Aug. 28, 1923. 1,466,104

R. S. SMITH ET AL

PRESS FOR OFFSETTING METAL PLATES IN THE LINE OF THEIR WIDTH

Filed March 22, 1920 6 Sheets-Sheet 1

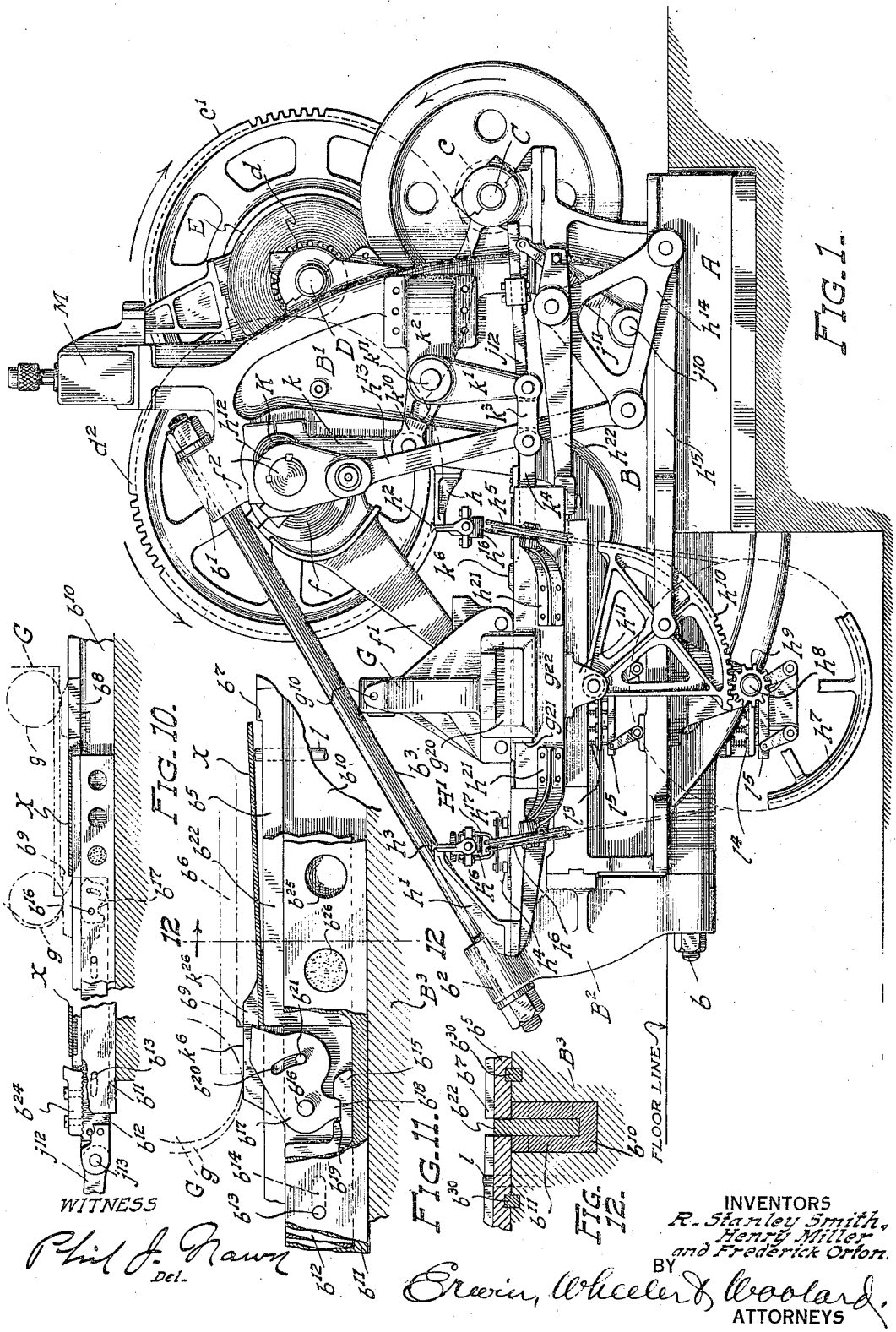


FIG. 1.

FIG. 10.

FIG. 11.

FIG. 12.

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PRESS FOR OFFSETTING METAL PLATES IN THE LINE OF THEIR WIDTH

Filed March 22, 1920 6 Sheets-Sheet 2

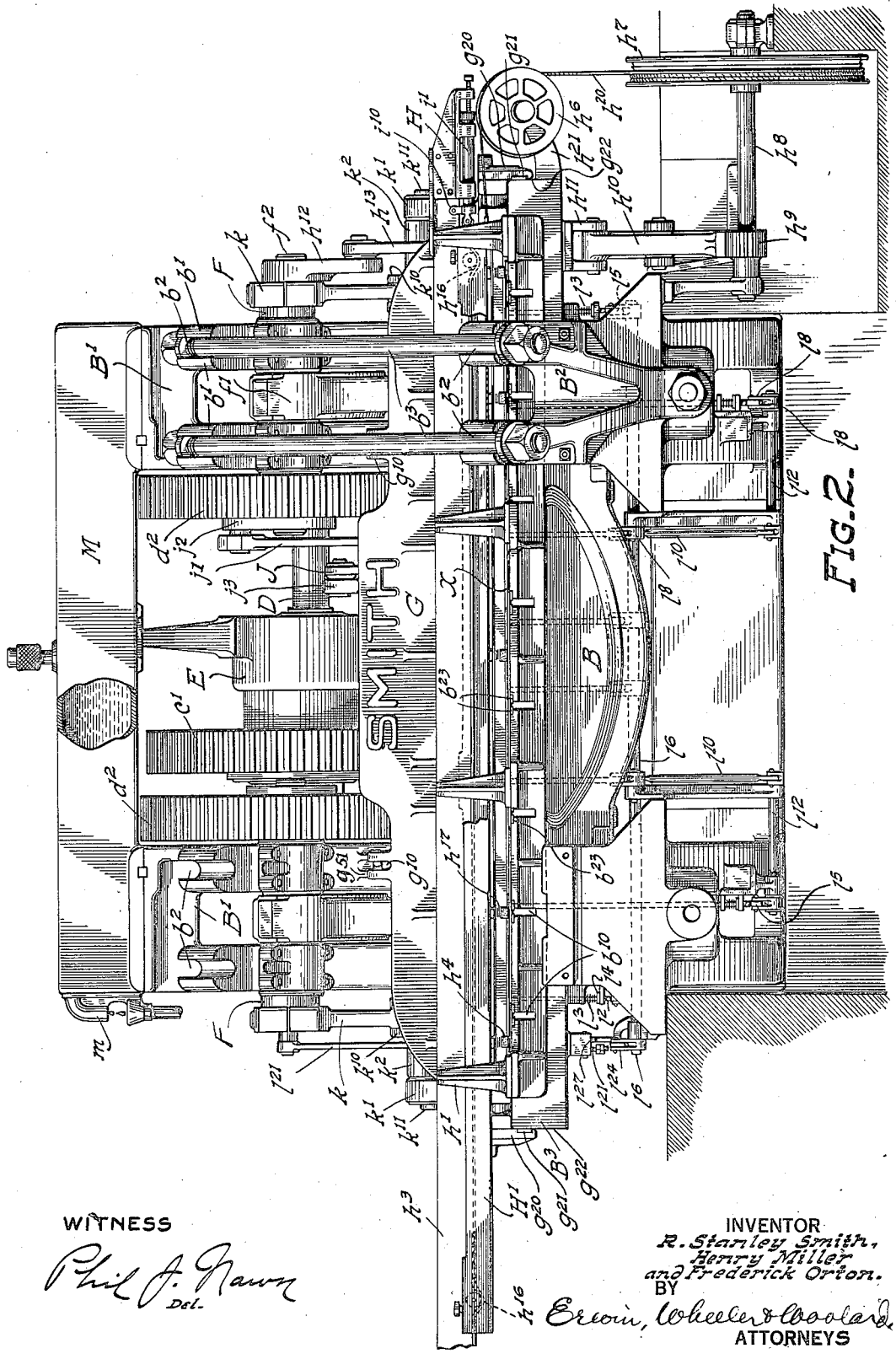


FIG. 2.

