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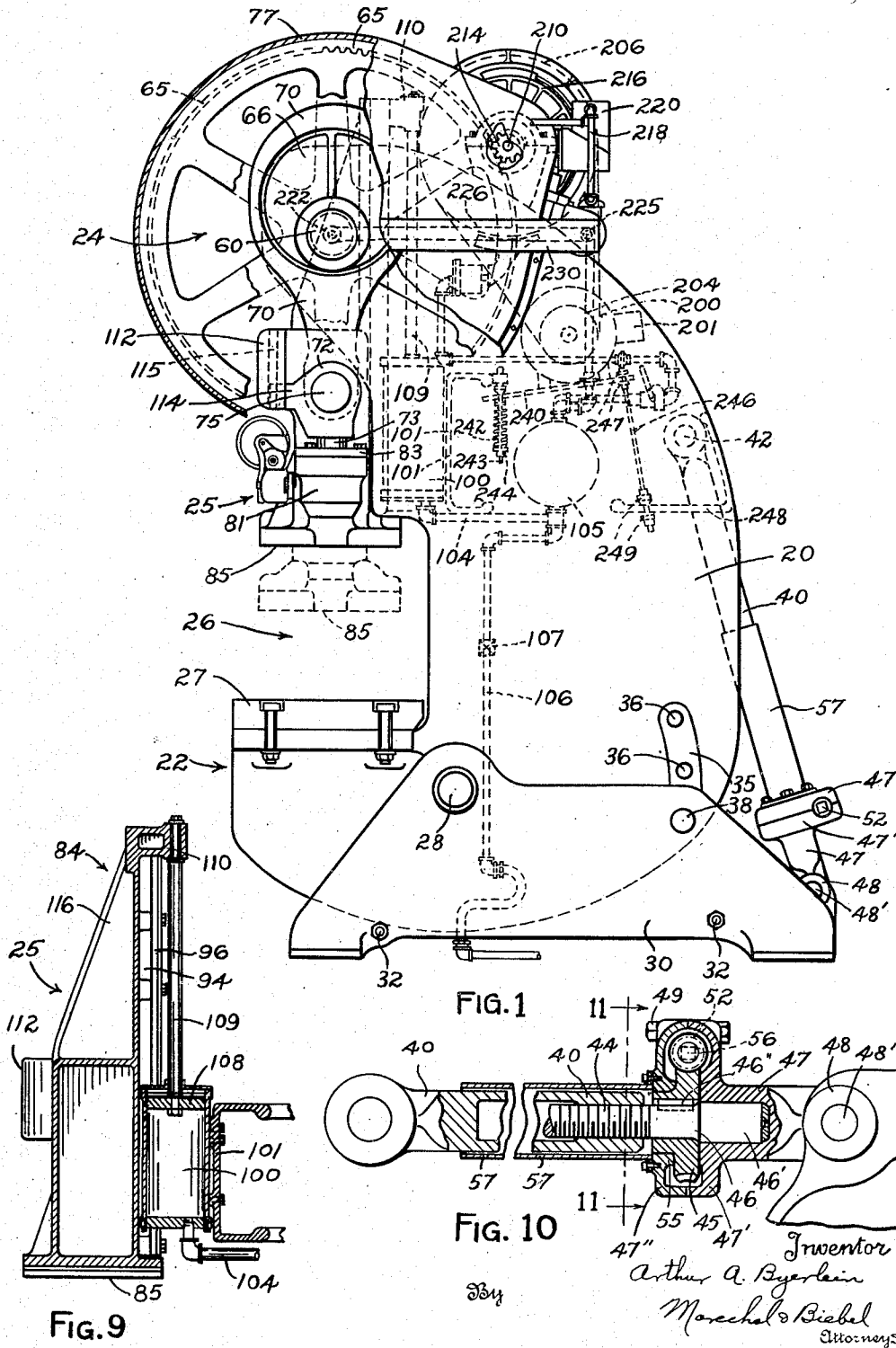
A. A. BYERLEIN

2,514,933

PRESS

Filed June 5, 1946

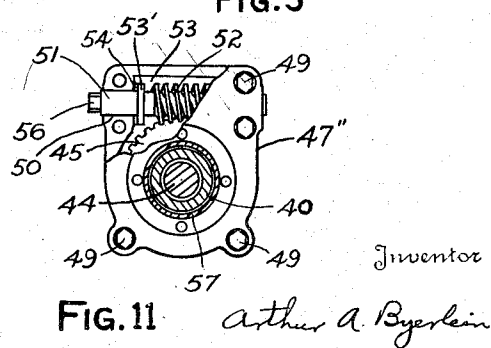
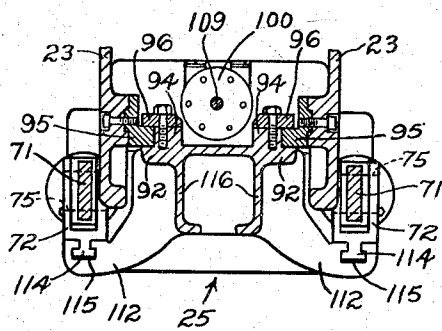
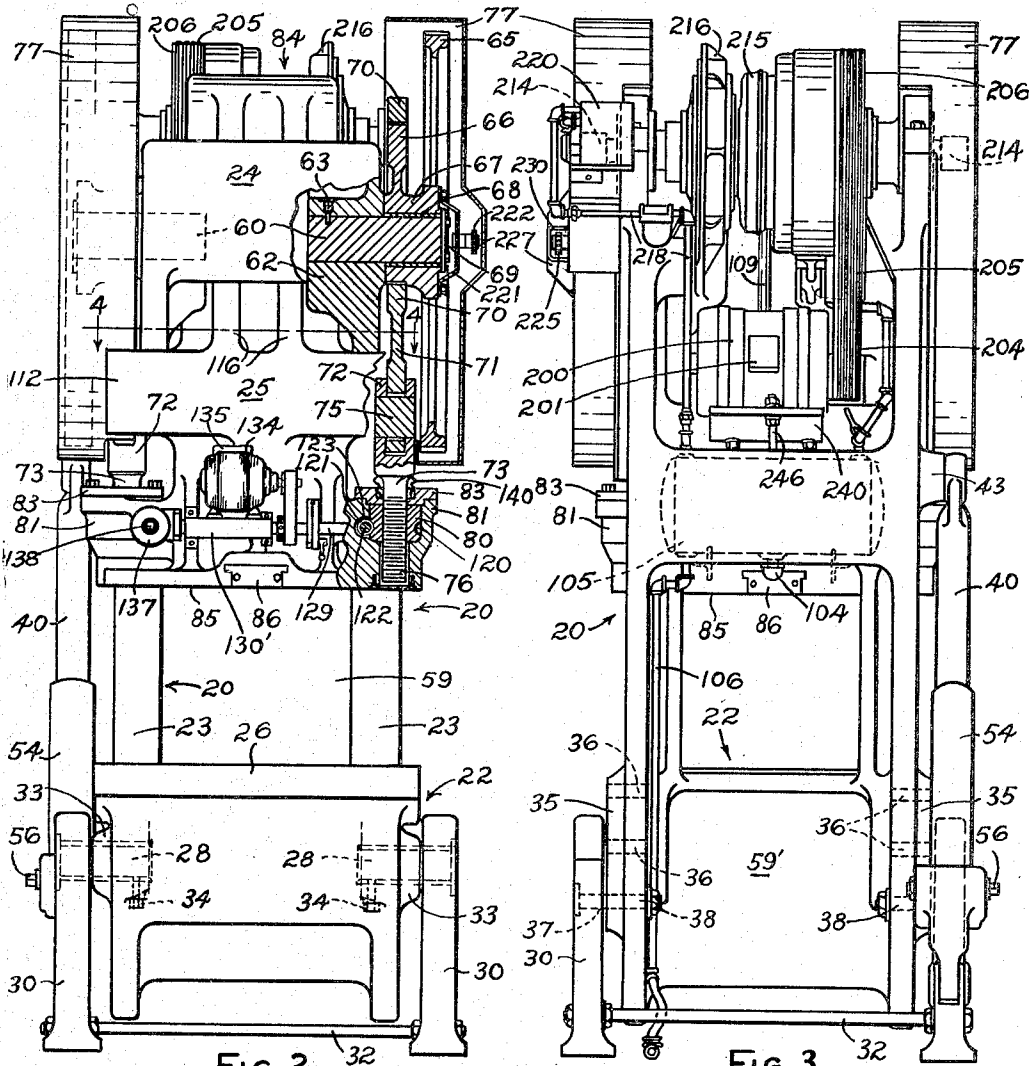
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UNITED STATES PATENT OFFICE

