

(No Model.)

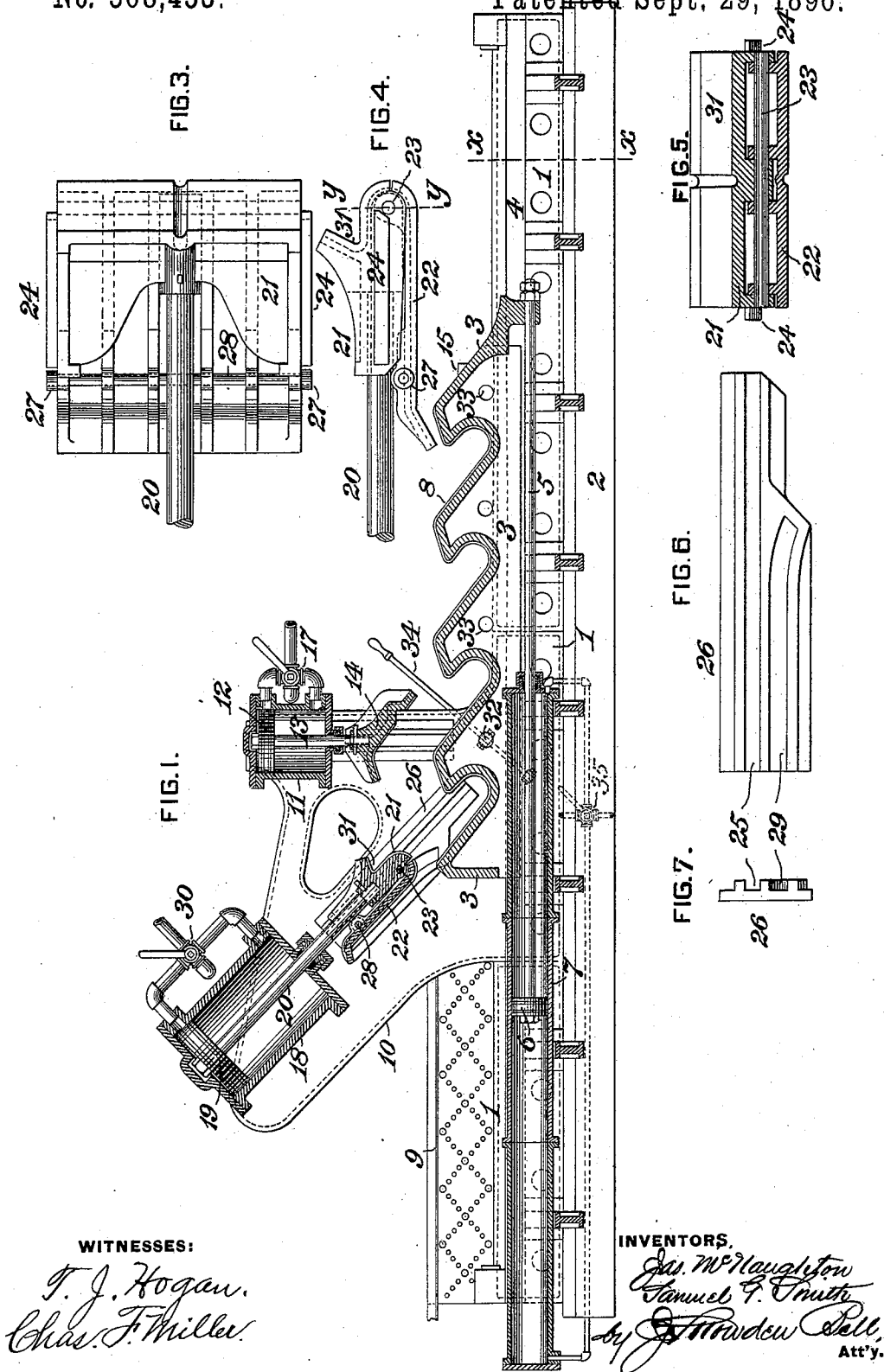
2 Sheets—Sheet 1.

J. McNAUGHTON & S. G. SMITH.

CATTLE GUARD MACHINE.

