(No Model.) 2 Sheets—Sheet 1.

A. J. DOUGLASS.

SHEET METAL BENDING MACHINE.

No. 505,567. Patented Sept. 26, 1893.

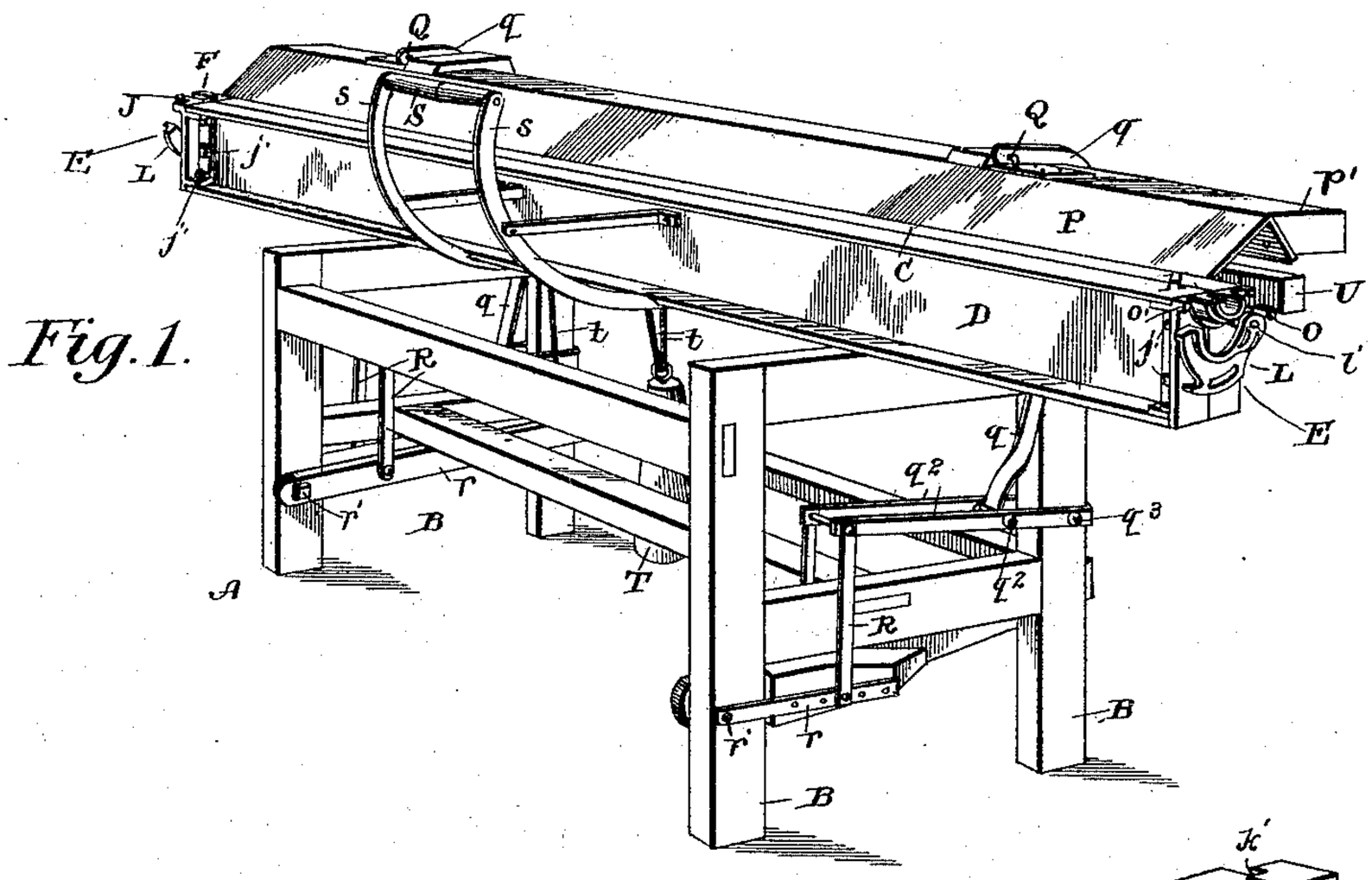


Fig. 1.

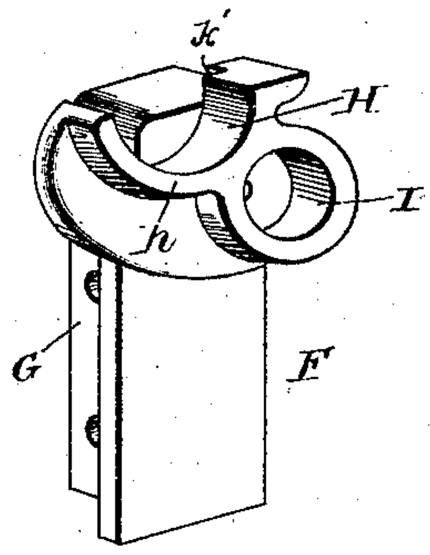


Fig. 2.