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PRESS

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This invention relates to presses for performing blanking, perforating, and other fabricating operations, and more particularly to gap frame presses for performing such operations upon metal and including both inclinable presses and gap frame presses on fixed legs.

One of the principal objects of this invention is to provide such a press which has a reciprocable die slide of dimensions approximating those of the stationary die carrying portion, or bed, and which has means for effectively and efficiently guiding and operating said reciprocable die slide without adversely increasing the dimensions of the press.

Another object of the invention is to provide such a press of the open back, gap frame type in which multiple high pressure operating mechanism for the reciprocable die slide and effective guiding means therefor are provided without increasing the width or depth of the press.

Still another object is to provide a press having a reciprocable die slide carrying an elongated guiding portion mounted for reciprocal movement within an overhanging frame portion and providing elongated bearing portions for effectively maintaining alignment of the die carrying portion of the slide during use without adversely increasing the width or depth of the press structure.

Another object of the invention is to provide such a press having multiple high pressure operating mechanism for the reciprocable die slide.

A further object is to provide such a press in which the die carrying portion of the die slide extends laterally beyond the slide carrying portion of the press and the slide guiding parts carried thereby and in which the slide and said slide carrying portion have cooperating guide members located inwardly of the lateral extent of the die carrying portion of the slide which cooperating guide members are constructed to effectively guide the slide throughout its operating movement and whereby the width of the die carrying portion of the die slide may approximate the width of the bed portion without adversely increasing the width and depth of the press structure.

Other objects and advantages of the invention will be apparent from the following description, the accompanying drawings and the appended claims.

In the drawings, in which a preferred embodiment of the invention is illustrated, and in which like characters of reference designate like parts throughout:

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Fig. 1 is a side elevation, partly broken away, of a press embodying the invention;

Fig. 2 is a front elevational view of the construction of Fig. 1, with some parts broken away and other parts in section to show details of construction;

Fig. 3 is a rear elevational view of Fig. 1;

Fig. 4 is a fragmentary sectional view taken substantially on the line 4-4 of Fig. 2;

Fig. 5 is a fragmentary front elevational view of the die carrying slide, with parts broken away to show details of construction;

Fig. 6 is a fragmentary top view with parts at the left shown in section along the line 6a-6a and parts at the right shown in section along the line 6b-6b of Fig. 5;

Figs. 7 and 8 are fragmentary front and rear elevations, respectively, of the press slide member;

Fig. 9 is a detail view in vertical section of the press slide and counterbalance therefor;

Fig. 10 is a view, partly broken away and partly in section, showing the means for moving the inclinable part of the press;

Fig. 11 is a detailed sectional view on the line 11-11 of Fig. 10, with some parts broken away to show details of construction; and

Fig. 12 is a detailed view of part of the slide adjustment mechanism, along the line 12-12 of Fig. 5, looking in the direction of the arrows.

Inclinable presses, and particularly open-back, gap-frame inclinable presses, have heretofore been made of substantially standard sizes and the size and general mode of construction and operation have been such as to limit the length of the guiding means for the die slide and this has placed restrictions on the size of die slide which could be used or has limited the stability of the die slide in use. For example, such an inclinable press of so-called size A-6½, which is quite a large inclinable press, has a bed portion about 27 inches by 40 inches. To provide such a machine having a die slide having a die receiving portion or flange approaching this size and secure reasonably good operating results, with the heavy unbalanced forces that may be encountered, presents a difficult problem as the guides for the slide inclinable presses as heretofore used are comparatively short and unbalanced operating forces thus not easily met. And to secure the necessary power with the conventional single point of pressure connection between the crankshaft and the die requires a comparatively large crankshaft and unduly large lateral extension of the die slide and die beyond the central con-

nection of the connecting rod to the die slide, and has presented great or even insuperable constructional or operating difficulties. The present invention permits of meeting these inherent difficulties so that multiple points of pressure connection may be secured whereby less massive operating parts may be used and also long and satisfactory guides are attained without the necessity for widening or deepening the press frame, thus avoiding the use of more floor space and also avoiding any objectionable increase in weight of the press. Thus a very effective and efficient construction is attained which gives inherent operating advantages and with a comparatively large slide approaching or approximating in size the press bed portion—which is especially advantageous for certain operations, e. g., piercing, blanking and trimming.

These and other advantages are attained by the present invention of which a preferred embodiment is shown in the drawings.

In such preferred embodiment the press frame is designated generally by the reference character 20. It is shown as an integral casting formed to provide a bed portion 22 and a portion 24 overhanging bed portion 22 and substantially narrower than said bed, said portions being connected by side members 23. The slide member, for carrying the movable die, is designated generally by the reference character 25 and is mounted for reciprocal movement in the gap 26 between frame portions 22 and 24. A bolster plate 27 is bolted, or otherwise secured in usual manner, to bed 22 and provided with suitable means, such as usual bolt receivers, for fastening a lower die thereto. Frame 20 is pivotally supported by means of pins 28, which pass through the side-frames 23 and into a base which comprises two upright members 30 secured together by means of a plurality of tie rods 32, shown as held in place by nuts, the base thus being made into a suitably strong and rigid structure. As shown for example in Fig. 2, the pins 28 are mounted in enlarged or reinforced portions 33 carried by base members 30 and held in place by means of locking bolts 34. Near the bottom and rear of frame 20 each side-frame has a plurality of holes, arranged generally in an arc having its center in the axis of the pivot pins 28, these holes being formed in a reenforced arcuate shaped boss portion 35. Each of these holes 36 is adapted to receive a bolt, 38, which may be mounted in one or another of the holes. Each base member 30 is also provided with a hole or passage 37 each located to be registrable with one of the cooperating set of holes or passages 36. By positioning the pins or bolts 38 in aligned passages 36 and 37 the frame 20 may be locked in any selected one of a plurality of positions about pivot pins 28, three such selective positions being illustrated and the holes 36 and 37 being so positioned relatively that the frame 20 may be positioned upright or in two different inclined positions.

