Nov. 15, 1938. A. H. LONG 2,136,856

FORMING PRESS

Filed Nov. 9, 1936 4 Sheets-Sheet 1

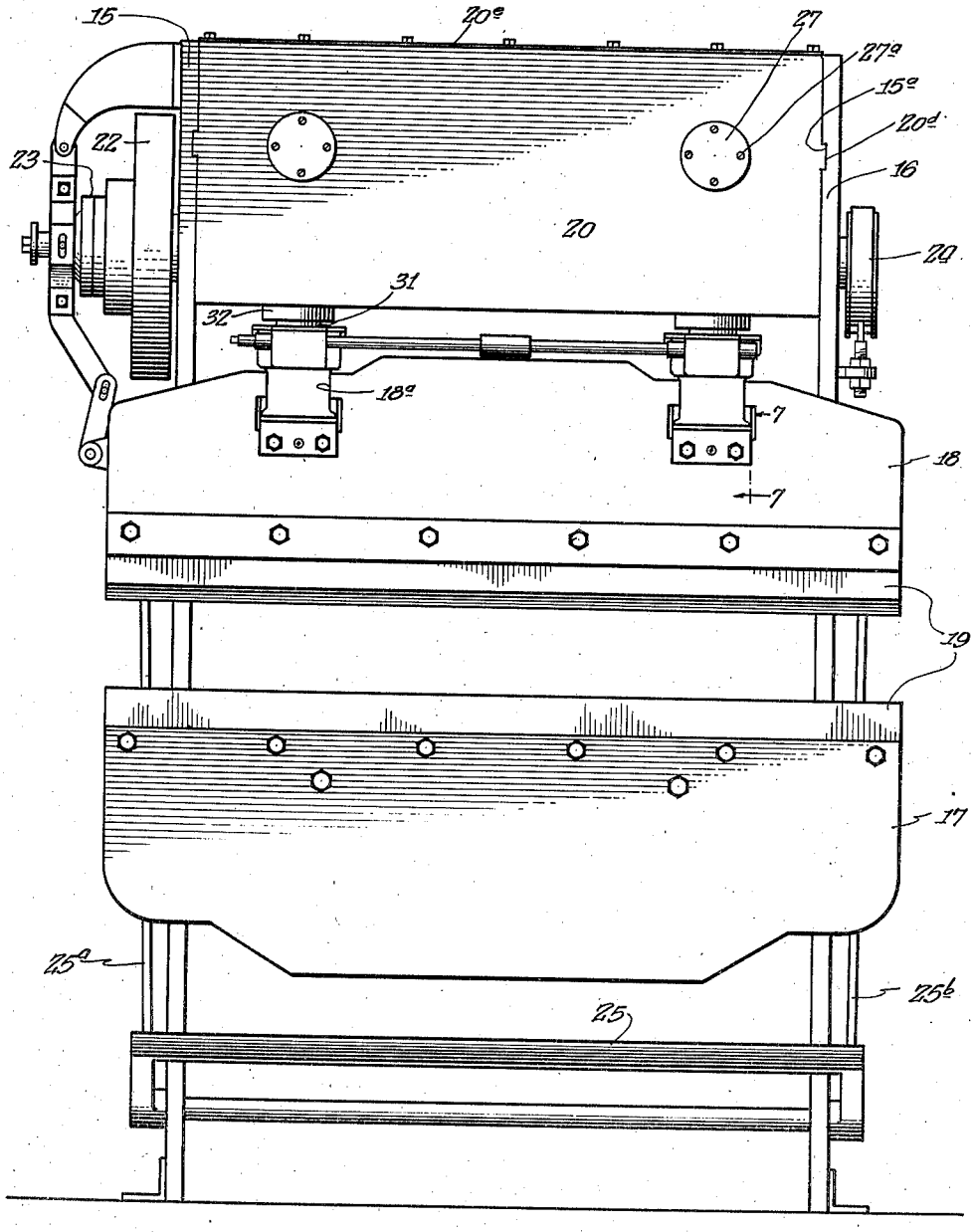


