March 15, 1955 G. MEZEY 2,703,994

DOUBLE DRILL PRESS

Filed Aug. 28, 1952 3 Sheets-Sheet 1

FIG. 1

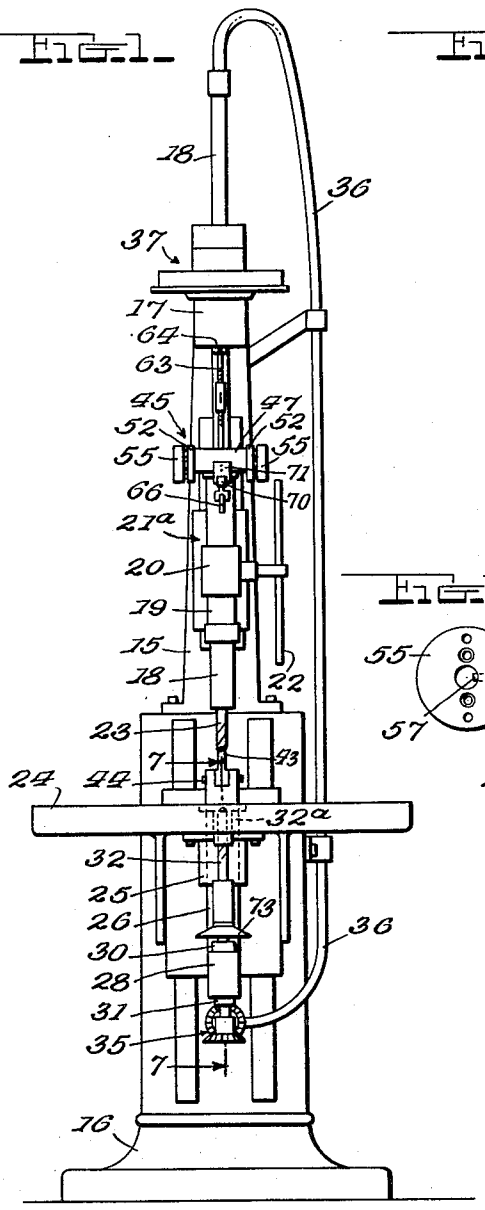


FIG. 2

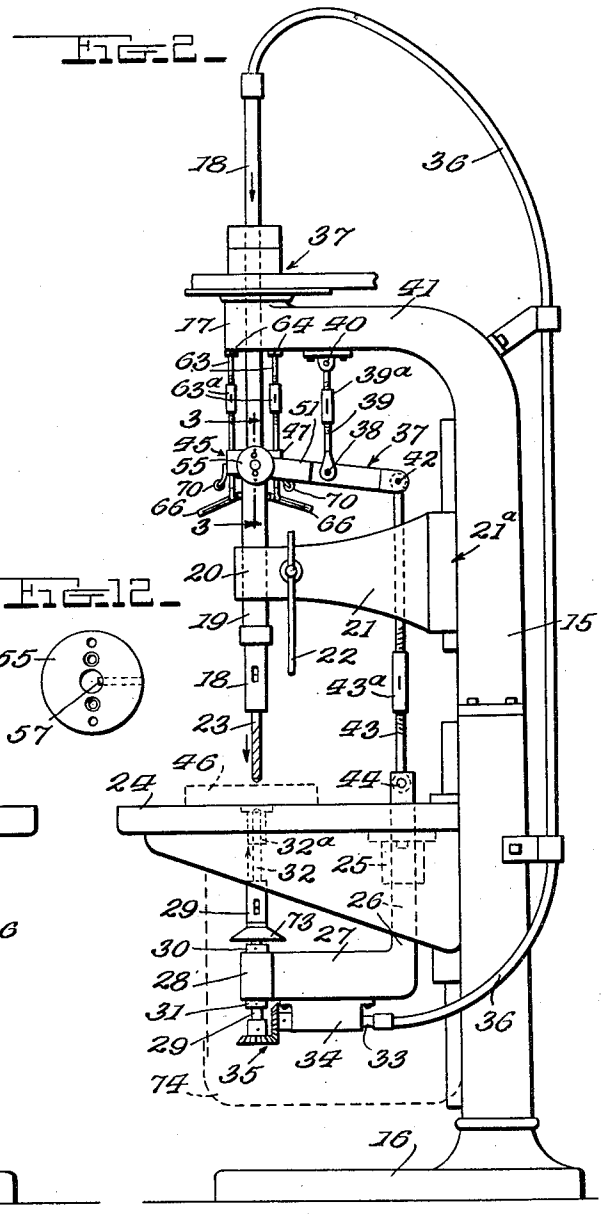
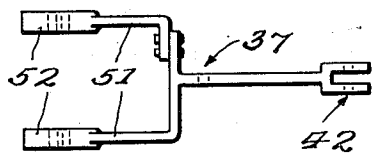


