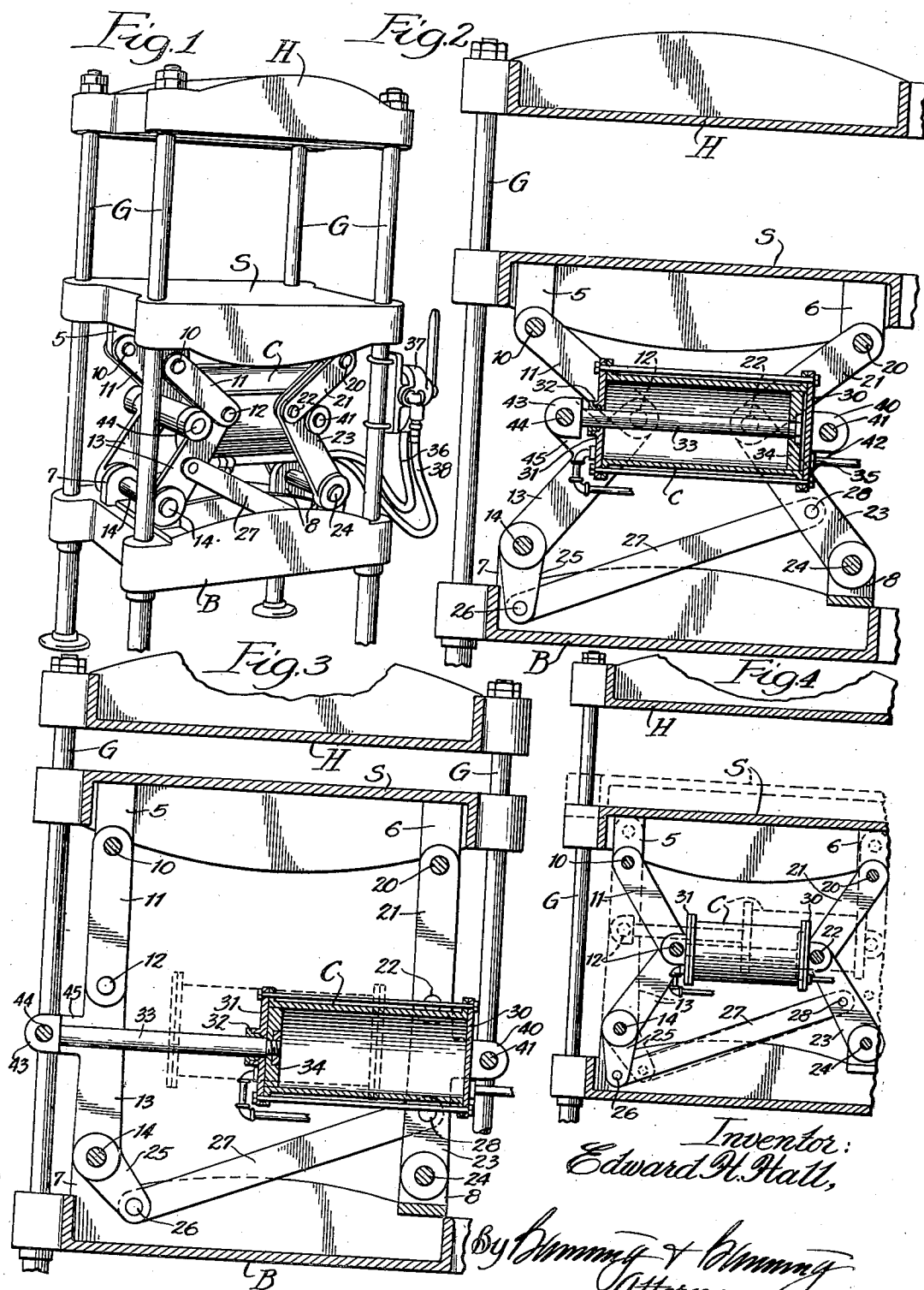


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PNEUMATIC PRESS

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PNEUMATIC PRESS

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2 Claims. (Cl. 100—70)

My present invention relates to a press, such as is used in die operations, and more particularly to the employment therewith of a pneumatic or hydraulic motor by which a slide is moved toward and from a head whereby to apply to the work therebetween an even pressure irrespective of the distribution of the load.