Fig. 1

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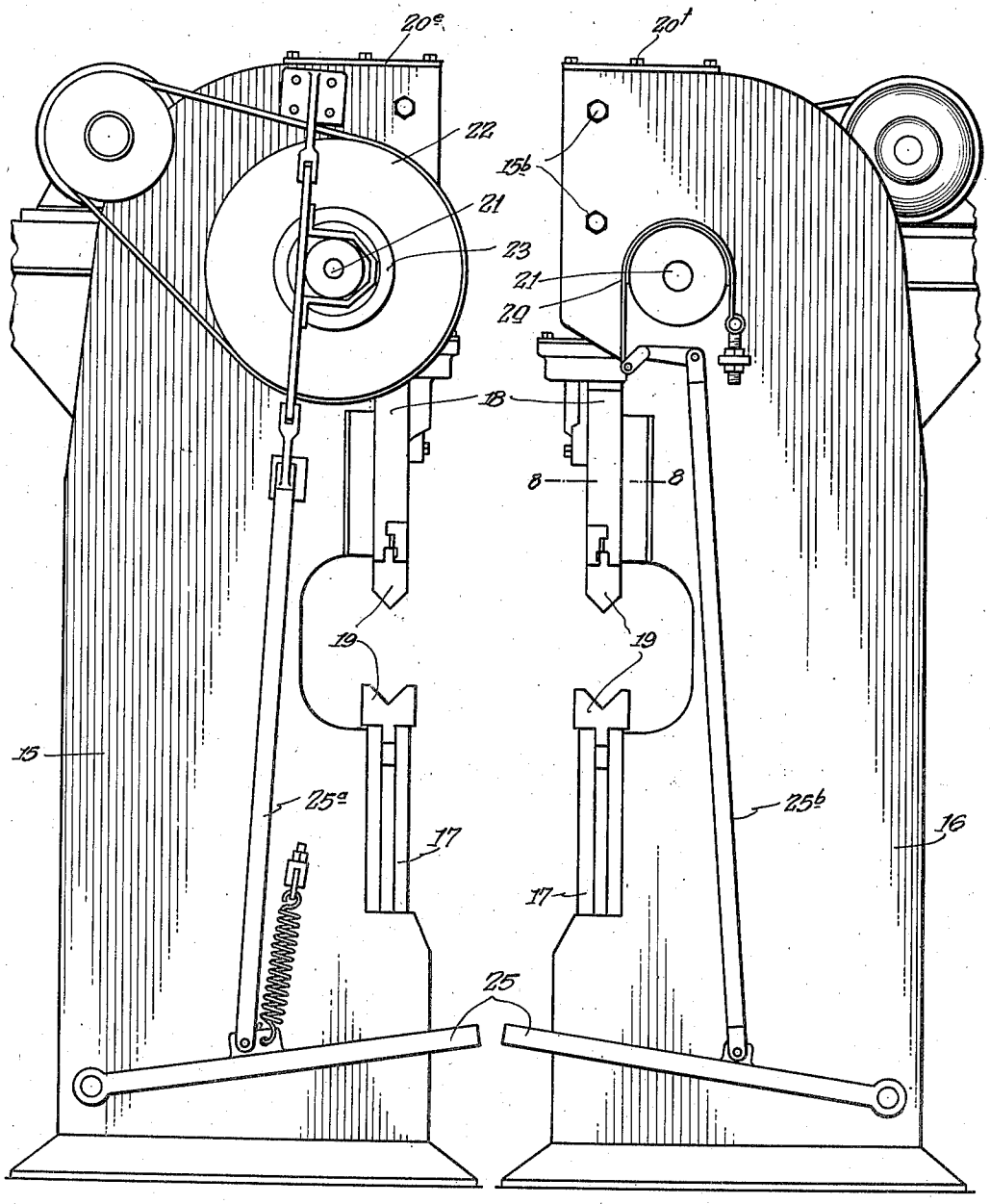


