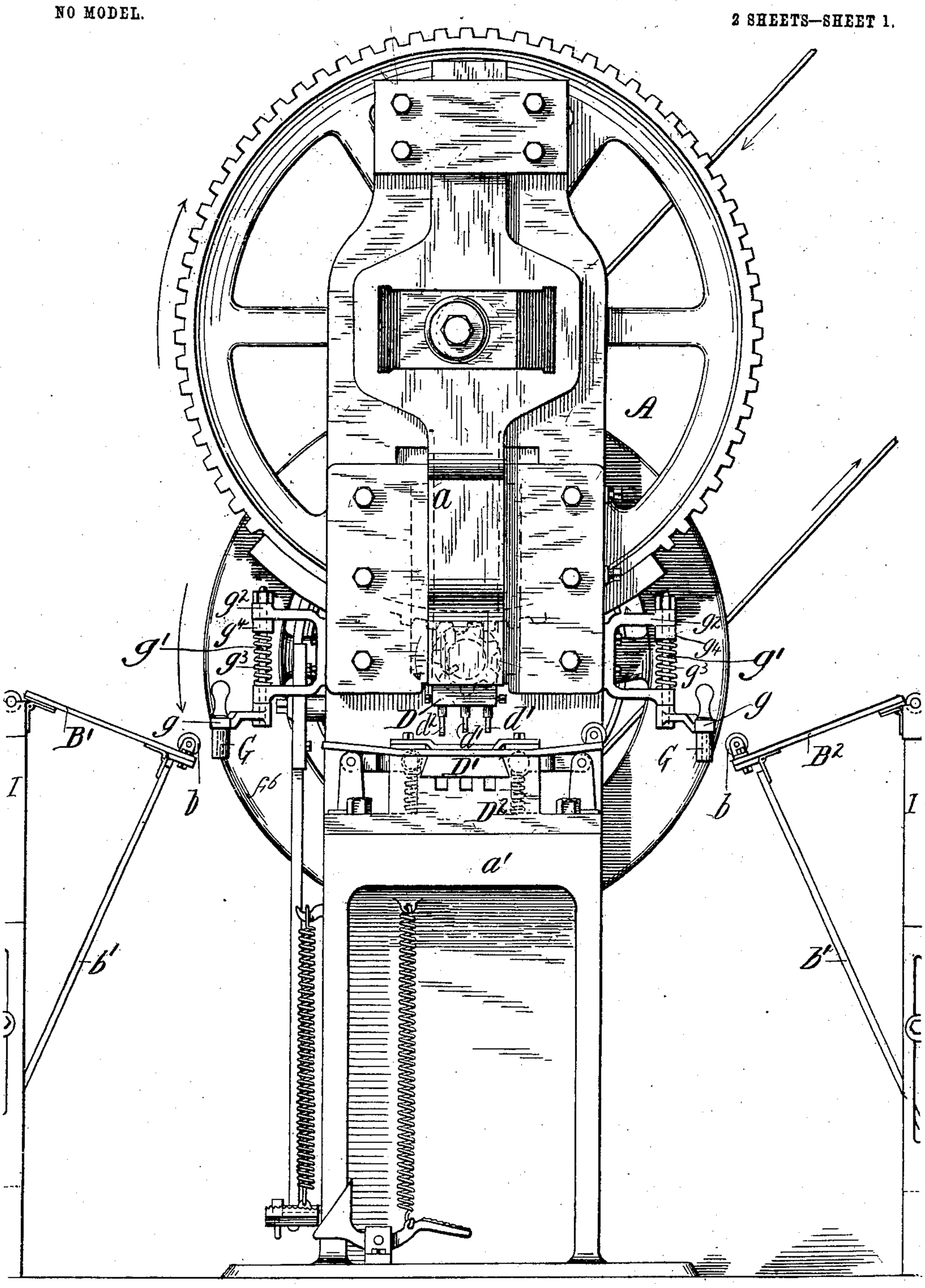
No. 733,967. PATENTED JULY 21, 1903.

G. F. HUTCHINS & J. B. LOSEY.

BENDING MACHINE AND DIE THEREFOR.

