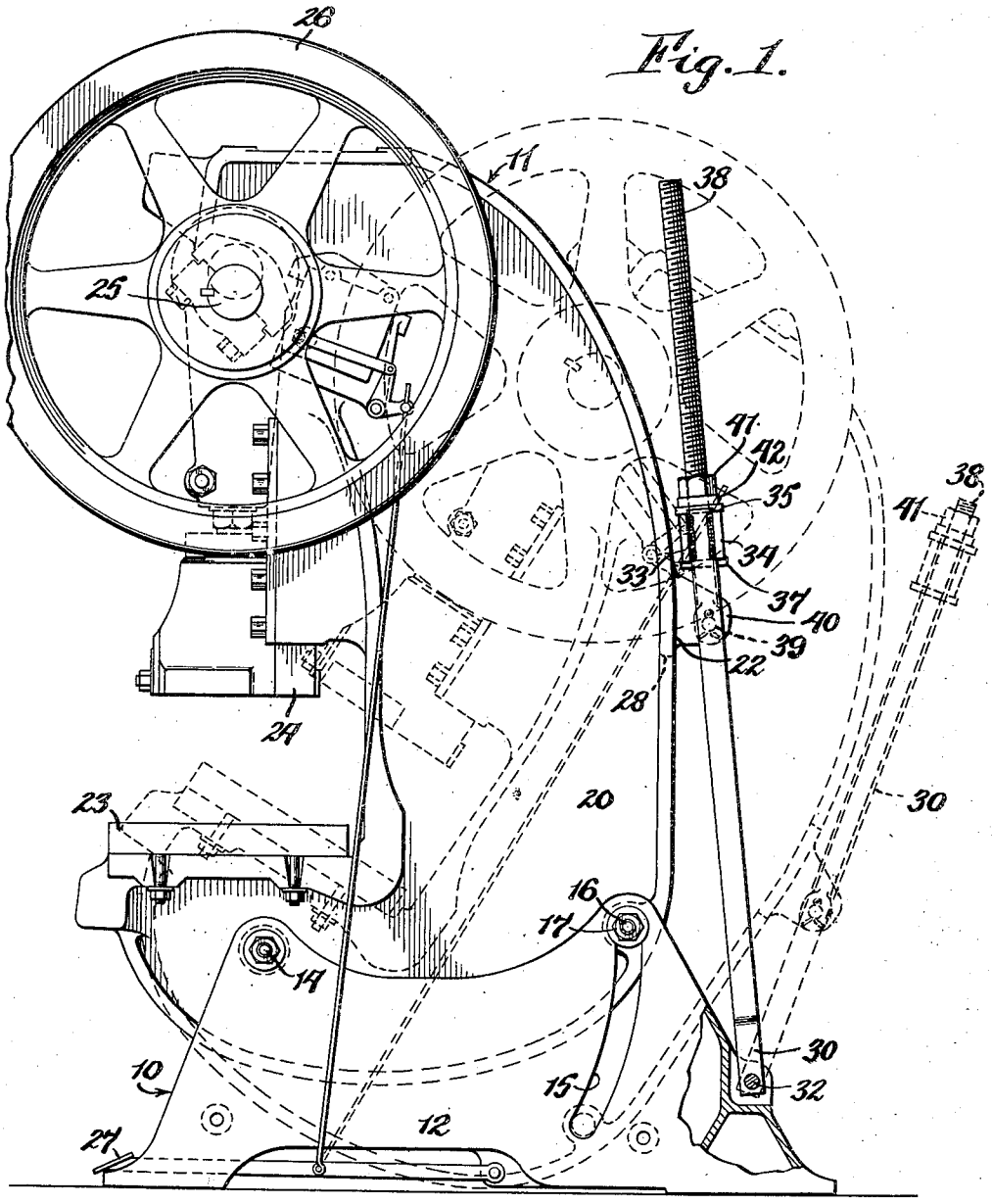
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INCLINING DEVICE FOR INCLINABLE PUNCH PRESSES

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Fig. 1.



INVENTOR
Frederic Orton
BY
Popp and Popp
ATTORNEY

Feb. 1, 1938. F. ORTON 2,106,917

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Fig. 2.