No. 568,453.

Patented Sept. 29, 1896.



WITNESSES:

T. J. Hogan.
Chas. F. Miller.

INVENTORS.

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Att'y.

(No Model.)

2 Sheets—Sheet 2.

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FIG. 2.

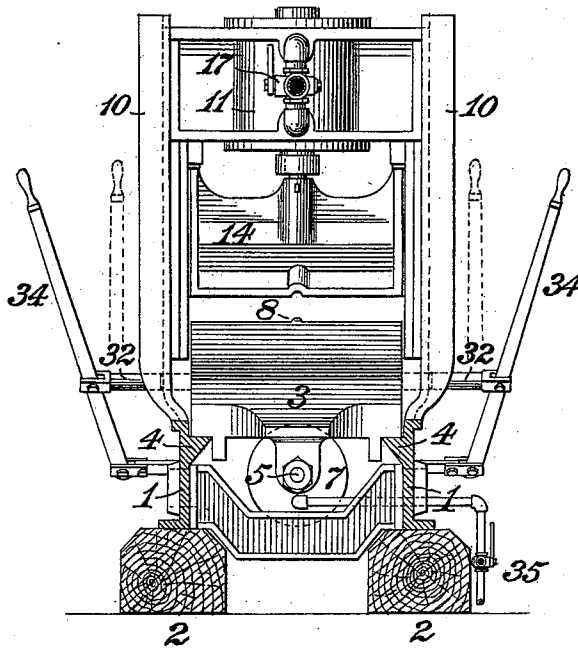
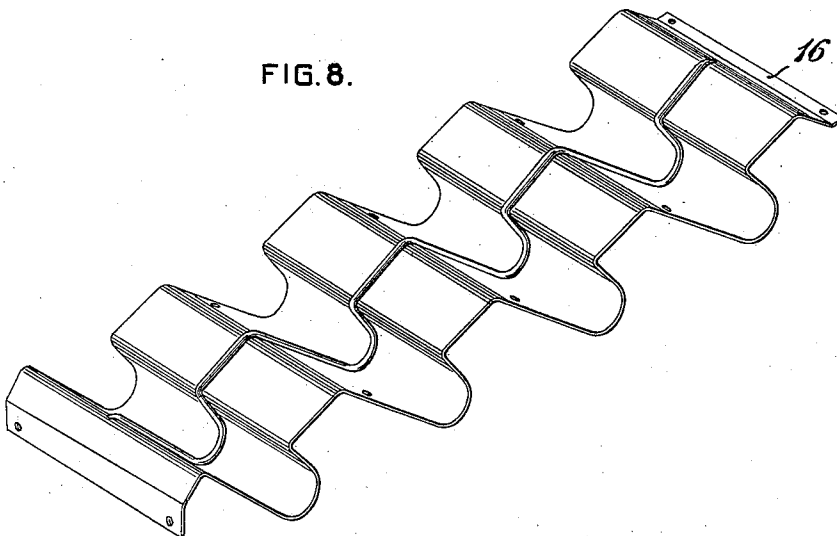


FIG. 8.



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UNITED STATES PATENT OFFICE.

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CATTLE-GUARD MACHINE.

SPECIFICATION forming part of Letters Patent No. 568,453, dated September 29, 1896.

Application filed July 29, 1896. Serial No. 600,874. (No model.)

To all whom it may concern:

Be it known that we, JAMES McNAUGHTON and SAMUEL G. SMITH, of Waukesha, in the county of Waukesha and State of Wisconsin, have invented a certain new and useful Improvement in Cattle-Guard Machines, of which improvement the following is a specification.

The object of our invention is to provide a simple, durable, and powerful mechanism by means of which sheets or plates of metal may be formed into what are known as "cattle-guard sections" with uniformity, accuracy, rapidity, and at slight cost by the action of fluid-pressure upon shaping or bending dies.

The improvement claimed is hereinafter fully set forth.