APPLICATION FILED JULY 19, 1902.

NO MODEL. 2 SHEETS—SHEET 1.



Witnesses:
E. A. Allen.
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Fig. 1.

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by their Attorney
Edward J. Beach

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NO MODEL. 2 SHEETS—SHEET 2.

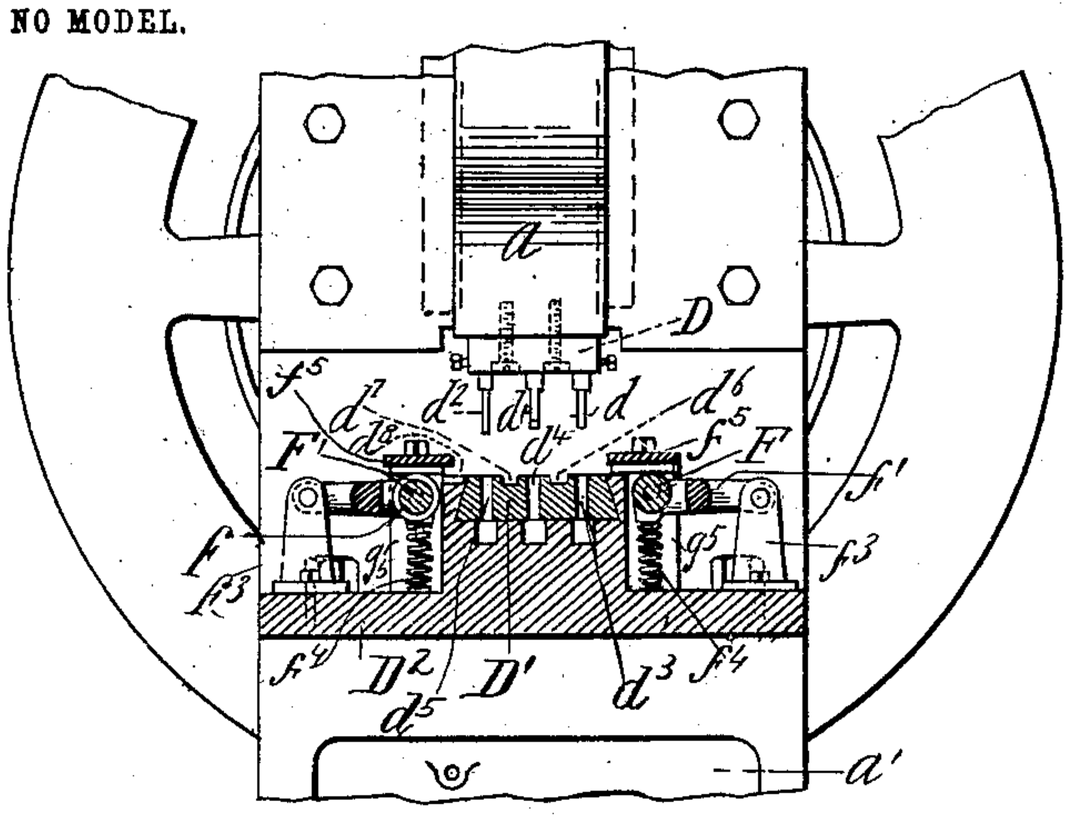

Fig. 2.

