Nov. 29, 1938. W. KLOCKE 2,138,106

PRESS SLIDE WITH GAG CONNECTION

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Fig. 1.

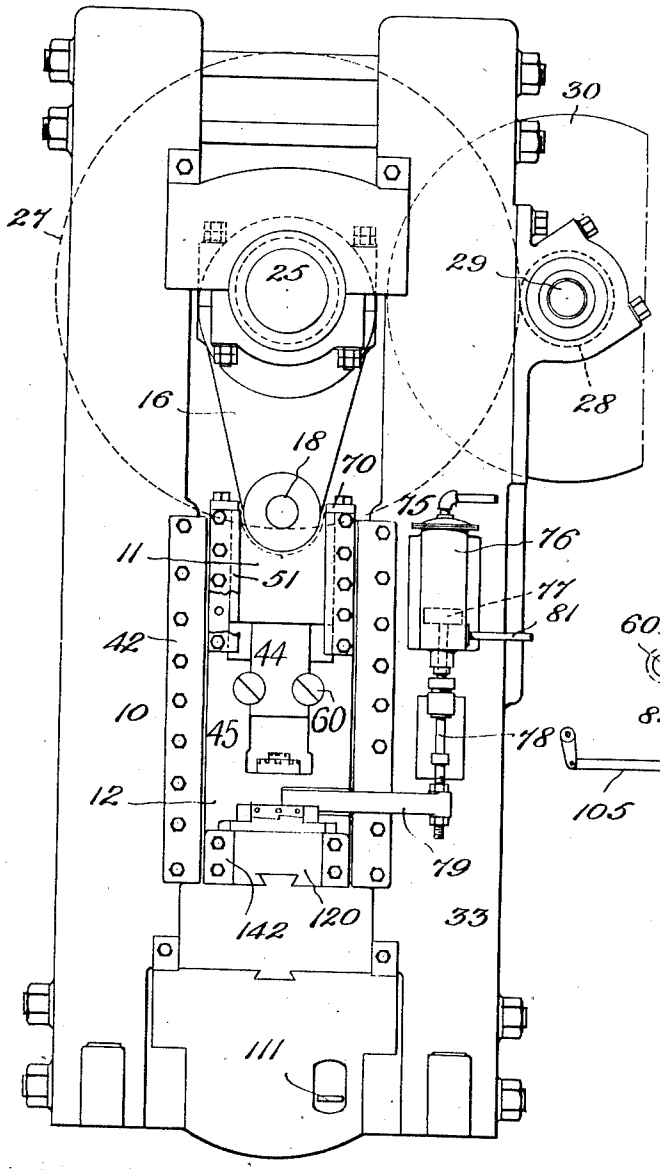
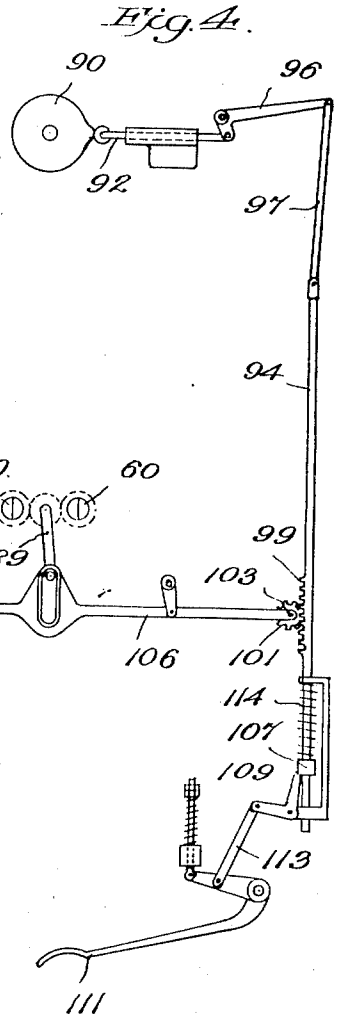


Fig. 4.



INVENTOR.
WILLIAM KLOCKE
BY G. R. Thompson
ATTORNEY.