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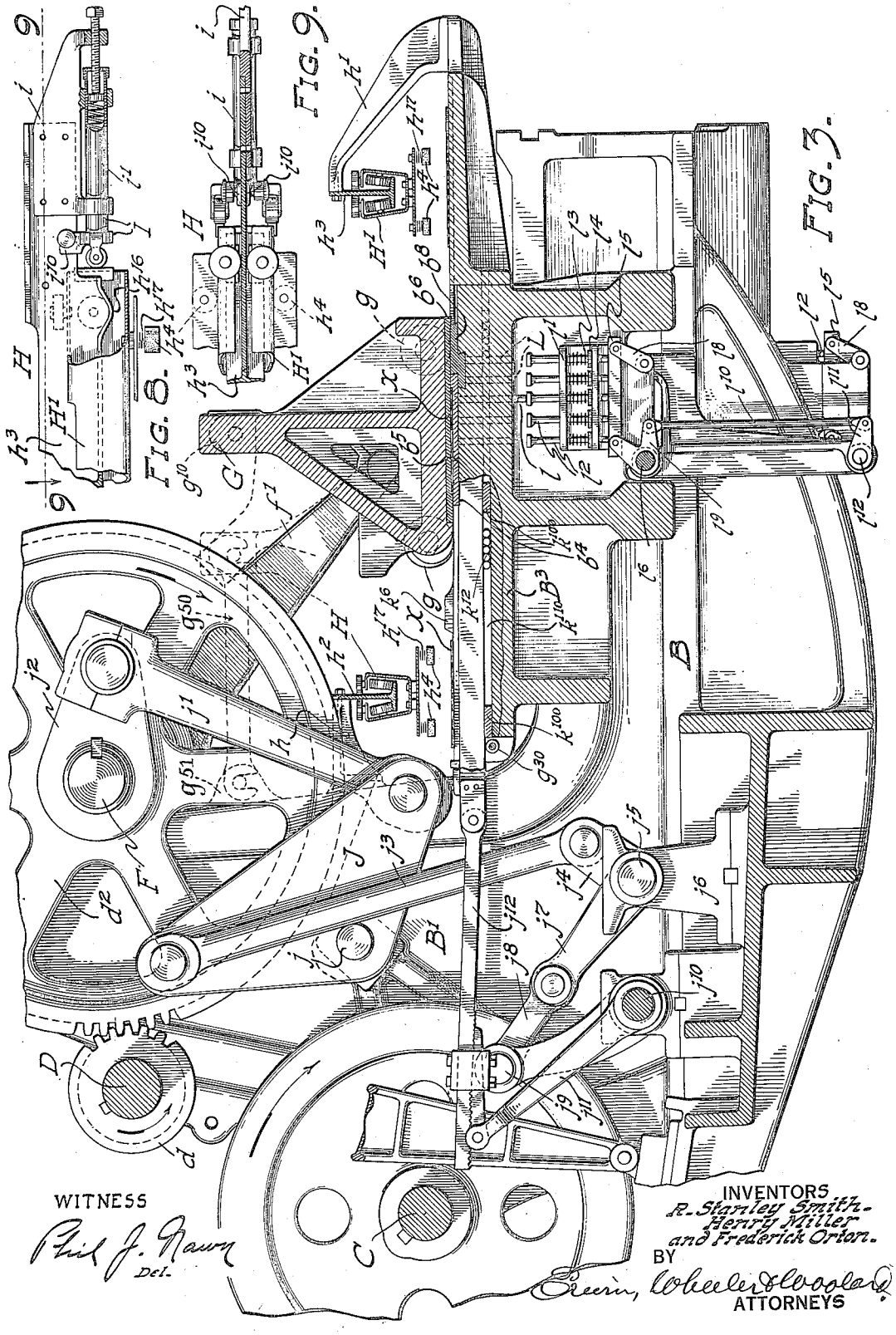
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PRESS FOR OFFSETTING METAL PLATES IN THE LINE OF THEIR WIDTH

Filed March 22, 1920 6 Sheets-Sheet 3



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PRESS FOR OFFSETTING METAL PLATES IN THE LINE OF THEIR WIDTH

Filed March 22, 1920 6 Sheets-Sheet 4

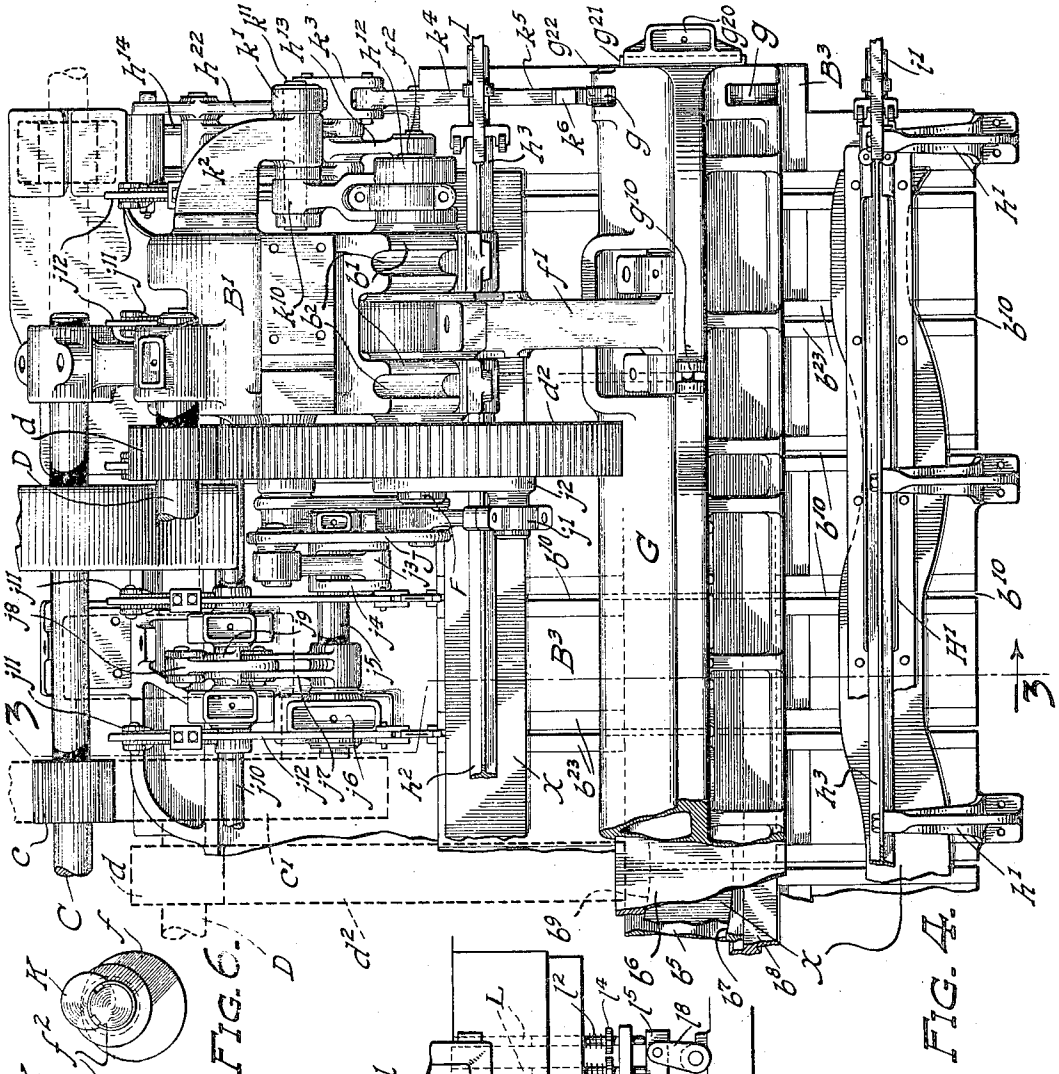


FIG. 4.

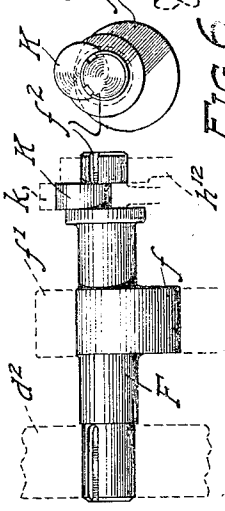


FIG. 5.

FIG. 6.

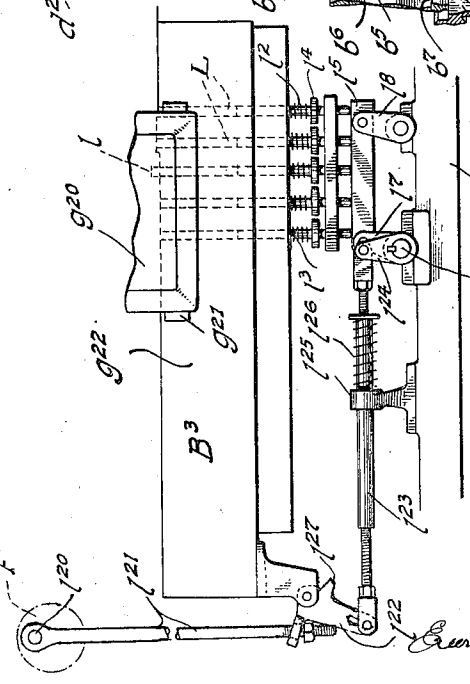


FIG. 7.

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PRESS FOR OFFSETTING METAL PLATES IN THE LINE OF THEIR WIDTH

Filed March 22, 1920 6 Sheets-Sheet 5

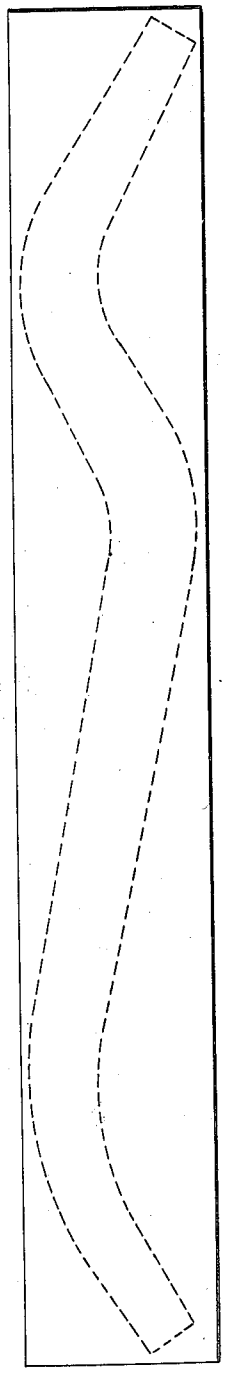


FIG. 13.