In the accompanying drawings, Figure 1 is a vertical longitudinal central section through a cattle-guard machine embodying our invention; Fig. 2, a transverse section through the same, looking to the left, at the line $x x$ of Fig. 1; Fig. 3, a plan view, on an enlarged scale, of the sectional bottom-shaping die; Fig. 4, a side view of the same; Fig. 5, a transverse section through the same at the line $y y$ of Fig. 4; Fig. 6, a side view in elevation of one of the guide-plates of the same; Fig. 7, an end view of said guide-plate as seen from the left, and Fig. 8 a view in perspective of a finished cattle-guard.

Our invention is designed for the manufacture of cattle-guard sections of the general class or type of that set forth in Letters Patent of the United States No. 489,601, granted and issued to John J. Callaghan and Albro R. Horn under date of January 10, 1893, but may be applied, without variation of structural or operative principle, in the production of various other forms thereof. The special pattern of cattle-guard section for the manufacture of which our invention was devised is shown in Fig. 8, and consists of a rectangular sheet of metal bent into transverse inclines connected at their tops by flat, and at their bottoms by curved, portions of the sheet. Prior to our invention these sections had been formed by the slow and expensive

operation of bending the sheets into the required form by hand, and power-actuated mechanism for the purpose had not been considered practicable, by reason of the difficulty which was encountered in providing a die capable of drawing the stock into the curved portions connecting the lower ends of the inclines and releasing itself after operation. Our improvement successfully overcomes this difficulty and enables the sheets to be rapidly and uniformly bent to the form designed without undue strain upon the metal or cramping of the dies thereon.

In the practice of our invention we provide a substantial bed-plate or horizontal supporting-frame 1, which is fixed upon a suitable foundation 2. A matrix-die 3, the upper surface of which is composed of a series of transverse inclines connected alternately by flat top portions and curved bottom portions, so as to conform, substantially, to the shape desired to be given to the sheets of metal from which the cattle-guard sections are to be formed, is fitted to traverse longitudinally on guides 4 on the supporting-frame 1, and is connected at its forward end to the rod 5 of a piston 6, which is fitted in a cylinder 7, fixed horizontally between the side members of the frame, to and from the opposite ends of which cylinder steam or other fluid under pressure may be admitted and exhausted, when and as required to move the matrix-die 3 in either direction, by a suitable cock or valve 35. In this instance a central rib or curved projection 8 is formed upon the matrix-die for the purpose of forming a longitudinal corrugation in the cattle-guard section, and it is obvious that a plurality of such ribs may be provided, if desired. A substantially horizontal transverse face 15 is also formed upon the matrix-die for the purpose of producing a corresponding surface 16 on the front end of the cattle-guard section.

A light frame or table 9 for the reception and support of the sheets of metal to be worked by the machine is supported on the main supporting-frame 1, at and adjacent to one end thereof, and a vertical frame or

housing 10 is formed upon or fixed to the frame 1, adjacent to the table 9.

A fluid-pressure cylinder 11 is secured to the vertical frame 10, with its axis in a substantially vertical plane, and is fitted with a piston 12, to the rod 13 of which is secured a top shaping and clamping die or former 14, the lower face of which corresponds in form with the flat top portions and the front inclined side of the matrix-die 3. The function of the die 14, in connection with the matrix-die 3, is to form the flat top portions and the front inclined portions of the cattle-guard sections and to clamp and hold the sheet while the sectional bottom-shaping die, to be presently described, is forming the remaining portions of the cattle-guard sections. Steam or other fluid under pressure is admitted to and exhausted from the opposite sides of the piston 12 to effect the upward and downward movements of the die 14, as required, by a cock or valve 17 of any suitable and preferred construction.

A fluid-pressure cylinder 18 is secured to the vertical frame 10, with its axis at substantially the same angle to the line of traverse of the matrix-die 3 as the inclined faces of said die. A piston 19 is fitted in the cylinder 18, and the rod 20 of said piston is connected to a sectional and expansible bottom-shaping die or former 21 22, by which the curved bottom portions and the adjoining parts of the inclined portions of the cattle-guard section which have not been acted on by the die 14 are formed. One of the sections 21 of the bottom-shaping die, which is provided with an angular face 31, conforming with the upper rear corner portions of the matrix-die 3, is rigidly secured to the piston-rod 20, and the other section 22 is jointed to the section 21 by a transverse pin 23, passing through lugs on the two sections near their lower ends and coupling them one to the other.

