No. 773,591. PATENTED NOV. 1, 1904.

C. DE L. RICE.

MULTIPLE SPINDLE DRILL PRESS.

APPLICATION FILED APR. 27, 1903.

NO MODEL. 3 SHEETS—SHEET 1.

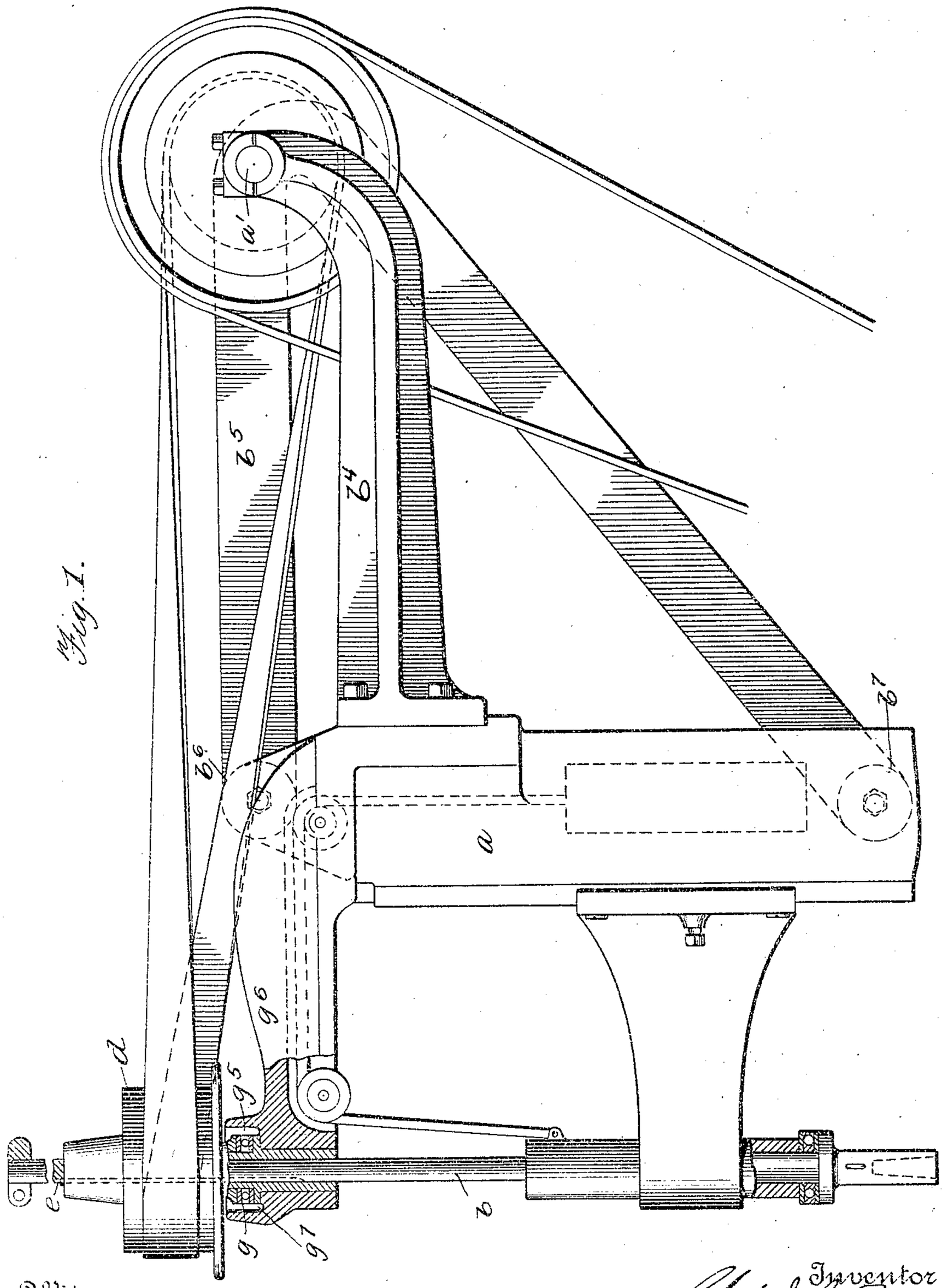

Fig. 1.