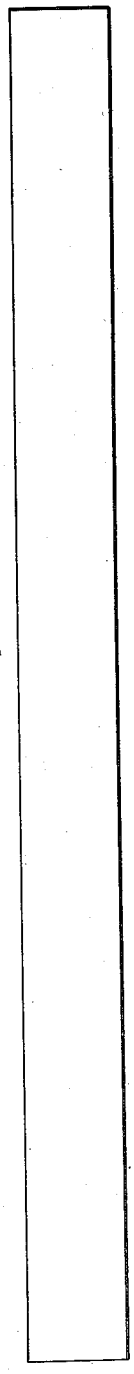


FIG. 14.

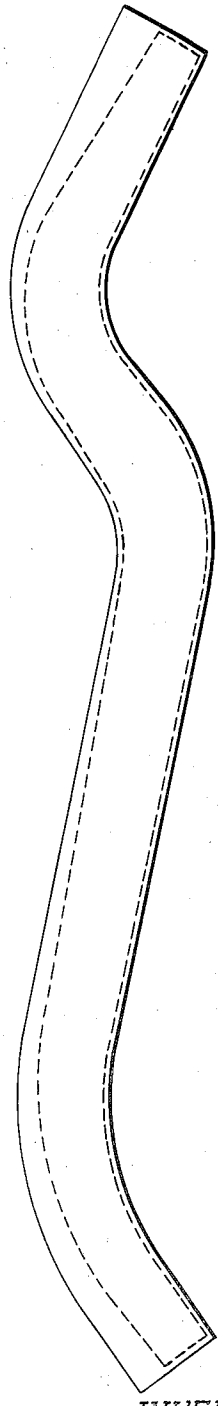


FIG. 15.

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Aug. 28, 1923. 1,466,104

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PRESS FOR OFFSETTING METAL PLATES IN THE LINE OF THEIR WIDTH

Filed March 22, 1920 6 Sheets-Sheet 6

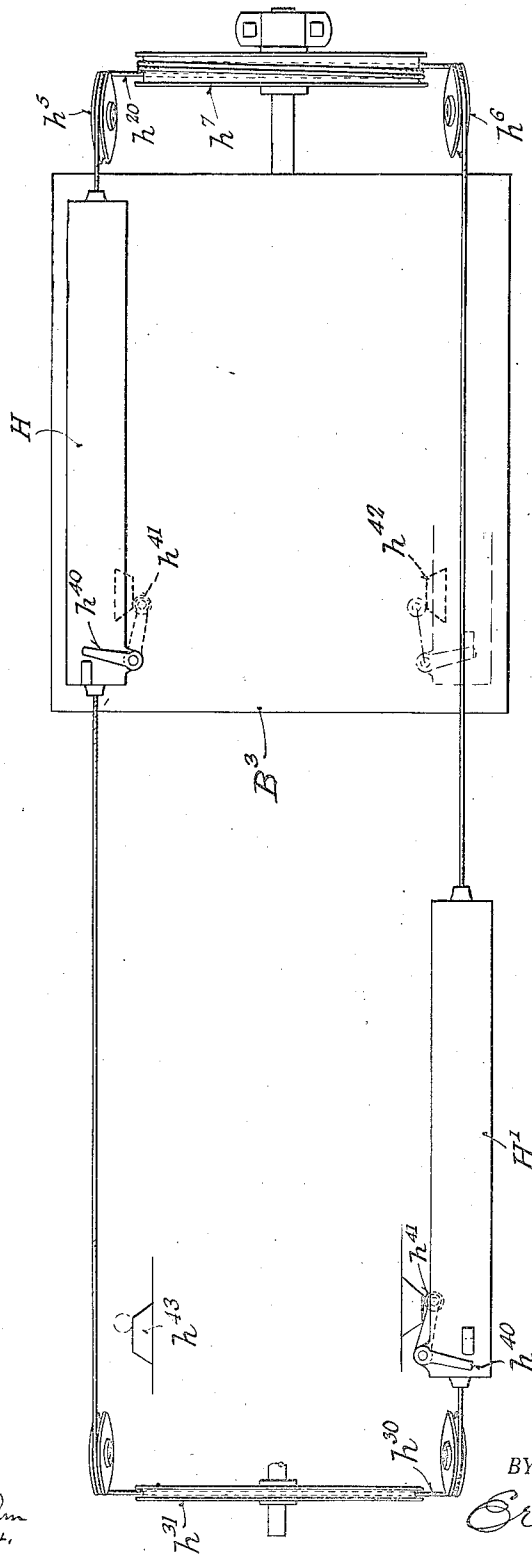


FIG. 16.

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Patented Aug. 28, 1923. 1,466,104

UNITED STATES PATENT OFFICE.

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PRESS FOR OFFSETTING METAL PLATES IN THE LINE OF THEIR WIDTH.

Application filed March 22, 1920. Serial No. 367,799.

To all whom it may concern:

Be it known that we, REUBEN STANLEY SMITH, HENRY MILLER, and FREDERICK ORTON, all citizens of the United States, and residing in the city of Milwaukee, county of Milwaukee, and State of Wisconsin, have jointly invented a certain new and useful Improvement in Presses for Offsetting Metal Plates in the Line of Their Width; and we hereby declare the following to be a full, clear, and exact description thereof, such as will enable others skilled in the art to which the invention pertains to make and use the same, reference being had to the accompanying drawings for a disclosure as to one form of construction in which the invention has been embodied.

The invention outlined.

The invention relates to offsetting presses which are designed to impart an edgewise bend to a flat metal plate.

Our present invention resides in an improvement upon the offsetting press designed by Henry Miller, one of the inventors herein, and disclosed in Patent No. 1,340,138, granted May 11, 1920, on an application filed March 30, 1918, Serial #225,791.

Curved articles, such as the curved side bars of an automobile or other vehicle frame, are now produced from appropriately contoured flat blanks punched from sheet metal plates, followed by an operation in which the blanks are duly flanged by the dies of a drawing press. These products as is well known, have the formation of channel bars in cross section, which bars are constituted of a vertical web with parallel flanges extending from one side of the web. The width of the contoured blanks generally varies in the length thereof. Inasmuch as the flanges as a rule are uniform in the distance of their projection from the web, the variations referred to are usually limited to the web, in the completed bar.

While the straight or main portion of the side bar drawn from the blank, is usually defined by parallel lines, extending in the direction of the length thereof, it happens that the curved portions of the side bar in their relation to the area of the blank from which the bar is formed, will in many types of bars extend a considerable distance at one or both sides of the area bounded by the parallel lines. In consequence of this, the width of the blank between extreme points on the lines projected in parallelism with the lines defining the straight or main portion of the side bar, must greatly exceed the width of the blank in the sections which are to form the straight portions of the side bar.

It is therefore required that a metal plate or sheet having a width in excess of the width of the blank upon the parallel lines of its most widely separated or extreme points, be used in order that an integral blank of the required contour and over-all width may be punched therefrom, but, as one result of such requirement, a considerable portion of the superficial area of the metal plate or sheet lying beyond the contour lines is without use and is wasted.

This requirement necessitates also the consumption of an excessive quantity of material, with the result that the amount of scrap following the older yet prevailing practice is very great and largely disproportionate to the area embraced within the contour lines of the side bar blank. For example, the width of a side bar blank may not exceed 8 inches at any point in the length thereof, but by reason of such side bar being required to be produced with curves at certain points, one of which will project 2 inches at one edge of the blank and the other of which will project 4 inches at the other edge, it will be necessary to use a metal plate 14 inches in width, in order to present sufficient area for the production therefrom of a side bar blank having a width no greater than 8 inches at any given point. The high percentage of loss of expensive material which follows this wasteful method of production is quite obvious, and inasmuch as there are but limited purposes for which the waste portions can be utilized, it results that a large proportion of the superficial area of the metal plate has no value other than as scrap. To convert this waste material into merchantable form involves further expense in handling and reduction to scrap of such sizes as to accord with the requirements of the steel foundries and rolling mills, which specify that scrap presented for purchase must not exceed certain dimensions.

By the use of our invention, we have practically eliminated the waste above referred

to, and are able to produce a contoured blank from which a curved side bar for an automobile frame may be produced, and this we do from a metal plate having very little or no greater width than the side bar blank at any given point, and the superficial area of which plate exceeds but slightly the area of the blank to be punched therefrom.

In carrying out our invention, we take a rectangular sheet metal plate the width of which may be several inches less than the width which would be required in a metal plate for the production of the blank under the older practice. By applying pressure to the opposite edges of the metal plate we offset or bend the same edgewise or in the direction of its width, and so convert a rectangular plate into a plate with curved edges and of such extreme width between its projected side lines that a side bar blank provided with the necessary curved sections may be punched therefrom with the creation of a minimum of waste material.