The lower ends of the sections 21 and 22 are curved in conformity with the curved bottom portions of the face of the matrix-die 3, and the sections are longitudinally corrugated in correspondence with the central rib 8 of the matrix-die 3. Rectilineal movement of the section 21 parallel with the axis of the cylinder is insured by lateral guide-tongues 24, fitting longitudinal grooves 25 in guide-plates 26, secured to the vertical frame 10, and the section 22 is caused to move parallel to the section 21 (except for a short traverse immediately preceding the lower limit of its stroke) by rollers 27, fixed on the ends of a transverse shaft 28, journaled in the section 22 near its upper end, said rollers fitting grooves 29 in the guide-plates, which grooves are parallel with the grooves 25 for the major portion of their length and are curved or inclined outwardly therefrom in cam form at their lower ends. Fixed lateral

projections on the section 22, adapted to engage the grooves 29, may, if desired, be employed and would constitute the mechanical equivalent of the rollers 27, but the latter are preferable in operation by reason of the reduction of friction due to their use. The movement of the piston 19 in either direction is effected and controlled through the intermediation of a suitable cock or valve 30, by which steam or other fluid under pressure is admitted to and exhausted from either end of the cylinder 18, as required.

The matrix-die 3 is successively locked in position for the forming-dies 14 and 21 22 to operate upon successive portions of the sheet of metal fed into the machine by locking-pins 32, which fit openings in the side members of the supporting-frame 1 and are engaged with and disengaged from corresponding openings 33 in the matrix-die 3 by pivoted hand-levers 34.

In the operation of the machine the matrix-die 3 is moved by the piston 6 into such position that the foremost of its transverse inclines stands immediately below the corresponding face of the shaping and clamping die 14 and is locked in said position by the hand-levers 34 and locking-pins 32. A sheet of metal, cut to proper dimensions, is placed upon the table 9 and moved thereon until its forward portion is brought between the dies 14 and 3. The cock or valve 17 is then moved to admit motive fluid to the upper side of the piston 12, which, with the connected shaping and clamping die 14, makes a downward stroke in and by which the die 14 bends the forward portion of the sheet into the form of the first-inclined face of the matrix-die 3 and the adjoining top flat face and lower horizontal face 15 thereof. The die 14 is allowed to remain in position against the sheet of metal, so as to clamp and hold the same for the next succeeding operation, to wit, the action of the sectional bottom-forming die 21 22 upon the sheet. This is effected by admitting motive fluid above the piston 19, by proper movement of the cock or valve 30, whereby the sectional die 21 22 is moved to the lower limit of its traverse, in and by which the portion of the sheet of metal adjoining the first top flat portion which has been formed by the die 14 is bent against the succeeding two inclined portions and intermediate curved bottom portion of the die 3. In its downward traverse the die 21 22 draws the metal of the sheet into the recess of the die 3 bounded by the above-recited portions of the face of said die and bends the sheet of metal into corresponding form. As the die 21 22 is driven home, that is to say, for a short period in its traverse immediately preceding the limit thereof, its lower section 22 is moved outwardly toward the adjacent face of the matrix-die 3 by the cam-shaped ends of the guide-grooves 29, thereby expanding the sec-

tional die and drawing the stock behind the finished portion of the cattle-guard section around the nose or lower end of the die until sufficient has been taken in to conform to the portions of the faces of the dies 21, 22, and 3, which then oppositely abut against the sheet. At the conclusion of this operation motive fluid is admitted to the lower sides of the pistons 12 and 19 and exhausted from their upper sides, thus effecting the upward stroke of said pistons and releasing the dies 14 and 21 22 from the sheet. The locking-bolts 32 are then released and the matrix-die 3 moved forward by admitting motive fluid behind the piston 6 until the next succeeding top flat portion of the matrix-die 3 stands immediately below the corresponding portion of the face of the die 14. The matrix-die is then locked in such position and the operations before described of the dies 14 and 21 22 are repeated, and these operations are continued in the same manner until the sheet is finished, after which the matrix-die is retracted to its original position by admitting motive fluid to the right-hand side of the piston 6, and the machine is in readiness for operation upon another sheet of metal.