Referring to Figs. 1, 3, 7 and 10, for example, means is illustrated for effecting rocking motion of frame 20 about pivot pins 28. Such means comprises a rod 40 which is pivotally secured at its upper end to a pivot pin 42 carried by boss 43 on frame 20. This rod is hollow throughout its greater extent and at the opposite end the wall is thickened and threaded for engagement with the threaded rod 44, one end of which is screwed therethrough to extend into the hollow passage within the rod 40. A gear 45 is opera-

tively secured to the lower end of rod 44. As shown, this lower end has its extreme lower end portion 46' of somewhat larger diameter than the threaded part of the rod and the end portion 46 which receives the gear 45 and thus provides a shoulder against which the gear 45 abuts when it is slipped over the inclined screw or rod 44 before assembly of this inclining or positioning mechanism. The hub of the gear 45 has an internal longitudinal keyway cut therein, and the part 46 has a longitudinal key receiving pocket which receives the key 46'', this arrangement permitting ready assembly of the gear 45 on the part 46 so that it may seat against the shoulder formed by part 46' and thus automatically move to properly adjusted position on the rod 44 as these parts are assembled. The enlarged portion 46' seats rotatably in a passage in the member 47 which is pivotally connected at one end to a receiving lug or enlargement 48, carried by one of the side members 30, by pivot pin 48'. Preferably a grease member or gasket is interposed between the rod portion 46' and the bottom of the passage in which it is rotatably mounted, to facilitate maintaining easy rotatable operation of the screw 44.

The other end of the member 47 is enlarged to form a part 47' which is one part of a housing for the gear 45 and its operating mechanism. Co-operating with housing part 47' is another housing part 47'', the two parts being held in assembled position by bolts 49 to form a securely engaged and tight housing. Each of the parts 47'—47'' is provided also with aligned passages 50 which together form receiving and bearing passages into which opposite ends of the shaft 51 are rotatably positioned. This shaft 51 carries a worm pinion 52 formed integrally with the shaft 51, or otherwise held in place thereon, which pinion meshes with the worm gear 45. As shown each of the parts 47'—47'' is formed with an enlarged space, the two spaces together forming an internal housing space 53 for the pinion 52, when these parts are in assembled relation. Spaced collars or flanges 53' are carried by the shaft 51 and seat against suitable gaskets or washers 54, which in turn rest against the inside wall of the parts 47'—47'' to hold the worm in proper adjustment with respect to the gear 45, to permit ready turning of the shaft 51 for the operation of the gears 45—52, to absorb the operating forces and to prevent ingress of dirt into and of grease out from the gear housing chambers. The inner face of the part 47' serves as a bearing face against which the gear 45 is rotated, the other part 47'' having an inturned flange 55 which forms a bore receiving the collar of the gear 45 and which rests against the opposite face of gear 45, when the parts are assembled. With the parts 47'—47'' tightly bolted together with the gears in position as described, the gear 45 is thus held rotatably between the cooperating face of the part 47' and the flange 55, and the gear 45 being keyed to the rod 44 to permit relative axial movement of the gear upon this rod or screw, while the two are constrained to rotate together, assembly of these parts and pulling the parts 47'—47'' tightly together by the bolts will cause the gear 45 to seat against the abutment shoulder formed by the enlarged portion 46' and to be held with proper rotating clearance between the flange 55 and the bearing face of the member 47'. One end of the shaft 51 extends outside the housing and has provisions, such as a squared end 56, to receive a driving

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member, or crank, to rotate the worm 52 and with it the gear 45. When such rotation is to be effected the pins or bolts 33 are removed, and such rotation will cause the threaded portion of the bolt 44 to rotate relative to the non-rotatable portion 40 thereby to cause said rods to move telescopically with respect to each other and thus to increase or decrease the distance between pivot 42 and pivot 43. Thus the frame 20 may be readily swung or rocked about pins 28, and when it is in the desired upright or inclined position it may be locked in such position by inserting the bolts 38 in the holes 37 and the ones of the holes or passages 36 which have been brought into alignment. Preferably nuts are provided for the inside ends of the bolts 38 to hold them against displacement during operation of the press.

A sleeve 57 is secured to housing part 47' and extends to enclose the rod 40 throughout a considerable portion of its length. This sleeve provides adequate clearance to permit of lengthening or shortening the inclining screw members. As shown its lower end is provided with a laterally extending flange which is bolted tight against the outside face of part 47', and thus protects the adjusting mechanism from ingress of dirt or the like in use.

As stated, the press structure illustrated is of the open-back type, and the open-back of the frame 20, above the bed portion being indicated by the numeral 59, the back part of this frame likewise being open below the bed portion, as indicated by the numeral 59'. This permits of gravity discharge when the frame is inclined, and of free discharge of parts at the rear of the press, in any position thereof.

Frame portion 24, which is at the upper end and overhangs the bed portion 22, carries a pair of aligned shaft members 60, one at each side. Each of these members is shown as having one end mounted in a passage in the frame, which is reinforced by enlarged portion 62 to give the necessary strength factor. Each shaft member has one end held in its passage by locking member 63 and the other end extending outwardly from the frame to support rotatably a gear 65 and an eccentric 66. As shown, each drive gear 65 and its eccentric 66 are integral, each being affixed to a common hub 67 whereby one drive gear-eccentric unitary member is rotatably mounted on the projecting end of one shaft 60 and the other on the end of the other of these shafts. The hub 67 of the unitary drive gear-eccentric member is provided with a suitable bearing or bearing surface indicated at 68; and the outer end of each hub 67 carries a cover plate 69, which is attached to the hub by means of stud bolts or the like, and which serves to retain grease and to prevent the ingress of dirt.

Each of the eccentrics carries an eccentric strap 70, which in turn carries a depending link member 71, the lower end of which extends between the bifurcated upper end 72 of a lower link member 73, the two power transmitting link members being pivotally connected by means of a pivot or wrist pin 75. Each of the lower link members 73 has its lower portion 76 formed as an adjusting screw, each adjusting screw being threadedly mounted in an adjusting nut 80, which in turn is rotatably mounted in a receiving housing 84, within the die slide 25, this adjusting nut being held in place by means of an apertured cover plate 83, which is bolted or otherwise secured to the die slide. The inner face of the cover plate 83 engages the adjusting nut

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80 and as the cover member 83 is firmly bolted or otherwise secured to the die slide the slide is thus caused to reciprocate, in work operations, upon rotation of the drive gear 65, the eccentric and link arrangement transforming rotary motion into reciprocatory motion of the slide. Of course, the cover members 83 must be bolted or otherwise secured to the die slide member so as to withstand all of the forces incident to the upward movement of slide.