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NO MODEL. 3 SHEETS—SHEET 2.

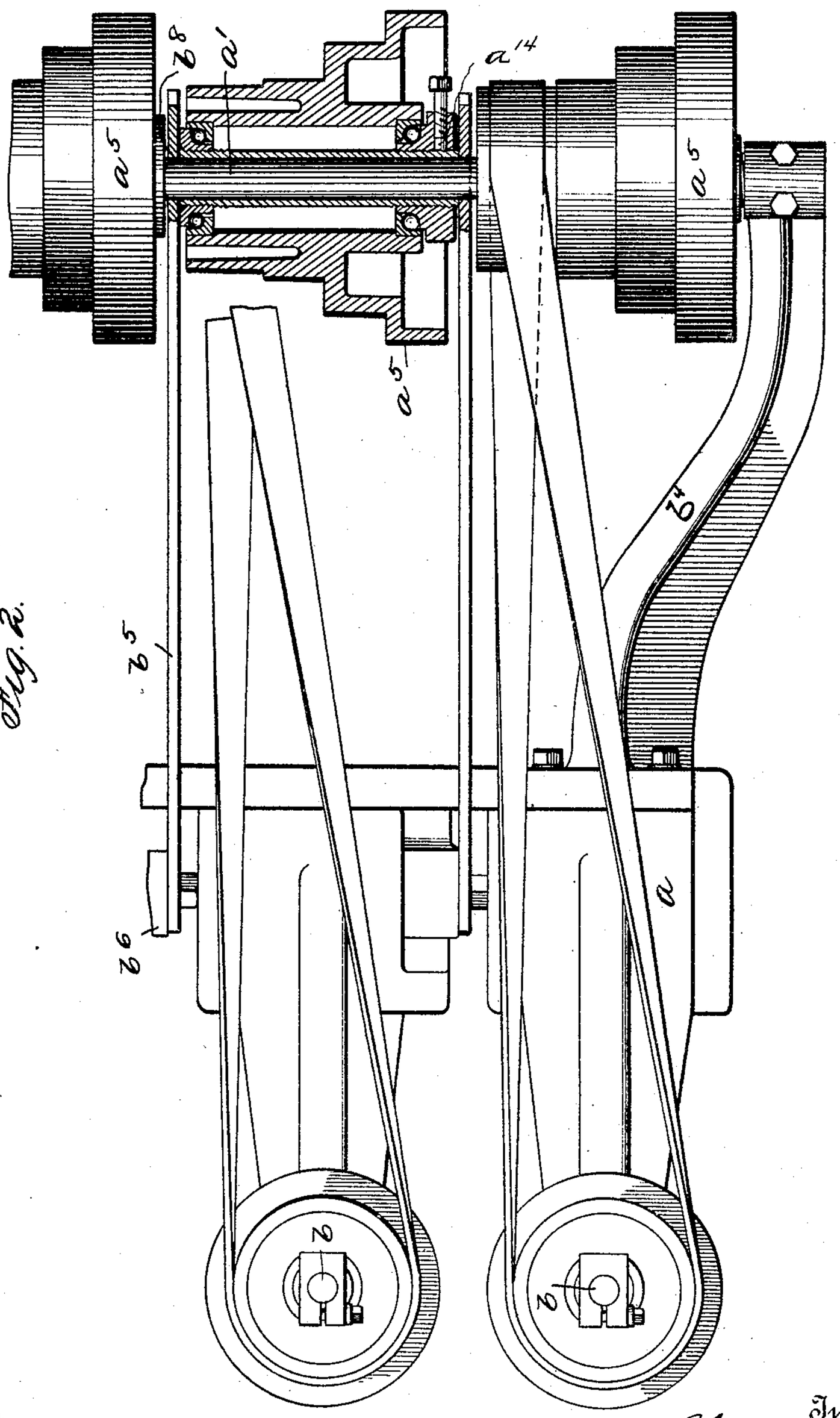

Fig. 2.