It will be obvious that the form and relation of the flat and curved surfaces of the matrix-die and the corresponding faces of the shaping-dies may be varied materially without departure from the essential features of our invention, and we do not therefore confine ourselves to the specific form of said dies herein described and shown. Neither do we limit ourselves to any specific construction of valve mechanism for controlling the movement of the several pistons of the machine, as various types thereof are well known in the art and are applicable under our invention by a skilled mechanic without variation from the essential operative principle thereof.

We claim as our invention and desire to secure by Letters Patent—

1. In a machine for bendingsheets of metal, the combination, substantially as set forth, of a matrix-die having a series of transverse inclines connected alternately by intermediate top and bottom portions, a shaping and clamping die having a face conforming to the top portions and an adjacent inclined portion of the face of the matrix-die, a sectional and expansible bottom-forming die having a face conforming to the bottom portions and adjacent inclined portions of the matrix-die, mechanism for imparting longitudinal movement to the matrix-die, and traversing the shaping and clamping die and the bottom-forming die toward and from the face of the matrix-die, and a cam device for expanding the bottom-forming die in the terminal portion of its stroke toward the matrix-die.

2. In a machine for bendingsheets of metal, the combination, substantially as set forth, of a matrix-die, having transverse inclines connected alternately by curved bottom por-

tions, an expansible bottom-forming die, composed of two sections journaled one to the other and having faces conforming to the bottom portion and adjoining inclined portions of the matrix-die, mechanism for traversing the bottom-forming die toward and from the matrix-die, guides for maintaining uniform rectilinear movements of one section of the bottom-forming die, and similar movements of the other section through the major portion of its traverse, and a cam device for moving the latter section, relatively to the former, adjacent to the terminal of its traverse toward the matrix-die.

3. In a machine for bendingsheets of metal, the combination, substantially as set forth, of two die-sections, each having curved end faces and flat adjoining longitudinal faces, a pin coupling said sections adjacent to their end faces, longitudinal guide-tongues on one of said sections, and laterally-projecting members on the other section adapted to engage fixed cam-grooves.

4. In a machine for bendingsheets of metal, the combination, substantially as set forth, of a matrix-die having a series of transverse inclines connected alternately by intermediate top and bottom portions, a shaping and clamping die having a face conforming to the top portions and an adjacent inclined portion of the face of the matrix-die, a bottom-forming die having a face corresponding to the bottom portions and adjacent inclined portions of the matrix-die, mechanism for imparting intermittent longitudinal movement to the matrix-die and traversing the shaping and clamping die and the bottom-forming die toward and from the face of the matrix-die, and locking devices for successively fixing the matrix-die in position for the action of the shaping and clamping and bottom-forming dies.

5. In a machine for bendingsheets of metal, the combination, substantially as set forth, of a supporting-frame, a matrix-die having a series of transverse inclines, connected alternately by intermediate top and bottom portions, and fitted to traverse longitudinally on the supporting-frame, a piston working in a fluid-pressure cylinder and having its rod connected to the matrix-die; a shaping and clamping die having a face conforming to the top portions and an adjacent inclined portion of the face of the matrix-die, a piston working in a fluid-pressure cylinder at an angle to the matrix-die, and having its rod connected to the shaping and clamping die, a bottom-forming die composed of two sections, journaled one to the other and having faces conforming to the bottom portions and adjacent inclined portions of the matrix-die, a piston working in a fluid-pressure cylinder, at an angle to the matrix-die, and having its rod connected to one of the bottom-forming die-sections, fixed guide-plates having grooves continuously parallel with the

axis of the piston-rod and grooves parallel therewith for the major portion of their length and having cam-formed portions at their ends toward the matrix-die, guide-tongues on the
5 die-section fixed to the piston-rod, engaging the grooves continuously parallel therewith, and laterally-projecting members on the

other die-section, engaging the grooves having cam-formed end portions.

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