Jan. 2, 1945. R. G. LE TOURNEAU 2,366,272

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Filed July 13, 1943 3 Sheets-Sheet 1

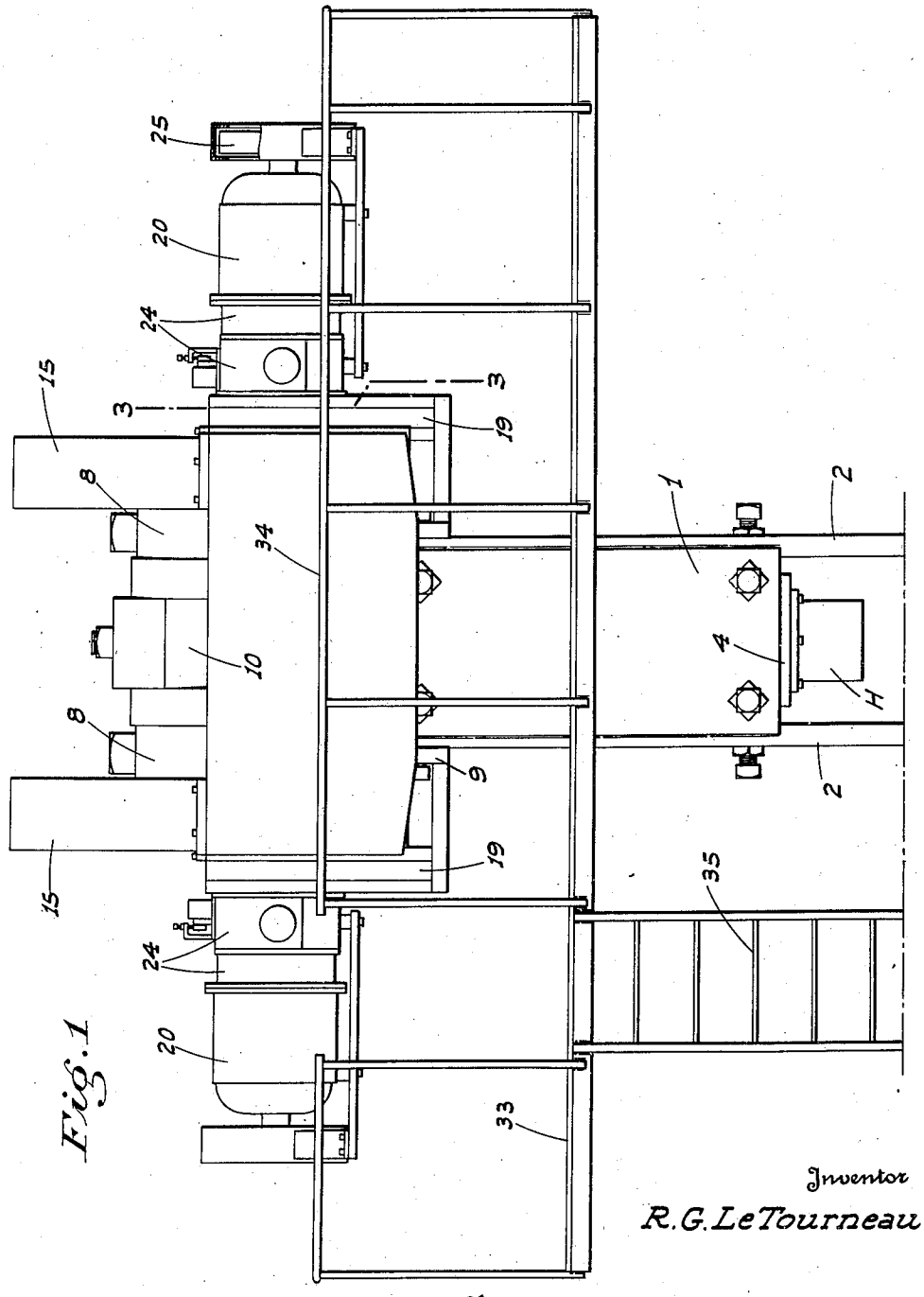