Fig. 2 Fig. 3

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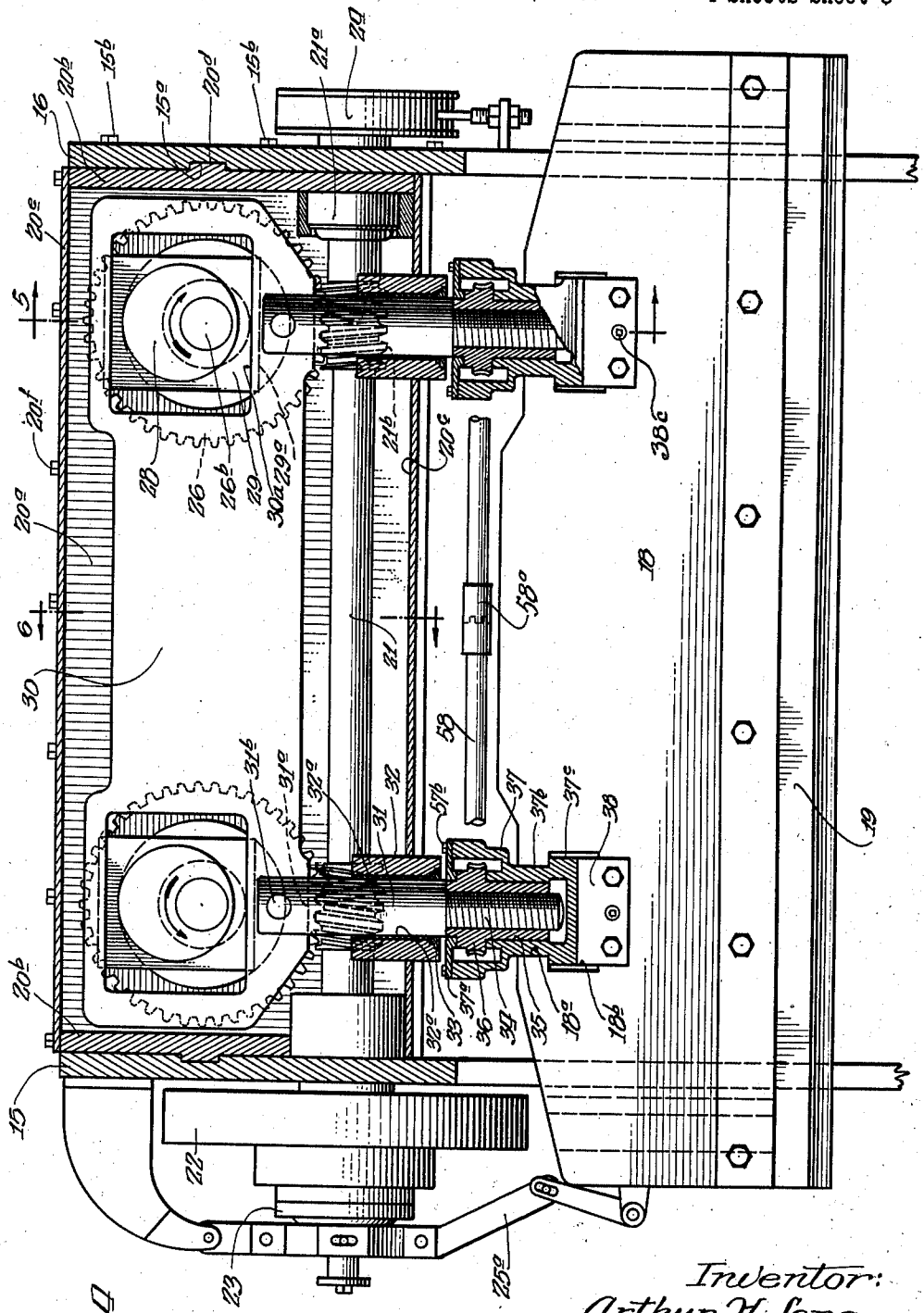