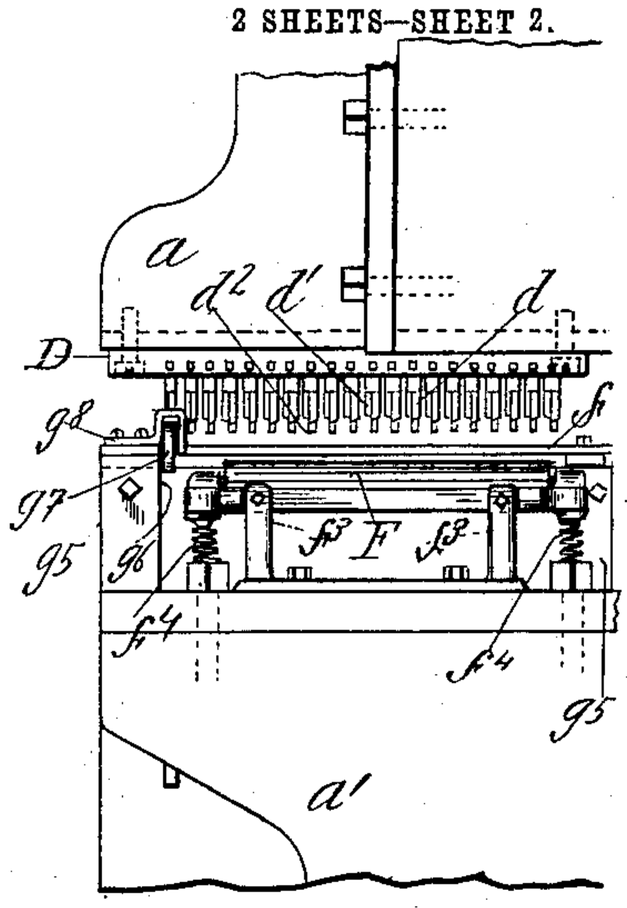

Fig. 3.

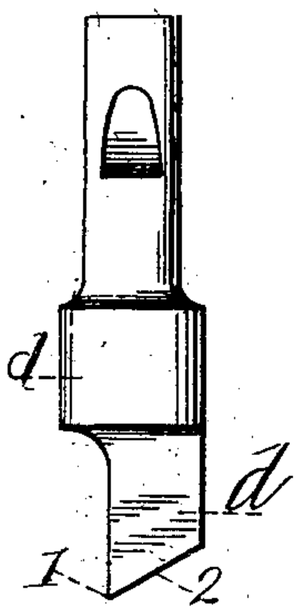

Fig. 7.

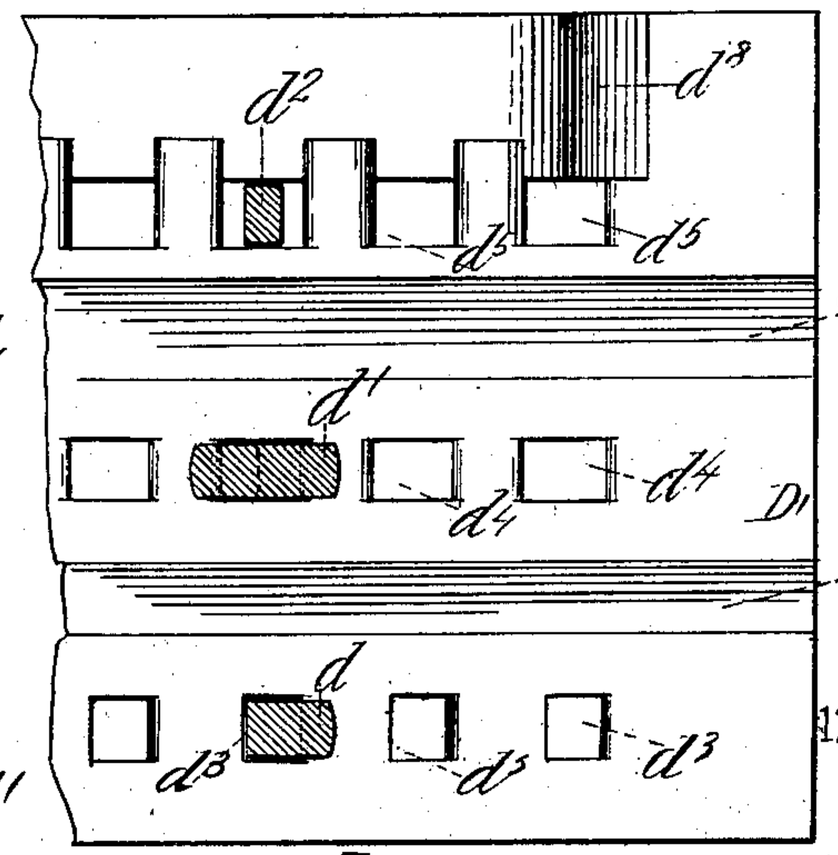

Fig. 5.