FIG. 12

FIG. 13



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DOUBLE DRILL PRESS

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FIG. 3

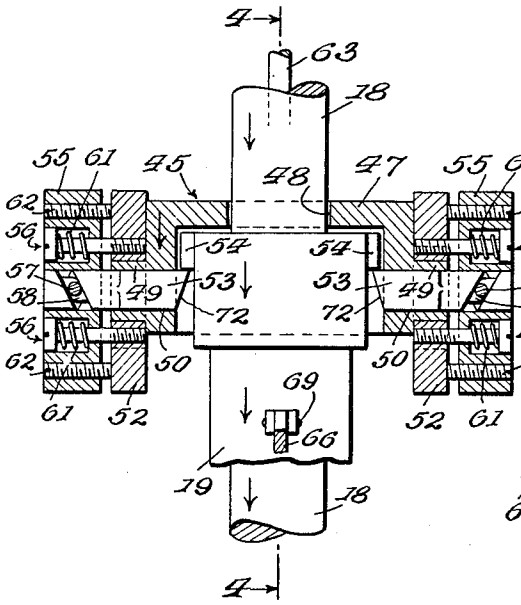


FIG. 4

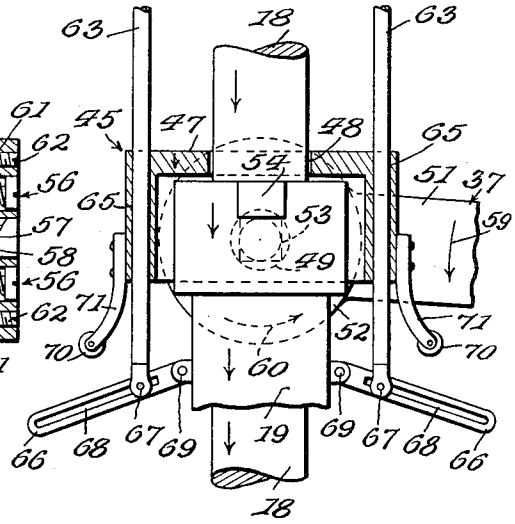


FIG. 5

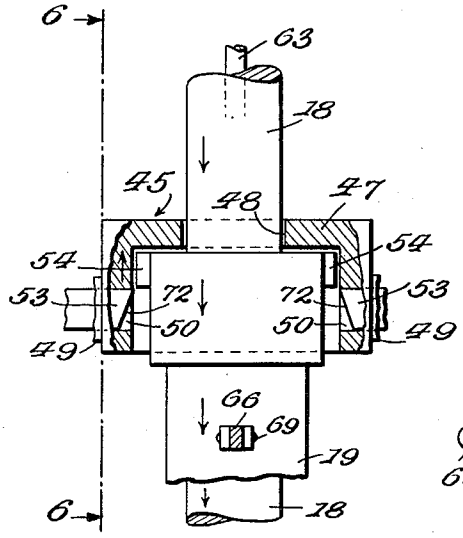
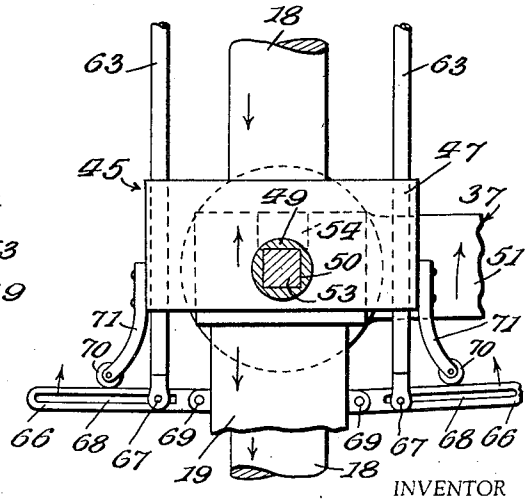