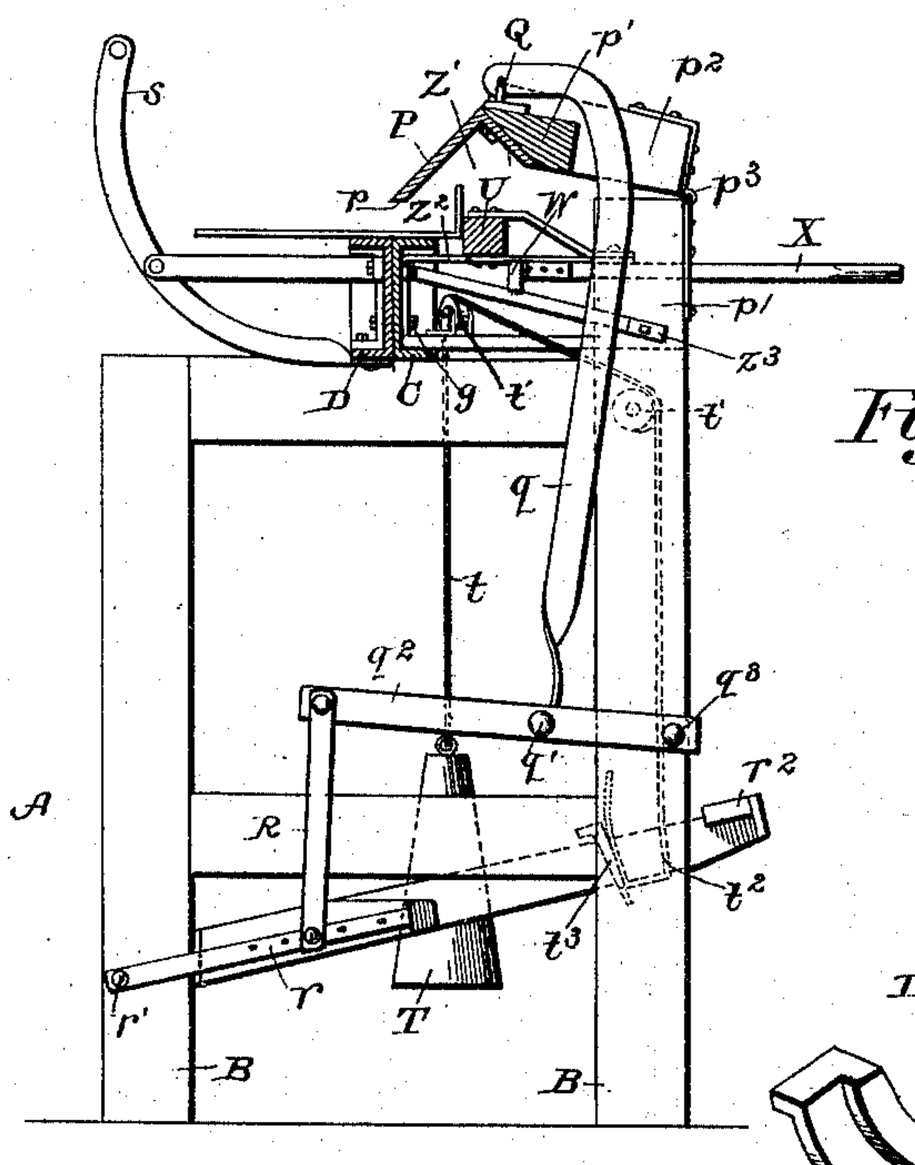
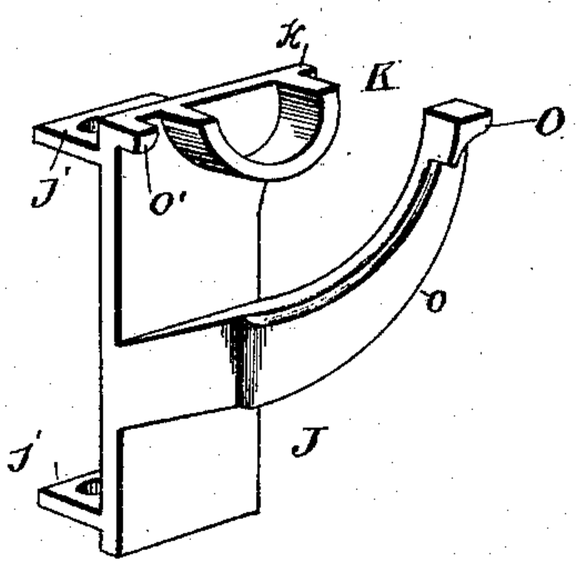
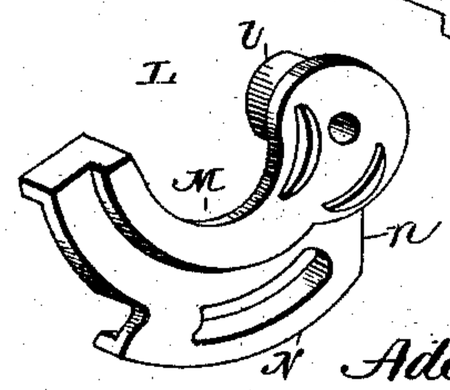


Fig. 8.





Witnesses

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(No Model.) 2 Sheets—Sheet 2.

A. J. DOUGLASS.

SHEET METAL BENDING MACHINE.

No. 505,567. Patented Sept. 26, 1893.

Fig. 3.

