J. R. STEPHENSON.

MULTIPLE DRILL.

APPLICATION FILED APR. 2, 1909.

1,012,024.

Patented Dec. 19, 1911.

2 SHEETS—SHEET 1.

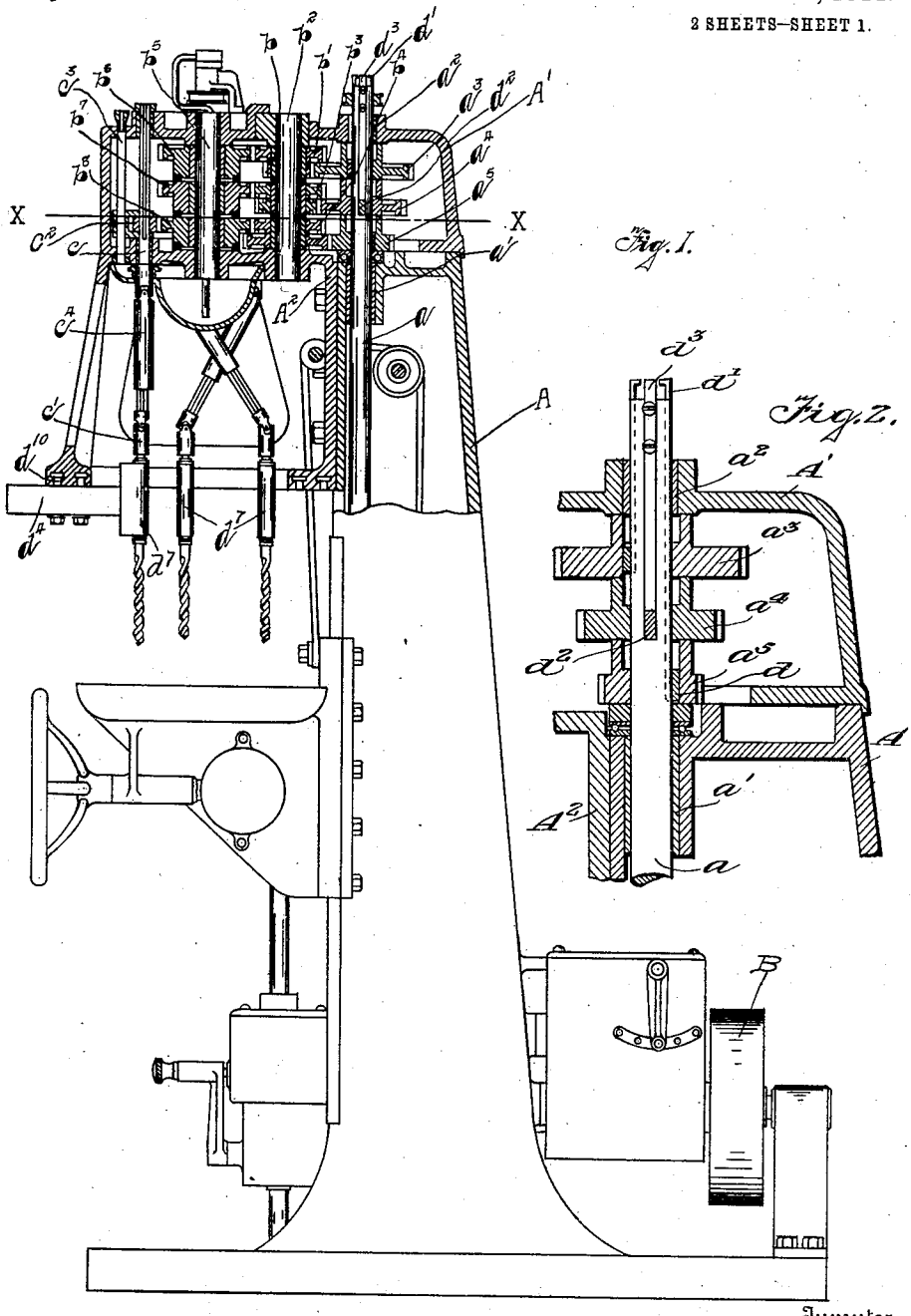

Fig. 1.

Fig. 2.

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2 SHEETS—SHEET 2.

Fig. 9.