As shown, the press is provided to have two points of operating power or pressure application to the movable die slide, the two links 73 which are adjustably connected to the die slide being connected adjacent its side edges and approximately midway from the front to the rear. It will also be noted that the movable die slide has such width that it extends laterally on both sides beyond the outside of the side frame members 23, and the over-all width of the die slide, as shown for example in Fig. 2, closely approximates the over-all width of the bed 22 and the bolster plate 27 carried thereby.

By means of such two point pressure connections the operating pressures are transmitted to the movable die slide adjacent the side edges, and as a result the normal operating pressures exerted by the press mechanism and any unbalanced pressures due to unusually shaped dies or other factors known to give substantial unbalanced forces are more readily compensated for, especially with the form of slide construction utilized in this embodiment of the invention. A movable die slide and movable die of a greater width may therefore be safely used for operating conditions which could not readily be met by a single pressure connection, arranged centrally of the width of the die as well as centrally fore and aft, and operating conditions can be readily met in an entirely satisfactory manner with effective and efficient operation with such two point pressure connection which would prove insuperable difficulties for a single point pressure of the same size and weight.

By the construction shown herein effective and efficient operation under heavy pressures is further greatly added to by the form of slide and the guiding means which are effective as between the slide and the press frame. And thus effective and efficient operations can be readily attained using parts which are of considerably lighter weight by comparison with the conventional inclinable press; and likewise die slides which are of width approximating the width of the bed, a width considerably in excess of that normally used on conventional inclinable presses, can be used quite satisfactorily. The slide member 25 includes an elongated upper portion which is designated generally by the numeral 84 and a laterally extending die receiving portion which is designated by the numeral 85, this die receiving portion 85 being shown as provided with a slide cap 86, and a depending flange to receive and assist in supporting the upper die member. As shown, the upwardly extending portion 84 is of considerably less width than the outwardly projecting portion 85, and this slide portion 84 is provided with outwardly projecting flanges 92 and rearwardly projecting flanges 94, at each side, each pair of projections together providing elongated bearing surfaces adapted for sliding and guiding engagement with guide members 95 carried by the side walls 23 of the frame 20. As shown, for example in Fig. 4, the guide members 95 each comprises a generally L-shaped member

or gib which is bolted to an inward face of its side frame member 23, the parts being properly machined to fit accurately, and the back of the gib member being provided with a projecting rib which fits into a corresponding groove formed in the face of the frame member 23. This construction is such that with the members 95 tightly bolted in place and with their guiding faces cooperating with the portions 92 and 94 of the slide, quite extended or elongated guides are provided against lateral or tilting movement of the slide and also against backward or tilting movement thereof. Each member 94 of the slide also has a guide member 96 bolted to it which member projects to provide a guide face for contact with the face of its cooperating guide element 95 opposite to the guiding contact of the member 95 with the lateral extension 92. For easier manufacture and assembly and disassembly these members 96 are made separate from and are bolted to the projections 94, and when properly assembled to have guiding surface contact with the guides 95 the slide is guided against forward tilting of the slide member.

The width of the portion 84 of the slide member 25 is such that this portion of the slide member lies between the side frame members 23 throughout a considerable zone, and thus elongated guides are provided which are of very much greater extent than the short guides in conventional inclinable presses. Furthermore these elongated guide surfaces are in contact throughout substantially the entire working stroke of the slide since, as shown for example in Figs. 1 and 2, the top of the slide portion 84 extends substantially above the top of the frame when the slide is at the top of its stroke.

This construction and combination for the above described driving connection wherein the power is applied to the outer sides of the die slide through the two sets of link members provides for a highly accurate alignment of the slide throughout its working stroke with consequent efficient operation to give high quality work. And likewise it strongly resists tendency to cocking of the slide and thus jamming of the parts, and cocking which might result from unusually heavy unbalanced pressures is thus prevented. Likewise the pressure exerted between the two dies is maintained within the desired fine tolerance of uniformity which in turn likewise makes for higher quality work. And this is true in connection with a wide die slide of a width considerably greater than that in previous presses of this type of comparable size, a width approximating or closely approaching the width of the bed and bolster plate.

The slide 25 is counterbalanced by a pneumatic counterbalance cylinder 100 affixed, as by bolts as shown, to the supporting channel shaped cross member 101 which extends across from one side frame member 23 to the other. The cylinder 100 is connected through pipe 104 to a tank 105 which is supplied with compressed air, at substantially constant pressure, through pipe 106 connected to suitable source of pressure air, such as the factory air line which is usually maintained under substantially constant pressure, if desired a suitable pressure control valve 107 being inserted in the air supply line 106.

A piston 108 is reciprocable within cylinder 100 and its piston rod 109 is connected to an extension 110, carried at the top of the slide portion 84, so that the proper assistance to the up-travel of the slide mechanism, through the pressure air

in the counterbalance mechanism, is provided. It should be noted that because of the construction of the slide member which provides the elongated upper portion 84, located between the side frame members 23, the counterbalance cylinder may be readily affixed to a bracing cross section located back of the slide and its operating mechanism, and with a simple and effective connection direct to the upper portion of the slide mechanism to give a very simple and compact and effective arrangement.

The slide 25 is likewise provided with laterally extending arm portions 112, each of which extends laterally a distance sufficient to overlie the general vertical zone, on each side, in which the slide operating link mechanism is located, as shown more particularly in Figs. 2, 5 and 6. The rear face of each of these lateral extensions 112 is provided with a vertically arranged slot which receives a guiding member carried by the bifurcated upper end 72 of the lower link member 73. As shown the rear of the bifurcated portion is provided with a T-shaped projection 114, and the cooperating portion of the lateral extension 112 is provided with the correspondingly shaped slot 115 (see particularly Figs. 4 and 6). These parts are properly formed to have guiding and sliding fit, and by means of this arrangement the cooperating guiding members referred to above are supplemented to provide additional quite substantial guiding means effective against thrust at the pivotal connection between the links 71 and 73 caused by oscillation of the eccentric strap links 71 during operation of the press. It will be noted that by the arrangement and construction of parts herein set forth the slide member is greatly strengthened and reinforced by the enlargements in the body portion thereof, approximately midway between the upper and lower ends of the slide, and that these guide carrying extensions 112 may be formed integrally with this heavier portion of the slide and may themselves be formed of adequate size to give the desired strength and rigidity to withstand all the operating forces to which the press parts may be subjected, and, also, this construction permits of the side extensions 112 being extended laterally sufficiently to give adequate guiding of the operating linkage without the necessity of widening the press frame or bed or in any way increasing the overall dimensions of the press. Therefore by the use of such rugged guiding construction for the link mechanism the two-point pressure support operating mechanism may be utilized without widening the press frame or increasing its overall dimensions in any way and yet a very strong rugged construction is secured which permits of using comparatively lightweight operating linkage while maintaining ample rigidity and accuracy in operation under comparatively high operating pressures and even under very substantial unbalanced pressures due to the character of the work. Also, the rigidity of the slide mechanism, and the effectiveness of the guiding mechanisms referred to is so enhanced by providing two vertical reinforcing projections or ribs 116, which extend upwardly from the reinforcing portion carrying the lateral extensions 112 to approximately the top of the slide member.