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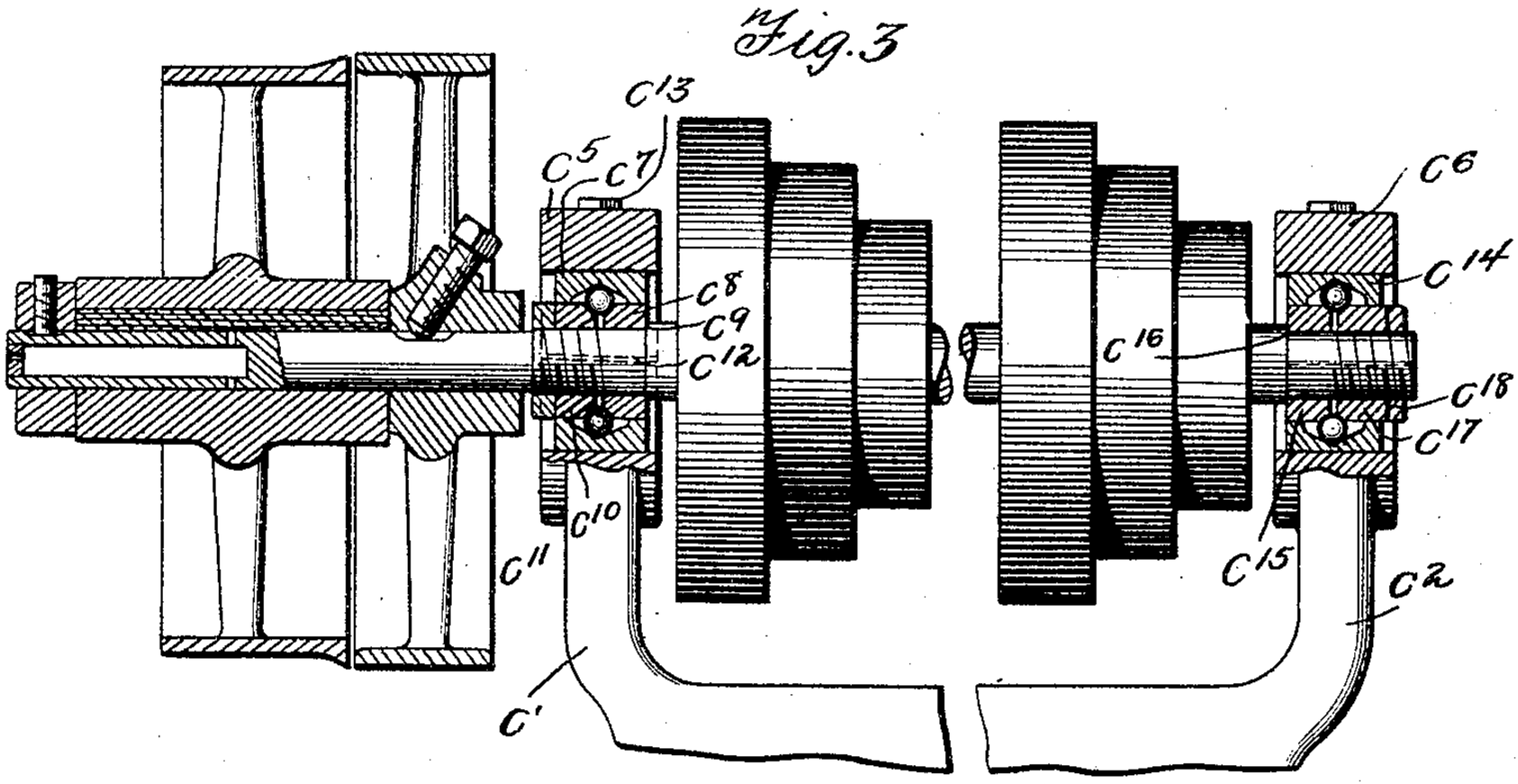
NO MODEL. 3 SHEETS—SHEET 3.