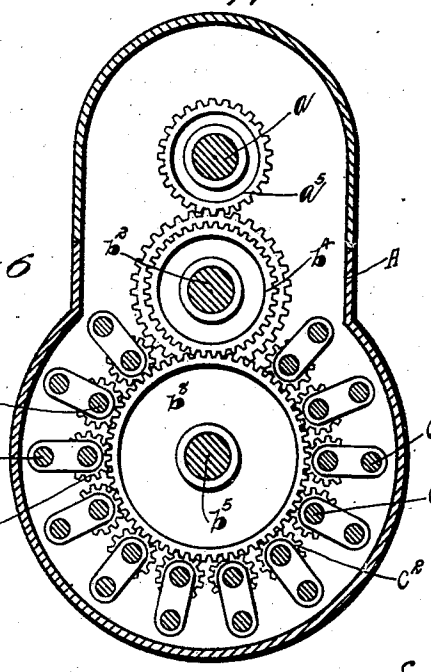


Fig. 5.

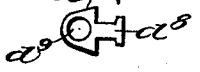


Fig. 6.

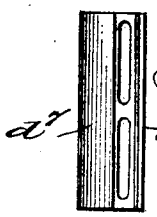


Fig. 7.

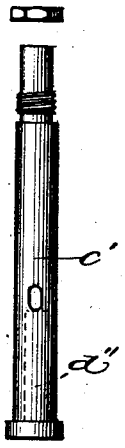


Fig. 8.

Fig. 4.

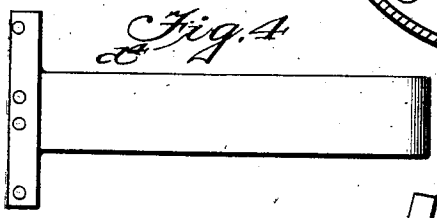
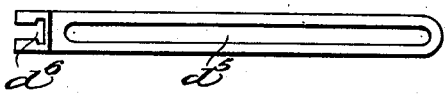


Fig. 3.



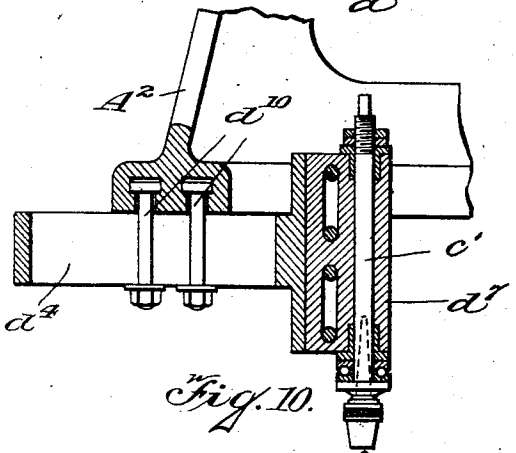


Fig. 10.

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MULTIPLE DRILL.

1,012,024. Specification of Letters Patent. Patented Dec. 19, 1911.

Application filed April 2, 1909. Serial No. 487,433.

To all whom it may concern:

Be it known that I, JAMES R. STEPHENSON, a citizen of the United States, residing at Dayton, in the county of Montgomery and State of Ohio, have invented certain new and useful Improvements in Multiple Drills, of which the following is a specification.

This invention relates to improvements in multiple drills and the particular object is to so construct the parts that each drill spindle may at any moment be connected with a separate and independent set of gears thereby making it possible to operate two or more drills at different speeds, and it is a further object to improve the supporting means for the different drill spindles.

In the drawings, Figure 1 is a side elevation of the machine, partly broken away, so as to show the change speed mechanism in vertical section. Fig. 2 is a detail view of the main driving shaft broken away at its lower end. Figs. 3, 4, 5 and 6 are detail views of the supporting bracket for the spindle. Figs. 7 and 8 are detail views of the spindle. Fig. 9 is a top view of gears showing casing in section on line x x Fig. 1. Fig 10 is a sectional view of the supporting brackets for the spindle.

Like parts are represented by similar characters of reference in the several views.

