

Jan. 23, 1923.

1,443,176

C. R. GABRIEL.
DRAWING PRESS AND REVERSING MECHANISM FOR SUCH PRESSES AND SIMILAR MACHINES.
FILED JAN. 8, 1920.
3 SHEETS-SHEET 1

Fig. 1.

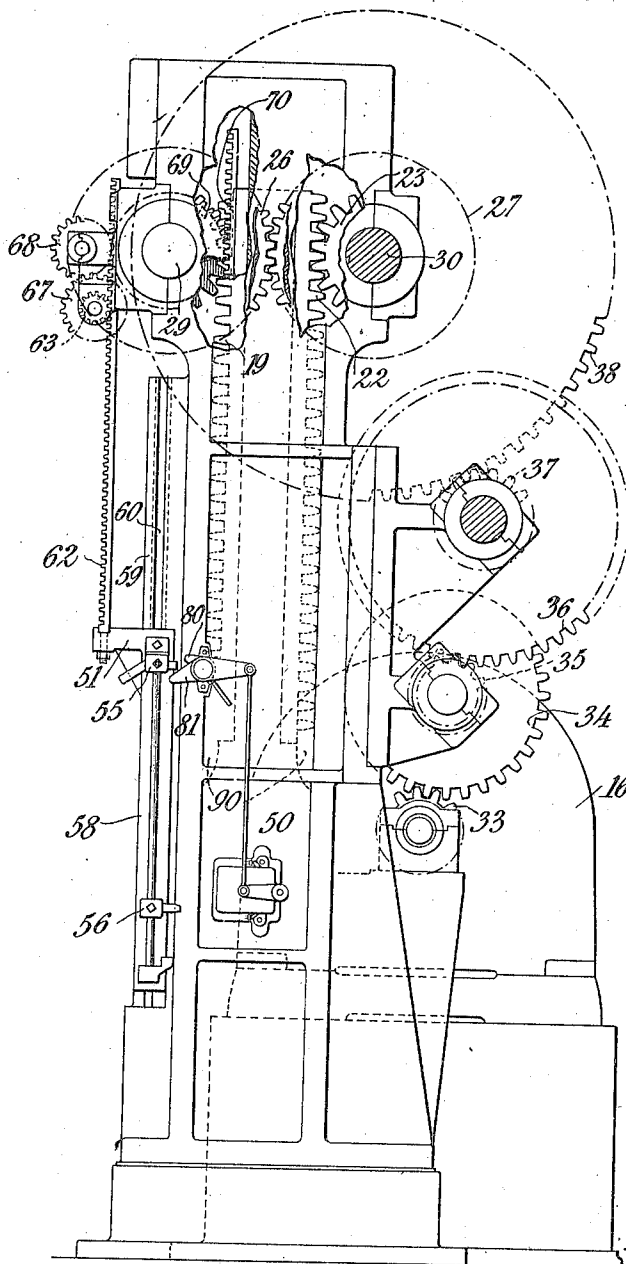
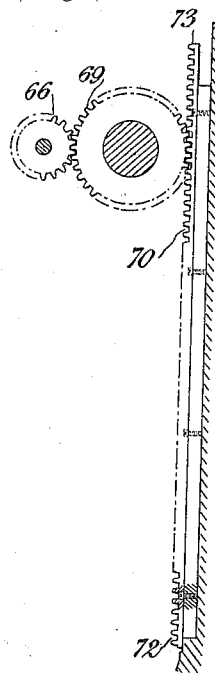


Fig. 2.



INVENTOR :