Fig. 3



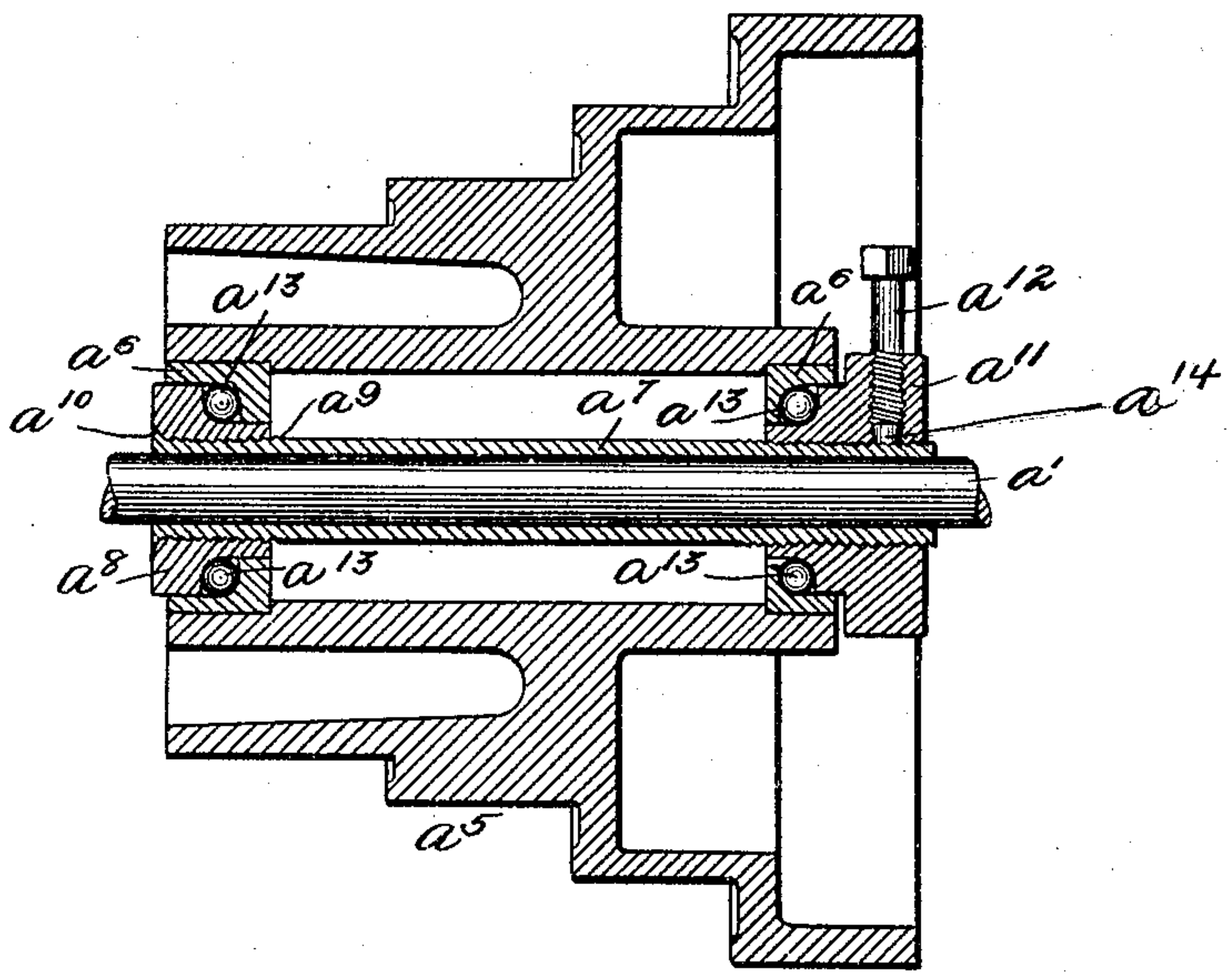


Fig. 4.