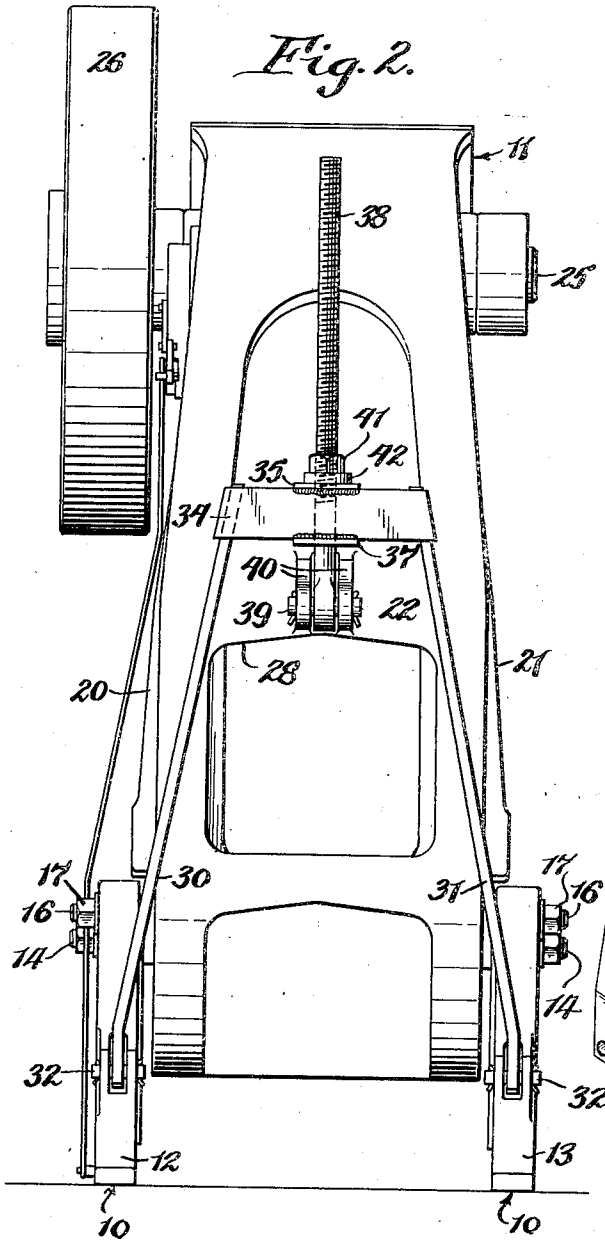


Fig. 3.



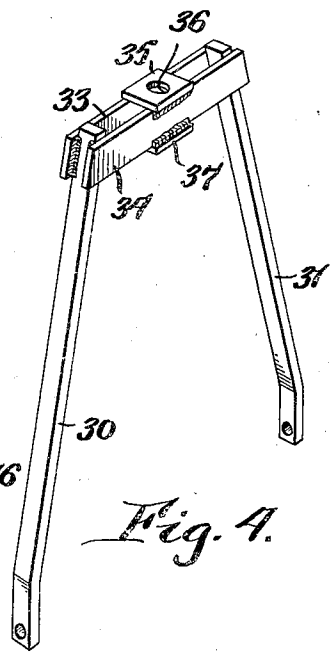


Fig. 4.

INVENTOR
Frederic Orton
BY
Popp and Popp
ATTORNEY

Patented Feb. 1, 1938 2,106,917

UNITED STATES PATENT OFFICE

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INCLINING DEVICE FOR INCLINABLE PUNCH PRESSES

Frederic Orton, Buffalo, N. Y., assignor to Niagara Machine & Tool Works, Buffalo, N. Y., a corporation of New York

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12 Claims. (Cl. 164—103)

This invention relates to an inclining device for inclinable punch presses and more particularly to that type of inclinable punch press in which the main frame can be adjusted from upright to inclined position so as to allow the work to be discharged from the die and to drop through an opening in the back of the main frame by gravity.

The invention is shown in connection with a relatively heavy punch press primarily designed for blanking out a form from sheet metal and drawing any previously cut blank to shape by means of suitable complementary dies (not shown) although, of course, the invention is not limited to any specific use of the press.