Fig. 4

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Fig. 5

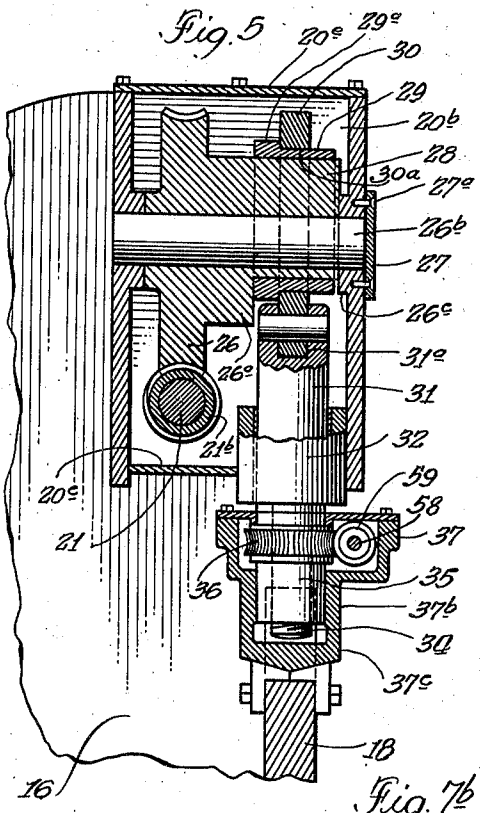


Fig. 6

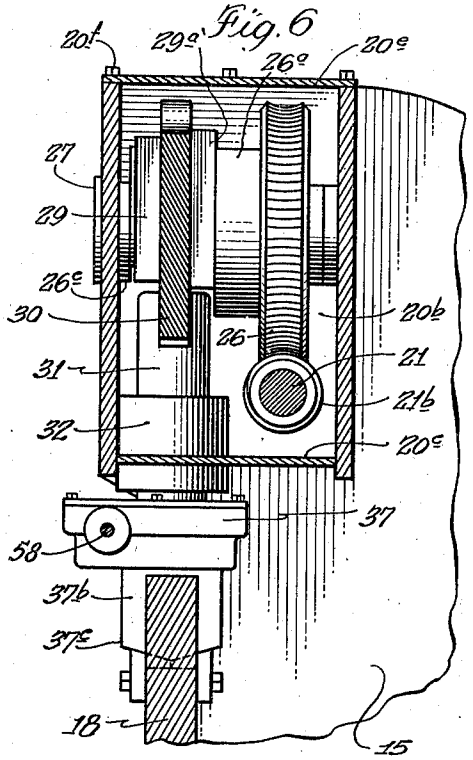


Fig. 7b

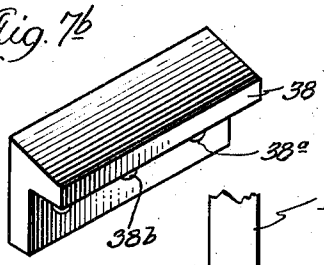


Fig. 7

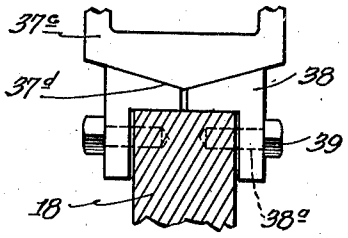


Fig. 8

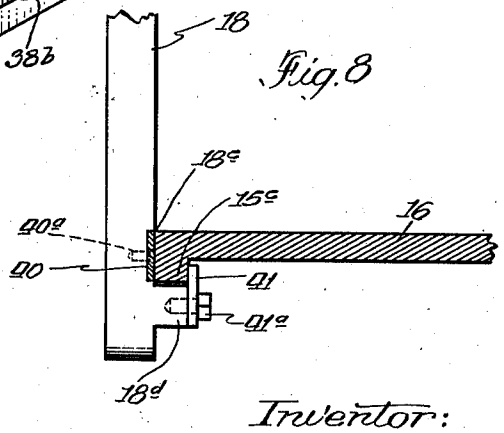
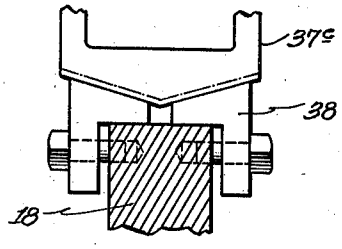


Fig. 7a



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Patented Nov. 15, 1938 2,136,856

UNITED STATES PATENT OFFICE

2,136,856

FORMING PRESS

Arthur H. Long, Chicago, Ill., assignor to Dreis & Krump Mfg. Company, Chicago, Ill.