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Fig. 2

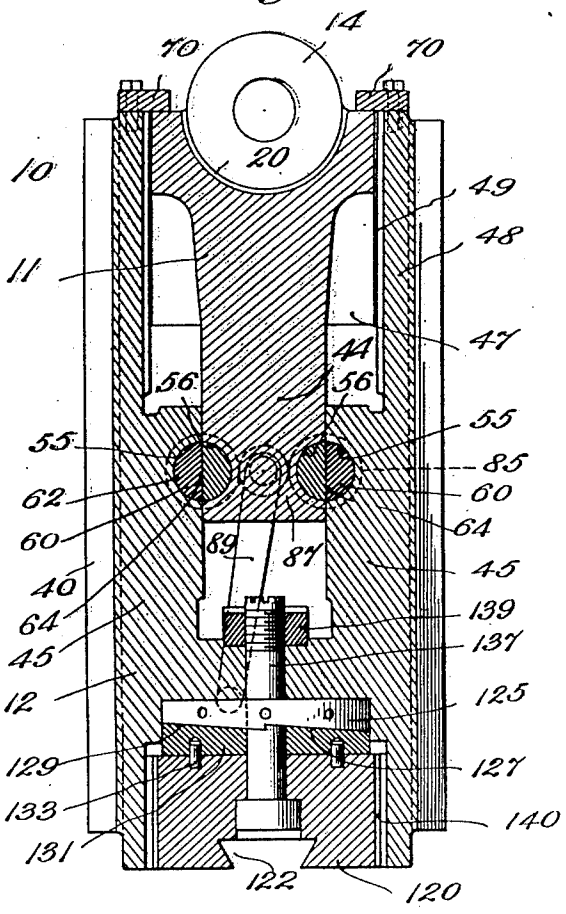
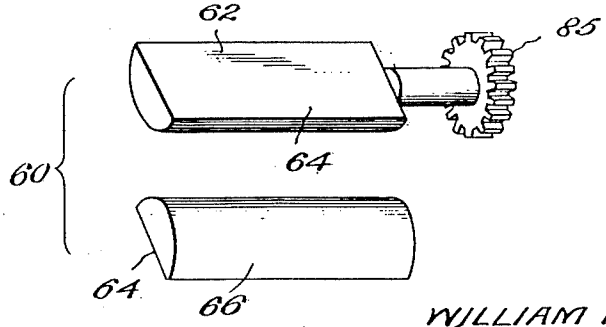


Fig. 3.



INVENTOR.
WILLIAM KLOCKE
BY G. R. Thompson
ATTORNEY.

UNITED STATES PATENT OFFICE

2,138,106

PRESS-SLIDE WITH GAG-CONNECTION

William Klocke, Woodhaven, N. Y.

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8 Claims. (Cl. 78—39)

This invention relates to press-slides with gag-connections, and provides improvements therein.

The present invention provides a slide provided with a gag-connection, which is improved as to precision of operation, ruggedness, rigidity, and safety. There is also obtained virtual elimination of impact, as between the parts of the slide, and economy in the manufacture. The present invention has special utility in large presses, as for example, forging presses (with rated working force of 1000 tons for example).

An embodiment of the invention is illustrated in the accompanying drawings, wherein:

Fig. 1 is a view in front elevation of a large mechanical type forging press incorporating the invention.

Fig. 2 is a vertical sectional view of the slide.

Fig. 3 is a perspective view of a key, one of the parts being displaced to better illustrate the construction.

Fig. 4 is a somewhat diagrammatic view illustrating means for operating the gag-connection.

Referring to said drawings, numeral 10 designates the press slide. The press slide comprises two parts 11 and 12, which parts are relatively movable longitudinally. The part 12 is a tool-carrying part. Part 11 is provided with suitable means 14 for attaching a connecting rod 16. These means may comprise spaced ears or lugs, between which the end of the connecting rod fits, and through which lugs and the end of the connecting rod a connecting pin 18 is passed. A bearing surface 20 is provided on the part 11 for sustaining the thrust of the connecting rod 16.

The slide 10 is reciprocated by any suitable means through the connecting-rod 16, as by means of crank shaft 25 having a gear 27 thereon driven by a pinion 28 on the shaft 29 on which is mounted a fly-wheel pulley 30.

The slide 10 and driving parts are mounted on a frame 33. The frame here illustrated is of massive, rugged and rigid construction, and the press illustrated is a large mechanical type forging press. A mechanical type forging press, where the slide 10 has a definite stroke, and embodying the present improvements, is capable of producing forgings of a high degree of accuracy and precision. As an example of the size and duty of these forging presses, a forging press according to the design illustrated, has a height of over 19 feet, a weight of over 200,000 lbs., and is designed to apply a normal working force to the work between the dies which are mounted on the bed and slide 10, of 1000 tons.

The slide 10 is provided with suitable means for guiding its reciprocatory movement, which, as here shown, may comprise machined faces 40 which slide against corresponding faces on the frame 33, and it is also confined front and back by means which include the gibs 42 fastened to the frame 33. The design is such as to obtain accurate reciprocatory movement of the slide under great stresses.