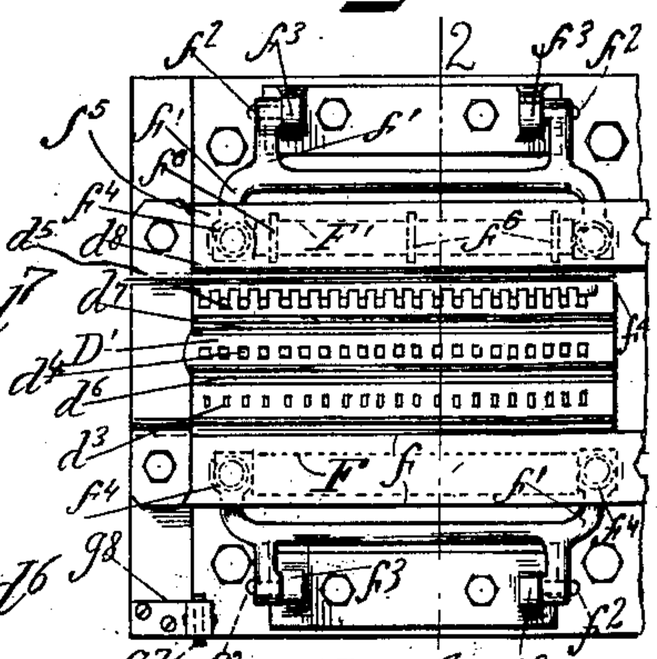

Fig. 4.

Fig. 8.

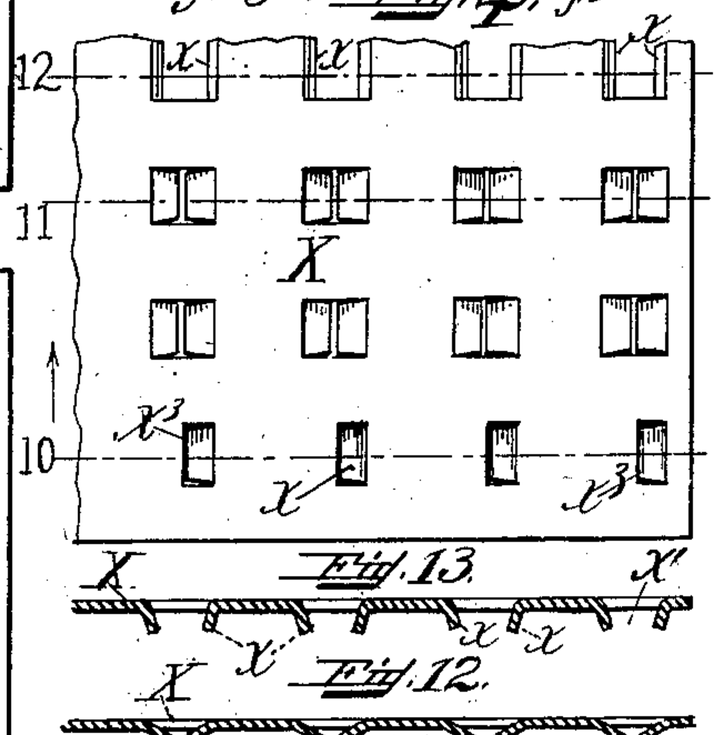

Fig. 13.

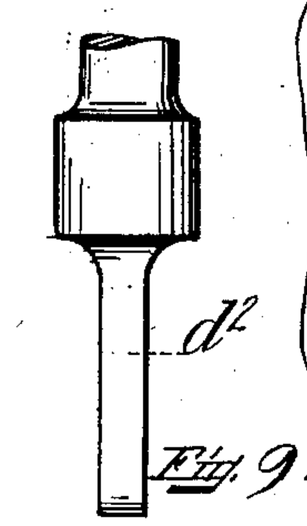

Fig. 9.