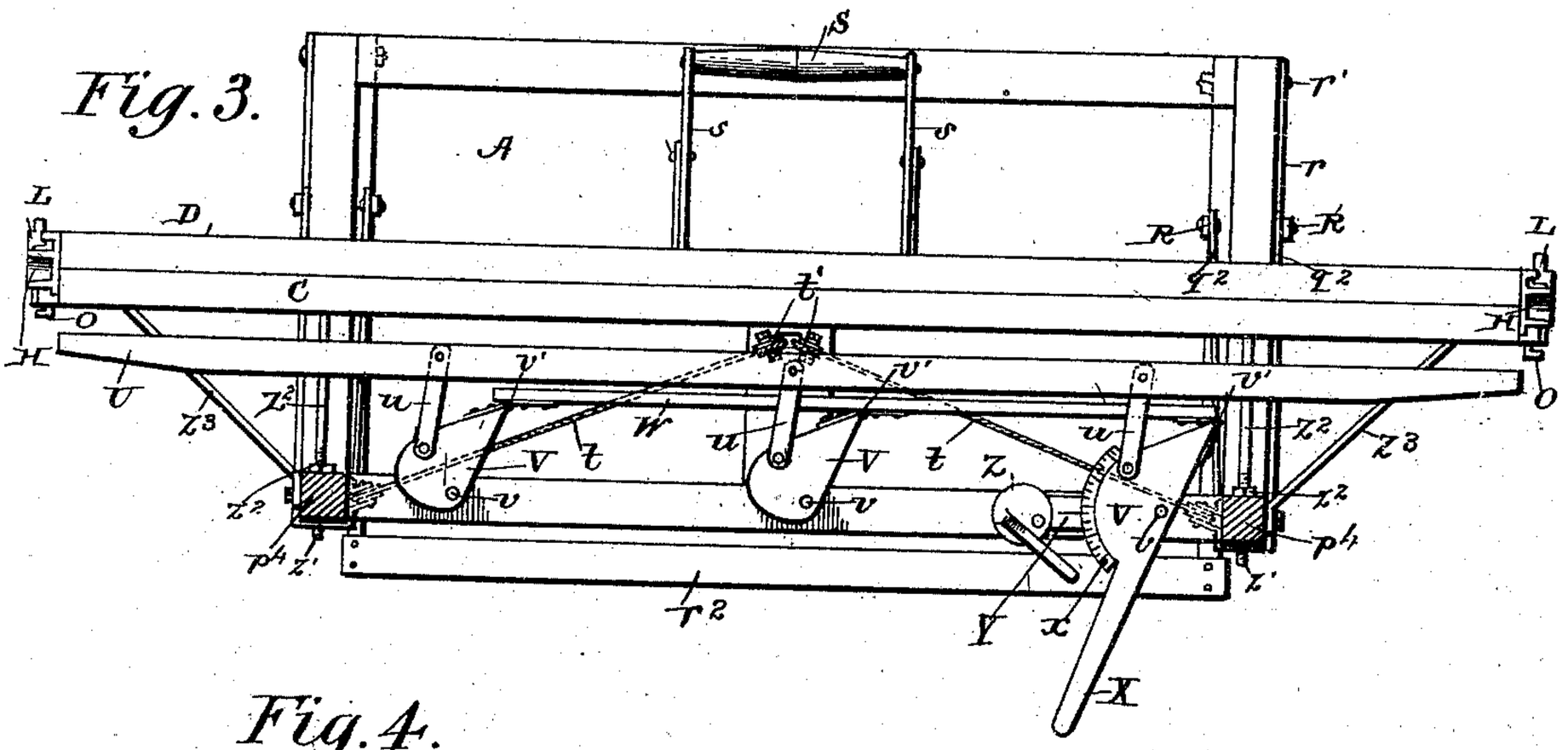


Fig. 4.

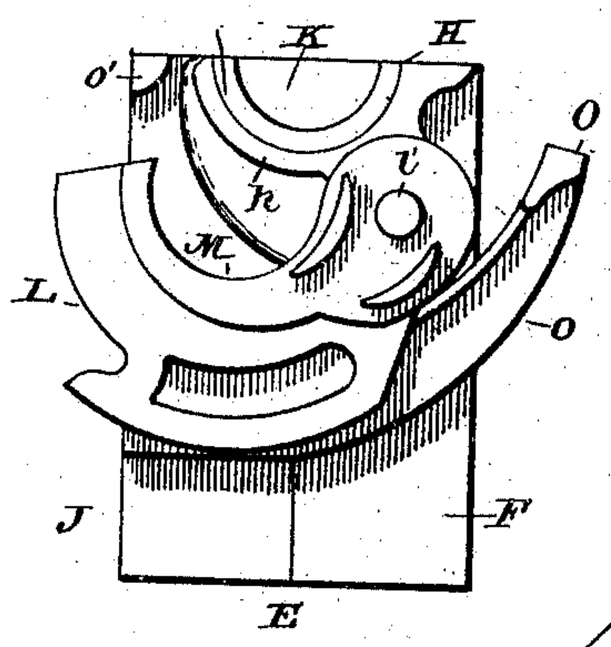


Fig. 5.