Inclinable punch presses to which the present invention is applicable in general consist of a base adapted to be secured to the floor and a main frame inclinably mounted on this base to swing fore and aft, the axis of inclination of the main frame being preferably close to the bed on which the work is placed so as to minimize changes in elevation of the working surface when the main frame is inclined and the main frame also preferably having an opening through its back and through which the work from the die drops by gravity. The common form of inclining device now used to move the main frame to any desired angle consists of a heavy compression screw arranged under the main frame and connecting the lower rear part of the main frame with a heavy thrust member which is cradled in the base, a nut being provided which bears against this thrust member and permits of adjusting the effective length of this screw. Not only is such an inclining device necessarily of heavy construction but it is also most inaccessible in that it is necessary for the operator to reach way down under the main frame in order to secure adjustment of the inclination of the main frame. The difficulty in getting access to the adjusting mechanism is increased when the main frame is lowered because access is obtained from the rear of the press and the adjusting screw is necessarily almost concealed when the main frame is dropped to its lowermost position. Furthermore, the ease with which the adjustment can be effected varies with the inclination of the main frame. As the main frame is inclined the angle of the screw becomes more and more unfavorable and more effort is required to return the main frame to its upright position when the press is sharply inclined. This unfavorable condition coincides with the increased difficulty of getting at the adjusting nut. In addition these two unfavorable conditions coincide with the further unfavorable condition that the more the main frame is inclined the more difficult it is to raise the cause of its increased off-balance position.

It is one of the objects of the present invention to provide an inclining device which is arranged at the back of the main frame instead of underneath and it is therefore at all times conveniently accessible for adjustment.

Another object is to provide such an inclining device which consists of one member purely in tension and one member purely in compression, said members being so connected as to always automatically assume positions in a common plane so that there are no lateral bending forces imposed on these members.

Another purpose of the present invention is to provide an inclining device which is entirely external of the frame and is provided with a single adjusting means only.

It is another aim of the present invention to provide such an adjusting device in which the adjusting nut is always conveniently at hand height so that the operator is not required to reach under the machine to effect adjustment.

It is another purpose to provide such an adjusting device in which the application of force is always in substantially the same relation to the main frame so that an increasingly unfavorable leverage is not encountered as the main frame is inclined and also in which the application of force is at all times in a generally vertical direction, this being, of course, the most favorable for elevating the main frame.

Another object is to include in the adjusting device a tension member in the form of a tension screw the effective length of which is adjusted to secure the desired inclination of the main frame. By employing the screw as a tension member the screw can, of course, be made much lighter than the compression screws heretofore employed.

Another purpose is to provide such an inclining device in which the device does not block the opening in the back of the main frame or the space underneath this opening so that the device does not interfere with placing a box or receptacle under this opening to catch the articles falling through this opening by gravity.

Another aim of the present invention is to provide such an adjusting device which at all times is arranged close to the back of the main frame so as to avoid unsightly projections and also in which the tension and compression members, which form the inclining device, and their pivotal

connections are always disposed in the same plane.

In the accompanying drawings:

Fig. 1 is a side elevation of an inclinable press having an inclining device made in accordance with my invention.

Fig. 2 is a rear elevation thereof.

Fig. 3 is a perspective view of the tension screw employed in my inclining device; and

Fig. 4 is a perspective view of the two compression arms or links employed in my inclining device and the cross bars connecting the upper ends of the same.

While my invention may be employed in any type of inclinable press the form illustrated in the drawings comprises a base **10** on which the main frame **11** is inclinably mounted so as to tend to fall rearwardly as illustrated by dotted lines in Fig. 1. The base **10** preferably consists of two side standards **12** and **13** each of which is formed at its front end to provide a bearing for studs **14** projecting out from the main frame **11** and well in advance of the center of gravity of the main frame and each of which is also provided with an arcuate slot **15** concentric with the studs **14** and receiving a stud **16** projecting out from the main frame. The main frame swings around the stud **14** as a pivot and is steadied in any inclined position by tightening a nut **17** on each of the studs **16**, this steadying being desirable due to the unbalanced location of the flywheel at one side of the frame. However, the weight of the frame is always borne by the inclining device as hereinafter described.

The main frame **11** is shown as a single casting having side walls **20** and **21** and a back **22** and as supporting a bed **23**, on which the work is placed, slide **24** which carries the dies and a crank shaft **25** by means of which the slide is reciprocated, this crank shaft being driven by a pulley **26** or in any other suitable manner. The usual clutch operating mechanism including a treadle **27** is also mounted on the main frame **11**. In order to vary the elevation of the bed **23** as little as possible as the main frame **11** is inclined to different positions the main pivot studs **14** for the main frame **11** are arranged directly under and close to the bed **23**. The principal reason for inclining the main frame **11** is to permit the work to be discharged from the die and from the press by gravity. For this purpose the back **22** of the main frame is formed to provide a large opening **28** arranged in rear of the bed **23** so that work from the die and bed fall rearwardly out of the press by gravity when it is inclined. This work can be caught in a box or other suitable receptacle arranged in rear of the punch press and under the opening **28**.