FIG. 6



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DOUBLE DRILL PRESS

Filed Aug. 28, 1952 3 Sheets-Sheet 3

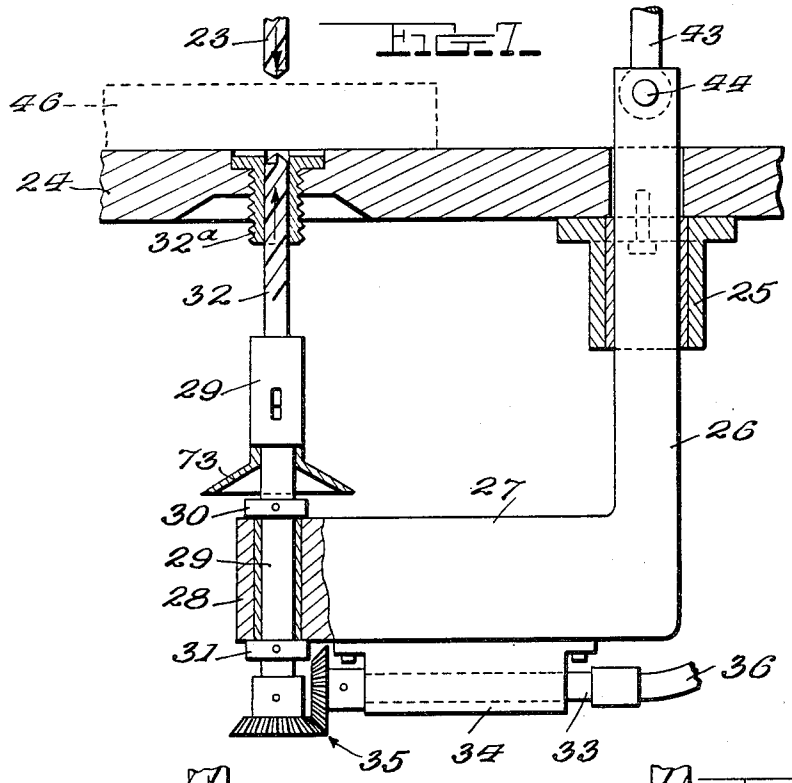

Fig. 7

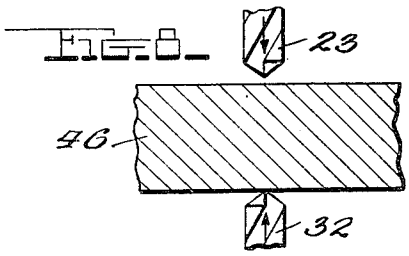

Fig. 8

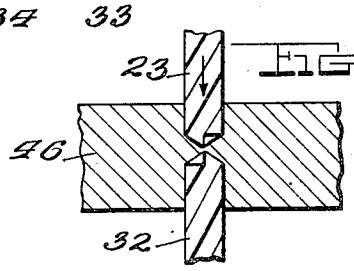

Fig. 9

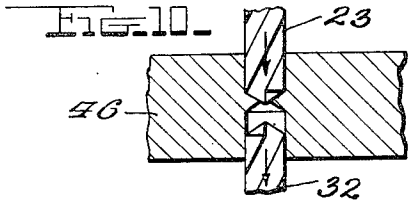

Fig. 10

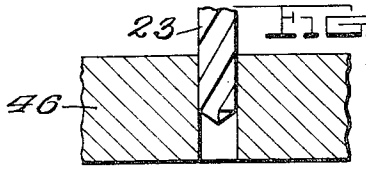

Fig. 11

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United States Patent Office 2,703,994 Patented Mar. 15, 1955

2,703,994

DOUBLE DRILL PRESS

George Mezey, Ithaca, N. Y.