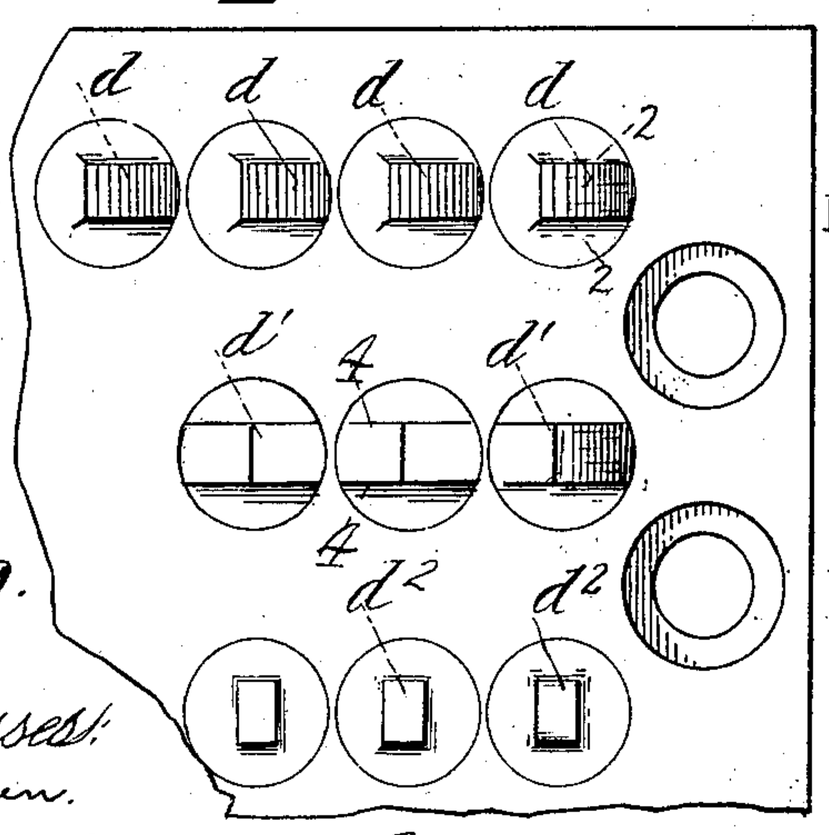

Fig. 6.

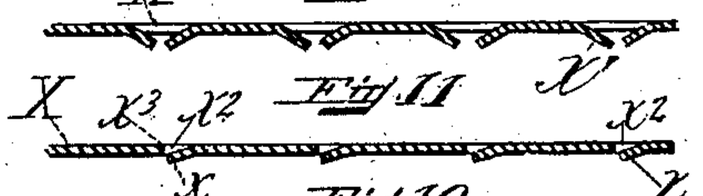

Fig. 12. Fig. 11. Fig. 10.

Witnesses:
E. A. Allen.
W. E. Coursey.

Inventors:
George F. Hutchins
James B. Losey
by their Attorney
Edward S. Beach

No. 733,967. Patented July 21, 1903.

UNITED STATES PATENT OFFICE.

GEORGE F. HUTCHINS, OF WORCESTER, MASSACHUSETTS, AND JOHN BENJAMIN LOSEY, OF GROTON, NEW YORK, ASSIGNORS TO UNIVERSAL SAFETY TREAD COMPANY, OF JERSEY CITY, NEW JERSEY, A CORPORATION OF NEW JERSEY.

BENDING-MACHINE AND DIE THEREFOR.

SPECIFICATION forming part of Letters Patent No. 733,967, dated July 21, 1903.

Application filed July 19, 1902. Serial No. 116,224. (No model.)

To all whom it may concern:

Be it known that we, GEORGE F. HUTCHINS, residing at Worcester, in the county of Worcester and State of Massachusetts, and JOHN BENJAMIN LOSEY, residing at Groton, in the county of Tompkins and State of New York, citizens of the United States, have invented certain new and useful Improvements in Bending-Machines and Dies Therefor, of which the following is a specification, reference being had therein to the accompanying drawings.

The object of our invention is to produce a machine for forming sheet material (commonly sheet metal) with a plurality of perforations each of which is provided at its opposite sides with outwardly-extending integral projections of regular and uniform appearance and particularly of equal height. Such product is not new with us, but is illustrated, for example, in Figure 8 of United States Letters Patent No. 638,666, granted to Frederick W. Huestis, assignor to the Universal Safety Tread Company, for a tread for stairs, &c., on December 5, 1899, and in numerous foreign patents.