Application November 9, 1936, Serial No. 110,022

4 Claims. (Cl. 153—21)

My invention relates to forming presses, and more particularly to that type in which a ram is reciprocable relative to a bed, and my main object is to provide a press of this kind which is comprised of the fewest number of parts consistent with its requirements.

A further object of the invention is to design the novel press with units and parts of utmost simplicity for purposes of economy in manufacture and replacement, facility in assembly and repair, and ease of operation.

A still further object of the invention is to group the principal operating parts compactly to save space and enable them to occupy a common lubricating bath.

Another object of the invention is to dispose the vital running gear in balanced relation, in order that the pressure imparted to the ram may be uniform.

An additional object of the invention is to concentrate the efforts of the ram-operating units inwardly of the press and so cause the incidental stresses to merge with such efforts rather than detract therefrom.

Another object of the invention is to eliminate strain, undue wear and shearing tendencies wherever possible, that the press may operate with efficiency and over long periods without attention or repair.

An important object of the invention is to provide supporting means for the press ram which are adjustable to changes in the alinement of the ram.

Another object of the invention is to equip the ram-supporting means with release devices which are quickly actuated to relieve the locking of the ram-operating gear on dead center.

With the above objects in view and any others which may suggest themselves from the description to follow, a better understanding of the invention may be had by reference to the accompanying drawings in which—

Fig. 1 is a front elevation of the novel press;

Figs. 2 and 3 are end views from the left and right, respectively;

Fig. 4 is an enlarged front elevation of the upper portion of the press, partly in section;

Figs. 5 and 6 are sections taken on the lines 5—5 and 6—6, respectively, of Fig. 4;

Fig. 7 is an enlarged section of a detail taken on the line 7—7 of Fig. 1;

Fig. 7*a* is a duplicate of Fig. 7, showing certain parts in a changed position;

Fig. 7*b* is a perspective view of a part appearing in Fig. 7; and

Fig. 8 is a detail section taken on the line 8—8 of Fig. 3.

In forming presses of the type under consideration, the drive to the ram frequently entails the use of a plurality of shafts and gears, which spread the drive over a large area, involve considerable production and maintenance costs, lower the efficiency of the press, and create grinding and other noises. Due to these deficiencies presses of this kind are larger in size and heavier than the work actually requires, and need more power to run them. Besides, the multiplicity and spread of the parts in the running gear necessitates more extensive lubrication, greater care to keep isolated units lubricated and free from clogging, and a greater consumption of the lubricant. In view of these considerations I have designed the novel press with means to eliminate the defects related and render the press simple, high in efficiency and silent in operation.

In accordance with the foregoing, specific reference to the drawings indicates the side walls of the press at 15 and 16, and its bed at 17. The ram 18 is vertically reciprocable along the front edges of the walls 15 and 16; and the facing edges of the ram and bed are formed with suitable receptacles for a pair of forming dies 19, whose shape may vary according to the form to be imparted to the work.

The end walls 15 and 16 carry between them a housing comprised of front and back walls 20 and 20*a*, side walls 20*b* and a bottom 20*c*. The housing is built as a rigid unit by welding or otherwise securing its component parts; and it is supported by the seating of outward horizontal ribs 20*d* of the side walls 20*b* in matching grooves 15*a* on the inner sides of the walls 15 and 16. The housing is further secured to these by receiving bolts 15*b* from the outside, and receives a lid 20*e*, secured by cap screws 20*f*.