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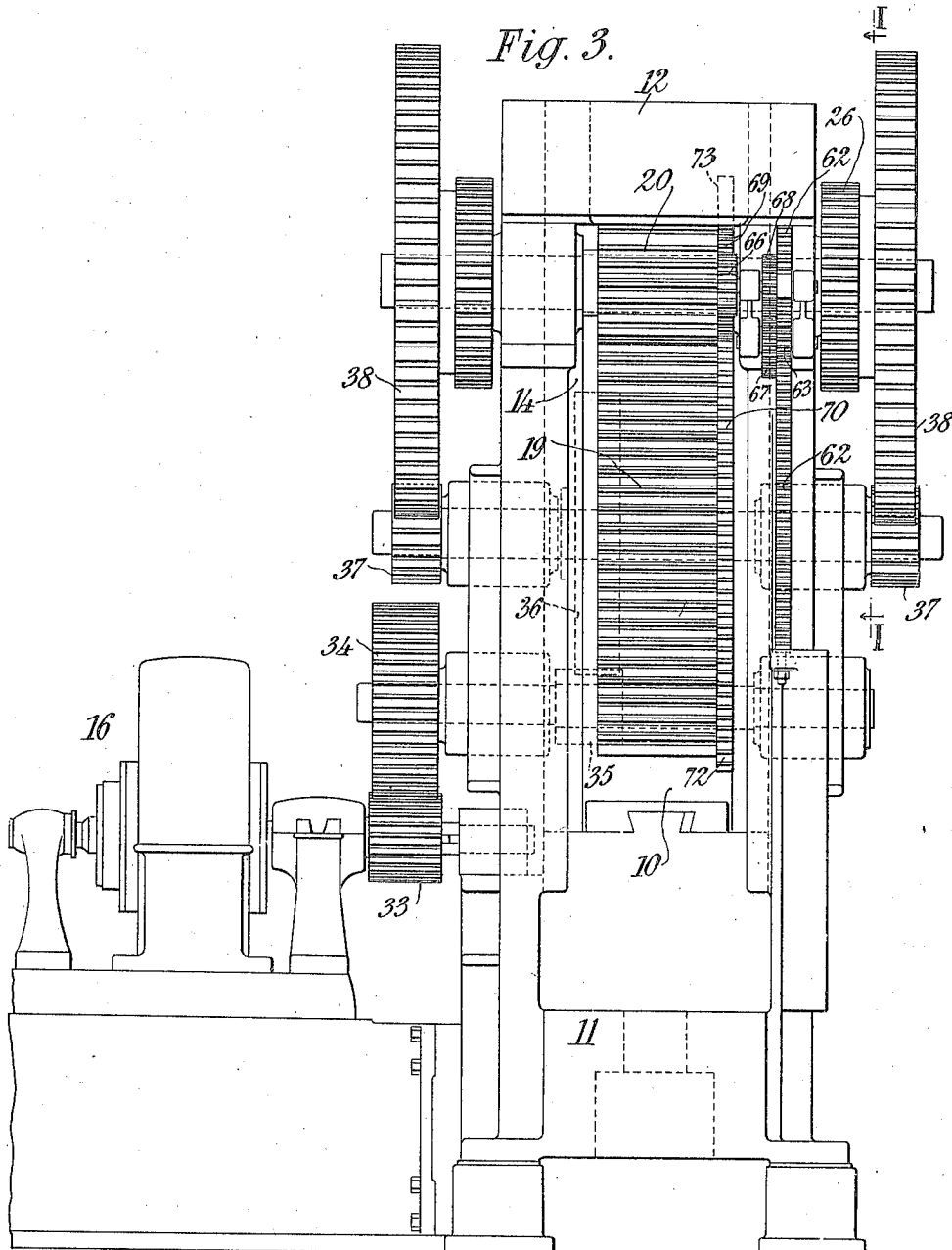
By Attorneys,

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3 SHEETS-SHEET 3

Fig. 4.