Fig. 1 is a side elevation of our new machine, showing portions of delivery and receiving tables, one at one side and the other at the other side of the machine. Fig. 2 is a partial front elevation of the machine, showing the female-die-block support, the female die, and certain other parts in vertical section at line 2 2 of Fig. 4 and on a line parallel with the front side of the machine. Fig. 3 is an elevation of a portion of the machine, looking at it from its right-hand side as it stands in Fig. 1. This view illustrates the arrangement of the punches in parallel lines and in files and shows other parts of the machine to be described. Fig. 4 is a top plan view of the female die-block and of certain cross-bars and antifriction-rollers carried by the female-die-block support. Fig. 5 is a partial top plan view of the female die-block, showing three punches in cross-section. Fig. 6 is an under plan view of the male die-block. Fig. 7 is a side view of one of the punches which first cut and bend. Fig. 8 is a side view of all but the shank of one of the punches which next cut and bend. Fig. 9 is a side view of one of the finishing-punches, the tang of the punch being broken off. Fig. 10 is a cross-sectional view on line 10 of Fig. 13 and represents a piece of sheet metal as it appears after the first acting punch has operated on it. Fig. 11 is a cross-sectional view at a line 11 11 of Fig. 13 and represents the material after the second acting punch has operated on it. Fig. 12 is a cross-sectional view of the finished product of the machine at line 12 12 of Fig. 13 and shows the condition of the material after all three punches have successively done their work. Fig. 13 is a top plan view of the material in process.

In the drawings illustrating the principle of our invention and the best mode now known to us of applying that principle, A is an ordinary punching-machine having a vertically-reciprocating die-carrying member *a* and comprising a die-support *a'*. These punching machines or presses are made in a great many different forms, and, generally considered, comprise intergeared stationary and reciprocating beds, one of which carries the female and the other of which carries the male die-block, as will be readily understood by all skilled in the art. In accordance with our invention we attach the male die-block D to the reciprocating die-carrying member *a* and mount underneath the same on the support *a'* the female-die-block support D^2, in which the female die D' is mounted in any suitable manner, but preferably by the dovetail construction illustrated. The male and female die-blocks D and D', with other parts to be described, are new with us, as are also the work-support tables B^2 and B' and other parts hereinafter described.

