The springs F F allow the forming-plate D to give sufficiently after it has bent the blank to permit the two sections B and C to close completely upon the blank, as shown in Fig. 3. As the punch B is drawn back after the dies have been closed the sliding bars N and H and the swinging plate L are automatically thrown back to their first positions by the springs which actuate them, and the bent plate S is then drawn off longitudinally from the foot of the presser-plate D. The form of the outer ends of the presser-plates D and L, and of the opposite recesses G and P, and forming-bar N, admit of variation to produce grooves of various designs.

For narrow and acute-angled grooves the sliding bar N may also be wholly dispensed with, the recess P being made of such a width and so inclined or shaped as that the foot of the swinging presser-plate L may play therein and operate to draw and crimp the blank

into the same, substantially as when the bar N is used.

It is evident that the movement of the swinging plate L and sliding bars N and H may all be made positive by suitable mechanism, so as to coact in producing the desired result, substantially in the order and manner described, instead of being actuated in part by springs.

I claim as my invention—

1. The combination, with the shaping or forming block in a die for pressing sheet metal, of a hinged presser-plate carried by the punch-block, to enter a recess in the forming-plate with a swinging movement, substantially in the manner and for the purpose herein set forth.

2. The combination, in a die for pressing sheet metal, with a spring-actuated yielding presser-plate, D, on one side of the punch of the die, of a second swinging presser-plate pivoted to the punch to drop against its opposite side and close with the punch into a recess in the former of the die, substantially in the manner and for the purpose herein set forth.

3. In a die for pressing sheet metal, the combination, with an adjustable sliding forming-bar moving in a recess in the forming-block, of one or more wedge-blocks carried by the punch to engage said sliding bar and move it laterally in its recess, and a swinging presser-plate hinged to the punch to enter the recess in advance of the laterally-moving bar, substantially in the manner and for the purpose herein set forth.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

CHAS. B. COOPER.

Witnesses:

DAVID A. BURR,
A. B. MOORE.