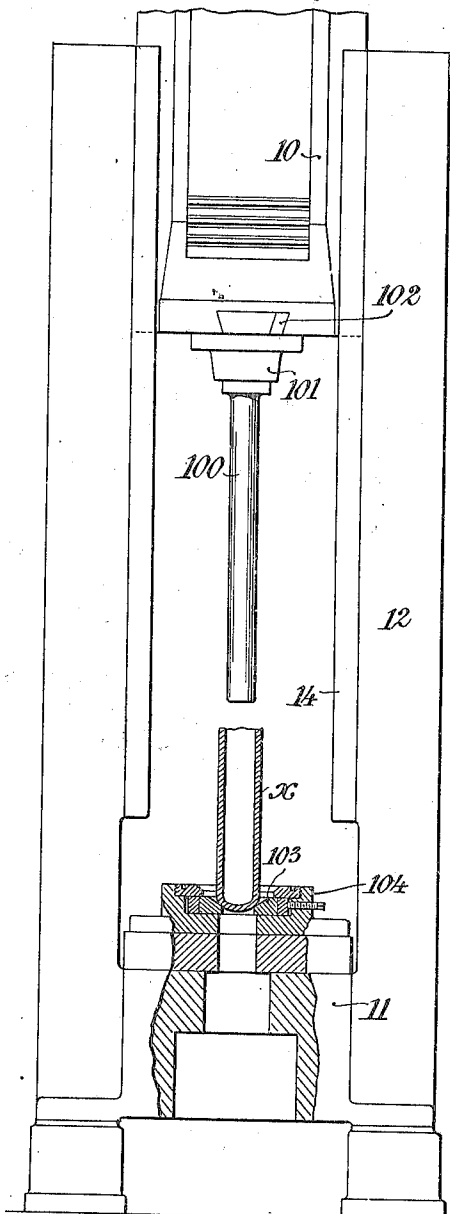
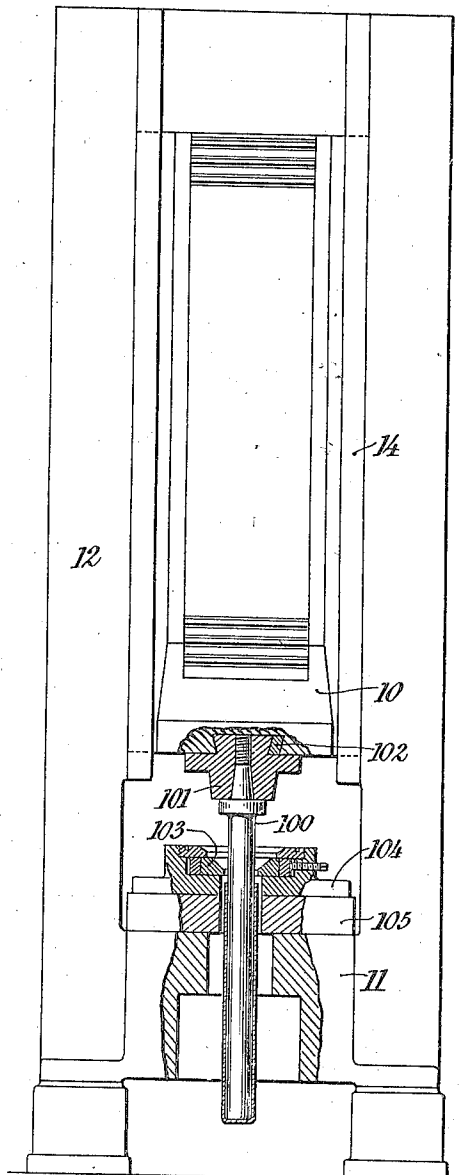


Fig. 5.



Inventor
Charles R. Gabriel,
By Attorneys,
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UNITED STATES PATENT OFFICE.

CHARLES R. GABRIEL, OF BROOKLYN, NEW YORK, ASSIGNOR TO E. W. BLISS COMPANY, OF BROOKLYN, NEW YORK, A CORPORATION OF WEST VIRGINIA.

DRAWING PRESS AND REVERSING MECHANISM FOR SUCH PRESSES AND SIMILAR MACHINES.

Application filed January 8, 1920. Serial No. 350,209.

To all whom it may concern:

Be it known that I, CHARLES R. GABRIEL, a citizen of the United States of America, residing in the borough of Brooklyn, county of Kings, in the city and State of New York, have invented certain new and useful Improvements in Drawing Presses and Reversing Mechanism for Such Presses and Similar Machines, of which the following is a specification.

This invention relates to drawing presses, and to reversing mechanism for such presses or the like, and aims to provide improvements thereon.

The invention provides a drawing press having a rack and pinion driven plunger for deep drawing, in which great force is applied to the plunger, and in which there is an adequate or usual factor of safety in the strength of the teeth of the driving rack and pinion, without said driving rack and pinion being objectionably and disproportionately broad with regard to the plunger head and other parts of the press. The necessary strength of the teeth is obtained by dividing or apportioning the rack upon more than one side of the plunger, as for example upon two sides, thereby securing the effect of a rack having teeth of the width of the teeth upon the several racks.