Male die-block D is provided with three

parallel rows of punches, each row of punches comprising any desired number of punches held in the die-block in any desired manner, but preferably severally removable therefrom, so that in case one of the punches is broken or dulled a new or repaired one may be substituted. The punches d of the first row are severally formed, as shown in Figs. 6 and 7, with the cutting-apex 1 at one side of the longitudinal axis of the punch, the parallel cutting edges 2 2 thereof extending from the cutting-apex 1 upwardly and rearwardly to the rear side of the punch, and these cutting edges 2 2 passing or extending from the rear edge of the punch downwardly and forwardly past the vertical axis of the punch to the cutting-apex 1. The purpose of the punches d is to cut and bend (in coöperation with the corresponding female-die recesses d^3, see Fig. 5) the projections x (shown in Figs. 10 to 13, inclusive) in the sheet material X. To this end the sheet material to be treated is placed on table B^2 and fed between the punch and die members of the machine to table B'. The lower edge of the sheet-metal plate X, as appears in Fig. 13, is the advancing edge. When the sheet X has been fed far enough between the punch and die members D and D', the first row of perforations x^2, Fig. 10, and projections x will be formed. The advancing edge portion of sheet X is then lifted sufficiently to take the projections x out of the female-die recesses d^3, and the sheet is then fed along in the machine until said first row of projections x falls into the first cross-groove d^6 in the upper surface of female die D', between the female-die recesses d^3 and d^4. A second descent of the male die-plate D causes the punches d to form a second row of perforations x. Thereafter sheet X is again lifted and fed forward, the second row of projections x being brought into the first cross-groove d^6 between the female-die recesses d^3 and d^4, when the first-formed row of projections x will drop into the female-die recesses d^4, which are in working alinement with the punches d'. The third descent of the male die-plate causes punches d to punch the third row of projections x and also causes the punches d' to act for the first time. When the punches d' thus act, they cut and bend down the ears x'. (See Fig. 11.) In doing this they also bend farther down the ears x, for the working end of each die d' is V-shaped, as shown in Fig. 8. Sheet X is again lifted and fed forward until the first row of projections x (together with their companion projections x') are brought over and into the second cross-groove d^7 in the upper face of female die-block D' between female-die recesses d^4 and d^5. Then the male die-block descends and punches d and d' perform their work, as already described. Sheet X is again lifted and fed forward until the first-formed row of projections x (with the companion projections x') are brought over and dropped into the female-die recesses d^5. At this time four rows of projections have been formed, the first-formed row being in recesses d^5, the secondly-formed row being in cross-groove d^7, the thirdly-formed being in die-recesses d^4, the fourthly-formed row being in cross-groove d^6. Upon the next descent of male die-block D all three rows of punches d', d', and d^2 act upon sheet X, the punches d^2 being finishing-punches and longer than the other punches, so as to pass between the projections x and x' and press them farther apart until they stand parallel one with the other and substantially at right angles to sheet X. Sheet X in the feeding thereof after the first action of punches d is moved forward, then lifted, then moved forward, and then dropped or lowered, and these operations are repeated until the sheet X has been treated to the desired extent; but after the first operation of the finishing-dies d^2, in order to avoid lifting the advancing edge and subsequently to avoid lifting the succeeding portions of sheet X, that have been acted on by the finishing-dies and so to facilitate convenience in feeding, it is desirable to feed sheet X forwardly without lifting the projections x and x' out of the die-recesses d^5. Consequently we form female die-block D' with the clearance d^8. (See Figs. 5 and 2.) To this end the margin of the die-block D' is cut away opposite the outer sides of die-recesses d^5 to a sufficient depth to allow the projections x and x' to pass easily out of the recesses d^5 when sheet X is fed forward. Cutting-apex 1 of punch d in severing the sheet X forms the end x^3 of the projection x' (see Fig. 10) so that the apex 3 of punch d' does not cut, and only the corners 4 of punches d' cut in forming the projections x'. By offsetting the apices 1 and 3 of punches d and d' the companion projections x and x' are readily formed and the ends of projections x' forced downwardly without being crowded against the previously-formed projections x. It is in part to prevent such crowding of the secondly-formed projections x' against the first-formed projections x during the formation of the projections x' by the punches d' that the offset of the apices 1 and 3 is desirable. Such offsetting is not absolutely essential in all cases; but it is to be observed that the apices of the intermediate punches are offset in relation to the apices of the preceding punches—namely, for the purpose of preventing the sheet X from being crowded edgewise when the punches descend. Sheet X is laid upon table B^2 and moved by hand or some suitable mechanical feed between the die-blocks D D'. After passing from table B it is led on anti-friction-roller F and the cross-plate f, ar-