Our improved press is equipped with a pair of dies having acting faces conforming to the outlines of the curved blank which it is desired to produce. When a rectangular plate is placed between the dies and pressure is exerted to cause such dies to have a relative approach to each other, the metal of the plate will flow cross-wise of the plate under the pressure exerted by the dies so as to conform to the outlines thereof. For instance, instead of using a 14 inch metal plate in the production of a curved side bar blank, the greatest width of which on any line is only 8 inches, with an over-all width of about 14 inches, we may use a plate having a width but slightly in excess of 8 inches, and by bending the plate edgewise as described, produce a curved plate from which a curved blank for the side bar may be punched, notwithstanding that the curved blank at its extreme opposite points on projected parallel side lines does have a width greatly in excess of 8 inches.

As in the press disclosed in the patent hereinbefore referred to, the offsetting dies of our improved press act also with a clamping action upon the sides of the metal plate, and thus prevent any disturbance of the plane of the plate when the bending pressure is applied to the edges thereof.

In our improved construction of press, the offsetting head may be partially rotated so as to separate the die members, and form an angular opening in which the dies mounted upon the bed and the offsetting head, respectively, will be rendered accessible when it becomes necessary to effect adjustment or replacement.

We have also provided means for effecting complete separation of the die members at the conclusion of the offsetting operation, so that a fresh plate may be fed between the dies at the moment that the curved plate is ejected therefrom.

We have further provided an electromagnetic carrier system by means of which the metal plates are delivered to the press in a position to be fed to the offsetting dies, and which system also carries from the press the curved plates after the latter have been acted upon by the offsetting dies.

A novel feeding means has been devised for use in connection with our improved press, whereby the rectangular plates are automatically fed between the separated offsetting dies, and ejected therefrom after the offsetting operation has been performed. The movement of ejection of the curved blank from between the offsetting dies continues to a point where such curved blank is deposited in a position to be picked up and taken away by the out-going carrier previously mentioned.

The several novel features residing in our invention will be pointed out in the claims appended to this specification.

The drawings.

In the drawings which accompany this specification,

Figure 1 is a view in end elevation showing the general arrangement of the parts of an offsetting press embodying our invention, and looking from the right in Fig. 2.

Fig. 2 is a view in side or front elevation, looking from the left of Fig. 1.

Fig. 3 is an enlarged view partly in section, on the line 3—3, Fig. 4, and looking in the direction of the arrow on the said line.

Fig. 4 is an enlarged plan view of the portion of the press at the right of Fig. 2, many parts being broken away in the interest of clearness.

Fig. 5 is a view in elevation showing one of the eccentric shafts for imparting movement to the offsetting and clamping head during the offsetting operation.

Fig. 6 is an end view of the said shaft, looking from the right in Fig. 5.

Fig. 7 is a view showing the actuating mechanism for the lifter or knock-out mechanism.

Fig. 8 is a view in elevation, partly in section of the electromagnetic carrier or transfer device by which the metal plates are fed to the press and removed therefrom, this view showing also the arrangement of the buffer device designed to arrest the movement of the electromagnetic carrier when the end of its throw has been reached.

Fig. 9 is a plan view of the parts shown in Fig. 8, such view being taken on the line 9—9, Fig. 8.

Fig. 10 is a view in elevation of the devices for feeding the metal plates into position for action thereon by the offsetting and clamping dies.

Fig. 11 is an enlarged view of some of the parts shown in Fig. 10, indicating the manner in which the parts illustrated perform their functions, and showing the operation of the knock-out device.

Fig. 12 is a vertical sectional view of the feeding slide on the line 12—12, Fig. 11, looking in the direction of the arrow.

Fig. 13 is a conventional illustration, inserted for the purpose of enabling a ready understanding to be had of the comparative area of a rectangular metal plate required to produce a curved side bar blank of given contour, under the systems of production heretofore prevailing.

Fig. 14 illustrates a rectangular metal plate the dimensions of which are much less than the dimensions of the blank illustrated in Fig. 13, but which may have its longitudinal lines so changed by operation of our offsetting press, as to permit the production therefrom of the side bar blank having the contour outlined in Fig. 13.

Fig. 15 is an illustration of the plate shown in Fig. 14 in the form in which it appears after having been subjected to an edgewise bending or offsetting operation in our improved press. This view also has indicated thereon the outlines of the curved side bar blank, the dimensions of which are exactly those of the side bar blank indicated in Fig. 13, and which may be punched from the curved metal plate with a minimum waste of material.

Fig. 16 shows diagrammatically the arrangement of the connections for operating the electro-magnetic carriers.

In the several views, like reference characters have been used to designate the same parts.

The frame structure.

In the drawings, the base A of the offsetting press will be supported upon any suitably arranged foundation, such base being set approximately at the floor line. The main frame B resting upon the said base is provided with standards B^1 at the rear side for supporting the shafts of the main driving and operating mechanisms, and with other standards B^2 at the front thereof. The structure composed of the main frame B and the parts indicated B^1 and B^2, has in its general aspect a C-outline, and may be formed in one piece or of a plurality of pieces properly united so as to form a rigid and unitary structure. In the construction illustrated in Fig. 1, the standards B^2 are separately formed and united to the main frame B by bolts or tie rods b. At their front sides the standards B^1 are provided with branches b^1 in the tops of which are formed recesses b^2, similar recesses b^2 being formed in the tops of the standards B^2. These recesses lie in the same plane and are adapted to receive straining rods b^3, which tie the parts of the press together to enable it to better resist the stresses of the offsetting mechanism, which are exerted in the general direction of or approximately in the plane in which the straining rods b^3 lie.

The driving means.

The driving shaft C of the machine is journaled in bearings at the rear of the main frame, and its direction of rotation is indicated by the arrow on the fly wheel. A pinion c keyed to the shaft C, meshes with a gear c^1 rotating loosely upon a shaft D, likewise journaled in bearings at the rear of the machine, and to which shaft D movement of the gear c^1 is transmitted by a clutch E of suitable construction, and which may be operated at the desired time intervals to impart rotation to the shaft D, from the driving shaft. Pinions d, d, keyed to the shaft D, mesh with gears d^2, d^2, keyed to the aligned eccentric or cam shafts F, F, journalled in bearings at the front of the standards B^1. The shafts F are provided with eccentrics f, which serve to impart movement to the offsetting and clamping head of the machine, in a manner which will presently be described.

The offsetting mechanism.

The main frame B is provided with a bed B^3 having a smooth top surface, which is channeled as at b^4 for the reception of one of the pair of contoured dies indicated b^5 and b^6 in Figs. 3 and 11, and which dies receive between them the plate which is to be offset in the direction of its width. In the form in which the machine is illustrated, the offsetting die b^5 is placed in the channel of the bed and fixed in position upon the latter. This die, it will be observed from Figs. 3, 10 and 11, is cut away to a depth equal to the thickness of the plate to be offset, so as to present a shoulder b^7, which follows an irregular line as indicated in Fig. 4, and which conforms to the outline of the curve which it is desired to produce in the particular plate to be offset. As indicated in Figs. 3 and 10, the die member b^5 will be backed up by a shouldered strip b^8 of hardened metal dovetailed lengthwise of the bed B^3, and fixed therein, and underlying in part the die b^5. The face of the die b^5, lies flush with the rear surface of the bed B^3 so that the blanks x may be moved without obstruction into engagement with the shoulder b^7, of the said die.

A movable offsetting head G, to the under side of which the complemental offsetting die b^6 is attached, is adapted to travel over the bed of the press. Because of the difficulties encountered in manufacturing dies of considerable length, this die is made in comparatively short sections, with the

edges thereof arranged in contact, so as to be continuous. The loss incident to warping in tempering lengthy dies and the breakage under the strains imposed thereon is therefore avoided by the use of sectional dies of short lengths. The eccentrics f, on the shafts F hereinbefore referred to, are connected by means of eccentric links f^1, so as to impart the thrust of the eccentrics to the said movable head. As shown in Figs. 3 and 11, the offsetting die b^6 is also cut away to the thickness of the plate x which is to be offset, so as to present a shoulder b^9 which like the shoulder b^7 on the complemental die b^5, will follow a curved line conforming to the outline possessed by the plate which is to be offset in the direction of its width. The offsetting head G carrying the die b^6, is provided with rollers g at the front and rear sides thereof, so as to lessen the frictional engagement of the said head in its reciprocatory movements over the bed of the press.

Referring to Fig. 3, it will be observed that the rotation of the eccentric shaft F is in the direction indicated by the arrow, and that as a result of this movement, a downward or clamping pressure is applied to the plate at or before the commencement of the offsetting operation. The clamping movement thus exerted at the time stated is important, for it serves to hold the plate with its sides in exactly parallel planes, and prevents any buckling of the plate at the time of the application of the offsetting pressure. As the eccentric f continues its thrust with an increasing pressure upon the offsetting head, the clamping pressure relaxes in a slight degree on account of the change in the angle upon which the clamping pressure is applied, due to the rotation of the eccentric shaft. However, inasmuch as the offsetting pressure applied to the metal plate has instituted a molecular movement in the said metal plate, such movement will continue until the eccentrics have made their full throw and the offsetting dies have imparted the desired shape to the plate, and this result is achieved without disturbing the planes in which the sides of the metal plate lie. The effect of the movement of the upper offsetting die b^6 against the metal plate resting upon the fixed lower offsetting die b^5, will be to cause the said metal plate to completely conform to the irregular outlines of the correspondingly contoured shoulders b^7 and b^9 of the said offsetting dies.