Mechanism for changing the effective travel of the slide, and the die carried thereby, is mounted upon the slide. This adjustment of the operating linkage is secured by rotation of the nuts 80. As these nuts are mounted to rotate

but are held against movement along in either direction of the axis of rotation, rotation of the nuts will cause the threaded portions of the adjusting screws 73 to be elevated or lowered, so as to cause corresponding movement of the die slide away from or toward the bed of the press. For accomplishing this adjustment in a very simple and highly effective manner each nut 80 has worm gear teeth formed annularly about its outer periphery as indicated by the numeral 120; these gear teeth being adapted for engagement with a worm pinion 124 which is carried by a shaft 122, which shaft is arranged with its axis of rotation transverse to the axis of rotation of the nut 80, the shaft being rotatably mounted within a passage 123, formed in the wall of the upward projection which houses the nut 80. As shown the passage 123 receives a bearing member 124 at one end which rotatably supports one end of the shaft 122 and also receives in its other end a member 125 which likewise has a passage therethrough for receiving the other end of the shaft 122 in rotatable position.

The shaft 122 carries a collar 126 which abuts against the inner end of the member 125, a suitable grease ring or gasket being preferably interposed to facilitate rotation, this collar during operation engaging with the cooperating end of the member 125 and such gasket or wear ring to hold the pinion in adjusted position, in mesh with the worm teeth on the nut 80, and against movement in one direction. The end of the shaft 122 which projects outwardly beyond the bearing portion of the member 122 carries a bevel gear 127, which is suitably connected to said shaft, and which has suitable packing and grease rings and wear rings interposed between the back of the bevel gear 127 and member 125, this construction preventing movement of the shaft 122 in opposite direction during operation.

Meshing with the gear 127 is another bevel gear 128, the two gears being arranged so that their axes of rotation are at right angles to each other as illustrated. The gear 128 is mounted upon one end of a shaft 129, which extends through an opening in the projecting portion of the member 125, suitable grease and packing and wear rings being interposed between the gear 128 and this projecting portion to hold the parts in properly adjusted position for operation.

The other end of the shaft 129 is correspondingly supported in an extension of a member similar to the member 125, which is positioned at the opposite side of the press slide, this shaft carrying a gear corresponding to the gear 128, but facing in the opposite direction, and meshing with a gear corresponding to 127, to affect actuation of the adjusting nut associated with the operating linkage at the left of the slide, so that the two nuts will be actuated simultaneously to affect uniform elevation or lowering of the slide with respect to the adjusting screws; whenever the shaft 129 is rotated. Referring more particularly to Fig. 5, the shaft 129 extends through a supporting bearing member 130, and through a supporting sleeve 130', these supports being affixed to the slide with the parts in properly adjusted relationship. The shaft 129 carries, approximately midway of its length, a gear 131 which in turn meshes with a gear 132, mounted upon the stub shaft carried by a supporting member which is affixed to the face of the slide, the two supporting members referred to being shown as a single member which is marked 133. Also affixed to the face of the slide is a motor 134,

which is fastened to the face of the slide by means of a supporting plate 135, this motor carrying a drive gear 136, which in turn meshes with the gear 132. The motor has suitable switch control mechanism, not shown, whereby upon operation of the motor the nuts 80 will be rotated simultaneously with respect to the adjusting screws 73 to affect equal up or down adjustment of the slide, with the slide and associated parts kept in proper alignment and adjustment with respect to each other.

As shown in full lines at the left of Fig. 5, the gear for the left side of the view is provided with a cover or enclosure marked 137, which encloses the gears 127 and 128 and protects the operator and also prevents ingress of dirt, etc. This same cover 137 is shown diagrammatically at the right side of Fig. 6 and marked with the numeral 137. This cover is omitted from the right side of Fig. 5 to permit more ready disclosure of the construction.

The projecting end of the shaft 122 has its end 138 formed for driving connection with a hand crank, or the like, and the same is true with the corresponding shaft for the left hand side, as shown in Fig. 5. By means of this arrangement the motor 134 with the chain of drive gears may be dispensed with and the remaining part of the adjusting mechanism operated by hand.

Preferably a flexible grease resistant sleeve 140 has its upper end connected to the operating link 73 and its lower end to the cover member 83, this sleeve being of suitable grease resistant synthetic rubber or other sufficiently flexible material, and fastened in place so as to retain grease to insure ready operation of the link adjusting mechanism and to prevent ingress of dirt into the screw mechanism. The relative proportions and dimensions of the guiding extensions 114 and the receiving T-slots 115 are such, and the width of lateral extensions 112 are such that the entire range of adjustment provided for use during operation of the press will not materially affect the fitting of the extensions 114 into these guiding T-slots, and thus proper guiding and resistance to any thrusts effective at the wrist pin 75 will be properly effected in all positions of the mechanism.

A brake mechanism is provided for effecting a control of adjustment of the slide by the motor or hand operated mechanism above described. Jaw members 142 are pivoted at 143 to a bracket 144 carried by slide 25. Jaws 142 engage brake wheel 145 keyed or otherwise secured to shaft 129, and jaws 142 are normally forced into gripping position by means of adjustable spring 146 and bolt 147. This brake may be released by cam 150 carried by shaft 151 and operated through a suitable handle 153. Shaft 151 is also indicated as carrying a mercury switch 155 or similar device which is so connected to the control circuits of motor 134 that the latter cannot operate except when switch 155 and shaft 151 are rotated to the position in which cam 150 releases brake jaws 142. A similar brake device may be employed when the adjusting of the slide is carried out by a hand crank as described, but in such case switch 155 may be eliminated.

Fig. 5 also illustrates a gauge for registering the adjustment of slide 25 on connecting screws 75. As shown, it comprises an indicating pointer or finger 160 secured to one (or both) of connecting screws 73 by means of a wire 161 connected at one end to a lug 162 depending from

the part 114 and at its other end to the pointer 160. The finger or pointer 160 registers with a suitable scale device 163 carried by the slide. This scale may satisfactorily register the adjustment of slide 25 in inches, and fractions thereof, from position of maximum or minimum distance from bolster plate 26 when at the bottom of its stroke. By such gauge, accurate adjusting of the slide to accommodate dies of different depth may be readily accomplished.

The main driving means, for work operation of the press, in the illustrated embodiment, comprises a motor 200 which is provided with a suitable control box indicated diagrammatically at 201 (see, e. g., Figs. 1, 2 and 3). This motor carries a drive pulley 204 upon the motor shaft, which is shown as provided with grooves to receive V-belts 205 which are in driving connection with the flywheel 206 provided with corresponding V-shaped belt receiving grooves. The flywheel 206 runs continuously during operation of the press on the shaft 210, which shaft is journaled at the top of the side frame members 23, and carries on each end, outside of said frame members 23, gears 214, each of which meshes with one of the drive gears 65, whereby, upon rotation of the main shaft 210, the gears 65 are rotated to cause rotation of the eccentrics and the eccentric straps 70 to thus affect reciprocatory movement of the slide, and the upper die carried thereby.