ranged transversely of the female die-block D′ and parallel with the die-recesses d^3, d^4, and d^7. Antifriction-roller F is a plain-surfaced roll journaled in the arms of a hinged bracket f', supported on suitable journals f^2 in the vertical arms f^3, suitably secured to the die-block support D^2. The roll-support arms f' are yieldingly supported by springs f^4, interposed between the under sides of said arms f' and the die-block support D^2. These springs serve to hold the roll F upwardly toward the under side of the cross-bar f, and the purpose of having the roll F held up by spring-pressure is to accommodate stock varying somewhat in thickness and also to give an easier play to the antifriction-roll F as the sheet X is drawn over it. When sheet X passes the cut-away portion d^8 of the female die-block, the advancing edge of the sheet passes under a cross-bar f, which is parallel with and corresponds to the cross-bar f^5. Beneath cross-bar f^5 there is an antifriction-roll F′, mounted and controlled by spring-pressure similarly to the antifriction-roll F; but roll F′ is provided with an annular collar f^6, the purpose of which is to engage the under side of the sheet X between rows of projections and to lift the plate upwardly, so that the ends of the projections x and x' will either not drag or drag but lightly over the surface of the female die-block D′ during the feeding of the stock. That edge of the sheet X which is farthest from the operator as he stands in front of the machine (the front is shown in Fig. 1) is conveniently guided by the spring-pressed vertical rolls G, one on each side of the machine. Each roll G is mounted on a vertical stud carried by the swinging arm g of the vertical rocker-shaft g', which is journaled in a bar g^2, shown as fixed to and projecting from the frame of the machine above the female die-block. Said vertical rock-shaft g' is combined with a helical spring g^3, one end of which is fast to the collar g^4, which is loose on the rock-shaft g', and the other end of which is secured to an arm of the bracket g^2, the spring being so arranged that its tension serves to press the rolls G toward the front of the machine during the feeding operation. That edge of sheet X which is nearest the operator is guided by the front vertical walls of the spaces formed between the under sides of the cross-bars f and f^5 and the rolls F and F′. Said cross-bars are mounted at each end on vertical supports g^5, and one of these guides serves for the inner edge of the sheet, as represented by g^6, indicated in the inner wall of one of the two front and similar uprights g^5. That margin of the sheet X which is nearest the operator as he stands in front of the machine is preferably held onto its work by the antifriction-roll g^7, mounted in the bracket g^8. (See Figs. 3 and 4.) It is quite desirable in feeding the sheet material from table B, which is a horizontal table, only the front legs of which are shown in the drawings, that the surface of that table be considerably above the upper surface of the female die-block and that the upper surface of the receiving-table B′ be also above the upper surface of the female die-block, so that as the sheet material passes from one table to the other through the machine it will be bent down when the punches operate and tend to spring upwardly in consequence of its own resiliency when the punches move upwardly. The springs f^4 facilitate this movement of the sheet metal. Conveniently the inner end of each table B^2 and B′ is a hinged section, as shown, carrying an antifriction-roll b. This hinged end of the table is held in any desired adjusted position by the strut b'.

In practical use the machine which we have described is used for converting strips of sheet metal or other sheet material of very considerable length into sheets having rows of perforations with integral projections at two opposite sides of each perforation. Such perforations and projections are frequently for the purpose of holding lead or other non-slipping material; but the product of this machine may be used for numerous other purposes.

Having thus described our invention in the best form which is now known to us, we desire to be understood as claiming it in the broadest legally-permissible manner and with the expectation that different constructors will embody some or all the features of our invention in somewhat different forms.

Prior to our invention no organized construction, so far as we are aware, has been devised for doing the specific kind of work done on this machine.

The advantages of our machine are that it will make the structure illustrated in Fig. 13 with accuracy and rapidity.

What we claim is—

1. A male die-block provided, *seriatim*, with a row of initial cutting and bending punches; a row of complementary cutting and bending punches; and a row of finishing-punches.

2. A male die-block provided, *seriatim*, with a row of initial cutting and bending punches; a row of complementary cutting and bending punches; and a row of finishing-punches which are longer than the other punches.

3. A male die-block provided, *seriatim*, with a row of initial cutting and bending punches; a row of complementary cutting and bending punches; and a row of finishing-punches; said initial and complementary cutting and bending punches being formed with

apices, and the apices of the punches in one row being offset with relation to the apices of the punches in the other row.

4. A female die-block provided, *seriatim*, with a row of initial recesses; a cross-groove; a row of complementary recesses; a cross-groove; and a row of finishing-recesses.

5. A female die-block provided, *seriatim*, with a row of initial recesses; a cross-groove; a row of complementary recesses; a cross-groove; a row of finishing-recesses; and a clearance-recess.

In testimony whereof we affix our signatures in presence of two witnesses.

GEORGE F. HUTCHINS.
JOHN BENJAMIN LOSEY.

Witnesses to Mr. Hutchins's signature:
EDWARD S. BEACH,
M. E. COVENEY.

Witnesses to Mr. Losey's signature:
CHARLES L. HAWLEY,
ALICE E. ERB.