The bed B^3 of the machine is provided with a series of spaced transverse channels b^{10}, in which channels slides b^{11} are mounted for movement. The slides b^{11} serve to feed the metal plates into position for operation thereon by the offsetting dies, in a manner which will presently be described. See Fig. 12. The offsetting dies b^5, and the backing strip b^8, are likewise formed in short sections. The length of each of such sections is approximately equal to the distance by which the said transverse channels b^{10} are separated. A key b^{30}, seated in the bed, and engaging a corresponding seat in the under side of the die section at each side of the slot, will prevent movement of the die sections toward the rib b^{22}, to be later referred to and avoid binding the latter by the pressure applied to the dies. See Fig. 12.

The devices for supplying the rectangular plates.

The metal plates which are to be offset are delivered to the machine for offsetting, by reciprocating electromagnetic carrier devices. Supported upon brackets h, which are attached to the frame work of the machine, is a track h^2, the location of which is indicated in Figs. 3 and 4. The vertical web of the track section is attached to the brackets referred to, and upon the lateral flanges extending from the bottom line thereof, an electromagnetic carrier H is arranged to travel. The said carrier is provided with antifriction rollers which serve to support and position the carrier with respect to the track on which it travels in carrying the metal plate into the machine. Suspended from the lower side of the carrier are the electromagnets h^4.

The metal plates to be offset are stacked or presented at one end of the press, which in the construction illustrated is the left hand end, viewing Figs. 2 and 4.

From such position, the metal plates are brought into the press and deposited at the rear of the offsetting head, by the carrier H moving over the track. In operation, the carrier H is withdrawn to the limit of its outward movement along the track h^2, at which time the electromagnets of the carrier will be energized, so that such magnets will attract a metal plate then in position to be brought into the machine. When the carrier has made its movement over the track h^2 to the limit of its inward stroke, the magnets thereon will be deenergized and the metal plate supported by the magnets will be released and be permitted to rest at the rear of the offsetting head, upon the feeding devices by which it will be positioned between the offsetting dies for action, as will be described later.

At each end the track h^2, viewing Figs, 2 and 4, is provided with a buffer device I, with which the carrier will contact at the end of either movement. This buffer device is supported by a bracket i secured to the track, and comprises an adjustable spring pressed plunger i^1, having at its forward end a yoke carrying a pair of separated rollers for con-

tact with the housing of the carrier, in the manner illustrated in Figs. 8 and 9. The forward or inner end of each plunger is also provided with two friction devices i^{10} adapted to bear against the sides of the vertical web of the track, and so create a resistance to the further movement of the carrier, when the latter has reached the end of its throw.

In their normal operation, the electromagnets move in a plane a little above the bed of the press so as to allow a space between the magnets and the bed of the press for the clear movement of the metal plates over the bed of the press. At the moment that the magnets are energized to attract the metal plates, it is desirable that such magnets be permitted to descend below the plane of their normal movement. This result we achieve by forming depressions in the supporting flanges of the track, into which the supporting rollers of the carrier will run, so that when passing over such depressed portions of the track the electromagnetic carriers will be lowered and the magnets thereof brought into contact with the metal plate at the moment in position thereunder. This construction is illustrated in Figs. 2 and 8, in which the track is shown as depressed at h^{16}. To relieve the magnets from the shock of the contact with the metal plate when the carrier passes over the depressions and into the lower plane as described, we have constructed the magnets h^4 with capacity for yielding movement under the impact with the metal plate, and have surrounded the shank of such magnets with expansion springs h^{17}, which will be compressed upon the occurrence of the contact mentioned, and so absorb the shock of the impact.

The devices for removing the curved plates.

Having in the foregoing described the construction and operation of the devices which supply the machine with rectangular plates, it seems appropriate to now describe the devices for removing the curved plates from the machine after the offsetting operation, in view of the similarity of construction and the joint operation of the said plate supplying and removing devices, together with their actuating mechanism, and to described at a later time the construction and operation of the means which feed the rectangular plates to the offsetting mechanism.

The devices for removing the curved plates from the machine after the offsetting operation has been performed, are the same in construction and operation as the devices which supply the rectangular plates thereto, and having fully described the supplying devices, it will be sufficient to state that at the front side of the machine, brackets h^1 are arranged so as to support a second rail h^3, upon which operates a second electromagnetic carrier H^1, in the construction of which the arrangement previously described is duplicated, and needs no further description. The electromagnets of the two carriers are energized and deenergized in proper order to achieve the desired operations.

The electro-magnets may be controlled by a timing mechanism, or by switches of suitable construction. In Fig. 16, we have illustrated a knife-switch of simple form which has proven effective in operation. Each of the carriers H and H′ has mounted thereon a switch, the knife h^{40} of which is formed as one arm of a bell-crank, and the other arm of which carries an anti-friction roller h^{41}, the latter being aligned for contact with oppositely arranged fixed cams h^{42} and h^{43}, which are adapted to vibrate the rollers h^{41} to open and close the switches at the end of the reciprocations of the carriers, to energize and de-energize the electro-magnets, whereby the metal plates are picked up and released at the proper times.

Means for operating the electromagnetic carriers.

A cable h^{20}, the ends of which are attached to the jointly operating electromagnetic carriers, H, H^1, is guided by grooved wheels h^5 and h^6, journaled in brackets h^{21} at the right hand end of the machine, and is passed about a winding drum h^7 supported in journal boxes below the main frame at one end of the machine. The said drum h^7 is fixed on a shaft h^8, carrying also a fixed pinion h^9 which is in mesh with a sector gear h^{10}, the axis of which is mounted in a bracket h^{11} depending from the frame of the machine. Keyed upon the end f^2 of the eccentric shaft F is a crank h^{12}. The latter is connected by a link h^{13}, to one arm of a bell crank lever h^{14}, mounted upon a bridge piece h^{22}. The other arm of the bell crank is connected by a link h^{15} to the sector h^{10}, before referred to. It will thus be seen that with each rotation of the eccentric shaft F, an oscillating movement is imparted to the sector gear h^{10}, with the result that a rapid rotation is given to the drum h^7, the duration of the rotation of the said drum h^7 being sufficient to give a full traverse movement in opposite directions to the electromagnetic carriers H, H^1, which are attached to the cable before referred to as being passed about said drum. It will be understood that the opposite ends of the carriers may be attached to the ends of another cable h^{30} which is passed around a grooved idle pulley h^{31} rotating upon a fixed post at the other end of the machine, so that the draft upon one of the electromagnetic carriers H, H^1, will act through this second cable and its guiding pulley to move the other electromagnetic carrier in the contrary direction. This arrangement for transmitting

motion is so simple and well known that it is not necessary to illustrate or further describe the same. It will be observed that the rails or tracks h^2 and h^3 upon which the electromagnetic carriers H and H^1 operate, are disposed in parallel relation one at each side of the longitudinal plane of the offsetting head G.

The means for feeding the plates to the offsetting dies.

At a previous place in this specification we have referred to the bed B^3 as formed with a series of transverse channels b^{10}, in each of which channels a slide b^{11} has a reciprocating movement. For a portion of its length the said slide is formed U-shape in cross section, so as to constitute a groove in which the trigger actuating slide b^{12} is arranged for limited movement. As shown in Figs. 10 and 11, the slide b^{11} supports fixed pins b^{13} passed therethrough from side to side. These pins also pass through slots b^{14} formed in the trigger actuating slide b^{12}, so as to allow the trigger actuating slide to have a movement independent of the slide b^{11}. The range of such independent movement is determined by the length of the said slots b^{14}.

The trigger actuating slide b^{12} is formed with an extension b^{15} at its inner end, which extension lies in the bottom of the groove of the slide b^{11}. A cross pin b^{16} is fixed in the slide b^{11} near the inner end of the said groove, and mounted so as to rock freely upon the said pin is a trigger b^{17}. The said trigger is provided with a projection b^{18}, arranged radially with reference to the pivotal point of the trigger, which projection is seated in a notch b^{19}, cut in the face of the extension b^{15} of the trigger actuating slide. The action of these parts is like that of a rack and pinion motion. The trigger b^{17} has formed therein an arcuate slot b^{20}, which receives a pin b^{21} fixed in the sides of the slide b^{11}. The slots b^{14} and b^{20} are co-extensive, and the latter slot by reason of the pin passed therethrough serves to limit the vertical rocking movement of the trigger when the independent movement before referred to is imparted to the trigger actuating slide b^{12}. As shown in Fig. 11, the trigger actuating slide b^{12} has been given its full independent movement to the right, and has acted to raise the point of the trigger b^{17} out of the slot b^{10} and above the face of the bed B^3. The reverse operation is shown in Fig. 10, in which the trigger actuating slide b^{12} has received its full movement to the left, and has consequently withdrawn the trigger from its elevated position and to its position within the groove in the slide b^{11}. The purpose of these movements will be presently described.