Fig. 1

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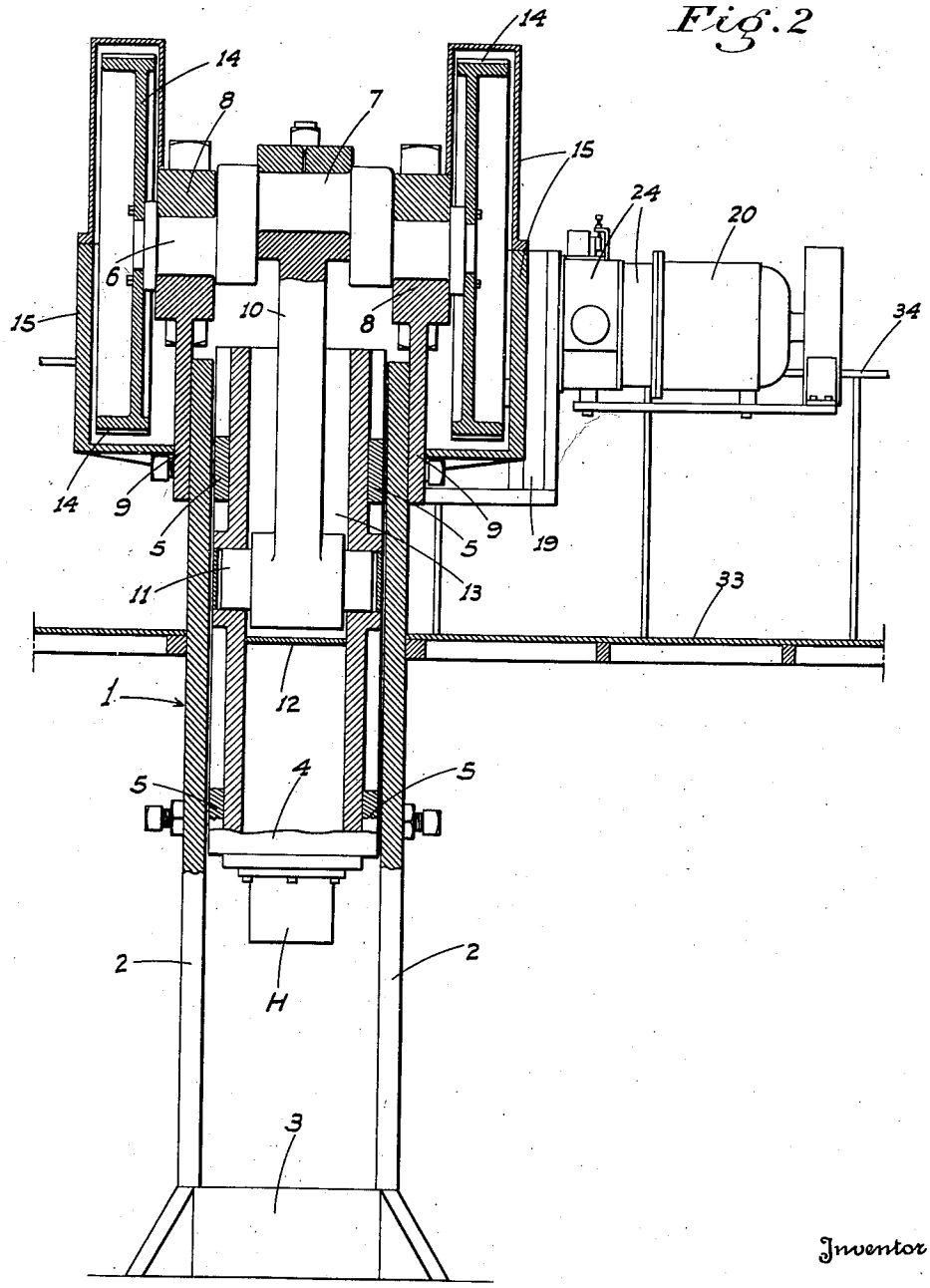
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Fig. 2