Application August 28, 1952, Serial No. 306,887

17 Claims. (Cl. 77—21)

This invention relates to a new and improved drill press having one drill for drilling downwardly in a work-piece, and a second drill, aligned with the first, for simultaneously drilling upwardly, the two drills jointly forming a hole through the work-piece. The improved drill press in thus advantageous over the conventional press for such reasons as the following:

1. A hole may be drilled in about half the time;
2. Both ends of the hole will be in perfect alignment;
3. Drill travel is shortened and danger of the drill springing and wandering is reduced to the minimum;
4. Any slight wandering which should occur will cause the misalignment to be present, not at, but between the ends of the hole where it may be easily corrected by the reaming operation which usually follows;
5. The point of break-through at the end of the drilling operation will be between, and not at, the ends of the hole and will require no burring operation, as is necessary when the drill of a conventional drill press breaks through the lower side of the work-piece;
6. Rejections for faulty drilling are almost entirely overcome;
7. Because of Nos. 2, 3, 4 and 6, more accurate estimates may be made of the time expenditure and cost of any job requiring successive drilling of a great number of holes;
8. With elimination of scrap cost of production is decreased to the minimum;
9. Output per man machine hour is increased to the maximum; and
10. Location gauge construction and inspection cost is lowered.

The foremost object of the invention is to provide an improved construction which will be of unusual simplicity yet will be highly efficient.

Another object of the invention is to provide a construction which will permit easy conversion of even a more or less obsolete drill press to an efficient double-drill press, thus conserving and salvaging capital investment in equipment and floor space.

Yet another object of the invention is to provide a novel mechanism whereby conventional downward feeding of the upper drill-carrying spindle will upwardly feed the lower drill.

A further object of the invention is to provide a novel mechanism whereby the lower drill feed will be stopped and this drill lowered out of the way of the upper drill before the two can come together.

A still further object of the invention is to provide a novel mechanism whereby the feed stopping and lowering means of the lower drill are actuated at the proper time by the descent of the spindle which drives and feeds the upper drill.

Yet another object is to provide for substantially equalizing the wear on the two drills by assigning substantially equal tasks to them.

A still further object of the invention is to provide a mechanism which will assure the same R. P. M. for both the upper and lower drills.

With the above and other objects in view that will became apparent as the nature of the invention is better understood, the same consists in the novel form, combination and arrangement of parts hereinafter more fully described, shown in the accompanying drawings and particularly claimed.

In the drawings:

Figure 1 is a front elevation of the improved drill press;

Figure 2 is a side elevation;

Figure 3 is an enlarged fragmentary vertical sectional view on line 3—3 of Figure 2, partly in elevation, the parts being shown in positions which they occupy at the start of the lowering of the upper drill and the simultaneous raising of the lower drill;

Figure 4 is an enlarged vertical sectional view, partly in elevation, on line 4—4 of Figure 3;

Figure 5 is a fragmentary view similar to a portion of Figure 6 but showing the coupling dogs released to discontinue the ascent of the lower drill;

Figure 6 is a vertical sectional view on line 6—6 of Figure 5, showing the parts in readiness for lowering the lower drill as the upper drill continues downwardly;

Figure 7 is an enlarged fragmentary vertical sectional view, partly in elevation, on line 7—7 of Figure 1, showing the mounting means for the lower drill;

Figures 8, 9, 10, and 11 are operational diagrams;

Figure 12 is a side elevation of one of the coupling dog releasing collars; and

Figure 13 is a plan view of the yoke lever.

The construction shown in the drawings will be rather specifically described but variations may be made within the scope of the invention as claimed.

A standard **15** rises rigidly from a base **16** and is provided with an upper bearing **17** for a drill-driving spindle **18**. This spindle **18** extends rotatably through the usual feed sleeve **19** and is so connected with this sleeve that raising and lowering of said sleeve will raise and lower said spindle. The sleeve **19** extends slidably and non-rotatably through a bearing **20** on an arm **21** which is vertically adjustable at **21a** on the standard **15**. The usual means is provided for raising and lowering the sleeve **19**, and this means includes the rotatable operating handle **22**. The lower end of the spindle **18** carries a drill **23** in the customary manner.