The ram 18 is operated from a single drive shaft 21 located in the rear, lower part of the housing 20 and running in bearings 21*a* carried by the latter. One end of the shaft extends through the wall 15 to receive a pulley drive 22, containing a suitable clutch 23, while the other end of the shaft extends similarly to receive a brake 24. When the ram is up—as shown—the clutch is disengaged and the brake applied; and to lower the ram a treadle 25 at the base of the press is actuated, with a lever 25*a* to the clutch for engaging the latter, and a lever 25*b* to the brake for releasing the same simultaneously. The drive, clutch and brake mechanisms need no detailed description, as any type may be employed which will operate and control the shaft 21 as described.

Inside the housing the shaft 21 carries a worm 21*b* near each end. As noted particularly in Figs. 4 and 5, each worm 21*b* meshes with a gear 26 near the rear wall of the housing, the gear having a hub 26*a* extending to the front wall thereof. The gears 26 are journaled on center pins 26*b* fixed in bearings 26*c* formed by inwardly thickening the front and rear housing walls. These receive closure plates 27 on the outside for the re-

tention of lubricant in the bearings **26***c*, the plates being secured by screws **27***a*.

The front portions of the gear hubs **26***a* are reduced to form eccentrics **28**, on which are disposed follower blocks **29**. These are rectangular and slidable in horizontal openings **30***a* formed near the ends of a massive link **30**, which extends almost the length of the housing **20**. The blocks **29** are enlarged with flanges **29***a* on the rear side of the link, to be kept by the latter from backing toward the rear housing wall.

The link **30** seats in vertical cavities **31***a* formed in a pair of posts **31** which are vertically slidable in bearing sleeves **32** disposed in the bottom of the housing **20**. The latter is perforated for the partial passage of the sleeves, the joint then being made tight by welding. The sleeves **32** carry suitable internal bushings **32***a* which are replaceable in case of wear; also, packings **33** are fitted in the bottoms of the sleeves to seal them against the escape of lubricant which is provided for the posts **31**.

The posts **31** are designed to support the ram **18**, and their connections with the latter are identical. Thus, each post is extended downwardly with a screw **34** upon which is threaded a cylindrical nut **35** having an annular enlargement in its upper portion in the form of a worm gear **36**. The nut **35** is rotatably disposed in a housing **37** which receives a portion of a shaft **58** carrying a worm **59**, which is in mesh with the gear **36**. The housing **37** receives a lid **37***a* secured by cap screws **57***b* and has sufficient internal room for a lubricant to ease the operation of the worm and gear. It will be evident that the rotation of the shaft portion **58** will cause the nut **35** to rise or fall along the screw **34** and carry the housing **37** and shaft portion **58** accordingly. The shaft portion **58** extends beyond one housing **37** to receive an operating crank (not shown), and the shaft portions are preferably joined by a simple clutch **58***a* in the center, which is adjustable to free either shaft portion for individual operation. Thus, while the shaft portions are normally intended to operate together for the uniform raising or lowering of the ram, it is possible to alter the height of one housing or the other whenever the level of the ram is to be adjusted.

The ram **18** is divided below each housing **37**, as indicated at **18***a*, to receive a constricted portion **37***b* thereof, the division then becoming enlarged in the form of an opening **18***b* to seat a corresponding enlargement **37***c* of the housing. While the constricted portion **37***b* is preferably of circular cross-section, the enlarged portion **37***c* has a flat front and rear formation, as indicated in Fig. 4 at the right, and terminates with a bottom ridge **37***d*. The ram receives an angle plate **38** from each side in the region below the enlargement **37***c*. The side sections of the plates are perforated at **38***a* for the passage of bolts **39** into the ram, while the upper sections of the plates are inwardly inclined at the same angle as the surfaces of the ridge **37***d*. When the connection is made under normal conditions, a small space exists between the upper sections of the angle plates; also, a small space exists between the side sections thereof and the ram, as shown in Fig. 7*a*.