Referring to Fig. 1, the frame or vertical standard for supporting the mechanism is indicated by A. The pulley B is the ordinary driving pulley, operated from any suitable source of power, and the ordinary and usual change of speed devices may be located in the lower part of the machine, so as to vary the speed of the main driving shaft, a, which, in turn, is connected to the pulley shaft in any usual way. The main driving shaft, a, is supported in bearings a^1 and a^2 formed in the upper part of the standard A and the supplemental casing A^1. There are shown supported on the upper part of said driving shaft, a, three separate gears, a^3, a^4, and a^5, and each of these gears is connected to the main shaft, a, by a sliding key, as hereinafter more fully explained. The largest gear a^3 is located near the extreme upper end of the operating shaft, a, and same is shown in mesh with a small gear, b, which is formed integral with a larger gear, b^1, and these two gears being loosely journaled on the intermediate shaft b^2. The gear a^4 likewise meshes with a gear loosely journaled on the intermediate shaft b^2, but larger than the gear, b. So likewise the lowermost gear a^5 on the main driving shaft, a, is shown in mesh with its associated gear on the intermediate shaft b^2. which gear is of different size from the other connecting gear on said intermediate shaft and thereby there is effected a change of speed through the different driving gears, b^1, b^3 and b^4, on said intermediate shaft. As shown in Fig. 1, the intermediate shaft b^2 at its upper and lower end is supported and mounted in casing A^2 which is bolted to the standard A. As is apparent from Fig. 1, the casings A^1 and A^2 comprise a head supported on the standard A and the gears are mounted within said head. There is likewise rigidly mounted within said head an additional shaft b^5 and loosely mounted on said shaft are three separate gears of equal size, b^6, b^7 and b^8, which are shown in mesh with their associated gear, b^1, b^3 and b^4, on the intermediate shaft b^2. It is apparent that ball races or analogous devices may be employed between the various gears, though I have not shown same in the drawings.

The drill spindle is of the ordinary type formed of two parts, c and c^1, these being upper and lower parts respectively, and these parts are connected together by an intermediate section c^4. The upper part, c, is rotatingly mounted at its upper and lower ends within bearings formed in the casing of the head, and there is slidingly mounted on said spindle a small gear c^2, and the ordinary shifter c^3 is adapted to shift said gear c^2 from the lowermost gear b^8, to the next succeeding gear b^7 or to the gear b^6 the parts being so shown in Fig. 1 that the gear c^2 is in mesh with the gear b^8, and in this way the small gear c^2 can, at any moment, be shifted from one position to another, and thereby the spindle will be operated at a different speed. It is to be understood that each spindle is formed like the others, hence it is unnecessary to repeat explanations as to the construction of each spindle, excepting to state that there is a

sliding gear c^2 for each spindle, adapted to mesh with any one of the three gears b^6, b^7, b^8. In this manner, it is permissible to drive one spindle by means of the lowermost gear b^8 while the companion spindle may be driven by means of the gear b^7 or the gear b^6, so that it is unnecessary always to drive the different spindles at the same speed, but, on the contrary, one spindle may be working at a low speed while simultaneously its companion spindle may be working at a high speed. It is also desirable that parts be so arranged that any set of gear can readily be thrown out of commission, when not needed to operate an associated spindle. For instance, if it is desired to operate all of the spindles at the same speed, the other two sets of gear mechanism could well be dispensed with and to this end there are shown devices for throwing out of commission each set of gear.

Referring to Fig. 2, the lowermost gear, a^5, is connected to the driving shaft, a, by the key, d, and the shifter rod, d^1, is formed with a hook at its upper end so that said shifter rod, d^1, may be lifted to move its key, d, so that the gear, a^5, will no longer be connected with the driving shaft, a. Likewise the gear a^4 is associated with a sliding key, d^2, which is controlled by the shifter rod d^3, and the gear a^3 has a similar key and shifter. The bracket or support, d^4, (Figs. 3 and 4) is formed with the usual slot d^5 and thereby is adjustably supported on the casing, A^2, by the bolts d^{10}, (see Fig. 1) in the usual and ordinary way. Said bolts d^{10} fit within grooves formed in the casing A^2 and the heads of the bolts are supported by ledges formed in the casing as clearly shown in Fig. 1 and as is quite usual in this kind of machinery. The shanks of the bolt project below the casing and are readily fitted into the slots d^5 and nuts are then applied to the ends of the shanks so as to support the bracket d^4 immediately below the casing A^2. At the free end of the bracket d^4 there is shown a peculiarly formed recess, d^6, which extends throughout the end of said bracket, and there is adapted to be fitted within said recess a member, d^7, which is formed with a shank, d^8, adapted to be slidingly mounted within said recess, d^6, and thereby same may be adjusted within said recess and held in adjusted position by screws or any approved means. The lower section, c^1, of the drill spindle, is supported within the hole d^9 formed in the member d^7. The drill itself is adapted to be fitted within the socket, d^{11}, formed in the lower end of the lower section c^1.