The invention provides, furthermore, a press which is compact, strong, shapely, symmetrical and smooth running.

The invention, furthermore provides a press or the like wherein the reversing mechanism may be readily adjusted, for changing the stroke of the plunger, or other moving part, and also one which maintains its timed or constant relation with the plunger or other moving part, despite the accidental or other running out of engagement of parts of the driving mechanism of said plunger or moving part.

Other features of improvement will be hereinafter set forth.

An embodiment of the invention is illustrated in the accompanying drawings. In said drawings,—

Figure 1 is a view, principally, side elevation, of a drawing press embodying the present invention.

Fig. 2 is a detail view of the rack and pinion which lies immediately in front of the large rack and pinion shown in Fig. 1, and shown clearly in front elevation in Fig. 3.

Fig. 3 is a front elevation of the press shown in Fig. 1.

Figs. 4 and 5 are sectional elevations showing the drawing die and punch in operation, the former before and the latter after the drawing operation.

In said drawings, numeral 10 designates a reciprocatory plunger, 11 a bed, and 12 the general frame of the press having slide-ways 14 for guiding the plunger 10.

A die and punch of usual form used for deep drawing are shown in Figs. 4 and 5. The punch 100 is carried by the plunger 10, being connected thereto in any usual way, as by a block 101 fastened to the plunger head by a dovetail and wedge 102 as usual. The die 103 is centered in a socket in a die-block 104 which may be fastened down on a plate or bolster 105, fastened in any usual manner on the bed 11. The work w to be drawn is in the form of a previously drawn cup, and is reduced and elongated in forcing through the die, to the form w' , Fig. 5. This is shown merely as one illustration of the drawing operation for which the press of my invention is adapted.

The plunger 10 receives its force from any suitable driving means, preferably an electric motor 16.

The plunger 10 is preferably made compact, with its head of a box or substantially square type, the size and weight of the press for a given driving force being thereby reduced.

The plunger 10 is reciprocated by racks and pinions, as the driving force delivered to the plunger 10 is very great, in order to obtain the requisite strength of the teeth of the rack and pinion, as these presses have been heretofore built, such rack and pinion would ordinarily have to be made very wide, in fact considerably wider than the necessary or desired width of the plunger 10. In order to obviate having to provide an unusual and objectionably wide rack and pinion, the rack teeth, according to the present invention, are formed on more than

one side of the plunger 10, preferably upon the front and back sides of the plunger, there being provided for example, a rack and pinion 19, 20 on one side, and a second rack 22 on the side of the plunger 10 opposite the rack 19. A driving pinion 23 corresponding in conjunction with the rack 22. On the two racks 19, 22 there is obtained a width of tooth corresponding with the width of tooth upon a single rack having a width equal to the combined width of the racks upon the two sides of the plunger. The teeth upon the plunger, and the corresponding pinion teeth may be given the requisite strength, thus having the necessary factor of safety, without unduly widening the rack, and other press parts.

The two pinions 20, 23 are preferably geared together, so as to move in unison, by means of companion gears 26, 27, mounted fast upon the pinion shafts 29, 30, carrying the pinions 20, 23 respectively. The teeth on one rack are preferably staggered with relation to those on another, as this gives a more even or uniform drive, this being of considerable importance in drawing presses.

The pinions 20, 23 are driven from the motor 16, or other driving device, through a train of reduction gears 33, 34, 35, 36, 37, and 38, connected to the shaft of one of the driving pinions, as for example, the shaft 30; the driving force being transmitted to the other driving pinion 20 through the companion gears 27, 26. For transmitting to better advantage, the large driving forces used, the gears 26 and 27 and 33 to 38 inclusive are preferably duplicated on the shafts carrying them.

The motor 16 acts to drive the pinions 20, 23 in one direction to lift the plunger 10, and also to drive the plunger 10 toward and against its work, in the opposite direction. The reversal of the motor 16, or other driving part, may be accomplished in any suitable manner.