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Fig. 3

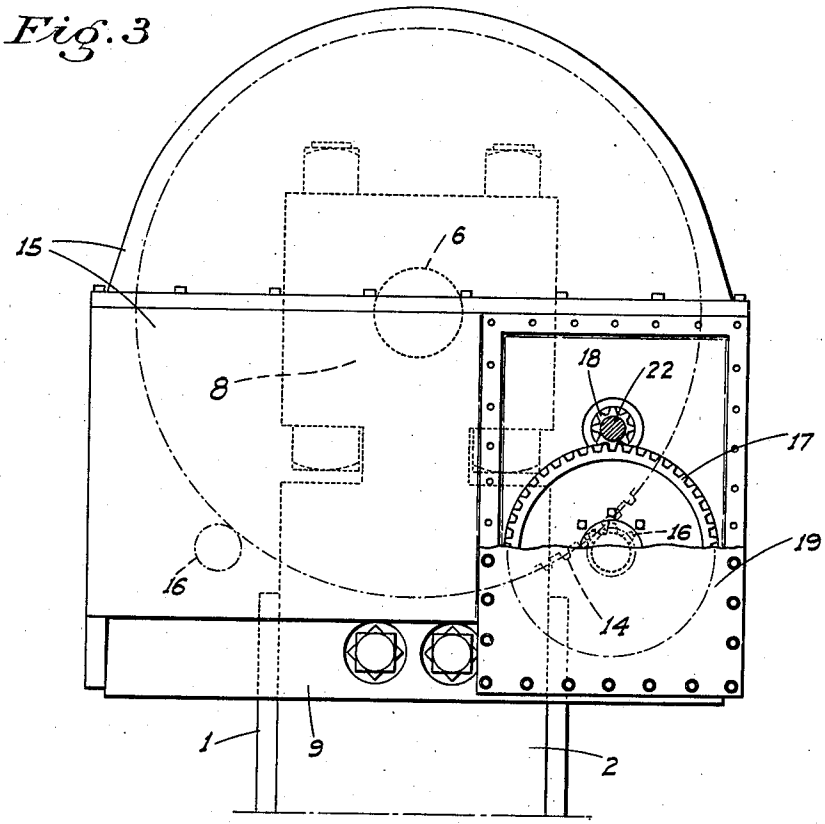
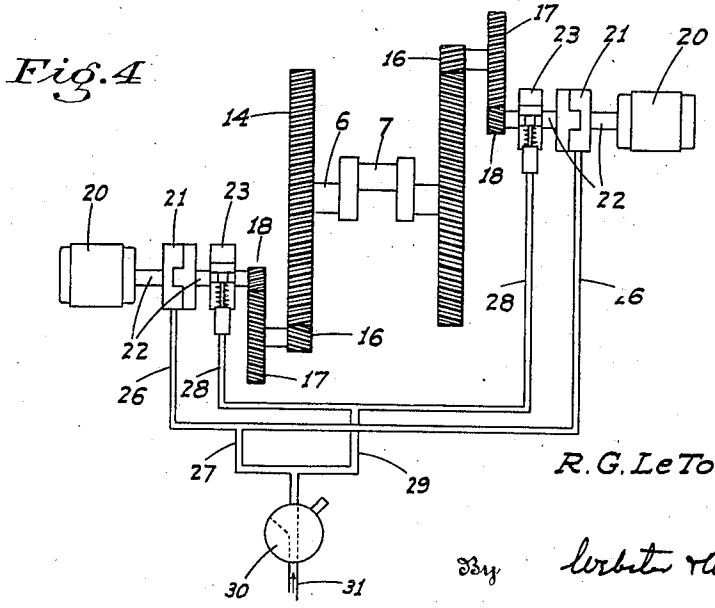


Fig. 4



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UNITED STATES PATENT OFFICE

2,366,272

CRANK PRESS

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Application July 13, 1943, Serial No. 494,586

7 Claims. (Cl. 100—70)

This invention relates to heavy-duty presses, preferably of the vertical ram type; an object being to provide a mechanism for operating the ram which includes a single throw crankshaft, and means for imparting rotation to the crankshaft from both ends and at relatively opposed points simultaneously. By so doing, I greatly reduce the torque load otherwise placed on the crankshaft if the power is applied to one end only of the shaft. This new arrangement also permits of the use of a smaller crankshaft to transmit a given power than can now be employed, with a corresponding reduction in manufacturing costs.

The crankshaft operating mechanism includes a pair of synchronized electric motors, with clutch and brake units interposed between the motor and shaft. Another object of the invention is to control the clutches and brakes so that the brakes are applied automatically as the clutches are released and also simultaneously with such releasing. In this manner instant halting of the crankshaft and the ram is accomplished without any coasting and without stopping the motors.

A further object of the invention is to provide a simple and inexpensive device, and yet one which will be exceedingly effective for the purpose for which it is designed.