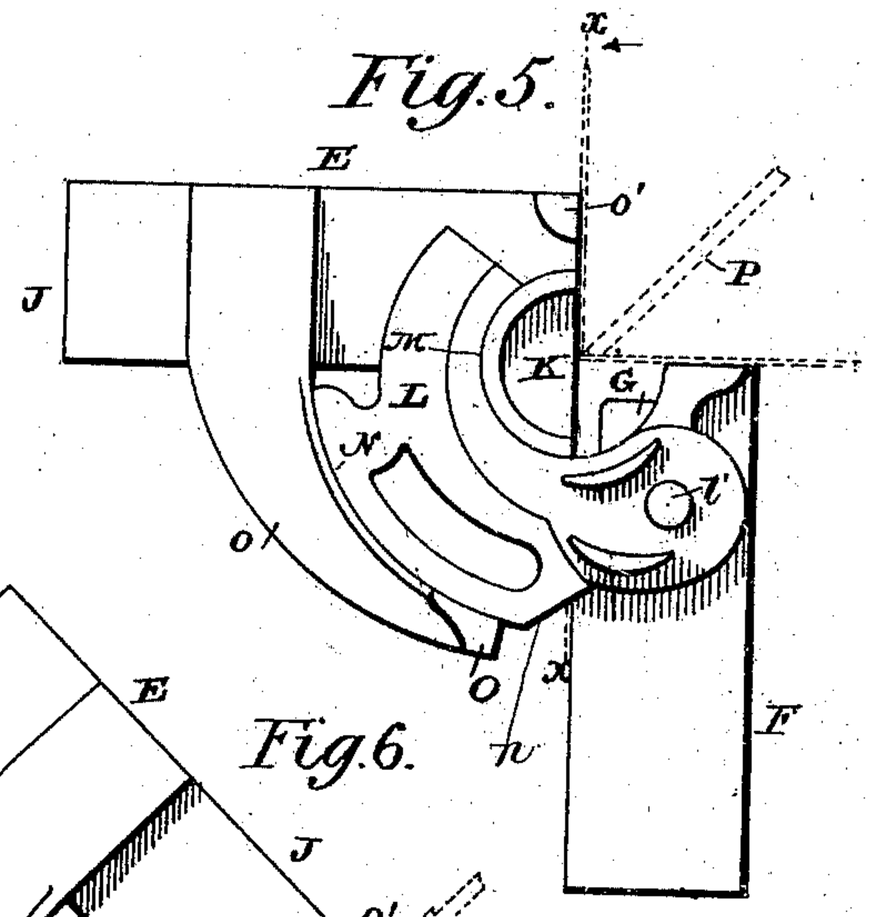


Fig. 6.

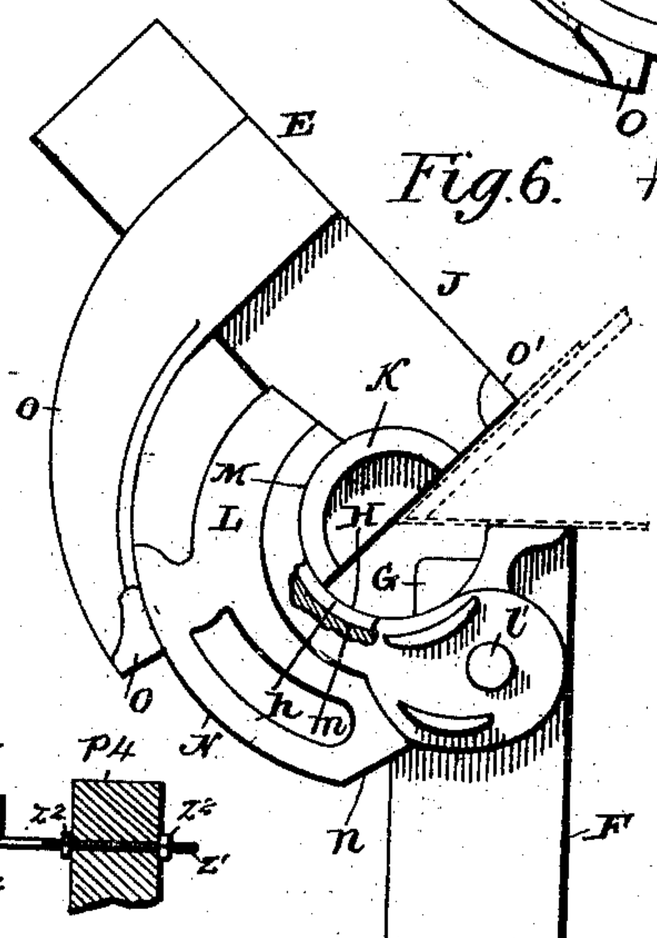


Fig. 7.

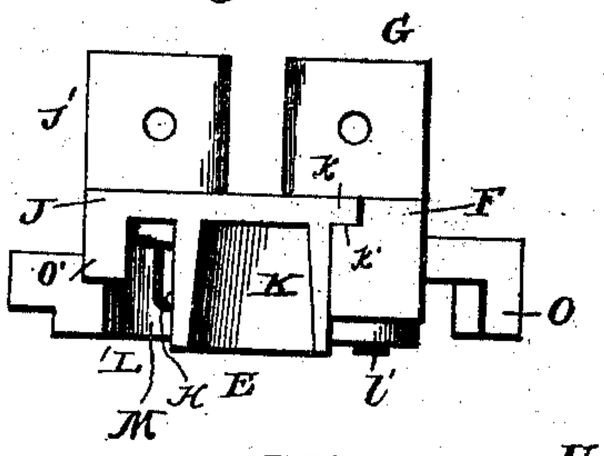


Fig. 9.