Preferably, however, the reversal of the motor 16, or other driving part is accomplished by any suitable reversing means, as for example, a reversing switch 50, and automatically operated means 51 for controlling the operation of said reversing device or switch. Moreover the arrangement of the reversing switch actuating means is preferably such that it is moved by, and in constant or timed relation with, the reciprocating part or plunger 10.

The means for actuating the reversing device, conveniently comprises one or more dogs or strikers 55, 56, mounted upon a movable carrier or slide 58. The frame may be provided with a slideway 59, with a dove-tail slot, for the carrier or slide 58. The carrier or slide 58 is conveniently reciprocated by means of a rack 62 and pinion 63,

and preferably through a reduction gearing comprising gears 66, 67, 68, and 69, the latter being preferably in mesh with a rack 70 formed or fixed upon the plunger 10, this rack 70 being conveniently separate from the rack which meshes with the driving pinion, and also preferably extending beyond said driving rack at both ends as indicated at 72, 73. The gear 69 is conveniently mounted upon the same shaft as one of the driving pinions, as for example the shaft 29, and is preferably loosely or idly mounted upon said shaft, for a purpose hereinafter more fully explained.

The strikers 55, 56 are adjustably mounted upon the slide or carrier 58, in order to act upon suitable tappets 80, 81, connected to the reversing switch 50, at different times, in order that the stroke of the plunger may be varied. As drawing presses usually stand vertical, and as these long-stroke presses are ordinarily 15 to 20 feet and more high, it is desirable to have the strikers 55, 56 within convenient reach of a workman or attendant standing upon the floor of the shop, and the reduction gearing permits of the motion of the slide or carrier 58 being so reduced that both of the strikers may be in convenient reach. The reduction of the motion of the slide or carrier 58 also admits of the said carrier being mounted upon a relatively short slide which may be readily formed upon or attached to a part of the frame of the press, without projecting beyond said framework. The slide or carrier 58 is also preferably arranged to move vertically, inasmuch as its moving parts are least in the way of the attendant.

The racks 19 and 22 are provided with a free space 90 at their lower ends, and their length is such that the pinions may run off from the racks when the plunger is lowered to its maximum extent. Should the reversing means fail to reverse the motor, the pinions may run off the racks at either end, and hence turn idly in the spaces 90 or at the end of the racks, thereby preventing the driving means from jamming the plunger against either the head of the press, or the bed of the press, and crushing or straining said parts.

In order that the strikers may not lose their constant or timed relation to the movements of the plunger, the rack 70 has its ends 72, 73 extended beyond the ends of the racks 19, 22, so that the gear 69 remains in mesh with said rack 70 upon occasions when the pinions 20, 23 run off of the racks 19, 22. Moreover, where the gear 69 is mounted upon the shaft carrying the pinion 20, the said gear 69 is mounted loosely or idly upon said shaft 29, so that the pinion 69 will not turn with the pinion 20, after the pinion 20 has run off of the rack, and continues to rotate.

When the racks 19 and 22 are brought back into mesh with the pinions 20, 23, the relation of the slide or carrier 58 carrying the strikers is restored to what it was when the pinions 20, 23 ran off the racks, 19, 22.

The operation and manipulation of the press will be understood from the foregoing description.

The inventive ideas herein set forth may receive other embodiments than that herein specifically illustrated and described.

What is claimed is:—

1. A drawing press or the like, comprising a reciprocating plunger and a rack and pinion drive, said rack being divided and placed on more than one side of said plunger, whereby the requisite strength of teeth may be secured without unnecessarily increasing the width of said plunger, shafts on which said pinions are mounted, and said shafts each having driving gears on each end thereof, whereby the torsional twist between said pinions and the ends of the shafts on which they are mounted are equal.

2. A drawing press or the like, comprising a reciprocating plunger and a rack and pinion drive, said rack being divided and placed on more than one side of said plunger, whereby the requisite strength of teeth may be secured without unnecessarily increasing the width of said plunger, shafts on which said pinions are mounted, and said shafts each having driving gears on each end thereof, the gears on the two pinion-shafts intermeshing whereby the torsional twist between said pinions and the ends of the shafts on which they are mounted are equal.