These objects I accomplish by means of such structure and relative arrangement of parts as will fully appear by a perusal of the following specification and claims.

In the drawings similar characters of reference indicate corresponding parts in the several views:

Figure 1 is a side elevation of the upper portion of my improved press.

Figure 2 is a fragmentary sectional elevation of the press, showing the ram and its connecting rod at the top of the stroke.

Figure 3 is an enlarged fragmentary cross section on the line 3—3 of Fig. 1.

Figure 4 is a diagram of the driving connections between the motors and the crankshaft.

Referring now more particularly to the characters of reference on the drawings, the press comprises an upstanding column 1 of rectangular form and cross section and which includes vertical end plates 2. A work supporting bed 3 is disposed at the bottom of the column which is open between end plates for a certain distance above the bed.

Disposed in the column is a hollow rectangular plunger or ram 4, on the lower end of which a suitable die holder H is mounted. The ram is slidably engaged on all sides by upper and lower sets of adjustable wear plates 5, the lower set being located in a plane adjacent the lower end of the ram when the latter is at the top of its stroke, as shown in Fig. 2.

A crankshaft 6 having a single crank 7 is disposed above the column with its crank centrally of the ram; the crankshaft being journaled in bearings 8 which are rigid with transverse plates 9 secured against the upper portions of the end plates 2. A connecting rod 10 engages the crank and depends into the ram from the upper end thereof, the rod being connected at its lower end with the ram by means of a cross pin 11 mounted in the latter intermediate its ends. The pin is sealed at its ends in the ram, as shown, and a cross wall 12 closes the ram a short distance below the pin so as to form an oil tight sump 13 about the pin and the lower end of the connecting rod in which a supply of lubricant may be maintained.

Bull gears 14 are mounted on the ends of the shaft 6 beyond the bearings 8, being enclosed in housings 15 secured as a unit in connection with the plates 9 and the upper portion of the column 1. Each gear is engaged by a pinion 16 on one side and near the bottom, as shown in Fig. 3, the pinions of the two gears engaging the same in opposed relation or on opposite sides, as indicated in Fig. 4.

Each pinion is fixed as a unit with a gear 17 which in turn meshes with another pinion 18, each gear and pinion unit being enclosed in an auxiliary housing 19 secured on the corresponding housing 15. A motor 20 drives the pinion 18, the motors of the two pinions being synchronized with each other. All the pinions and gears are helically cut, the helix angles being opposed on the two sets of gears, as indicated in Fig. 4.

An air operated clutch 21 of suitable type, such as that shown in the patent to O. R. Peterson and Fred H. Stevens, No. 2,351,876, dated June 20, 1944, is interposed in the shaft line 22 of each motor and the corresponding pinion 18; the clutch member nearest the pinion being arranged as a unit with a suitable brake 23 of the spring-engaged and air-released type. Each clutch and brake unit is mounted in a housing 24 projecting outwardly from the upper portion of the corresponding housing 19, as shown in Fig. 1; the corresponding motor in turn being secured against the outer end of housing 24. In order to steady the constantly turning motors as they are alternately placed under and relieved of load by cor-

responding clutch or de-clutching operations, the shaft of each motor is provided at its outer end with a fly-wheel **25**, which also provides reserve power when the ram is under heavy load.

It is desirable that the rotation of both gears **14** shall stop simultaneously and instantly and without any coasting when the motors are disconnected from driving relation with the pinions **18** by a de-clutching action. To this end I provide the following arrangement: The air feed lines **26** to both clutches are connected to a common conduit **27**, and likewise the air feed lines **28** to both brake release air cylinders are connected to a common conduit **29**. The conduits **27** and **29** connect in common with the outlet of a suitable air valve **30**. By this arrangement the clutches are engaged and the brakes are released when the valve is turned to place conduits **27** and **29** in communication with the air feed line **31**. When the valve is turned to place conduits **27** and **29** in communication with the exhaust port of the valve, the clutches are released and the brake springs act to set the brakes.

Rotation of the gear trains as a whole is thus instantly halted at the initial pinions **18**, and since there is a considerable speed reduction between said pinions and the gears **14**, no measurable amount of movement of the crankshaft will ever take place after the clutches are released. By controlling the operation of both clutches and both brakes by the one valve, there is no chance for any relative lag in operation between one operating unit or the other to develop.