The work table is shown located below the spindles. The various parts of my machine are shown to be so arranged as to present a more effective machine than heretofore known.

Having thus described my invention, I claim:

1. In a multiple drill, the combination of a frame, a head supported by said frame, a main driving shaft projecting within said head, a plurality of sets of gears located within said head and connected to said driving shaft, a plurality of spindles supported within said head, a gear for each of said spindles, and means for shifting said gear so as to connect it with any desired set of said first mentioned gears, substantially as specified.

2. In a multiple drill, the combination with a set of rotatable spindles, of a driving shaft, a set of driven gears common to the entire set of said spindles, means for connecting the driving shaft and driven gears to cause said gears to be all driven in the same direction, and means for connecting any of the set of gears with any spindle, substantially as specified.

3. In a multiple-spindle drill, the combination of a co-axial series of gears, means for driving said gears at different speeds, a series of spindles arranged around the axis of said series of gears, and intermediate shiftable geared connections between said several spindles and the coaxial series of gears, whereby each spindle may be connected to and disconnected from gears of the coaxial series, substantially as specified.

4. In a multiple drill, the combination of a plurality of spindles, with a set of driven gears common to the plurality of spindles, means for driving the different gears in said set at different speeds simultaneously, and means for connecting any one of the said gears with any spindle, substantially as specified.

5. In a multiple-spindle drill, the combination of a set of driven gears coaxially arranged, means for driving said gears at different speeds simultaneously, a set of rotatable spindles mounted substantially concentric with the axis of said gears, and means for connecting any one of the said driven gears with any spindle, substantially as specified.

6. In a multiple drill, the combination of a stationary frame, a head or cap supported by said frame, a set of rotatable spindles, rotatably mounted within said head, a set of driven gears common to all of said spindles, means for driving said gears at different speeds simultaneously, and means for connecting any one of said gears with any spindle, substantially as specified.

7. In a multiple drill, the combination of a stationary frame, driving mechanism, and a table supported by said frame, a head or cap supported near the upper part of said frame, shafts also supported within said head, and a plurality of sets of gears supported by said shafts, a plurality of drill

spindles projecting within said head, a movable gear on each spindle, and means for shifting said gear whereby each spindle may be connected with each set of shaft gears, substantially as specified.

8. In a multiple drill, the combination of a plurality of spindles with a driving shaft, and a set of driven gears common to said spindles, and driving connections between said gears and said shaft including a sliding key whereby any specific spindle may be connected to said driving shaft, substantially as specified.

9. In a multiple drill, the combination of a plurality of spindles, a set of driven gears common to said spindles and capable of being driven at different speeds simultaneously, and means for connecting a spindle with different gears whereby said spindle will be operated at different speeds, substantially as specified.

10. In a multiple drill, the combination of a driving shaft and a plurality of gears and means for connecting each gear to said shaft without the intervention of the other gears and arranged to produce simultaneously different speeds, a plurality of spindles and movable connecting means between said spindles and said gears whereby any spindle may be connected to any one of said gears for the purpose of operating said spindles simultaneously at different speeds, substantially as specified.

11. In a multiple drill, the combination of a plurality of spindles, a plurality of gears common to said spindles and capable of transmitting different speeds simultaneously in the same direction, and means for connecting each spindle with any one of said gears whereby said spindles may be operated at different speeds in the same direction, substantially as specified.

12. In a multiple drill, a main driving shaft, a plurality of spindles arranged about said shaft, a plurality of gears common to said spindles and operated by said shaft to transmit different speeds simultaneously in the same direction, and means for connecting each spindle with any one of said gears whereby said spindles may be operated at different speeds in the same direction, substantially as specified.

In testimony whereof, I have hereunto set my hand this 26 day of March, 1909.

JAMES R. STEPHENSON.

Witnesses:

EDWARD BUSCH,

PEARL N. SIGLER.