Suitable clutch mechanism is provided, which is indicated generally by the reference numeral 215, this clutch mechanism not being illustrated in detail but comprising a driving member which is connected to the flywheel and rotates therewith and a driven member which is mounted upon the main shaft 210, whereby when the two portions of the clutch mechanism are clutched together the shaft 210 will be caused to rotate and affect working operation of the press, but when they are unclutched the flywheel with its clutch portion will continue to rotate but a brake will be applied to stop rotation of the other portion of the clutch and the shaft 210 and thus bring the press operating mechanism to rest. This brake mechanism is indicated generally at 216, and it is preferably of pneumatic type, operated from the pressure air in the tank 105. The pipe 218 transmits pressure air from the tank 105 to a valve control box indicated generally at 220 for controlling the operation of the clutch and brake mechanisms, the shaft 210 as shown being provided with a pressure air passage for transmitting the necessary pressure air to affect operation of the clutch and brake mechanism referred to. The construction, as shown, is such that the press is automatically connected and disconnected from the driving motor at predetermined sequential point in the cycle of operation of the press. As shown the hub 67 carries a member 221, which in turn supports a sprocket wheel 222, arranged to rotate coaxially with the hub 67. A second sprocket wheel 225 is mounted adjacent the control box, these two wheels being interconnected by means of a drive chain so that the sprocket 225 is caused to rotate in synchronism with the rotation of the driving gears 65 and eccentric 66. The gears and the interconnecting chain for safety are preferably enclosed in an enlargement 227, formed in the housing 77 which encloses one of the gears 65 and the eccentric and strap mechanism associated therewith, this being shown at the right of Fig. 2 and at the left of Fig. 3, and also being

shown in Fig. 1. Also a guard channel 230 is provided which encloses the sprocket chain and safeguards the operator. As the hub 67 rotates through the 360° travel of the work cycle of the press the gears and the sprocket chain 226 cause corresponding actuation of the control mechanism so that as the slide approaches to within a predetermined angular distance of upper dead center the pneumatic valves are actuated to disengage the two parts of the clutch and apply the brake 216 to thus bring the press slide and its operating mechanism to rest at substantially upper dead center. Likewise the control box and valve mechanism therein is connected to the press control 201 so that when the control mechanism is actuated, as by means of a push button where electric controls are used, the clutch is engaged and the brake 216 at the same time disengaged and the press will thereupon perform a complete cycle in work operation and again be brought to rest at substantially upper dead center in the manner described. Other controls with other sequential operational steps may be provided for by utilizing the control mechanism adapted to give such desired sequential operating controls.

As illustrated in Figs. 1 and 3 the motor 200 is mounted upon a platform 240 which is supported at one end on coil springs 242, which springs are adjustably carried upon bolts 243 supported in depending position from the upper flange of the cross channel member 101. Adjustment of the springs to the tension desired may readily be accomplished by means of the adjusting nuts 244. The opposite end of the motor platform is supported upon an adjustable supporting rod 246, the upper end of which is connected to the end of the platform by means of a pair of adjustable nuts or collars 247, and the lower end of which is connected to a supporting flange 248, shown as formed integral within frame 20. This supporting flange 248 has an opening therein through which the lower end of the rod 246 passes, the lower end of this rod being also threaded and having nuts or collars 249 threadably positioned on the upper and lower sides respectively of the supporting flange 248. As indicated in Fig. 1 at least one of these nuts 249 has a conical shape to provide a readily tiltable contact with the upper face of the flange 248, and by proper adjustment of the rod 246 the platform 240 may be readily adjusted to meet operating conditions in the several operating positionings of the inclinable framework. In addition the tension of the springs 242 may be readily adjusted so that in the various positionings the motor will be supported in proper position and the tension of the drive belts may be maintained.

While the form of apparatus herein described constitutes a preferred embodiment of the invention, it is to be understood that the invention is not limited to this precise form of apparatus, and that changes may be made therein without departing from the scope of the invention which is defined in the appended claims.

What is claimed is:

1. In a press of the character described, the combination of a frame providing a bed and a portion overhanging said bed and spaced therefrom to leave a gap therebetween, means carried by said overhanging frame portion forming laterally spaced guide surfaces, a slide mounted in said guide surfaces for reciprocal movement with respect to said bed, said slide including a die-

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carrying face adapted to move across said gap, power supplying means carried by said frame, and a pair of power transmitting reciprocable members positioned laterally outside said guide surfaces and each connected to said power supplying means and to said slide to transmit a balanced actuating force to said slide.

2. In a press of the character described, the combination of a frame providing a bed and a portion overhanging said bed and spaced therefrom to leave a gap therebetween, means in said overhanging frame portion forming laterally spaced guide surfaces, a slide mounted in said guide surfaces for reciprocal movement with respect to said bed, said slide including a die-carrying face extending at each side laterally beyond said guides, power supplying means carried by said frame, a power transmitting reciprocable member connected to said power supplying means and to said slide adjacent one outer side of said laterally extended slide face, and a second power transmitting reciprocable member connected to said power supplying means and to said slide adjacent the opposite side of said laterally extended slide face for transmitting with said first named reciprocable member a balanced actuating force to said slide.

3. In a press of the character described, the combination of a frame providing a bed and a portion overhanging said bed and spaced therefrom to leave a gap therebetween, said frame having an opening in the back thereof in line with said gap, means in said overhanging frame portion forming guides, a slide including an upper part supported in said guides for reciprocal movement with respect to said bed and a lower part providing a die-carrying face adapted to move across said gap, power supplying means carried by said frame, a pair of power transmitting reciprocable members positioned one at each side of said frame and laterally outside said opening in the back of said frame, and means providing operative connections from said pair of reciprocable members to said power supplying means and to said slide to transmit a balanced actuating force to said slide.

4. In a press of the character described, the combination of a frame providing a bed and a portion overhanging said bed, said frame including side members supporting said overhanging frame portion in spaced relation with said bed to leave a gap therebetween, said frame having an opening in the back thereof in line with said gap and an opening in said overhanging portion extending generally perpendicularly to said bed, a slide including an upper part extending into said opening in said overhanging frame portion and adapted for reciprocal movement in said opening with respect to said bed, complementary guide means carried by said upper slide part and the inner walls of said overhanging frame portion cooperating to maintain operating alignment of said slide with respect to said bed, said slide including a lower part providing a die-carrying face extending laterally beyond said frame sides, power supplying means carried by said frame, a pair of power transmitting reciprocable members positioned at opposite sides of said frame and outside said side members, and means providing operative connections from said pair of reciprocable members to said power supplying means and to the sides of said lower slide part to transmit a balanced actuating force to said slide.