Since the press is a relatively high structure and at times it is necessary to lubricate the crankshaft bearings, adjust the brakes and perform other servicing operations, a platform or catwalk **33** provided with a guide railing **34** is mounted on the column **1** below the various housings at a suitable level for convenience of the service man. This platform is arranged so as to enable such service man to walk all around the various operating units of the press so that he may efficiently and conveniently service the same; access to the platform from the floor or ground being had by means of a depending ladder **35**.

From the foregoing description it will be readily seen that I have produced such a device as substantially fulfills the objects of the invention as set forth herein.

While this specification sets forth in detail the present and preferred construction of the device, still in practice such deviations from such detail may be resorted to as do not form a departure from the spirit of the invention, as defined by the appended claims.

Having thus described my invention what I claim as new and useful and desire to secure by Letters Patent is:

1. A press including an upstanding fixed column, a vertical ram slidable vertically therein, a horizontal crankshaft supported from the column above the ram, a connecting rod between the crankshaft and ram, bull gears on the crankshaft at its ends, separate gear trains each including a pinion engaging one of the gears on one side, housings fixed with the column in which the gear trains are mounted, and drive motors for the separate gear trains projecting in opposite directions away from each other and supported on the corresponding housings.

2. In combination with a press which includes a movable ram, a crank shaft beyond one end of the ram and a connecting rod between the crank shaft and ram, of means to drive the crank shaft, such means comprising a separate motor at each side of the ram, a pinion mounted in driving relation with each motor and a train of reduction gears mounted in driving relation between each pinion and the respective ends of the crank shaft, and means to simultaneously break the driving relation between each motor and its corresponding pinion.

3. In combination with a press which includes a movable ram, a crank shaft beyond one end of the ram and a connecting rod between the crank shaft and ram, of means to drive the crank shaft, such means comprising a separate motor at each side of the ram, a pinion mounted in driving relation with each motor and a train of reduction gears mounted in driving relation between each pinion and the respective ends of the crank shaft, and means to simultaneously break the driving relation between each motor and its corresponding pinion and at the same time brake the rotation of the pinions.

4. In combination with a press which includes a movable ram, a crank shaft beyond one end of the ram and a connecting rod between the crank shaft and ram, of means to drive the crank shaft, such means comprising a separate motor at each side of the ram, a pinion mounted in driving relation with each motor and a train of reduction gears mounted in driving relation between each pinion and the respective ends of the crank shaft, and means to simultaneously break the driving relation between each motor and its corresponding pinion; the pinions respectively engaging their adjacent gears at diametrally opposed points relative to the axis of the crank shaft.

5. In combination with a press which includes a movable ram, a crank shaft beyond one end of the ram and a connecting rod between the crank shaft and ram, of means to drive the crank shaft, such means comprising a separate motor at each side of the ram, a pinion mounted in driving relation with each motor and a train of reduction gears mounted in driving relation between each pinion and the respective ends of the crank shaft, and means to simultaneously break the driving relation between each motor and its corresponding pinion; the pinion and train of gears being helically cut.

6. In combination with a press which includes a movable ram, a crank shaft beyond one end of the ram and a connecting rod between the crank shaft and ram, of means to drive the crank shaft, such means comprising a separate motor at each side of the ram, a pinion mounted in driving relation with each motor and a train of reduction gears mounted in driving relation between each pinion and the respective ends of the crank shaft, and means to simultaneously break the driving relation between each motor and its corresponding pinion; the pinion and train of gears being helically cut, and the helix angles of the gear teeth of one pinion and its corresponding train of gears being the opposite of those on the other pinion and its corresponding train of gears.

7. In combination with a press which includes a movable ram, a crank shaft beyond one end of the ram and a connecting rod between the crank shaft and ram, of means to drive the crank shaft, such means comprising a separate motor at each side of the ram, a pinion mounted in driving relation with each motor and a train of reduction gears mounted in driving relation between each pinion and the respective ends of the

crank shaft, and means to simultaneously break the driving relation between each motor and its corresponding pinion and at the same time brake the rotation of the pinions; such latter two means comprising an air operated clutch and a separate spring-engaged and air-released brake on each pinion shaft, an air supply line leading in common to both clutches, an air supply line leading in common to both brakes, a single air supply line connected in common to both of the first named supply lines, and a valve operable to selectively admit air to the single supply line or to exhaust it to the atmosphere.

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