The side walls **15** and **16** of the press are outwardly enlarged with gibs **15***c* to provide a substantial frontal surface along which the ram **18** is movable. In order that the ram may not be permanently worn along the course of contact with the gib, the affected portions of the ram are recessed as indicated at **18***c* to each receive a bronze gib liner **40**, secured by screws **40***a*. Also, the ram is made with a rearward vertical rib **18***d* for guidance along the gib **15***c*, a retainer plate **41** being secured on the rear face of the rib by bolts **41***a* and extending to overlie the rear face of the gib projection.

It will be evident that the wear of the gib liners **40** during the prolonged use of the press will cause the ram to depart slightly from its vertical alinement with the posts **31**. It is for this reason that the angle plates **38** are made with the inclined relation to the housing enlargement **37***c* indicated in Fig. 7. Should a departure of the character mentioned occur, the screws **39** may be manipulated to adjust the angle plates laterally in a direction to take up the error in alinement. However, this adjustment will not be prejudicial to the connection with the housing enlargement **37***c*, as the latter will find its seat upon the plates despite the lateral departure thereof. It is understood that the amount of error considered in the above adjustment is usually very slight, and that a more considerable amount of error would be disposed of by re-lining the ram.

It is understood that the operation of the ram is induced by the simultaneous effect of the eccentrics **28** upon the posts **31**. It is noted in Fig. 4 that the threads of the worms **21***b* are in opposite directions, whereby to rotate the gears **26** as indicated by the arrows in the central portions thereof. As the eccentrics rise and fall, the link **30** follows suit, the blocks **29** moving laterally in the link openings **30***a* to allow for the lateral motion of the eccentrics. Downward pressure of the link upon the posts **31** is effected by the seating of the link in the cavities **31***a*, while cross pins **31***b* are passed through the posts and the link to connect these parts for joint movement on the upstroke. The motion is then transmitted to the ram directly through the adjusting units below.

It will be seen that the entire vital mechanism for the operation of the ram is contained in the housing **20**. The compact nature of the mechanism assembly makes it possible to build this housing relatively small and to fill the same with a lubricant to serve all the parts involved. The fact that a single prime shaft is employed to actuate the raising and lowering mechanism makes the running gear exceedingly simple, eliminating a multiplicity of bearings and other material, with attendant provision for lubrication and use of extended space. The mechanism harmonizes with the requirement that the ram be actuated at two laterally spaced points by the provision of the dual arrangement of the worms **21***b*, gears **26**, eccentrics **28**, etc. Thus, the effect upon both connections with the ram is uniform. Further, the provision of the link **30** assures the positive connection of the dual working units and the operation thereof in perfect unison. Also, the rotation of the gears **26** in the directions denoted by the arrows directs the motion of the gears inwardly at the points where they are driven, so that they may co-act to maintain the joint travel of the units in keeping with their connection by the link **30**. The inward influence of the gears is transmitted to the shaft **21**, so that no special bearings or reinforced end walls are required to resist end-thrust. By the action of the eccentrics the link **30** receives the co-acting influences of the gears indirectly in the zone of its connections with the posts **31** and performs as an equalizing link, since it balances and evenly divides the pressure imparted by the eccentrics to the ram-operating

posts **31**. Also, due to the purely vertical motion of the equalizing link, the posts **31** receive no lateral stress and will therefore impose no strain or undue wear on their bearings. Further, the arrangement of the dual operating units in conjunction with the link makes for a very compact drive which occupies a fraction of the space employed for the same purpose in conventional presses.

The arrangement is also favorable to the functions of installation or repair. The mechanism may be built into the box-like housing **20** as a unit and is thus ready to be installed within the walls of the press by the simple application of the latter to the sides of the housing. Conversely, if a repair or overhaul is required, the external units may be disconnected and the side walls **20***b* sprung apart to permit the joints thereof with the housing **20** to become freed and the housing to be lifted out.