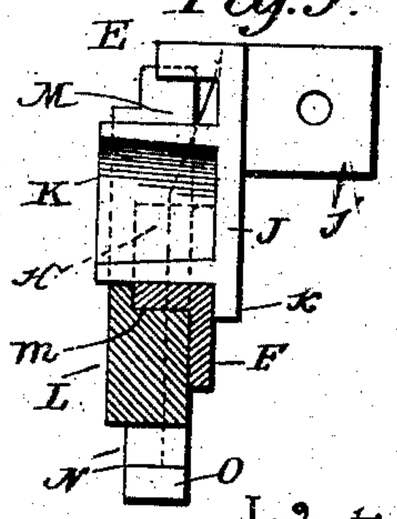
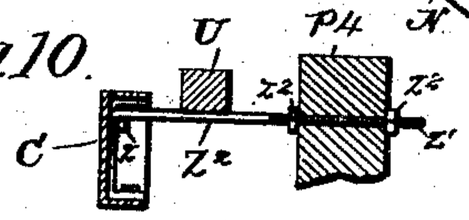


Fig. 10.



Witnesses

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UNITED STATES PATENT OFFICE.

ADELBERT J. DOUGLASS, OF ILION, NEW YORK.

SHEET-METAL-BENDING MACHINE.

SPECIFICATION forming part of Letters Patent No. 505,567, dated September 26, 1893.

Application filed April 5, 1893. Serial No. 469,178. (No model.)

To all whom it may concern:

Be it known that I, ADELBERT J. DOUGLASS, a citizen of the United States, residing at Ilion, in the county of Herkimer and State of New York, have invented a new and useful Metal-Bending Machine, of which the following is a specification.

This invention relates to metal bending machines; and it has for its object to provide certain improvements in machines of this character, whereby sheet and other light metals can be readily and accurately bent or folded for forming bent metal articles of various characters.

To this end the main and primary object of this invention is to construct a metal bending machine in which indefinite lengths of metal can be bent or folded into the desired form, owing to the specific hinge devices which do not interfere in any particular with the bending surface of the machine, but on the contrary permit the metal, to be bent, to be projected through and beyond the ends of the machine in order to bend any length of stock, all of which will be hereinafter more particularly described.

With these and many other objects in view which will appear as the invention is more specifically set forth, the same consists in the novel construction, combination and arrangement of parts, hereinafter more fully described, illustrated and claimed.

In the accompanying drawings:—Figure 1 is a perspective view of a metal bending machine constructed in accordance with this invention, shown as ready to receive the metal to be bent. Fig. 2 is a central vertical transverse sectional view of the machine, showing the metal in position to be bent, and also showing one edge already bent. Fig. 3 is a top plan view of the machine, the clamping devices being removed. Fig. 4 is a detail elevation of one of the end hinges closed. Fig. 5 is a similar view showing the hinge open at right angles. Fig. 6 is a view similar to Fig. 5 showing the movable hinge member open to its limit. Fig. 7 is a detail plan view of one of the hinges. Fig. 8 is a detail perspective view of one of the hinges, the parts of which are separated from each other. Fig. 9 is a detail sectional view on the line x—x of Fig. 5. Fig. 10 is a detail sectional view of the bed bar connection with the supporting frame.

Referring to the accompanying drawings:—A represents a suitably constructed leg frame having the opposite end pairs of legs B, and supporting in position on the top thereof the elongated stationary bed bar C. The stationary bed bar C, is constructed of a suitable length of channel iron so as to project beyond each end of the supporting leg frame A, and is by any suitable means secured fast on said leg frame so as to form a bed support for the metal, which is bent from one edge of the same in a manner to be presently described.

Arranged alongside of the stationary channel iron bed bar C, is the swinging channel iron bending bar D. The swinging bending bar D, is disposed longitudinally of the frame A, and when in its normal position is designed to have its flat side rest against and register with the corresponding side of the stationary bar C, so that the flat top faces of the stationary and movable bars are flush and in line with each other, so that the metal to be bent into shape can be clamped in position on top of said bars before commencing the operation of bending or folding the same.

In order to provide for pivotally connecting the bar D, to the bar C, so that the former can be swung away from and above the latter to bend the metal, it is necessary to employ hinge devices to form the pivotal connection between the two bars, and in the present invention I employ a specific construction of open hinge arranged at and connecting the opposite ends of the two bars D and C, and these hinges may be designated as E. The open hinges E, are provided with the fixed bearing members F, which approximate the end rectangular shape of the channeled iron or bars, and are provided with the angular attaching flanges G, projecting from one side thereof and adapted to snugly fit in the open ends of the stationary bars C, and are adapted to receive the attaching bolts g, which hold the bearing members F, securely fastened to each opposite end of the stationary bed bar C. The bearing members F, of the open hinges E, are further provided at their outer

sides, with the off-standing half-circle open bearings H, which bearings are formed by the laterally extending flanges *h*, and project beyond the flat side of the bar C, so that the circle center of such open bearings, will be in the same vertical plane as the flat side of the bar C, which is the point of bend or fold of the metal being operated upon as will be more clearly set forth. The members F, are also provided at the same side as the open bearings H, and slightly below such bearings, with the open bearing sockets I, the function of which will presently appear, while the open bearings H, form pivotal bearings for the journals of the swinging journal hinge members J. The swinging journal hinge members J, are also provided with the off-standing attaching flanges *j*, projected from one side thereof and adapted to fit into the open ends of the swinging bending bar D, and securely fastened to such ends of the bending bar on the bolts *j'*.