As heretofore stated, the parts 11 and 12 of the slide 10 are relatively movable longitudinally, and these relatively movable parts have lapping portions 44, 45. The lapping portion 44, as here illustrated is a projection on the slide part 11, which enters a recess in the slide part 12, and has a sliding fit with the lapping portions 45 on each side of said recess.

Additional lapping and guiding means, as here illustrated, may be provided between the relatively movable slide parts 11 and 12, and thereby the accuracy and precision in the working of the press aided. The slide parts 11 and 12 may be provided with additional lapping portions 47, 48, the meeting faces of which are accurately finished and fitted, as indicated at 49, to provide a broad bearing between said parts 11 and 12.

Gibs 51 fastened to the slide part 12 confine the slide part 11 at right angles to the faces 49, so that the slide part 11 has a true axial movement in the slide part 12.

Key-ways 55 and 56 are formed in the adjacent sides of the lapping portions 44, 45 of the slide parts 11 and 12, and keys 60 are provided for locking the slide parts 11 and 12 together, and unlocking them. The key 60 may be of any suitable form, and the key-ways 55, 56 are of a shape to conform to the keys. Advantageously the keys 60 are of an oscillatory type, and comprise a semi-cylindrical oscillatory part 62, and the face 64 on the chord side of said semi-cylindrical part 62 is made so as to be flush with the meeting plane of the lapping portions 44, 45 in the unlocking position of the key 60. An advantage of the semi-cylindrical oscillatory key is that a broad bearing surface may be obtained in the locking position of the key with a small amount of motion of the key to and from locking position. Advantageously the key 60 also comprises another part 66 forming the complementary part to the semi-cylindrical part 62 so that the parts 62 and 66 together constitute a full cylinder. The parts 62, 66 of the key fit snugly in the key-ways 55 and 56, and in many ways give the effect of a full cylindrical key in the locking position of the key, the key parts 66 aiding in sustaining the stresses and strains between the slide parts

11 and 12, when the key locks these parts together and force is applied through the driving connections of the slide.

Means are advantageously provided for limiting the extension of said relatively movable slide parts 11 and 12, so that the limiting position of extension corresponds to a position of the slide parts in which said key-ways 55, 56 are in register, and in which position the locking together and the unlocking of the slide parts 11 and 12 is effected. The means for limiting the extension as aforesaid, may, as here shown, comprise flanges 70 fastened to the slide part 12, against which the slide part 11 abuts at said limit of its extension. The flanges 70 also perform another function. They maintain a mechanical connection between the slide parts 11 and 12 so that the part 12 of the slide is kept from falling should other means for supporting said lower slide part 12 (hereinafter referred to) fail. The slide part 11 being connected to the connecting rod 16 by the pin 18 will hold up said slide part 12, through the flanges 70, in the position of extension of said slide parts 11 and 12.

Means are provided for counterbalancing the weight of the slide part 12. Any suitable means for this purpose may be provided. As here shown, the counterbalancing means comprises a fluid pressure device 75 (hydraulic or pneumatic), which device comprises a cylinder 76 and a piston 77 having a rod 78 connected to the slide part 12 through an arm or bracket 79. The cylinder 76 may be connected through a pipe 81 to an auxiliary vessel of large size (not shown), so that the displacement of fluid in the cylinder is small as compared with that in the auxiliary tank, and thereby only small changes in pressure effected by displacement of the fluid to and from the cylinder 76. The counter-balancing means 75, in the unlocked position of the slide parts 11 and 12, acts to hold the slide part 12 counterbalanced, so that the slide part 11 may make an idle reciprocation while the slide part 12 is supported by the counter-balancing means in a raised position. Moreover, when the slide part 12 is thus supported, impact between the top of slide part 11 and the flange 70 on slide part 12 may be made very small.

Suitable means are provided for moving the keys 60 to lock together and unlock said relatively movable parts 11 and 12 of the slide. In the form of key shown, that is, a semicylindrical oscillatory key as illustrated in Fig. 3, the means are such as to oscillate or turn the key, and may comprise a gear wheel 85 and centered on the axis of the semicylindrical part 62, which meshes with a gear 87 having an arm 89 through which the said gear 87 may be turned, and the turning movement thereof imparted through the gear wheels 85 to the keys 60.