Occasionally it happens that a job becomes wedged in the form dies when the ram is on bottom dead center, making it very difficult to secure the release of the ram. Ordinarily this is done by prying the ram-operating gears by hand until the ram is released, but in my press the release may be procured much more easily. In the event of a deadlock of the type mentioned, it is only necessary to withdraw the angle plates **38** by backing the screws **39** as shown in Fig. 7*a*, which will provide a sufficient space between the housing enlargement **37***c* and the angle plates for the necessary clearance, as indicated by dot-and-dash lines. In this connection the angle plates **38** have tapped center holes **38***b* for screws **38***c* to bear on the ram in case the plates become jammed, and release them. It is thus possible to correct an occasional mishap of this kind in a few minutes, keeping the press out of service but momentarily.

In summing up the features of the novel press, it is apparent that its simplicity and compactness are of first importance. The sturdy and equalized construction of the ram-operating mechanism makes for uniform pressure to the ram and sufficient strength to take the heavier loads imposed on the machine. The absence of spur gears and extra shafts saves power and makes the operation of the press silent. The parts of the ram-operating mechanism which rotate or bear frictional stresses are all within the housing **20** in a constant bath of lubricant and protected from dust and contact by external objects. Parts subject to torsional and bending stresses have been eliminated in the present machine. Thus, it is noted that the pins **26***b* are stationary and receive no rotative impulse; also, the shearing stress on these pins is so slight as to be negligible. There is no shearing stress on the post pins **31***b*, as the equalizing link **30** bears down directly upon the posts **31** by seating in the cavities or pockets **31***a* thereof. The unitary nature of the ram-operating mechanism makes it interchangeable in case an important repair is necessary by enabling the defective unit to be replaced by a new or spare one on short notice and the use of the press resumed. The open character of the mechanism when exposed makes for easy access to its parts; and the simplicity of the latter facilitates removal and replacement of any that are found defective. Finally, the disposal of the ram and the connections for its adjustment are features which save labor and keep the press in proper condition with a minimum of attention.

While I have described the invention along specific lines, it is not limited thereto, but is susceptible to various minor changes and refinements, these, however, not departing from the scope and spirit of the appended claims.

I claim:—

1. In a forming press, a ram, ram operating mechanism comprising a drive shaft, oppositely rotating transmission gears at points along said shaft, a tie member between said gears, said gears including means for moving said tie member vertically, said tie member comprising means for equalizing the lateral thrust of said gears, and connections from said tie member to points along said ram, said press having side walls, a lubricant containing housing removably supported between said side walls, said shaft, gears, and tie members being contained in said housing, and said connections between said tie member and said ram extending through a wall of said housing and having a fluid tight joint therewith.

2. In a forming press, a ram, ram operating mechanism comprising a drive shaft, oppositely rotating transmission gears at points along said shaft, a tie member between said gears, said gears including means for moving said tie member vertically, said tie member comprising means for equalizing the lateral thrust of said gears, and connections from said tie member to points along said ram, said forming press having side walls, said side walls being formed to provide horizontal channels on their inner sides, a lubricant containing housing having horizontal ribs on the side walls thereof, said ribs being adapted to fit in said channels to removably support said housing between said side walls, said shaft, gears and tie members being contained in said housing, and said connections between said tie member and said ram extending through a wall of said housing and having a fluid tight joint therewith.

3. In a forming press including a superstructure and a ram below the same, an operating mechanism for the ram comprising a drive shaft journaled in the superstructure, cross pins fixedly carried by the latter at spaced points along the course of the shaft, gears journaled on the pins and having their hubs formed as eccentrics, pinions carried by the shaft in mesh with the gears, a tie member between the eccentrics, followers between the latter and the tie member, the eccentrics and followers being arranged to move the tie member vertically, and connections from the latter to points along the ram.

4. In a forming press including a housing and a ram below the same, an operating mechanism for the ram comprising a drive shaft in the housing and journaled in the sides of the same, cross pins fixed between the front and rear walls of the housing at laterally-spaced points opposite the shaft, gears journaled on the pins and having their hubs formed as eccentrics, pinions carried by the shaft in mesh with the gears, a tie member between the eccentrics, followers between the latter and the tie member, the eccentrics and followers being arranged to move the tie member vertically, and connections from the latter to points along the ram.

ARTHUR H. LONG.