The journal members J, of the open hinges E, have extending laterally from the upper ends thereof, the half journals K, which are designed to fit in and work loosely within the half circle open bearings H, of the opposing bearing members F, so as to form a strong pivotal connection between the two channel bars, while at the same time it will be clearly seen from Figs. 1 and 4 of the drawings, that the top edges of the hinge members when closed, are flush with the top faces of the channel bar so that the metal to be bent can project any distance beyond the ends of the bars to provide for bending any length of work, as will be more fully referred to. The half journals K, are set in slightly from one edge of the journal members J, to leave the bearing edges *k*, adapted to snugly work in the bearing grooves *k'*, formed in the bearing members F, at one edge of the open bearings H, and said half journals K, are also formed in lengths slightly greater than the width of the bearings H, so as to project beyond the outer edges of such bearings, in order to secure a purchase in the supplemental swinging bearing arms L, working on the outer sides of the open hinges E. The swinging bearing arms L are formed on a curve and are provided at one extremity with the bearing hubs *l*, having a pivotal bearing in the sockets I, and held or retained in such sockets by the retaining screws *l'*. The arms L, are provided in their upper edges with the supplemental open bearings M, at one edge of which are formed the stop shoulders *m*, adapted to be brought up into contact with the laterally extended flanges *h*, forming the bearings H, so that the supplemental open bearing M, of the arms L, can be brought into accurate alignment with the open bearings H, and so as to form a direct continuation of such open bearings on the same circle, as is clearly indicated in Figs. 5 and 6, of the drawings, in order to provide a bearing for the journals K, to the full limit of movement of the members J, carried at each end of the bending bar D.

The swinging arms L are each provided with the depending curved contact flange N, at one end of which is formed the beveled or cam lifting edge *n*, with which are adapted to contact the beveled lifting and retaining lugs O, at one end of the curved hinge arm *o*. The curved hinge arms *o*, are formed as a part of each of the journal members J, and project from one side of said journal members so as to work flat against the outer faces of the fixed bearing members F, and to be brought into contact with the beveled and rounded contact edges of the bearing arms L. A strike lug *o'*, projects from one side of the journal members J, near their upper edges and is adapted to come in contact with the swinging ends of the bearing arms L, to lower the same as the bending bar D, is allowed to drop to its normal closed position.

Now it is thought that the operation of the open hinges will be clear to those skilled in the art with but a slight description as to the operation. As previously described, the top edges of the open hinges are flush with the flat top faces of the channel iron bars, when the machine is closed, so that the metal to be bent can be placed on top of the bed formed by the channel bars, and can project beyond the open hinges at each end of said bars and not interfere in any particular with the free movement of such hinges. By reference to Fig. 5 of the drawings particularly, it will be seen that as the swinging bending bar D, is swung away from the stationary bar C, the journal members J, move out with the bending bar. The curved hinge arms are therefore carried out to a position so as to bring the lugs O, at one end of the same, against the beveled lifting edges of the swinging bearing arms L. As the bending bar continues to swing out and up, the lugs O, throw the bearing arms L, up to a position in which they form accurate upward continuations of the open bearings H, so as to accommodate the movement of the journals K, as they rise up with the journal members J. After the lugs O, have left the beveled edges *n*, the same commence to ride over the curved edge of the contact flange N, which flange is an arc of the working center of the swinging journal members J, so that the said lugs therefore serve to retain the journals K snugly in the open bearings, in which they turn, it being now clear that the said journals are longer than the width of the bearings H, so as to secure a pivotal purchase in the supplemental bearings of the swinging bearing arms. It is to be further observed by reference to Figs. 5 and 6 of the drawings, that the working center of the swinging journal members J, is the point of bend or fold of the metal as shown in dotted lines, so that it will now be clearer that the metal can extend directly over the open hinges and not interfere

with the free working thereof, thus providing a construction wherein the length of work to be operated on is not limited to the precise length of the machine.