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No. 773,591. Patented November 1, 1904.

UNITED STATES PATENT OFFICE.

CHARLES DE LOS RICE, OF HARTFORD, CONNECTICUT.

MULTIPLE-SPINDLE DRILL-PRESS.

SPECIFICATION forming part of Letters Patent No. 773,591, dated November 1, 1904.

Application filed April 27, 1903. Serial No. 154,436. (No model.)

To all whom it may concern:

Be it known that I, CHARLES DE LOS RICE, a citizen of the United States of America, residing at Hartford, in the county of Hartford and State of Connecticut, have invented certain new and useful Improvements in Multiple-Spindle Drill-Presses, of which the following is a specification.

The object of the herein-described invention is to produce a strong, compact machine, simple in construction and adjustment and advantageous in its operation.

In the drawings, Figure 1 is a side elevation of a part of the machine, having certain parts broken away to show the construction. Fig. 2 is a plan view of part of the machine, having certain parts in section and broken away to show construction. Fig. 3 is a plan view of the driving-shaft. Fig. 4 is a sectional view of one of the loose pulleys.

The general construction of the main parts of the frame of the machine shown in the drawings and its operation are in the main common to multiple-spindle drill-presses, *a* being the upper part of the frame of the machine, commonly called the "head," *b*, the spindle properly supported and guided, and *a'* a stationary rod supporting the loose counter-pulleys which drive the spindles.

As in the ordinary construction of machines of this class the pulley *d* is driven from one of the loose counter-pulleys on the rod *a'* and in turn drives the spindle *b*, it being connected therewith by the key and keyway shown at *e*. By reason of the necessary construction the driving connection between the pulley and spindle is very near to the center, and the small amount of leverage thus obtained requires a correspondingly greater driving force. Having in mind these conditions and observing the operation of a machine of this class, it will be seen that in order to permit the spindle to move through the pulley during its cutting feed the resistance due to the friction of the key in the keyway must be overcome. The practical result of this condition is to drive the pulley hard down against its under thrust-bearing, causing a great amount of frictional resistance at this point, which must be overcome by the driving-belt. These conditions are very much exaggerated as the size of the drill increases. In order to reduce the friction of the pulley on its thrust-bearing to a minimum, I provide the antifriction-bearing *g*, which takes the pressure of the pulley during the cutting feed of the spindle and practically eliminates the frictional resistance at this point, greatly diminishing the duty of the driving-belt. As will be seen, this bearing is positioned in the recess g^5 in the bracket g^6, which is supported on the frame. The walls of the recess form an oil-groove g^7, which insures the continual proper lubrication of the bearing and prevents the splashing or throwing of the oil by reason of the high rate of revolution of the spindle.

In Figs. 2 and 4 there is illustrated a novel construction of the loose-running pulleys, which are mounted on the stationary rod *a'* and form the intermediate or counter connection between the spindle-pulley and the driving-pulley. Referring to Fig. 4, a^5 denotes a pulley having at each end a bearing a^6. a^7 is a sleeve which is adapted to slide on the rod *a'*. On one end of the sleeve a^7 the bearing-cone a^8 is threaded up to the shoulder a^9, the end of the sleeve being peened over, as at a^{10}, making the cone practically integral with the sleeve. On the opposite end of the sleeve there is threaded the adjusting-cone a^{11}, which may be secured thereto by means of the set-screw a^{12}, operating in the hole provided for that purpose in the cone. Between the cones and cases suitable antifriction devices, such as the balls a^{13}, are located. It will be seen from this construction that the pulley is self-contained—that is to say, it can be assembled and its bearings adjusted before it is mounted on the stationary rod. The number of pulleys used is dependent only upon the number of spindles in the machine. In assembling they are strung upon the rod *a'*. When properly positioned, the set-screws a^{12} (which have only been "finger-tightenened" previously in order to maintain the bearing adjustments) are driven home, clamping the sleeve a^7 on the rod *a'*, thus locking the bearings, positioning the pulley laterally on the rod, and securing the sleeve a^7 to the rod. In place of having the set-screw engage the sleeve di-