Movement of the arm 89 to move the keys 60 may be effected in suitable manner. As here shown, means for the purpose may comprise a cam 90 fastened on the crank shaft 25, and thereby turning with the main crank. A follower 92 is pressed against the cam 90, and acts on a rod 94 through a bellcrank 96 and link 97. The rod 94 has a rack 99 thereon which meshes with a pinion 101, which pinion has a crank-pin 103 which is connected to fork-piece 105 through a link 106. The arm 89 is engaged by said fork-piece 105. The lower part of shift-rod 94 may be provided with a collar 107, adjacent a pivoted dog 109 which may be connected to a treadle 111 through a link 113. The position of the cam 90 shown in Fig. 4 corresponds to the position of the keys 60 in which the slide parts 11 and 12 are unlocked. When the treadle 111 is free, the dog 109 engages the collar 107, and holds the key 60 in unlocking position. In this position the press may run without imparting reciprocation to the slide part 12. Pressure on the treadle 111 releases the collar 107 from the dog 109, allows the follower 92 to ride off of the high part of the cam 90, and the rod 94 and fork-piece 105 to move under the action of a spring 114 and move the arm 89 to turn the keys 60 so as to lock the slide parts 11 and 12 together.

Generally in presses, a means is provided for adjusting the bottom-of-the-stroke position of the slide 10. Such adjustment takes care of tools of different height. The adjustment is usually provided in the connecting rod. There are objections, particularly in forging presses, to the use of the ordinary adjustable connecting rod. Means are provided herein for adjusting the bottom-of-the-stroke position of the slide, which are especially suitable for a slide having a gag-type of connection, and for a forging press. These adjustable means comprise a block 120 on which the tool or die is mounted (the block 120 being shown with the usual dove-tail groove 122 for attaching tools). Between the block 120, and the bottom of the slide part 12 a disk 125 is placed having one or more spiral inclines 127 on a face, which inclines bear against corresponding inclines 129 on either the block 120 or the slide part 12. As here shown the inclines 129 are formed on a disk 131 which is fastened to the block 120 by dowel-pins 133. The block 120 is fastened against the underside of the slide-part 12, through the disks 125, 131, by an axial bolt 137 and a nut 139. The disk 125 is round, and may be turned to adjust the position of the block 120 with relation to the bottom of the slide 12. The block 120 is preferably provided with rectangular sides having a sliding fit against faces on the slide part 12, as indicated at 140. The block 120 is further confined by gibs 142 fastened to the slide part 12, and acting on the block 120 at right angles to the faces 140. The block 120 is very accurately and strongly supported by the means described, which means contribute to the formation of accurate and precisely formed forgings.

Operation

In presses having much weight in the slide or in the driving connections, the starting and stopping imposes severe duty on the usual brakes and clutches. In a press such as here shown, provided with a slide having a gag-connection, the fly wheel 30, gear 27, crank shaft 25, connecting rod 16, and slide part 11, ordinarily run continuously.

When it is desired to forge, the slide part 12 is locked to the slide part 11, and when it is desired to omit a forging action by the tools, the slide parts 10 and 11 are unlocked. The normal condition and relation of the slide parts 11 and 12 may be either a locked or an unlocked one. In the embodiments shown herein (see Fig. 4) the slide parts 11 and 12 are normally unlocked, and the forging action is brought about by the attendant pressing a treadle to effect the locking together of the slide parts 11 and 12. Release of the treadle effects unlocking of the slide parts 11 and 12.

When the keys are in the position shown Fig. 2, the slide part 11 may reciprocate without driving the slide part 12. The counterbalance 75 when

the keys 60 are in unlocking position, supports the slide part 12 in a raised position.