Having ascertained the detailed construction and operation of the pivotal connections between the bars C, and D, it is next necessary to describe the other working parts of the machine. Arranged to work over and onto the stationary bed bar C, is the angle clamp P. The angle clamp P, extends the entire length of the bed bar C, and is provided with a lower beveled edge p, adapted to be brought onto the bed bar C, directly at the joint edge thereof, in order to hold the work onto said bed bar at the very point at which such work is to be bent or folded over the lower edge and onto the clamp. The angle clamp P, may be formed in a right angle, acute, or other angle, and is securely attached to the longitudinally arranged clamp bar p', secured to one extremity of the hinge arms p^2, hinged at p^3, to leg extensions p^4, projected above the top plane of the frame. The longitudinally arranged clamp bar p', has pivotally attached to the top thereof as at Q, the upper curved ends of the clamp moving arms q, the lower ends of which are pivotally attached at q', to an intermediate point of the yoke levers q^2. The yoke levers q^2, embrace opposite end legs of the frame and are pivoted to such legs at q^3, at one end, and have attached to the other ends thereof the parallel connecting links R. The parallel connecting links R, are pivoted at their upper ends to one extremity of the levers q^2, and are adjustably connected at their lower ends to an intermediate point of the treadle levers r. The treadle levers r, pivotally embrace opposite legs B, as at r', at one end, and are connected at their other ends by the foot bar r^2, by means of which the operator can draw the angle clamp P, firmly down onto the work supported on the bed bar C. By pressing down the treadle lever r, the clamp P, is necessarily brought down onto the work and the bed bar C, and may be held in such position until the metal is bent or folded into the proper shape, by reaching over the top of the clamp and pulling on the handle S, connecting the upper ends of the curved handle arms s, securely attached and braced to the outer sides of the bending bar D. After the metal has been bent or folded over the retaining edge of the clamp P, by swinging the bending bar D, as clearly shown in Figs. 5 and 6 of the drawings, it is simply necessary to take the foot from the foot bar r^2, and the clamp P, will automatically lift itself above the work as clearly shown in Fig. 2 of the drawings, by reason of the action of the single weight T. The weight T, is attached to a central point of the weight rope t, having separate portions which pass over suitably arranged guide pulleys t', and have their extremities pass through separate perforations t^2, in the treadle levers r, and securely held in one of said perforations by means of the wedge pins or keys t^3.

In order to properly gage the work to be operated upon, and to accurately determine the point at which the bend or fold is to be made, I employ a horizontally moving gage bar U. The horizontally moving gage bar U, is arranged in rear of and parallel with the stationary bed bar C, and has pivotally attached thereto the links u. The links u, are pivotally attached at one end to the eccentric blocks V, pivoted at v, to one top side of the frame, and hinged at their pointed extremities v', to the connecting bar W, which secures the simultaneous movement of the said blocks, in order to provide for accurately adjusting the gage bar U, in a perfectly straight line. One of the blocks V, is further provided with an extended handle X, by means of which the gage bar can be controlled, and has at one edge thereof the scale x, on which is adapted to be clamped the index block Y. The index block Y, is seated to slide in one top side of the frame A, and is adapted to be clamped against the curved scale edge of the handle block by means of an adjacent clamping cam or eccentric Z.

From the foregoing it is thought that the construction, operation and many advantages of the herein described metal bending machine will be readily apparent to those skilled in the art without further description.

The importance and novel operation of the open hinges have already been set forth, and at this point it may be well further to observe that by arranging a series of such machines as herein described in a line with each other and end to end, a simultaneous bending of an indefinite length of metal can be effected, and it will also be observed by reference to Fig. 2 of the drawings, that by reason of the angle shape of the clamp P, a pocket Z', is formed under said clamp, which is sufficiently large to accommodate edges which have already been bent so that other edges of the same piece of metal can be easily bent or folded as may be desired, and other advantages besides those set forth will readily suggest themselves to those skilled in the art.

Although I have stated that the stationary bed bar C, may be held stationary on the leg frame by any suitable means nevertheless I preferably secure the same in position by means of the adjusting and securing rods Z^2. The rods Z^2, are secured fast at their inner ends as at z, to the channeled side of the bed bar C, and are provided with outer threaded extremities z', which project through perforations in the leg extensions p^4, and are engaged by the adjusting and securing nuts z^2, on both sides of such leg extensions. By reason of this connection of the rods Z^2, to the stationary bed bar and to the supporting frame, efficient means are provided whereby the said bed bar can be accurately adjusted to its proper position under the angle clamp. Furthermore the rods Z^2, form slide supports

for the horizontally movable gage bar U, and as may be clearly seen in the drawings, after the bed bar has been adjusted properly, the same may be held firmly in such position by means of suitable braces Z^3.

Changes in the form, proportion and the minor details of construction as embraced within the scope of the appended claims, may be resorted to without departing from the principle or sacrificing any of the advantages of this invention.

Having thus described my invention, what I claim, and desire to secure by Letters Patent, is—

1. In a metal bending machine, a stationary bed bar having a flat side, a correspondingly shaped swinging bending bar arranged alongside of the stationary bar, open hinges connecting the opposite ends of the two bars and having their top edges flush with the top faces of the bars to which they are secured, substantially as set forth.

2. In a metal bending machine, the combination of two abutting channel iron bars one of which is stationary and the other movable, open hinges pivotally connecting the opposite ends of the two bars and having their top edges flush with the top faces of said bars to permit of resting the work on the hinges and extending it beyond the same the working centers of said hinges being coincident with the point of bond or fold, a movable angle clamp adapted to work onto the stationary bar at the joint edge, and means for operating the clamp and for swinging the movable bar, substantially as set forth.

3. In a metal bending machine, the combination with the stationary bed bar and the movable bending bar working at one side of the stationary bar; of the open hinges pivotally connecting the extremities of said bars and comprising fixed bearing members attached to the ends of the stationary bar and having open half circle bearings, and the journal members attached to the extremities of the bending bar and having corresponding half journals working inside of the open bearings of the bearing members, both members of the hinges having their top edges flush with the upper faces of the bars and their centers coincident with the point of bend or fold substantially as set forth.