The inclining device forming the subject of my invention includes a pair of compression bars or links **30** and **31** each of which is connected to the rear end of one of the base standards **12** and **13** by a pivot pin **32** so that the compression bars **30** and **31** are free to swing rearwardly. These bars **30** and **31** rise from the base and are disposed on opposite sides of the opening **28** so that these bars in no way interfere with the placing of a box underneath the opening **28** to catch the work. At their upper ends these bars **30** and **31** are shown as connected by a pair of cross bars **33** and **34** which are spaced by the bars **30** and **31** and suitably welded or otherwise secured thereto. To the upper side of the cross bars **33** and **34** is welded a plate **35** having a hole **36** and a similar plate **37** is welded to the underside of these cross bars **33** and **34**. The plates **35** and **37** are centrally arranged and a tension screw **38** extends upwardly through these plates. The lower end of the tension screw **38** is pivotally secured by a pin **39** between a pair of ears **40** which extend rearwardly from the back **22** of the main press frame and are located immediately above the opening **28**, as best shown in Fig. 2. An adjusting nut **41** and washer **42** are provided on the upper end of the tension bolt **38**, these bearing against the upper plate **35**.

It will be seen that when the nut **41** is screwed down to its lowermost position, as shown by full lines in Fig. 1, the main frame of the punch press is upright and the studs **17** are at the upper limits of their movement in the arcuate slots **15**. In this position of the punch press frame the center of gravity is in rear of the pivot studs **14** so that the frame at all times tends to fall rearwardly and exert a downward pull on the tension screw **38**. Consequently the bolt **38** is at all times under tension and the adjusting nut **41** at all times bears downwardly on the cross bars **33** and **34** and the bars or links **30**, **31** are at all times under compression. As the nut **41** is backed off the effective length of the tension bolt **38** is increased thereby permitting the main punch press to swing backwardly. At the same time both the tension bolt **38** and the compression bars or links **30**, **31** swing rearwardly and in all positions these parts and their pivotal connections with the base and main frame are arranged in a common plane, this being illustrated by the dotted line position of these parts in Fig. 1. There is therefore no undue strain placed upon any of the parts in any position of adjustment and it will further be noted that the compression links and tension screw of the adjusting device are always disposed in an upright position, the extremes of movement being illustrated by the full and dotted lines in Fig. 1. Therefore in screwing the adjusting nut **41** down to return the main frame to its upright position the power is applied in a vertical direction which is, of course, the most favorable since the weight of the main frame bears downwardly. It will furthermore be observed that the adjusting mechanism at all times hugs the back of the main frame so as to avoid an objectionable and unsightly extension of the machine and that the elevation of the adjusting nut is always substantially the same and at convenient hand height and directly accessible. It will therefore be seen that the adjustment of the inclining device is accomplished more easily and with greater safety than a construction in which the inclining device is arranged under the main frame.

By arranging the pivots for the compression bars **31** and tension screw **38** below the connection between these members it will be seen that these parts at all times automatically assume positions in a common plane and hence the compression bars **31** are always purely in compression and the screw **38** purely in tension which eliminates all lateral bending forces on these members. Therefore the cross bars **33**, **34** need not be designed to resist bending strains as the forces imposed on them are always directly parallel with the tension and compression members which these bars connect. The inclining device can therefore be made of much lighter constructions as compared with inclining devices in which bending strains must be taken into consideration.

It will also be observed that the inclining device is at all times external to the main frame

and includes but one single adjustment, i. e. the nut 41. The disposition of the inclining device outside of the frame has, of course, the advantages previously stated, and by the provision of a single adjusting mechanism, the operation of the inclining device is made more simple and convenient.

From the foregoing it is apparent that the present invention provides a simple, inexpensive and sturdy inclining device for an inclinable punch press in which the adjusting nut of the inclining device is at all times readily accessible; in which the action of the inclining device is at the most favorable angle and in which the necessity for a heavy compression screw and cradled member is rendered unnecessary. At the same time the inclining device is attractive in appearance and does not in any way interfere with the functioning of the machine, particularly in the removal of the work falling through the back of the press by gravity.

I claim as my invention:

1. An inclining device for a punch press having a base and a main frame inclinably mounted on said base for fore and aft movement, comprising an elongated member maintained at all times under tension and extending upwardly in rear of said main frame and means pivotally connecting said member with the rear of said base and main frame and including a single means for varying the effective length thereof.