A table **24** is adjustably mounted upon the standard **15** in a conventional manner and the rear portion of said table is provided with a vertical guide bearing **25** in front of said standard. A vertical shank **26** extends slidably and non-rotatably through the bearing **25** and is provided at its lower end with a forwardly projecting arm **27**, the front end of said arm having a vertical bearing **28** in vertical alignment with the spindle **18**. A lower spindle **29** is rotatably mounted in the bearing **28** and is suitably held against sliding therein, for example, by collars **30** and **31**. The spindle **29** carries a lower drill **32** and the table **24** is provided with a bushing **32a** for this lower drill.

A short horizontal shaft **33** is mounted in a bearing **34** secured to the arm **27** and the front end of said shaft **33** is connected by bevel gearing **35** with the lower end of the spindle **29**. A flexible shaft **36** connects the rear end of the shaft **33** with the upper end of the upper spindle **18** whereby driving of said spindle **18** by conventional means **37** to drive the upper drill **23** will also effect driving of the lower spindle **29** to drive the lower drill **32** at the same speed.

A yoke lever **37** is fulcrumed centrally between its ends at **38** to the lower end of a vertical hanger rod **39** which is pivotally hung at **40** from the forwardly projecting upper end **41** of the standard **15**. The rear end of the yoke lever **37** is pivoted at **42** to the upper end of a rod **43**, and the lower end of this rod **43** is pivoted at **44** to the upper end of the shank **26** of the lower spindle carrier **26, 27**. The front end of the yoke lever **37** is connectable with and disconnectable from the drill raising and lowering sleeve **19** by means of a coupling device **45**.

When the yoke lever **37** is connected to the sleeve **19**, descent of this sleeve **19** to feed the upper drill **23** into the work-piece **46**, will swing the front end of said lever **37** downwardly, thereby upwardly swinging the rear end of said lever **37** and pulling upon the rod **43** to lift the carrier **26, 27**, thus lifting the lower spindle **29** and feeding the lower drill **32** into said work-piece, the feeding of the two drills being at uniform speed.

Before the two drills can meet, the coupling device **45** is raised and the swinging movement of the yoke lever **37** is reversed by means yet to be described. Thus, upward feeding of the lower drill **32** stops and this drill **32**

is lowered out of the way of the upper drill **23** which then completes the hole.

As the work of the lower drill stops slightly before that of the upper drill, the elements are preferably so related that said lower drill starts to cut slightly ahead of said upper drill, thus equalizing the work performed by the two drills and giving them equal life. The diagrammatic views (Figures 8 to 11) illustrate the actions of the two drills. In Figure 8, the lower drill **32** is ready to cut and the upper drill is still slightly spaced from the work-piece **46**. In Figure 9, the drills have almost met but the feed of the lower drill **32** has stopped. In Figure 10, the lower drill **32** is descending away from the upper drill **23** as the latter completes the hole, and hole completion by said upper drill **23** is shown in Figure 11.

The construction of the coupling device **45** and the means for lowering the lower drill upon release of said coupling device, are shown more particularly in Figures 3 to 6 although a number of the elements are seen on a small scale in Figures 1 and 2. A cap-like casing **47** receives the upper end of the sleeve **19** and is formed with a central opening **48** through which the spindle **18** extends slidably. Opposite sides of this casing are formed with outwardly projecting bearing bosses **49** and with aligned openings **50** extending through said bosses **49**. The front extremities of the yoke lever furcations **51** have bearings **52** turnably mounted on the bosses **49**, and two coupling dogs **53** extend slidably and non-rotatably through the openings **50** which extend through said bosses. The sleeve **19** is provided with downwardly facing lateral shoulders **54** which rest upon the inner ends of the dogs **53** when the sleeve **19** occupies its raised position and during lowering of this sleeve for drill feeding (see Figure 3). The dogs **53** thus connect the casing **47** with the sleeve **19** and cause the descent of the latter to swing the yoke lever **37** in the proper direction to raise the lower drill **32**. At the proper moment, however, the dogs **53** are released from the shoulders **54** (Figure 5), allowing the sleeve **19** and upper spindle **18** to further descend without further raising the lower drill by further moving the casing **47** downwardly. To effect this dog release, the construction now to be described, is provided.