Fig. 12 is a sectional view on the dotted line 12—12, Fig. 11, showing the slide b^{11} in the cross section at that end which is nearest the front of the machine. The forward end of the slide b^{11} extending in advance of the groove therein is provided with an upstanding rib b^{22}, which completely fills the contracted space between the contiguous edges of the lower offsetting die sections b^5. The said rib b^{22} will be of such length as to equal the width of the plate to be bent lengthwise so that when the slide b^{11} has been moved to proper position with relation to the said die sections, the rib b^{22} will fill such space and the horizontal face of the die will be unbroken, as indicated in Fig. 12. Consequently, any tendency of the plate to buckle in the offsetting operation by reason of the existence of the channels in the bed B^3, will be resisted by the presence of the rib, and the side planes of the plate will not be distorted by the pressure exerted against the edges thereof. As conventionally illustrated in Figs. 2 and 4, the upper part of the channel b^{10} is reduced by means of spaced parallel filler strips b^{23}, secured in channels cut in the face of the bed B^3. These filler strips abut the opposite sides of the die sections b^5, and bear upon the shoulders formed by the rib b^{22}, as the slide b^{11} is reciprocated.

At their outer ends the trigger actuating slides b^{12} are provided with adjustable gauges b^{24}, which gauges project above the face of the bed B^3, and are normally at the rear of the line upon which the plate x is deposited upon the incoming movement of the electromagnetic carrier H. The mechanism for imparting movement to the slides is connected to the trigger actuating slide b^{12}, and upon taking up the lost motion due to the presence of the slots b^{14}, the two slides b^{11} and b^{12} thereafter move as one, in either direction. In the position indicated in Fig. 10, the slides are shown as having made their full movement to the left, which in the actual construction will be to the rear of the machine. The triggers b^{17} carried by the several slides have been withdrawn to their lower position in the channels of the slides. It will be seen that the gauges b^{24} are in the rear of the plate x, which has just been deposited by the electromagnetic carrier H in position to be fed into the press, and that the depressed triggers b^{17} are at the same moment just in the rear of the blank now between the dies of the offsetting press. Independent movement of the slide b^{12} will move the triggers b^{17} to the position shown in Fig. 11, with their points projected from the slots in the bed B^3, and the further joint movement of the slides b^{11} and b^{12} will feed the rectangular plate x to the offsetting dies and will, at the same time, remove from the press the curved plate previously acted upon by the offset-

ting dies. The extent of the joint movement of the slides b^{11} and b^{12} is sufficient to carry the curved plate from the offsetting dies to a point at the front of the machine, where it will be deposited on the bed in position to be picked up and carried from the press by the outgoing electromagnetic carrier H¹. As indicated, this movement of the slides b^{11} and b^{12} serves through the gauges b^{24} to carry a new plate from its position at the rear of the press to the center line of the bed thereof and deposit such plate upon the lower offsetting die b^5. The slides having performed their function of delivering the curved plate previously acted on by the offsetting dies, and of feeding a fresh plate to such dies, will now retire to their rearward position. At the commencement of this movement to the rear, the independent movement of the trigger actuating slides b^{12} will withdraw the triggers b^{17} below the face of the bed and into the channels therein provided, and in such retracted position the said triggers will move in a plane which is below that occupied by the plate just inserted between the offsetting dies, and free from contact with the said plate. The operations described complete the cycle. In their forward movement, the raised points of the triggers b^{17}, pass along the contracted slot formed by the filler strips b^{23} and the contiguous ends of the sections b^5, of the lower offsetting die.

In order that the rectangular plate may be inserted between the offsetting dies, and the curved plate may be removed therefrom, it is necessary to provide means for effecting the separation of the offsetting dies to allow such insertion and removal. It is necessary also to provide devices for releasing the curved plate by lifting it clear of the lower die b^5, after the action of the offsetting dies so as to permit the removal of the plate. These mechanisms will be referred to later on.

Actuating means for the feeding devices.

A bell crank J pivoted upon a stud j mounted in the standard B¹, is connected by means of a link j^1 to the pin of crank j^2 keyed on the end of the eccentric shaft F adjacent the gear d^2. The other arm of the bell crank is connected by a link j^3 to an arm j^4, of a rock shaft j^5 mounted in bearings j^6 on the main frame. Fixed to the said shaft is one arm j^7 of a toggle, the other member j^8 of which toggle is connected with an arm j^9 of a rock shaft j^{10}, likewise mounted in bearings on the main frame. Fixed to the rock shaft j^{10}, at points opposite the transverse slots b^{10} in the bed of the press, are radial arms j^{11} pivoted at their upper ends through an adjustable connection to links j^{12}, which at their front ends are pivotally connected at j^{13} to the trigger actuating slides b^{12}, before referred to. The several slides b^{11} and B¹² will be actuated in unison to perform the operations of feeding the rectangular plate to the offsetting dies and removing the curved plates from such dies, in the manner previously described.

The forward ends of the slides b^{11}, are provided with openings b^{25}, which will be filled with a friction substance b^{26}, adapted to bear against the side walls of the grooves b^{10}, and overcome any tendency possessed by the said slides to have a movement other than that which is imparted to them through their actuation by the trigger slides b^{12}.

Anti-friction rollers, one of which is indicated g^{30}, in Fig. 3, will be placed in each of the transverse slots or channels k^5 in the bed B³ so as to ease the movement of the cam slides k^4 which work in such slots or channels.

Means for raising the offsetting head.

When the offsetting head is in normal clamping position upon the bed B³ of the press, the thickened shoulders b^7 and b^9 of the offsetting dies bear against the respective opposite faces or sides of the dies b^5 and b^6. To provide for the insertion of the rectangular plate between the said dies, and the removal of the curved plate therefrom, it is necessary that the offsetting head be raised so as to separate the dies and permit the manipulation of the plates in the manner described.

As hereinbefore stated, the offsetting head G is provided with antifriction rollers g at its ends, which rollers move over the top of the slides k^4, there being one of such rollers g at the front and at the rear of each end of the offsetting head. The rollers at each end are arranged in tandem to travel in the same path.

The eccentric shaft F at each end of the press is provided with a crank k, as shown in Fig. 5. One end of a link k is attached to the said crank and is connected at its other end to one arm k^{10} of a shaft k^{11} mounted on a bracket k^2 attached to the standard B¹. By means of a link k^3, the other arm k^1 of the shaft k^{11} is pivoted to a cam slide or wedge piece k^4, which works in an open channel or groove k^5 one at each end of the bed B³, and in the path of the travel of the antifriction rollers g. Each of the slides k^4 is provided with two cams or wedges k^6, spaced apart to correspond with spacing of the tandem rollers g at each end of the offsetting head.

In the operation of this feature of our construction, the movement of the offsetting head to impart an edgewise bend to the metal plate by the offsetting dies, is followed by a movement of the slides k^4, so that at the completion of such offsetting op-

eration the cams k^6 on the said slides are at the immediate rear of the rollers g of the offsetting head. The reverse throw of the eccentrics f which actuate the offsetting head, being greater than the throw of the cranks k, the offsetting head is caused by the rollers g to be drawn upon the cams k^6, so as to elevate the offsetting head above the bed of the press, and thus separate the offsetting dies sufficiently for the insertion therein of a fresh plate and the removal of the curved one therefrom. The cranks K having made their full throw, now act to withdraw the cam slides k^4 with the offsetting head G supported thereon. The eccentrics f having reached the limit of their rearward throw, the offsetting head G will come to a position of relative rest, with its dies b^6 upon the bed of the press, as the cam slides continue their rearward movement to withdraw from the support of the offsetting head. While the offsetting dies have been separated in the manner described, the feeding of the rectangular plate to the said dies and the removal of the curved plate therefrom will have taken place.

When the offsetting head G has completed the offsetting operation, and has commenced its rearward movement, the cams k^6 on the slides k^4, pass thereunder in the separating movement, as hereinbefore described. During the joint further movement to the rear, the great weight of the offsetting head is carried upon the said slides k^4, and to minimize the frictional effect in supporting and moving a weight of such proportions, we arrange the slides k^4 upon a series of supporting roller bearings, whereby the load is sustained during its movement.

In Fig. 3, a conventional showing of the arrangement appears. In the groove k^5, in the bed B^3, spacing blocks k^{100} are placed, so as to divide the said groove into channels k^{110}, in which are placed a series of rollers k^{12}, to form anti-friction bearings for the slides k^4, when the latter assume the task of supporting the offsetting head G.

Means for rocking the offsetting head to change the dies.

In order that the offsetting dies of the press may be expeditiously changed when it is desired to produce blanks having a different contour, we provide means whereby the offsetting head may be rocked so as to make accessible from the front of the press the under side of the offsetting head, to which the dies b^6 are attached, and also the corresponding area of the bed of the press, upon which the sectional dies b^5, are fixed.

The rollers g at the rear of the offsetting head G project slightly beyond the outlines of the head in which such rollers are mounted. Lugs g^{10} are formed upon the vertical web of the offsetting head and hooked rods g^{50} will be employed to connect the said lugs to fixed points g^{51} on the front of the standards B^1. Such hooked rods will act to restrain the upper portion of the offsetting head against movement from the rear line position (see dotted lines in Fig. 3) to which the head has been moved. The thrust of the eccentrics f will now cause the offsetting head to rock upon the connections with the lugs g^{10} as centers, thus effecting an angular separation between the face of the offsetting head and the bed of the press, and providing an open space in which the offsetting dies are rendered accessible for making the desired changes. In such rocking movement, the rollers g will move forward over the cam slides k^4 and support the offsetting head free from friction with the bed during such movement. After the dies have been changed, a continued operation will restore the offsetting head to its operative position upon the bed of the press, and the connectors g^{50} may be removed.