A primary object of this invention is to devise in a press of this general character an operating mechanism with which a pneumatic (or hydraulic) motor may be used to greatest advantage. As a feature of the invention I associate with such a motor a pair of opposed complementary toggle mechanisms adapted to be operated simultaneously and in unison upon release of a fluid force which is derived from any suitable source. More particularly, I have so arranged and organized the operating parts that the force delivered by the pneumatic motor is directed substantially in the line of movement of the interconnections between the several pairs of links which constitute the two opposed toggle mechanisms, so as to utilize most effectively the mechanical force which is delivered by the motor. In addition, the two sets of toggle mechanisms are mechanically interconnected in such a way as to control their joint movements whereby movement of the slide proceeds evenly, irrespective of whether or not the load accommodated thereon be evenly distributed. The present operating mechanism may consist of parts which are simple, inexpensive, accessible and effectively combined, all as suggested in the accompanying drawing, wherein—

Figure 1 is a perspective view of the press in its entirety;

Fig. 2 is a vertical section through the press showing the positions of the operating parts when the slide is in lowermost position;

Fig. 3 which is a similar view shows the position of the operating parts when the slide is in its uppermost position; and

Fig. 4 which is a view similar to Fig. 2, shows the motor joined to the opposed toggle mechanisms at the points of interconnection of their respective links rather than at a point slightly offset with respect thereto, as in the construction of the preceding figures.

In the exemplification shown, four guide rods G rise from a floor or base to support at their upper ends a fixed head H. Mounted upon the guides for movement toward and from the head is a slide S whereon the work is adapted to be carried. To operate the slide in its up and down movements I employ a pneumatic mechanism

which is positioned between the slide and a fixed bed B therebelow.

Depending from the slide are two pairs of lugs 5 and 6, one near each corner thereof, two pairs of oppositely positioned lugs 7 and 8 being understood from the bed therebelow. Pivotally joined at 10 to the lugs 5 and 6 are a pair of links 11 which interconnect at 12 with a pair of lower links 13 joining pivotally at 14 with the lower lugs 7. In like manner at 20 a pair of links 21 are pivotally joined to the lugs 6, these links being interconnected at 22 to other lower links 23 which are pivotally joined at 24 to the lower lugs 8. One of the lower links 13 is provided with an extension forming a crank arm 25 which at 26 is pivotally joined to a cross bar 27 which is pivotally connected at 28 to the opposite lower link 23. Since opposite ends of the cross bar are joined to opposed lower links spaced from their points of pivotal connection with the bed, any movement of either link is transmitted to the other so that their movements are synchronized at all times.

To produce a lifting movement of the slide it is obvious that the two toggle mechanisms should be moved in unison. The most effective way of doing this is to apply oppositely directed forces moving in a line which proceeds through the points 12 and 22 of the interconnection between the upper and lower links. This is especially important when the slide is in a down position, as in Fig. 2, because the toggle links then occupy a maximum angular position relative to each other. The force requisite to straighten the links, even though proceeding in the line which intersects the two points of interconnection, must work to greatest disadvantage when the lifting movement first starts inasmuch as the angle of the toggle links is then the greatest; partially or wholly compensating this disadvantage, however, is the fact that the slide, at the beginning of its upward movement, is free to move without resistance. As the movement proceeds, however, the toggle links will straighten up until finally at the conclusion of the movement (see Fig. 3) the links are in substantially a straight line position relative to each other. The operating force applied to the points of interconnection between the links becomes more and more effective as the links approach this straight line position. It is of chief importance, therefore, in the interests of successful operation, that the applied force be directed initially in a direction which is in line with the two points of interconnection between the links; it is of lesser importance, how-

ever, that this force continue along the same line. According to the showing of Figs. 1-3, the direction in which the force is applied drops slightly below a line extending through the two points of interconnection between the links as the latter advance toward their final straight position, whereas, according to Fig. 4, the operating force is applied always in the direction of this line.