rectly I prefer to use a plug a^{14}, which preferably is of soft metal, this plug resting in the set-screw hole and adapted to be engaged by the set-screw.

In machines of this class it is essential that the construction shall be as compact as possible in order to have all the parts within the reach of the operator and for other reasons, which are clearly apparent. It is also necessary to properly support the rod upon which the loose pulleys are mounted, and in order to do this and still make the machine as compact as possible I have provided braces b^5 of peculiar construction, which are located between the end brackets b^4, which are usually employed as shaft-supports. These braces are each preferably made of a single piece of thin metal having considerable depth. These braces are bent to shape, and their free ends are secured to lugs b^6 b^7 on the frame of the machine, as clearly shown in Figs. 1 and 2. At the proper point between their extremities they are pierced to receive the rod a', as at b^8. This provides both a vertical and lateral support for the rod against the tension of the belts from the counter-shaft and the spindle-pulley. The braces may be made in two parts, each part being secured at one end to the lugs b^6 b^7 and having their outer ends pierced to receive the rod a'. The construction first described, however, is preferable, inasmuch as it permits of a more compact construction. I am thus allowed to use a light rod and a lighter construction throughout and at the same time insure the greatest stiffness and rigidity to the machine.

In Fig. 3 there is illustrated the novel support for the driving-shaft and the adjustment of the bearings. c' c^2 denote the arms which support the bearings. They are provided with the usual cap-pieces c^5 c^6. In the arm c' there is mounted a ball-case c^7, the cone c^8, located against the shoulder c^9, and the cone c^{10}, by means of which the bearing is adjusted and locked in its adjustment by the lock-nut c^{11}. As shown by dotted lines at c^{12}, the cap c^5 is cut away, so that when the bolts c^{13} are driven home the ball-case c^7 is firmly clamped in place. In the arm c^2 there is located the ball-case c^{14}, similar to the ball-case c^7, also the cones c^{15}, driven against the shoulder c^{16}, and the adjusting-cone c^{17}, with its lock-nut c^{18}. When the bolts on the cap c^6 are driven home, the ball-case c^{14} is not clamped, but is held so as to permit it to slide or drift through the end of the arm c^2. When the bearings have been adjusted for any reason as to take up wear in the parts, this drifting of one of the ball-cases permits the parts to position themselves so as to relieve the arms or the shaft or the bearings of any unnatural strain, leaving the parts after adjustment in a normal or neutral condition.

I am aware that the improvements herein described are capable of modification, and I do not wish to be understood as limiting myself in the following claim more than is required by the state of the art.

I claim as my invention—

A multiple-spindle drill-press made up of a machine-head; horizontal bracket-arms which extend rearwardly from each side of said head; a rod the extremities of which are fitted in said arms; a plurality of thin, deep V-shaped braces spaced between said arms, the ends of each of which braces are secured one to the upper part of said head and the other to the lower part thereof, the mid-portion or point of each brace being pierced for the passage of said rod; a plurality of pulleys mounted free to rotate upon said rod and compactly nested thereon, said braces supporting said rod against vertical and horizontal stress due to the compactness with which said pulleys are mounted upon said rod; a plurality of spindles; and driving means therefor driven by said pulleys.

In testimony whereof I affix my signature in presence of two witnesses.

CHARLES DE LOS RICE.

Witnesses:

H. E. HART,

D. I. KREIMENDAHL.