The knockout mechanism for the curved plates.

Inasmuch as the upper plane of the thickened shoulder b^7 of the offsetting die b^5 corresponds to the plane of the upper surface of the metal plate x, when the latter has been placed upon the said die, it is necessary that such plate be lifted above the said shoulder so that the triggers b^{17}, in their forward movement may find the said metal plate free from engagement with the shoulder b^7, and carry the said plate from the press without obstruction.

We achieve this knockout movement by providing a series of vertical openings L through the bed B^3 of the press, which openings are distributed so as to underlie the area of the metal plate x when in position between the offsetting dies. Knockout pins l are selectively arranged in the said openings so as to bear against the under side of the metal plate near the front edge thereof. Frames l^1 mounted at the under side of the bed support and guide a series of headed rods l^2 in line with the vertical openings in the bed in which the knockout pins are arranged. The said headed rods are surrounded by expansion springs l^3, which acting upon collars l^4 fixed upon the said rods, serve to hold the rods l^2 in their normal lowered position. The lower ends of the said rods l^2 rest upon a lifting bar l^5 which is supported so as to have parallel motion, and thus impart a simultaneous upward movement to all of the headed rods. See Fig. 3. A shaft l^6, extending longitudinally of the machine, is provided with radial arms l^7 connected to one end of the lifting bar l^5, the other end of which bar is supported by a parallel pivoted arm l^8, to impart the motions described.

The limitations of space imposed by the main frame construction, require that the means for actuating certain of the knockout devices be located below the plane of the shaft l^6. The relative arrangement of such lower actuating means is indicated in Figs. 2 and 3, wherein like reference characters have been used to designate the parts of like construction and function. Other radial arms l^9, on the shaft l^6, are connected by links l^{10}, to arms l^{11}, on short parallel shafts l^{12}, arranged below the shaft l^6, one at each end of the machine, whereby the lifting bars l^5 are operated, as are those located in the higher plane.

A crank l^{20} is fixed upon the outer end of the eccentric shaft F, at the left hand end of the machine, Fig. 2, and is loosely connected by a link l^{21}, Fig. 7, to one arm of a bell-crank lever l^{22}, journaled in a bracket upon the frame. The other arm of the bell-crank is connected by means of a longitudinally adjustable link l^{23}, to an arm l^{24}, on the shaft l^6, before referred to. The link l^{23} is guided by a standard l^{25}, and confined about the said link between a collar thereon and the standard l^{25}, is an expansion spring l^{26}, which tends normally to turn the shaft l^6 to the right, Fig. 7, and move the lifting bars l^5 into their lowest plane. The loose connection existing between the crank actuated link l^{21} and the bell crank l^{22}, permits this independent movement of the lifting bars l^5, in case lost motion is provided in the also adjustable connection between the link l^{21} and bell crank l^{22}. The extent of the movement of the lifting bars l^5, under the action of the crank l^{20}, will be determined by the position at which the adjustment in the connection between the link l^{21} and the bell crank l^{22} is set. But the extent of the reverse movement will be determined by a stop lug l^{27}, on the heel of the bell crank, when such stop lug is brought into engagement with the bracket in which the said bell crank is journalled. The provisions for longitudinal adjustment residing in the link l^{23}, will permit variations and exact adjustments in the movement of the lifter bars, beyond that caused by the actuating crank motion.

The machine is provided with an oil reservoir M, located at the top thereof, as indicated in Figs. 1 and 2, by means of which the several bearings of the press are lubricated by gravity feed. Fig. 4 shows the general manner of forming the oil cups in the cap pieces of the journal boxes, and into which the oil may flow through distributing ducts leading from the reservoir M. An overflow outlet m, is shown in Fig. 2. Attached to each end of the offsetting head G is a guide g^{20}, the vertical face of which is provided with a wear resisting strip g^{21}, designed to bear against plane, parallel surfaces g^{22} at the end of the bed B^3, and thus prevent any deviation of the offsetting head from the line of its lateral movement. In view of the close fit between the vertical end surfaces of the bed B^3 and the guides g^{20} the corners of the parts mentioned are slightly rounded or chamfered, as indicated in Fig. 2, so that the said parts may have free relative movement with respect to each other, when the head is lowered into position upon the bed, following a change or adjustment of the offsetting dies.

The offsetting press embodying the present invention is designed to form an element of the assemblage of machines disclosed in Patent No. 1,397,020, granted November 15, 1921, upon an application, Serial #212,934, filed January 21, 1918, by R. Stanley Smith, one of the present inventors. The said assemblage includes machines which by their related, connected and successive operations, punch from metal sheets the side and cross bar and other blanks used in constructing an automobile or other vehicle frame, shape such blanks according to the particular requirements appertaining to each, perform the necessary milling operations thereon, assemble the several constituent parts, and secure all of such parts in their respective positions, so that in a continuous operation of mechanical devices a completed automobile or other vehicle frame is automatically produced.

The present offsetting press will be equipped with offsetting dies so contoured that the plate from which the side bar blank is to be punched, will have all of the necessary edgewise curves, both single and reverse, imparted thereto in a single operation of the press. It will be understood that the offsetting press, when used in the relation stated, will operate in a timed cycle and in synchronism with the timed operation of the other elements of the assemblage, as described in the application hereinbefore just referred to. When operated independently, the offsetting press will be timed as may be desired.

The replaceable sectional die employed in our improved offsetting press, is the separate invention of R. Stanley Smith. These die sections are constructed as units, some of which are formed with straight edges and others of which are formed with curved edges, as disclosed in application Serial #500,019, filed September 12, 1921, by Mr. Smith. The sectional dies having the curved edges are produced upon varying radii, so that by selections from the stock of die sections on hand, the press may readily be equipped with offsetting die members of the contour necessary to produce a curved plate of desired outline. This system of die construction is very flexible, and by its use the die members for the press

may be assembled in any desired arrangement or order. One dominating feature of the flexible die system is the elimination of the cost of producing special dies for each separate job. Die sections produced in accordance with the system, need not be discarded upon the completion of the job, but may be used in connection with other work. As already stated, the loss resulting from the breaking of lenthy dies, and the tendency to warp in tempering, is obviated.

We have hereinbefore referred to Patent No. 1,340,138, which discloses a press designed to offset a single metal blank in the direction of its width, such press being operated so as to impart to the blank by a single operation, all of the curves necessary to the formation of a curved plate from which a side bar blank may be punched. Presses for offsetting a plurality of metal plates, usually four or more, have been constructed, and such presses have been provided with a die member having a thickness equal to the thickness of the whole number of plates to be offset, and thus possessing rigidity sufficient to stand the pressure exerted in the operation. But such presses have not had the capability for producing more than a single curve in the several plates at one operation, and it has been necessary to subject the several plates to repeated operations, in order to produce therein the desired curved outlines. Prior to the construction of the press described in the said Patent No. 1,340,138, it had not been possible to offset a single plate in the direction of its width, the difficulty being that the blade of the punch used as one of the die members could not have a thickness exceeding the gauge of the metal plate, it being impossible to maintain the thin punch against crumpling when the necessary pressure of several hundred tons was applied.

Our present invention is designed to carry out the process disclosed in the said Patent No. 1,340,138, and which process is the separate invention of R. Stanley Smith, and is disclosed in his application filed March 31, 1920, Serial #370,136, wherein by a single operation, a single metal plate will have imparted thereto the several curves, both simple and reverse, which are produced in its length, and in the practice of which process a succession of metal plates is fed in timed relation to the offsetting press, by which in a single operation the several curves are produced in a single plate.

While we have described our improved press in connection with the production of curved plates from which blanks for the side bars of automobile frames may be produced, it will of course be understood that the press may be used for offsetting in the same manner the plates for the blanks of cross bars of such frame, as well as for any other purpose in which it may be desired to impart an edgewise bend to a metal plate. The edgewise bent plates will be thickened in certain areas, as desired, in the manner disclosed in the said Patent No. 1,240,138, and in accordance with the process of Mr. Smith, as disclosed in his said application filed March 31, 1920.

Having thus described our invention, what we claim and desire to secure by Letters Patent of the United States is:

1. In a press for bending sheet metal plates in the direction of their width, a set of offsetting dies, means for imparting relative movement to the said dies to conform the longitudinal edges of the plate thereto and exert a binding pressure upon the sides of the plate during the same operation, in combination with feeding devices adapted to position a metal plate between the offsetting dies.

2. In a press for bending sheet metal plates in the direction of their width, a set of offsetting dies, means for imparting relative movement to the said dies to conform the longitudinal edges of the plate thereto, in combination with feeding devices operating in timed relation to the movement of the offsetting dies to position a metal plate between the offsetting dies.

3. In a press for bending sheet metal plates in the direction of their width, a set of offsetting dies, means for imparting relative movement to the said dies to conform the longitudinal edges of the plate thereto, in combination with means for inserting a metal plate between the dies, and means for separating the dies to permit such insertion.