5. In a press of the character described, the combination of a frame providing a bed and an

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upper portion overhanging and spaced from said bed, a slide member including a die-carrying part approximating in width the width of said bed, power supplying means carried by said frame, means providing separate connections from said power supplying means to the outer sides of said die-carrying slide part to impart to said slide reciprocal movement with respect to said bed, said slide including an elongated upper part extending within said overhanging frame portion, and extended complementary guide members carried by said upper slide part and the inner walls of said overhanging frame portion cooperating to maintain alignment of said die-carrying slide part with respect to said bed during operation of said press.

6. In a press of the character described, the combination of a frame providing a bed and a portion overhanging and spaced from said bed, a slide member mounted for reciprocal movement in said overhanging frame portion with respect to said bed and including an elongated upper part engaging within said overhanging frame portion and a lower part substantially wider than said upper part and providing a die-carrying face, guide means carried by said upper slide part, complementary guide means carried by said frame, power supplying means, a pair of laterally spaced power transmitting reciprocable members positioned at opposite sides of said frame and means providing operative connections from said reciprocable members to said power supplying means, and means providing laterally spaced connections from each of said reciprocable members to said lower slide part.

7. In a press of the character described, the combination of a frame providing a bed and a portion overhanging and spaced from said bed, a slide member mounted for reciprocal movement in said overhanging frame portion with respect to said bed and including an elongated upper part engaging within said overhanging frame portion and a lower part substantially wider than said upper part and providing a die-carrying face, guide means carried by said upper slide part, complementary guide means carried by said frame, said lower slide part extending at each side laterally beyond said overhanging frame portion, shaft means carried by said overhanging frame portion extending laterally beyond each side thereof, a pair of power transmitting reciprocable members operatively positioned outside opposite sides of said frame and connected at their lower ends to said laterally extending sides of said lower slide part, means providing an eccentric connection between the upper ends of said reciprocable members and said extending shaft means, power supplying means, and means providing a driving connection between said power supplying means and said upper ends of said reciprocable members.

8. In a press of the character described, the combination of a frame providing a bed and a portion overhanging and spaced from said bed, a slide member mounted for reciprocal movement in said overhanging frame portion with respect to said bed and including an elongated upper part engaging within said overhanging frame portion and a lower part providing a die-carrying face, guide means carried by said upper slide part, complementary guide means carried by said frame, said lower slide part extending at each side laterally beyond said overhanging frame portion, a pair of shaft members positioned

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in opposite sides of said overhanging frame portion and extending laterally outwardly therefrom, a rotatable eccentric carried by each of said shafts laterally outside said overhanging frame portion, a pair of reciprocable power transmitting members located laterally outside said overhanging frame portion and within the lateral dimensions of said bed, each of said eccentrics carrying the upper end of one of said reciprocable members, adjustable means outside said overhanging frame portion securing the lower ends of said reciprocable members to said laterally extending sides of said lower slide part providing for adjustment of said members with respect to said slide in a direction parallel to the direction of reciprocal motion of said slide, means providing an adjustable connection between said lower end of each said reciprocable members and said slide at a position above said adjustable securing means, means limiting adjusting movement of said adjustable connection to a direction parallel to the direction of reciprocal motion of said slide to maintain said lower ends of said reciprocable members in substantially constant lateral relation with respect to said slide, power supplying means, and means providing a driving connection between said power supplying means and said eccentrics to impart reciprocal movement to said slide.

9. In a press of the character described, the combination of a frame providing a bed and a portion overhanging and spaced from said bed, a slide member mounted for reciprocal movement in said overhanging frame portion with respect to said bed and including an elongated upper part engaging within said overhanging frame portion and a lower part providing a die-carrying face and extending at each side laterally beyond said overhanging frame portion, a pair of power transmitting reciprocable members operatively positioned outside said frame and at either side thereof, a pair of connecting members pivoted to the lower ends of said reciprocable members, means forming a connection between each of said connecting members and said lower slide part, means for effecting adjustment of said members with respect to said slide in a direction parallel to the direction of reciprocal motion of said slide, and a forwardly extending T-shaped portion on each of said connecting members, said slide having lateral extensions at each side thereof positioned between the upper end thereof and said die-carrying face and each provided with a T-slot open at the back thereof and parallel to said upper slide part, said T-shaped portions on said connecting members engaging slidably in said T-slots and thereby maintaining said lower ends of said reciprocable members in substantially constant lateral relation with respect to said slide.

10. In a press of the character described, the combination of a frame providing a bed and a portion overhanging and spaced from said bed, a slide member mounted for reciprocal movement in said overhanging frame portion with respect to said bed and including an elongated upper part engaging within said overhanging frame portion and a lower part substantially wider than said upper part and providing a die-carrying face, guide means carried by said upper slide part, complementary guide means carried by said frame, power supplying means mounted on said frame, means for transmitting power from said power supplying means equally to each side of said lower slide part for imparting reciprocal movement to

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said slide, and pneumatic means for counterbalancing said slide including a cylinder mounted centrally of said frame and open to a source of compressed air, a piston mounted within said cylinder for reciprocal movement parallel to said slide and a piston rod secured at one end to said piston and at the other end to said slide.

11. In a press of the character described, the combination of a frame providing a bed and a portion overhanging and spaced from said bed, a slide member mounted for reciprocal movement in said overhanging frame portion with respect to said bed and including an elongated upper part engaging within said overhanging frame portion and a lower part providing a die-carrying face, said upper slide part including flange means extending outwardly therefrom along substantially the entire length thereof and defining a pair of grooves facing laterally outward, a pair of guide elements carried by the inner wall of said frame and each engaging in one of said grooves and cooperating with said flanges for maintaining linear operating alignment of said slide, power supplying means, and a pair of power transmitting reciprocable members each connected to said power supplying means and to said lower slide part adjacent opposite sides thereof for effecting reciprocal movement of said slide.

12. In a press of the character described, the combination of a frame providing a bed and a portion overhanging and spaced from said bed, a slide member mounted for reciprocal movement in said overhanging frame portion with respect to said bed and including an elongated upper part engaging within said overhanging frame portion and a lower part providing a die-carrying face, said upper slide part having a pair of laterally extending spaced flanges, adjacent the rear of each side thereof, each of said pairs of flanges defining therebetween a channeled groove extending along substantially the entire length of said upper slide part, a pair of guide elements carried by the inner wall of said frame and each engaging in one of said grooves and cooperating with said flanges for maintaining linear operating alignment of said slide, power supplying means, and a pair of power transmitting reciprocable members each connected to said power supplying means and to said lower slide part and adjacent opposite sides thereof for effecting reciprocal movement of said slide.