Two collars **55** are turnable upon the outer ends of the dogs **53** and are connected at **56** with the bearings **52** to turn with these bearings as the yoke lever **37** swings. These collars have inward projections **57** (preferably screws) and the collar-contained portions of the dogs **53** have cam grooves **58** receiving said projections **57**. Thus, as the yoke lever **37** is swung by downward feeding of the sleeve **19**, the bearings **52** turn upon the bosses **49** as shown by the arrows **59** and **60** in Figure 4, and through the connections **56**, said bearings **52** turn the collars **55**. This causes such coaction of the projections **57** and cam grooves **58** as to release the dogs **53** from the shoulders **54**, allowing further descent of sleeve **19** and spindle **18** without further ascent of the lower spindle **32**.

The connections **56** embody springs **61** which urge the collars **55** inwardly toward the casing **47**, and said collars **55** are provided with set screws **62** for limiting their movement under the influence of said springs **61**. By adjusting these set screws **62** and thus effecting endwise adjustment of the dogs **53** with respect to the shoulders **54**, the moment of dog release may be varied as required.

Means is provided for positively lowering the lower drill **32** out of the way of the upper drill **23**, as soon as the feed of said lower drill is stopped (by release of the dogs **53**). This means is shown more particularly in Figures 4 to 6 although it appears on a small scale in Figures 1 and 2 also.

Two vertical hanger rods **63** are secured at **64** (Figures 1 and 2) to the bearing **17** of the standard **15**, and the lower portions of said hanger rods extend slidably through openings **65** in the casing **47** of the coupling device **45**. Two casing lifting levers **66** are slidably fulcrumed to the lower ends of the rods **63** by means of pins **67** carried by said rods and extending through longitudinal slots **68** in said levers. The pins **67** may have rollers if desired. The levers **66** are disposed radially of the sleeve **19** and the inner ends of said levers are pivoted to said sleeve as shown at **69**. The casing **47** is provided with shoes preferably in the form of rollers **70** carried by arms **71** projecting downwardly from said casing, and said rollers are so located as to contact with the upper edges of the

levers **66** upon predetermined lowering of the sleeve **19**. When this sleeve **19** occupies its raised position (Figures 2 and 4) the levers **66** decline outwardly and the rollers **70** are upwardly spaced considerably from said levers. As the sleeve **19** is lowered to feed both drills into the work-piece, the casing **47** and its rollers **70** descend with said sleeve and the levers **66** so swing about their fulcrums that the outer ends of said levers rise. At the time the dogs **53** are released to stop the feed of the lower drill **32**, the levers **66** and rollers **70** are in contact as best shown in Figure 6. Consequently, as the sleeve **19** is further lowered to cause the upper drill **23** to complete the hole, the levers **66** continue to swing, with the result that they lift the casing **47**, thus swinging the yoke lever **37** in the reverse direction to lower the carrier **26**, **27** and the drill **32**. As the casing **47** rises, the dogs **53** again slide inwardly to the positions of Figure 3 but the shoulders **54** are then below said dogs due to the lowered position of the sleeve **19**. When this sleeve **19** is again raised, upon completion of the drilling operation, the shoulders **54** engage the beveled inner ends **72** of the dogs **53**, thus pushing said dogs outwardly against the action of the springs **61** and allowing said shoulders to pass said dogs. As soon as the shoulders clear the dogs, the springs **61** cause inward projection of said dogs under said shoulders, thus placing the elements in condition for the next drilling operation.