When it is desired to operate the press to forge (or to perform some other forming operation) the workman presses and holds down the treadle 111. The normal position of the parts prior to the pressure of the treadle is shown in Fig. 4. The keys 60 are in unlocking position, with the chord faces 64 flush with the meeting plane of the lapping parts 44, 45, so that the slide part 11 reciprocates idly with relation to the slide part 12. The pressure on the treadle 111 withdraws the dog 109 from the collar 107 on the rod 94. The parts are now in potential condition to bring about the locking together of the slide parts 11 and 12. When the slide part 11 makes contact with the flanges 70 on the slide part 12, the keyways 56 in the slide part 11 are in register with the keyways 55 in the slide part 12. This condition continues while the crank on shaft 25 is passing through an arc in the upper part of the circle of revolution of the crank, so that the key parts 62 and 66 of the keys 60, during the movement of the crank in said arc, may enter the opposite keyways and lock the slide parts 11 and 12 together. On the down stroke of the slide 10 (after the follower 92 moves off of the high point of the cam 90) the arm 89, acting under the influence of spring 114, rod 94, rack 99, pinion 101, crank pin 103, link 106, and fork-piece 105, turns the keys 60 to locking position, locking the slide parts 11 and 12 together so that they are driven as a unit to perform the forging or other work of the press. The slide parts 11 and 12 remain locked together until the keys 60 are moved to unlocking position by the high part of cam 90, which occurs when the crank on shaft 25 (after making a substantially complete revolution) again reaches a position in its upper arc of movement. The high part of cam 90 acts on the follower 92, and on the arm 89 through the intermediate parts hereinbefore described, to turn the key 60 to unlocking position. The cam 90 may be set so that its high part acts on the follower 92 at the upper dead center position of the crank, or thereabout. If the treadle 111 has not been released when the high part of the cam 90 passes the follower 92, the keys 60 will be immediately returned to locking position, and the slide parts 11 and 12 will be driven as a unit on the working stroke which is initiated at this time, and on succeeding working strokes, as long as foot-pressure is maintained on the treadle 111.

If the treadle 111 is released while the slide 10 is on its up-stroke (before or while the high part of cam 90 passes the follower 92), the dog 109 would engage the collar 107 on the bar 94 when the high part of the cam 90 makes contact with the follower 92 (at which time the keys 60 are moved to unlocking position) and prevent the keys 60 being moved to locking position when the high part of cam 90 passes the follower 92. When the high point of the cam 90 acts on the follower 92 as just described (position Fig. 4), and the rod 94 is actuated, the rack 99 under the action of spring 114 rotates the pinion 101, and the pin 103 thereon shifts the fork-piece 105 to move the arm 89 to turn the keys 60 to the position shown in Fig. 2, that is, where the chord faces 64 of the cylindrical key parts 62 and 66 are flush with the meeting plane of the slide parts 11 and 12. The slide part 11 can then reciprocate idly with respect to the slide part 12, the slide part 12 being supported in an elevated position by the counterbalancing means 75.

To set the dies or tools (not shown) mounted on the bottom of slide 10 and on the bed, the nut 139 on the bolt 137 is loosened and the disk 125 is turned until the block 120 is adjusted at a level which provides a proper clearance between the dies or tools. The nut 139 is then tightened to hold the block tightly in its adjusted position. The spiral inclines 127 on the disk 125 and on disk 131, depending on the relative positions thereof, determine the position of the block 120 with respect to the bottom of the slide part 12, and hence the bottom-of-the-stroke position of the slide. A broad and strong bearing is provided by the inclines 127.

The invention may receive other embodiments than that herein specifically illustrated and described.

What is claimed is:

1. A press-slide comprising two parts, relatively movable longitudinally, one a tool-supporting part and the other having means for attaching a connecting-rod thereto, said relatively movable parts having lapping portions, key-ways in adjacent sides of the lapping portions, a semi-cylindrical oscillatory key, and means for moving said key to and from a position wholly in one key-way to and from a position partly in each of the two key ways to lock together and unlock said relatively movable parts.

2. A press-slide according to claim 1, further comprising lateral guides on the press frame for confining the movement of one of said relatively movable parts, and lateral guides on the aforesaid relatively movable part for guiding the other relatively movable part.

3. A press-slide according to claim 1, further comprising means for limiting the extension of said relatively movable slide-parts, wherein the limiting position corresponds to a position of the slide-parts in which said key-ways are in register.

4. A press-slide according to claim 1, further comprising means for counter-balancing the weight of the lower one of the slide-parts.

5. A press-slide according to claim 1, wherein said key comprises another key part forming the complementary part of a cylinder.

6. A press-slide comprising two parts relatively movable longitudinally, one a tool supporting part and the other having means for attaching a connecting-rod thereto, said relatively movable parts having lapping portions, key-ways in adjacent sides of the lapping portions, keys comprising a semi-cylindrical oscillatory part, the face on the chord-side of which, in the unlocking position, is flush with the meeting plane of said lapping portions, means for oscillating said keys to lock together and unlock said relatively movable parts, and means for limiting the extension of said relatively movable slide-parts to a position corresponding to a position of the slide-parts in which said key-ways are in register.

7. A press-slide according to claim 6, wherein said keys further comprise another part forming the complementary part of the cylinder.

8. A press-slide according to claim 6, further comprising means for counterbalancing the weight of the lower one of said slide-parts.

WILLIAM KLOCKE.