4. In a metal bending machine, the combination with the stationary bed bar and the movable bending bar alongside of the same; of the open hinges pivotally connecting the extremities of the said bars and comprising fixed bearing members attached to the stationary bar and having half circle open bearings, the swinging bearing arms pivoted to the bearing members and having supplemental bearings adapted to be brought into alignment with the half circle bearings, and the journal members attached to the extremities of the bending bar and having half journals working inside of the half circle bearings and provided with hinge arms adapted to lift the swinging bearing arm into a functional position, substantially as set forth.

5. In a metal bending machine, the combination with the stationary bed bar and the movable bending bar alongside of the same; of the open hinges pivotally connecting the extremities of said bars and having their upper edges flush with the top faces of said bars, said hinges comprising fixed bearing members attached to the stationary bar and having half circle open bearings and bearing sockets, the swinging bearing arms having bearing hubs working in said bearing sockets, and supplemental bearings adapted to be brought in alignment with the half circle bearings, and the journal members, attached to the extremities of the bending bar and having half journals working in the half circle bearings and the supplemental bearings, and hinge arms adapted to lift the bearing arms into a functional position, substantially as set forth.

6. In a metal bending machine, the combination of two abutting channel iron bars, one of which is stationary and the other movable, of the open hinges pivotally connecting the extremities of said bars and comprisfng separate hinge members each of which is provided with an angular attaching flange adapted to be fitted into and secured within the open extremities of the channel iron bars, substantially as set forth.

7. In a metal bending machine, the combination with the stationary bed bar and the movable bending bar alongside of the same; of the open hinges comprising fixed bearing members attached to the stationary bar and having half circle open bearings and bearing sockets, the curved swinging bearing arms having bearing hubs working in said bearing sockets, open supplemental bearings adapted to be brought into extension alignment with the half circle bearings and a curved contact flange having a beveled or cam lifting edge, and the swinging journal members attached to the extremities of the bending bar and having half journals working in the half circle bearings and the supplemental extension bearings, and the off-standing curved hinge arms carrying at their extremities combined lifting and retaining lugs, and the strike lugs adapted to be lowered onto the moving ends of the bearing ends, substantially as set forth.

8. In a metal bending machine, the supporting frame, the stationary bed bar mounted on the frame and having a flat side, a correspondingly shaped swinging bending bar arranged alongside of the stationary bar, open hinges connecting the extremities of the two bars and flush with the top faces thereof, an automatically lifted clamp adapted to work onto the stationary bed bar at the joint edge, and an adjustable gage bar arranged in rear of the stationary bed bar, substantially as set forth.

9. In a metal bending machine, the supporting frame, the stationary bed bar mounted on the frame, an abutting bending bar hinged to

the bed bar, a clamp bar hinged to the top of the frame, an angle clamp secured to the clamp bar and having a beveled lower edge adapted to be clamped onto the work and the bed bar at the joint edge, said angle clamp forming in the space inclosed by the sides thereof a work pocket to accommodate bent or folded edges therein, clamp moving arms pivotally attached at their upper ends to the clamp bar, foot lever devices pivotally connected with said arms, suitably arranged weighted ropes connected with said foot lever devices, and an off-standing operating handle attached to the hinged bending bar, substantially as set forth.

10. In a machine of the class described, the combination with the supporting leg frame, and the stationary bed bar and swinging bending bar arranged on the frame; of a work clamp device hinged to one top side of the frame above said bars, clamp moving arms pivotally connected at their upper extremities to said clamp device, yoke levers pivoted to opposite ends of the frames and to the lower extremities of said clamp moving arms, treadle levers pivoted to the frame, links connected at their other extremities to the yoke levers and adjustably at their lower ends to the treadle levers, and a single weight rope having opposite portions passing over suitably arranged guide pulleys and removably attached at its extremities to the treadle levers, substantially as set forth.

11. In a metal bending machine, the combination with the bending devices; of an adjacent horizontally movable gage bar, and simultaneously movable adjusting blocks connected with each other and said bar, substantially as set forth.

12. In a metal bending machine, the combination with a stationary bed bar and an adjacent bending bar; of a horizontally moving gage bar arranged at one side of the bed bar, a series of eccentrically pivoted blocks adjacent to the gage bar one of which is provided with a curved scale edge and an extended handle, a connecting bar hinged to the extremities of said pivoted blocks, links pivoted to said blocks and to the gage bar, and a cam controlled index block arranged adjacent to the scale block and adapted to be clamped against the same, substantially as set forth.

13. In a metal bending machine, the supporting frame, a bed bar supported longitudinally on the frame, combined adjusting and securing rods fixedly attached at one end to one side of said bed bar and adjustably at their other ends to the supporting frame, a longitudinally arranged swinging bending bar at one side of the stationary bar and hinged thereto, and a horizontally moving gage bar arranged to slide on top of said rods substantially as set forth.

In testimony that I claim the foregoing as my own I have hereto affixed my signature in the presence of two witnesses.

ADELBERT J. DOUGLASS.

Witnesses:

J. H. SIGGERS,

GEO. C. SHOEMAKER.