While the operation of the improved press may be clear from explanations given during description, it may be well to briefly describe it as follows:

As the sleeve **19** is lowered to feed the upper drill **23** into work-piece **46**, the coupling device **45** swings the yoke lever **37** and thus effects raising of the lower drill carrier **26**, **27** to feed the lower drill **32** into said work-piece. Before the two drills can meet, the coupling device **45** is released, stopping the feeding of the lower drill **32**. As the sleeve **19** continues downwardly to cause the upper drill **23** to complete the hole, the levers **66** restore the coupling device **45** to raised position, thereby rocking the yoke lever **37** in the reverse direction to lower the lower drill **32**. When the sleeve **19** is again raised at the completion of the drilling operation, the coupling device **45** again connects this sleeve with the yoke lever **37**, placing the press in condition for the next drilling operation.

Suitable adjustments may be provided where advisable. The rod **43** is shown as formed from two sections adjustably connected by a turnbuckle **43a**, and a corresponding construction for the rods **39** and **63**, including the turnbuckles **39a** and **63a**. A chip guard and coolant deflector **73** may be provided above the bearing **28**, and a coolant and chip receiving casing **74** is shown in dotted lines in Figure 2.

From the above detailed description of the invention, it is believed that the construction, use, and operation thereof will at once be apparent, and while there is herein shown and described the preferred embodiment of the invention, it is nevertheless to be understood that minor changes may be made therein without departing from the spirit and scope of the invention as claimed.

What is claimed as new is:

1. A drill press comprising a table, an upper spindle over said table, means mounting said upper spindle for vertical movement, means for vertically moving said upper spindle, a lower spindle aligned with said upper spindle and disposed under said table, a carrier upon which said lower spindle is mounted, means mounting said carrier for vertical movement, means for rotating the upper spindle, a flexible drive connection between the upper end of the upper spindle and the lower end of the lower spindle for rotating them at the same speed, carrier operating means operatively connecting said upper spindle with said carrier and operative to raise said carrier as said upper spindle is lowered, said carrier operating means including releasable means for disconnecting said carrier operating means from said upper spindle, means for automatically releasing said releasable means when said carrier has been raised to a predetermined extent, and means for lowering said carrier upon release of said releasable means.

2. A drill press comprising a table, an upper spindle over said table, means mounting said upper spindle for vertical movement, means for vertically moving said upper spindle, a lower spindle aligned with said upper spindle and disposed under said table, a carrier upon

which said lower spindle is mounted, means mounting said carrier for vertical movement, means for rotating the upper spindle, a flexible drive connection between the upper end of the upper spindle and the lower end of the lower spindle for rotating them at the same speed, carrier operating means operatively connecting said upper spindle with said carrier and operative to raise said carrier as said upper spindle is lowered, said carrier operating means including releasable means for disconnecting said carrier operating means from said upper spindle, means for automatically releasing said releasable means when said carrier has been raised to a predetermined extent, and means actuated by further descent of said upper spindle for lowering said carrier upon release of said releasable means.

3. A structure as specified in claim 1; said releasable means being constructed to automatically reconnect said carrier operating means with said upper spindle upon return of the latter to raised position.

4. A structure as specified in claim 2; said releasable means being constructed to automatically reconnect said carrier operating means with said upper spindle upon return of the latter to raised position.

5. A drill press comprising a table, an upper spindle over said table, means mounting said upper spindle for vertical movement, means for vertically moving said upper spindle, including a sleeve surrounding said upper spindle and movable vertically therewith, a lower spindle aligned with said upper spindle and disposed under said table, a carrier upon which said lower spindle is mounted, means mounting said carrier for vertical movement, means for rotating the upper spindle, a flexible drive connection between the upper end of the upper spindle and the lower end of the lower spindle for rotating them at the same speed, carrier operating means operatively connecting said sleeve with said carrier and operative to raise said carrier as said sleeve is lowered, said carrier operating means including releasable means for disconnecting said carrier operating means from said sleeve and means for automatically releasing said releasable means when said carrier has been raised to a predetermined extent, and means for lowering said carrier upon release of said releasable means.

6. A structure as specified in claim 5; said releasable means being constructed to automatically reconnect said carrier operating means with said sleeve upon return of said sleeve to raised position.

7. A structure as specified in claim 1; said carrier operating means including a vertically swingable lever fulcrumed between its ends and a rod connecting one end of said lever with said carrier, said releasable means being positioned to connect the other end of said lever with said sleeve.