2. An inclining and supporting device for punch presses having a base and an unbalanced main frame inclinably mounted on said base and tending to fall from its upright position in one direction only, comprising an elongated member maintained at all times under tension and pivotally connected with one of said elements, a second elongated member maintained at all times under compression and pivotally connected at one end with the other of said elements and means adjustably connecting said members.

3. An inclining and supporting device for punch presses having a base and an unbalanced main frame inclinably mounted on said base and tending to fall from its upright position in one direction only, comprising an elongated member maintained at all times under tension and pivotally connected with one of said elements, a second elongated member maintained at all times under compression and pivotally connected at one end with the other of said elements and means connecting said members and including means for adjusting one member lengthwise relative to the other member.

4. An inclining and supporting device for punch presses having a base and an unbalanced main frame inclinably mounted on said base and tending to fall from its upright position in one direction only, comprising an elongated member maintained at all times under tension and pivotally connected with one of said elements, a second elongated member maintained at all times under compression and pivotally connected at one end with the other of said elements and means connecting said members and including means for adjusting one member lengthwise relative to the other member, said members being maintained at all times in a common plane.

5. An inclining device for punch presses having a base and a main frame inclinably mounted on said base, comprising an elongated member maintained at all times under tension and pivotally connected with one of said elements, a second elongated member maintained at all times under compression and pivotally connected at one end with the other of said elements and means connecting said members and including means for adjusting one member lengthwise relative to the other member, the pivotal connections between said members and elements and the connection between said members being disposed in a common plane in all positions of adjustment.

6. An inclining device for punch presses having a base and a main frame inclinably mounted on said base, comprising an elongated member maintained at all times under compression and pivotally connected at one end to one of said elements, a screw maintained at all times under tension and pivotally connected to the other element and means for adjusting said member and screw lengthwise relative to one another including a nut on said screw and bearing against said member.

7. An inclining and supporting device for punch presses having a base and an unbalanced main frame inclinably mounted on said base to swing fore and aft, the center of gravity of said main frame being at all times located in rear of the axis around which said main frame swings whereby said main frame at all times tends to fall rearwardly, comprising adjusting means pivotally connected to the rear of said base and extending upwardly along the back of said main frame, said adjusting means including a tension member carrying the weight of said frame and means pivotally connecting the adjusting means with said main frame.

8. An inclining device for punch presses having a base and a main frame having a working bed and inclinably mounted on said base to swing fore and aft, comprising elongated means pivotally connected at one end to the rear of said base and extending upwardly along the back of said main frame, means pivotally connecting said elongated means with said main frame at a substantial distance above said bed, and means adjusting the effective length of said elongated means to adjust the spacing of said pivotal connections.

9. An inclining device for punch presses having a base and a main frame inclinably mounted on said base to swing fore and aft, comprising an elongated member pivotally connected to the rear end of one of said elements and extending upwardly along the back of said main frame, a second elongated member connected to the rear end of the other element and means connecting said members and including means for adjusting one member lengthwise relative to the other member thereby to adjust the spacing of said pivotal connections, the said pivotal connections and the said connecting means lying in the same common plane in all positions of adjustment.

10. An inclining device for a punch press having a base and a main frame inclinably mounted on said base to swing fore and aft and having an opening in its back which allows the work discharged from the die to drop through by gravity when the main frame is inclined rearwardly, comprising a compression member pivotally connected to the rear end of said base and extending upwardly along the back of said main frame and on opposite sides of said opening, a tension member arranged above said opening and pivotally connected to said frame, and adjustable means connecting said compression and tension members.

11. An inclining device for punch presses having a base and a main frame inclinably mounted on said base, comprising an elongated member maintained at all times under tension and pivotally connected with one of said elements, a second elongated member maintained at all times under compression and pivotally connected at one end with the other of said elements and means adjustably connecting said members, said pivotal connections being disposed below said means adjustably connecting said members whereby said members at all times assume positions in a common plane thereby to eliminate bending strains on said members.

12. An inclining device for punch presses having a base and a main frame inclinably mounted on said base, comprising an elongated member maintained at all times under a tension and pivotally connected with one of said elements, a second elongated member maintained at all times under compression and pivotally connected at one end with the other of said elements and means connecting said members and including means for adjusting one member lengthwise relative to the other member, said pivotal connections being disposed below said means adjustably connecting said members whereby said members at all times assume positions in a common plane thereby to eliminate bending strains on said members.

FREDERIC ORTON.