The pneumatic motor herein shown comprises a cylinder C to which is fitted at opposite ends heads 30 and 31, the latter being provided with an axial opening surrounded by a stuffing box 32 through which is extended a rod 33 having connection with a piston 34 which is slidingly fitted within the cylinder. Air under pressure (or other fluid force) is admitted to the cylinder at 35 at a point behind the piston, a flexible tube 36 extending therefrom to a hand controlled three-way valve 37 which is in connection with a source of fluid supply. By opening this valve the piston is caused to advance from one end of the cylinder to the other, its return movement taking place when air is admitted, by proper manipulation of the valve, through another flexible tube 38 to the opposite cylinder end. Each operation of the valve will open a passage for discharge of air at the piston side opposite that upon which pressure is directed.

Extending from the cylinder head 30 is a lug 40 in pivotal connection as at 41 with a lug 42 which is extended laterally from the lower link 23 at a point relatively close to its interconnection 22 with the upper link 21. At the end of the piston rod which is extended exteriorly of the cylinder through the opposite head 31, is a fitting 43 having a pivotal connection at 44 with a lug 45 that is extended laterally from the lower link 13 at a point relatively close to its interconnection 12 with the upper link 11. In the down position of the slide the two pivotal points 41 and 44 are substantially in line with the interconnection points 12 and 22, so that the force initially applied by movement of the piston is in direct line therewith. As this movement proceeds the pneumatic motor moves down below the line which passes through the interconnection points 12 and 22, as best shown in Fig. 3, until at the conclusion of the movement the axis of the motor lies below this line a slight distance, as clearly represented in Fig. 3. It will be noted that a floating mounting is provided for the pneumatic motor so that it is free to move up or down, depending upon whether the toggle links are moving from straight to angular positions, or vice versa. It will be observed in these movements that the fixed bed B remains stationary.

The net result of operating the two sets of toggle mechanisms is to shift the vertical position of the slide toward or from the head so as to accomplish its intended work.

Referring now to Fig. 4, I have illustrated here two sets of toggle mechanisms, the same as already described. The pneumatic motor, however, is supported pivotally at the interconnection points 12 and 22 so that the opposed forces which proceed therefrom are directed always in the same line which extends between these points of interconnection. Such an arrangement has theoretical advantages, although for practical purposes the efficiency is substantially the same as in the mechanism already described. Where space is lacking, the arrangement of Fig. 4 may not be possible, hence the advantage under such conditions of the lugs 42 and 45 which extend laterally away from each other so as to provide between them a space of increased length wherein a pneumatic motor may be accommodated.

I claim:

1. In a press having a bed, guides extending vertically from the bed, a slide above the bed vertically movable along the guides, and a head above the slide in fixed relation to the bed, the combination of a pair of transversely spaced toggle mechanisms for moving said slide each comprising two laterally spaced hingedly connected pairs of links joined respectively to the bed and slide, one of each of said pair of said hingedly connected links having an out turned extension, a transversely expansible pneumatic motor extending between the opposed sides of said laterally spaced pairs of links and pivotally connected at its opposite ends to the outturned extensions thereof, and said pivotal connections always lying in a plane intersecting the axis of the pneumatic motor, whereby during any operation of the slide the hinge connections of said pairs of links will be in alignment with the pivotal connections of the motor at the lowermost position of the slide only and be entirely within the space between its pivotal connections with the opposite ends of said pneumatic motor and on opposite sides of said motor for carrying the motor therebetween.

2. The apparatus according to claim 1 in which a synchronizing bar is pivotally connected at its opposite ends to one link of each pair of hingedly connected links only, so that in completely lowered position of the slide the link connecting one end of the bar will lie in a plane normal to the upper surface of the bed, and in completely raised position of the slide the link connecting the opposite end of the bar will lie in a plane normal to the upper surface of the slide.

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