13. In a press of the character described, the combination of a generally hollow frame providing a bed and a portion overhanging and spaced from said bed, a slide member having an elongated upper part mounted for reciprocal movement in said overhanging frame portion in a direction substantially perpendicular to said bed, elongated guide means carried by said slide part and the inner walls of said frame and in cooperative engagement for maintaining the operating alignment of said slide during reciprocation, said slide having a die-carrying lower part extending laterally beyond said overhanging frame portion and approximating in width the width of said bed, power transmitting reciprocable members positioned laterally outside each side of said overhanging frame portion, means laterally outside said frame portion connecting the lower ends of said reciprocable members to the laterally extending sides of said lower slide part, means outside said frame portion for effecting adjustment between said connecting means and said slide parallel to the direction of reciprocation of said slide, and means for supporting and reciprocating

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ing the upper ends of said reciprocable members.

14. In a press of the character described, the combination of a generally hollow frame providing a bed and a portion overhanging and spaced from said bed, a slide member having an elongated upper part mounted for reciprocal movement in said overhanging frame portion in a direction substantially perpendicular to said bed, elongated guide means carried by said upper slide part and the inner walls of said frame and in cooperative engagement for maintaining the operating alignment of said slide during reciprocation, said slide having a die-carrying lower part extending laterally beyond said overhanging frame portion, power transmitting reciprocable members positioned laterally outside said overhanging frame portion, a pair of connecting members each pivoted at its upper end to the lower end of one of said reciprocable members, a housing carried by each of the laterally extending sides of said lower slide part outside said frame portion, and means within each of said housings forming an adjustable connection between said slide and the lower end of one of said connecting members to provide for adjustment between said reciprocable members and said slide parallel to the direction of reciprocation of said slide.

15. In a press of the character described, the combination of a generally hollow frame providing a bed and a portion overhanging and spaced from said bed, a slide member having an elongated upper part mounted for reciprocal movement in said overhanging frame portion in a direction substantially perpendicular to said bed, elongated guide means carried by said slide part and said frame and in cooperative engagement for maintaining the operating alignment of said slide during reciprocation, said slide having a die-carrying lower part extending laterally beyond said overhanging frame portion, power transmitting reciprocable members positioned laterally outside said overhanging frame portion, a pair of connecting members each pivoted at its upper end to the lower end of one of said reciprocable members, a housing carried by each of the laterally extending sides of said lower slide part outside said frame portion, means within each of said housings forming an adjustable connection between said slide and the lower end of one of said connecting members, means for adjusting said adjustable connections to vary the distance between said slide and said bed, said upper slide part having arm portions extending laterally therefrom at either side thereof into laterally overlying relation with said reciprocable members, and means providing an adjustable bearing between the upper ends of said connecting members and said arm portions of said upper slide part for resisting forward and backward thrust of the lower ends of said reciprocable members.

16. In a press of the character described, the combination of a generally hollow frame providing a bed and a portion overhanging and spaced from said bed, a slide member having an elongated upper part mounted for reciprocal movement in said overhanging frame portion in a direction substantially perpendicular to said bed, elongated guide means carried by said slide part and said frame and in cooperative engagement for maintaining the operating alignment of said slide during reciprocation, said slide having a die-carrying lower part extending laterally beyond said overhanging frame portion, power transmitting reciprocable members positioned laterally

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outside said overhanging frame portion, a pair of connecting members each pivoted at its upper end to the lower end of one of said reciprocable members, means outside said frame portion forming adjustable connections between the laterally extending sides of said lower slide part and the lower ends of said connecting members for varying the distance between said slide and said bed, the upper end of each of said connecting members having a forwardly extending projection thereon comprising a head portion and a neck portion smaller than said head portion, said upper slide part having a laterally extending arm portion at each side thereof provided with a slot substantially complementary in shape to said projection on said connecting members and open at the back thereof, said projections engaging slidably in said slots and thereby providing an adjustable bearing resisting forward and backward thrust of the lower ends of said reciprocable members.

17. In a press of the character described, the combination of a frame providing a bed and a portion overhanging and spaced from said bed, a slide member mounted for reciprocal movement with respect to said bed and including an elongated upper part and a lower part substantially wider than said upper part providing a die-carrying face, elongated complementary guide means carried by said overhanging frame portion and said upper slide part and cooperating to maintain the operating alignment of said slide with respect to said frame, power supplying means carried by said frame, a pair of power transmitting reciprocable members operatively positioned one at each side of said frame and laterally outside said guide means, means providing a connection between the lower end of each of said reciprocable members and the adjacent outer side of said lower slide part, and means providing an eccentric driving connection from said power supplying means to the upper end of each of said reciprocable means, said driving connection means being positioned between the upper and lower ends of said guide means.

18. In a press of the character described, the combination of a frame providing a bed and a portion overhanging and spaced from said bed, a pair of shaft members positioned in opposite sides of said overhanging frame portion, a gear wheel journaled on each of said shafts, drive means for rotating said gears, an eccentric secured to each of said gear wheels for rotation therewith, a pair of link members, each of said eccentrics carrying the upper end of one of said link members, a slide member reciprocable in said space between said overhanging frame portion and said bed, means connecting the lower ends of said link members to opposite sides of said slide member, said slide member having an elongated upper part, and complementary guide means carried by said overhanging frame portion and said upper slide part and cooperating to maintain the operating alignment of said slide member, said guide means being positioned laterally between said driving means.

19. An inclinable press comprising in combination, a supporting base, a frame providing a bed and a portion overhanging said bed and spaced therefrom to leave a gap therebetween, means carried by said base for pivotally mounting said frame, said frame having an opening in the back thereof in line with said gap, means for controlling and supporting the pivotal movement of said frame about said pivotal mounting to effect

tilting of said frame, said tilting means being positioned at the rear of said press and out of line with said opening in the back of said frame, a slide including an elongated upper part extending into said overhanging frame portion and a lower part substantially wider than said upper slide part and providing a die-carrying face adapted to move across said gap, means for supporting said slide including power transmitting reciprocable members positioned at each side of said frame laterally outside said opening in the back thereof, means providing connections between the lower ends of said reciprocable members and the sides of said lower slide part, means carried by said frame for supporting and reciprocating said reciprocable members to impart to said slide reciprocal movement with respect to said bed, and means carried by said overhanging frame portion and said upper slide part providing elongated complementary guide surfaces cooperating to maintain operating alignment of said slide with respect to said bed in all angular positions of said frame with respect to said base.

20. In a press of the character described, the combination of a frame providing a bed and a portion overhanging and spaced from said bed, a slide member mounted for reciprocal movement in said overhanging frame portion with respect to said bed and including an elongated upper part engaging within said overhanging frame portion and a lower part providing a die-carrying face and extending at each side later-

ally beyond said overhanging frame portion, a pair of reciprocable power transmitting members positioned at either side of and laterally outside said overhanging frame portion, adjustable means outside said frame portion securing said reciprocable members to said laterally extending sides of said lower slide part to provide for adjustment of said members with respect to said slide in a direction parallel to the direction of reciprocal motion of said slide, said upper slide part having arm portions extending laterally therefrom at either side thereof into laterally overlying relation with said reciprocable members, and means adjustably connecting said lower ends of said reciprocable members to said arm portions of said slide, said connecting means being adjustable in a direction parallel to the direction of reciprocal motion of said slide to maintain said lower ends of said reciprocable members in substantially constant lateral relation with said slide.

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