3. A drawing press or the like, comprising a reciprocating plunger and a rack and pinion drive, said rack being divided and placed on more than one side of said plunger, whereby the requisite strength of teeth may be secured without unnecessarily increasing the width of said plunger, shafts on which said pinions are mounted, and said shafts each having driving gears on each end thereof, the gears on the two pinion-shafts intermeshing, whereby the torsional twist between said pinions and the ends of the shafts on which they are mounted are equal, and one of said shafts being driven at both ends.

4. A drawing press or the like, comprising a reciprocating plunger and a rack and pinion drive, said rack being divided and placed on more than one side of said plunger, whereby the requisite strength of teeth may be secured without unnecessarily increasing the width of said plunger, shafts on which said pinions are mounted, and said shafts each having driving gears on each end thereof, the gears on the two pinion-shafts intermeshing whereby the torsional twist between said pinions and the ends of the shafts on

which they are mounted are equal, the teeth on one rack being staggered with relation to the teeth on the opposite rack.

5. A press or the like having a plunger, means for driving said plunger, a reversing device, and means for actuating said reversing device, comprising a striker, and means for reducing the extent of movement of said striker with relation to the movement of said plunger.

6. A press or the like having a vertically reciprocating plunger, means for driving said plunger, a reversing device, and means for actuating said reversing device, comprising a striker, and means for reducing the extent of movement of said striker with relation to the movement of said plunger.

7. A press or the like having a plunger, means for driving said plunger, a reversing device, and means for actuating said reversing device, comprising a carrier, and means for reducing the extent of movement of said carrier with relation to the movement of said plunger, and a striker adjustable on said carrier.

8. A press or the like having a vertically reciprocating plunger, means for driving said plunger, a reversing device, and means for actuating said reversing device, comprising a carrier, and means for reducing the extent of movement of said carrier with relation to the movement of said plunger, and a striker adjustable on said carrier.

9. A press or the like comprising a reciprocating plunger, a rack and pinion drive, a reversing device, and means for actuating said reversing device, comprising a transmission adapted to remain idly in fixed driving relation with said plunger when said driving rack and pinion accidentally pass out of mesh.

10. A press or the like comprising a reciprocating plunger, a rack and pinion drive, a reversing device, and means for actuating said reversing device comprising a rack separate from said driving rack and an idler or loose pinion, said latter rack and pinion being adapted to remain idly in mesh when the driving rack and pinion accidentally pass out of mesh, whereby said rack and pinion of said actuating mechanism remain in timed relation with said plunger.

11. A press or the like comprising a reciprocating plunger, a rack and pinion drive, a reversing device, and means for actuating said reversing device comprising a rack on said plunger separate from said driving rack and an idler or loose pinion, said latter rack and pinion being adapted to remain idly in mesh when the driving rack and pinion accidentally pass out of mesh, whereby said rack and pinion of said actuating mechanism remain in timed relation with said plunger.

12. A press or the like comprising a recip-

rocatory plunger, a rack and pinion drive, a reversing device, and means for actuating said reversing device, comprising a rack and pinion mounted idly along side of the driving pinion, said latter rack and pinion being adapted to remain idly in mesh when the driving rack and pinion accidentally pass out of mesh, whereby said rack and pinion of said actuating mechanism remain in timed relation with said plunger.

13. A press or the like comprising a reciprocatory plunger, a rack and pinion drive, a reversing device, and means for actuating said reversing device comprising a rack separate from said driving rack and an idler or loose pinion, said latter rack and pinion being adapted to remain idly in mesh when the driving rack and pinion accidentally pass out of mesh, whereby said rack and pinion of said actuating mechanism remain in timed relation with said plunger.

14. A press or the like comprising a reciprocatory plunger, a rack and pinion drive, a reversing device, and means for actuating said reversing device comprising a rack and pinion adapted to remain idly in mesh when the driving rack and pinion accidentally pass out of mesh, whereby said rack and pinion of said actuating mechanism remain in timed relation with said plunger, and a reduction gearing in mesh with said latter pinion.

15. A press or the like having a reciprocatory plunger, means for driving said plunger, a reversing device, means for actuating said reversing device, comprising a part having a reduced corresponding motion as regards the plunger, and means for adjusting the time of action of said actuating means on said reversing device.

In witness whereof, I have hereunto signed my name.

CHARLES R. GABRIEL.