4. In a press for bending sheet metal plates in the direction of their width, a set of offsetting dies, means for imparting relative movement to the said dies to conform the longitudinal edges of the plate thereto, in combination with feeding mechanism for inserting and ejecting the plates between and from the dies, and means for separating the dies to permit the operation of the feeding mechanism.

5. In a press for bending sheet metal plates in the direction of their width, a bed supporting an offsetting die, and an offsetting head supporting a complemental die, such dies receiving the plate between them, means for actuating the dies with relation to each other to offset the plate, and means whereby the head may be rocked upon the bed to permit access to the dies to replace the latter.

6. In a press for bending sheet metal plates in the direction of their width, a set of offsetting dies each having contoured portions for imparting curved longitudinal edges to the metal plate and having flat

clamping sides to preserve the plane of the plate, one of such dies being composed of separated sections, in combination with movable devices for feeding the plates between the dies, such devices acting to fill the spaces between the separated sections during the offsetting operation.

7. In a press for bending sheet metal plates in the direction of their width, a pair of offsetting dies and actuating mechanism therefor, in combination with means for supplying blanks to the press at one side of the dies and for removing them from the press at the other, after action by the offsetting dies.

8. In a press for bending sheet metal plates in the direction of their width, a pair of offsetting dies and actuating mechanism therefor, and devices for feeding the plates to the dies and ejecting them therefrom, in combination with means operating at one side of the dies for supplying the feeding devices with plates and operating at the other side of the dies for removing such plates from the press, following the offsetting operation.

9. In a press for bending sheet metal plates in the direction of their width, a set of offsetting dies with means for imparting relative movement to the said dies to conform the edges of the plate thereto, a bed upon which one of such dies is mounted, and means for feeding metal plates to the dies, such means being guided in transverse grooves formed in the bed.

10. In a press for bending sheet metal plates in the direction of their width, a movable offsetting head provided with a die, a bed provided with a complemental die, which latter is formed of separate sections, and devices for feeding the plates to the dies and ejecting them therefrom, such devices working in the spaces between the separated sections of the die.

11. In a press for bending sheet metal plates in the direction of their width, a set of offsetting dies arranged lengthwise of the press, means for imparting a relative lateral movement to the said dies, in combination with reciprocating carrier devices adapted to supply plates at one side of the offsetting dies, and to remove such plates from the other side of the dies, and means for feeding the plates through the offsetting dies.

12. In a press for bending sheet metal plates in the direction of their width, a bed provided with an offsetting die, a laterally reciprocating offsetting head provided with a complemental die, a cam actuated mechanism for separating the die members, in combination with a means for feeding the plates to the dies and ejecting them therefrom, during the separation of the dies.

13. In a press for bending sheet metal plates in the direction of their width, a set of offsetting dies, actuating means therefor, means for separating the dies, means for feeding the plates between the dies and connected devices for ejecting the plates from the dies, in combination with knockout devices adapted to release the plate from the dies for action by the ejecting devices.

14. In a press for bending sheet metal plates in the direction of their width, a bed provided with a fixed offsetting die, a laterally movable head provided with a complemental offsetting die, fixed guides to restrain longitudinal movement of the offsetting head during the offsetting operation, and means permitting the offsetting head to be rocked to render the dies accessible.

15. In a press for bending sheet metal plates in the direction of their width, a fixed offsetting die, a head supporting a laterally movable offsetting die, an eccentric shaft having connections to move the offsetting head and other connections operating in timed relation to separate the die members, and devices for feeding metal plates between the dies while separated.

16. In a press for bending sheet metal plates in the direction of their width, a bed supporting an offsetting die, and provided with a series of transverse channels, a laterally movable head carrying a complemental offsetting die, cam slides aranged in some of the channels of the bed and acting to raise the head to separate the dies, and feeding slides arranged in other channels of the bed, to feed a plate to the dies when separated.

17. In a press for bending sheet metal plates in the direction of their width, a pair of offsetting dies, one of which is mounted in the bed of the press and the other of which is mounted on a laterally movable head, the head and means for actuating the same, and straining rods connected to frame parts of the press in the approximate line of movement of the actuating means for the head and serving to take the thrust of such actuating means.

18. In a press for bending sheet metal plates in the direction of their width, a bed supporting an offsetting die, a laterally movable head supporting a complemental offsetting die, means for separating the dies, slides for feeding a plate to the dies while separated, and ejecting means carried by the feeding slides and positioned by the initial movement thereof for ejecting a plate from the dies in the feeding movement of the slides.

19. In a press for bending sheet metal plates in the direction of their width, a set of offsetting dies having relative lateral movement, means for separating the die members, in combination with a knock-out mechanism comprising knock-out pins adapted to lift the plate from engagement

with the dies, a lifter bar for actuating the said pins, a crank, and connections between the said crank and lifter bar.

20. In a press for bending sheet metal plates in the direction of their width, a longitudinally arranged offsetting mechanism comprising separable die members, a carrier adapted to supply the press with metal plates at one side of the offsetting mechanism and a carrier adapted to remove the plates from the press at the other side of the said mechanism, in combination with devices for feeding the metal plates through the offsetting mechanism.

21. In a press for bending sheet metal plates in the direction of their width, a fixed offsetting die, a movable complemental offsetting die, said dies being adapted to conform the edges of the plate to the contour of the dies, means to separate the dies, and feeding devices arranged to feed a plate to the dies when separated.

22. In a press for bending sheet metal plates in the direction of their width, a set of offsetting dies and means to impart relative movement to the dies to conform the edges of the plate thereto, in combination with means for automatically feeding the plates to the dies.

23. In a press for bending sheet metal plates in the direction of their width, a bed provided with an offsetting die, a head provided with an offsetting die and movable to conform the edges of the plate to the contour of the dies, and independent means for separating the dies for the insertion of a metal plate.

24. In a press for bending sheet metal plates in the direction of their width, a set of relatively movable offsetting dies adapted to conform the edges of the plate to the contour of the dies, in combination with means for positioning a plate between the dies.

25. In a press for bending sheet metal plates in the direction of their width, a set of relatively movable offsetting dies adapted to conform the edges of the plate to the contour of the dies, devices for feeding a plate to the dies, and means to exert a clamping pressure against the sides of the plate during the offsetting operation.

26. In a press for bending sheet metal plates in the direction of their width, a set of offsetting dies having relative lateral movement, means for separating the die members, in combination with a knock-out mechanism adapted to lift the plate from engagement with the dies, and actuating means for the knock-out mechanism.

27. In a press for bending sheet metal plates in the direction of their width, an offsetting mechanism adapted to conform the edges of the plates to the contour of the dies, comprising separable die members, a carrier system adapted to supply the press with metal plates and to remove the plates therefrom, in combination with devices for feeding the metal plates to the offsetting mechanism.

28. In a press for bending sheet metal plates in the direction of their width, contoured dies for shaping said plates, a pair of clamping surfaces adapted to prevent buckling of the plates during the bending operation, means for separating said clamping surfaces and said dies, and means for feeding the metal plates into position between the clamping surfaces and the dies.

29. In a press for bending sheet metal plates in the direction of their width, clamping means to resist buckling of the plates, contoured dies adapted to exert pressure on the edges of the plates, means to cause successive approach and retirement of the clamping means and the dies, and feeding mechanism operating in synchronism to automatically position and withdraw new and finished plates respectively, with respect to the clamping means and dies during the period of their retirement.

30. In a press for bending sheet metal plates in the direction of their width, a pair of contoured bending dies, a pair of plate clamping surfaces, means for moving said dies and said clamping surfaces toward and away from each other respectively, and synchronously operating mechanism adapted to insert and withdraw the sheet metal plates at the time of separation of said die and clamping surfaces.

31. In a press for bending sheet metal plates in the direction of their width, a pair of laterally moving bending dies, a pair of clamping surfaces and means for longitudinally feeding the plates into the press and depositing them between the clamping surfaces and bending dies.

32. In a press for bending sheet metal plates in the direction of their width, a frame comprising a bed for supporting an offsetting die and standards extending therefrom, a complemental offsetting die, actuating means therefor carried by the standards, and straining rods connecting the bed and the standards and extending approximately in the line of movement of the said complemental die, to take the thrust of the actuating means therefor.

33. In a press for bending sheet metal plates in the direction of their width, a movable offsetting die, a relatively fixed complemental die, the latter comprising separated sections, devices working in the spaces separating the sections of the fixed die for feeding metal plates to the dies, and means for filling said spaces to prevent buckling of the plate when bending pressure is applied thereto.

34. In a press for bending metal plates in the direction of their width, a movable off-

setting die, a relatively fixed complemental die, the latter comprising sections separated transversely in the length of the die, and means for closing the separations to prevent buckling of the plate when bending pressure is applied thereto.

35. In a press for bending sheet metal plates in the direction of their width, a set of bending dies and means for actuating them laterally with relation to each other, one of said dies being mounted for rotative movement to permit access to the dies.

36. In a press for bending metal plates in the direction of their width, co-operating dies for effecting the bending operation, means for carrying the plates into the press, means for positioning the plates between the dies for operation, and means for removing the bent plates from the press.

In testimony whereof we have signed our names at Milwaukee, Wis., this 17th day of March, 1920.

R. STANLEY SMITH.
HENRY MILLER.
F. ORTON.

Witnesses:
W. F. WOOLARD,
C. THEO. OSTERBERG.