8. A structure as specified in claim 5; said carrier operating means including a vertically swingable lever fulcrumed between its ends and a rod connecting one end of said levers with said carrier, said releasable means being positioned to connect the other end of said lever with said sleeve.

9. A drill press comprising a table, an upper spindle over said table, means mounting said upper spindle for vertical movement, means for vertically moving said upper spindle, including a sleeve surrounding said upper spindle and movable vertically therewith, a lower spindle aligned with said upper spindle and disposed under said table, a carrier upon which said lower spindle is mounted, means mounting said carrier for vertical movement, a coupling body adjacent the aforesaid sleeve, a coupling dog mounted on said body, said sleeve having a shoulder cooperable with said dog to connect said body with said sleeve for downward movement with the latter, a lever mounted adjacent said body, pivot means connecting one end of said lever with said body, whereby descent of said sleeve and body will swing said lever in one direction, connecting means from said lever to said carrier for raising the latter as said lever is swung as aforesaid, additional connecting means from said one end of said lever to said dog for releasing the latter when said lever has been swung to a predetermined extent, and means for lowering said carrier upon release of said dog.

10. A structure as specified in claim 9; said dog being constructed to re-engage said sleeve when the latter is returned to raised position.

11. A structure as specified in claim 9; said dog being slidably and non-rotatably mounted on said coupling body and disposed radially of said sleeve, said additional connecting means for releasing said dog comprising a cam on said dog and means engaging said cam and operated by said swinging of said lever.

12. A structure as specified in claim 9; said dog being slidably and non-rotatably mounted on said body concentric with said pivot means, said connecting means for releasing said dog comprising a collar turnably surrounding the outer end of said dog and connected with the pivoted end of said lever to be turned by the latter, an internal projection on said collar and a cam groove in said outer end of said dog, said cam groove receiving said projection.

13. A structure as specified in claim 9; said dog being slidably and non-rotatably mounted on said body concentric with said pivot means, said connecting means for releasing said dog comprising a collar turnably surrounding the outer end of said dog and connected with the pivoted end of said lever to be turned by the latter, an internal projection on said collar and a cam groove in said outer end of said dog, said cam groove receiving said projection, said dog having a beveled inner end to reengage the aforesaid shoulder of said sleeve when the latter is again raised, the connecting means between said collar and lever including spring means allowing outward yielding of said dog when said shoulder engages said beveled end.

14. In a means for raising a lower drill spindle when an upper spindle-operating sleeve is moved downwardly; a coupling body adjacent said sleeve and having an external bearing boss disposed radially of said sleeve, a dog extending slidably and non-rotatably through said boss, said sleeve having a shoulder normally resting on the inner end of said dog, a lever having a bearing surrounding said boss and turnable thereon as said sleeve lowers and swings said lever, a collar turnably surrounding the outer end of said dog, means connecting said collar with said bearing to cause turning of said collar with said bearing, and an internal projection on said collar, said outer end of said dog having a cam groove receiving said projection to retract said dog from said shoulder when said collar has been turned to a predetermined extent.

15. A structure as specified in claim 14; said collar and bearing connecting means including a spring urging said collar toward said bearing, and a set screw for limiting the movement of the collar under the influence of said spring.

16. In a drill press having an upper spindle, a sleeve surrounding said spindle for raising and lowering the same, a lower spindle, a vertically movable carrier for said lower spindle, and means for raising said carrier as said sleeve is lowered, said carrier raising means including a coupling body adjacent said sleeve and releasable means for connecting said coupling body with said sleeve while the latter is moving downwardly to a predetermined extent; a lever under said coupling body and extending radially from said sleeve, a fixed fulcrum with which said lever is slidably engaged between its ends to effect upward swinging of the outer end of said lever as said sleeve descends, and a shoe on said coupling body to contact with the upper edge of said outer lever and when said sleeve has descended to the extent at which said releasable means is released, whereby further descent of said sleeve will cause said lever to again raise said coupling body.

17. A structure as specified in claim 16; together with a fixed vertical hanger carrying said fulcrum, said coupling body being slidably engaged with said hanger.

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