O. C. BORNHOLT.

MULTIPLE SPINDLE DRIVING MECHANISM.

APPLICATION FILED DEC. 16, 1918.

1,404,265. **Patented Jan. 24, 1922.**

2 SHEETS—SHEET 1.

Fig. 1.

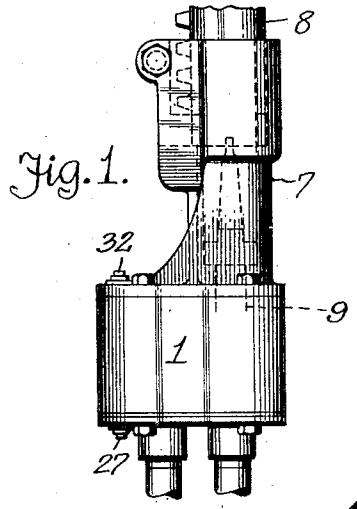


Fig. 2.

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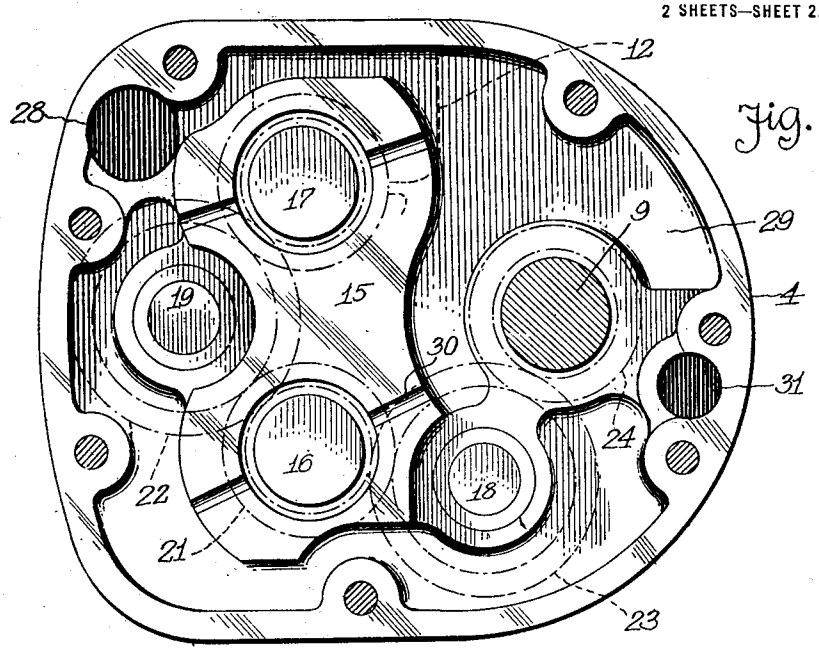


Fig. 3.

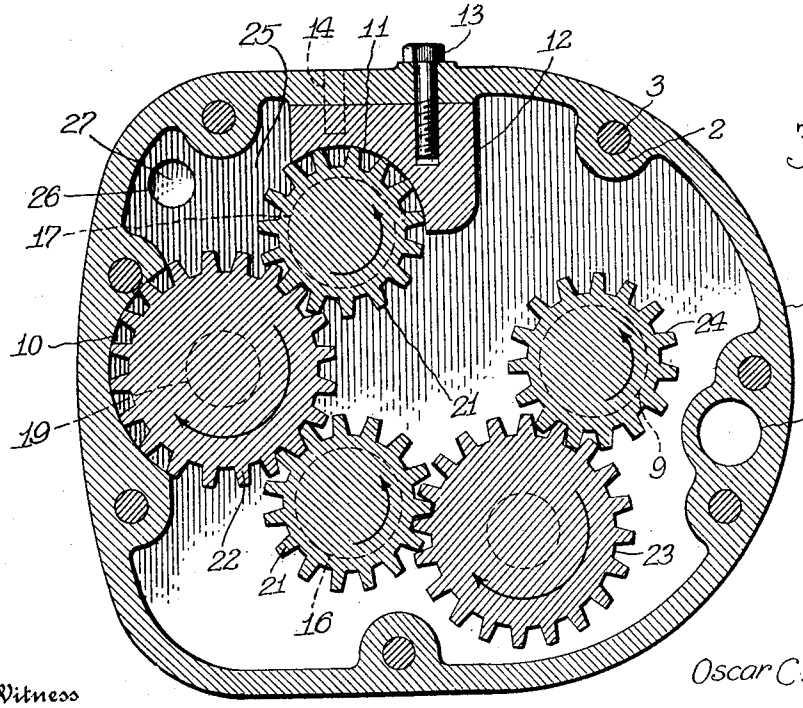


Fig. 4.

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MULTIPLE-SPINDLE DRIVING MECHANISM.

1,404,265. Specification of Letters Patent. Patented Jan. 24, 1922.

Application filed December 16, 1918. Serial No. 267,040.

To all whom it may concern:

Be it known that I, OSCAR C. BORNHOLT, a citizen of the United States of America, residing at Flint, in the county of Genesee and State of Michigan, have invented certain new and useful Improvements in Multiple-Spindle Driving Mechanism, of which the following is a specification, reference being had therein to the accompanying drawings.

My invention aims to provide power transmitting elements wherein some of the elements cooperate with a wall, partition or other structure in forming a lubricant chamber through which lubricant is forced by the action of the power transmitting elements.

My invention also aims to provide a multiple spindle drill head wherein the power transmitting elements are constructively arranged to insure a thorough lubrication of the bearings and other elements within the multiple spindle head, said head including a lubricant chamber and a bearing partition with said chamber and partition located relative to the power transmitting elements so that said elements may cause a circulation of the lubricant and thus serve functionally as a pump or lubricant distributing agent.

My invention further aims to provide a multiple spindle drilling mechanism consisting of comparatively few parts that are compactly arranged and require no attention whatsoever after proper installation. This mechanism will be hereinafter described and then claimed, and reference will now be had to the drawings, wherein

Figure 1 is a side elevation of a drill head in accordance with my invention;

Fig. 2 is a vertical sectional view on an enlarged scale;

Fig. 3 is a horizontal sectional view of the drill head taken on the line III—III of Fig. 2; and

Fig. 4 is a horizontal sectional view taken on line IV—IV of Fig. 2.

In the drawings, the reference numeral 1 denotes a drill head casing that has the inner wall thereof provided with a plurality of apertured bosses 2 and extending through these bosses are tie rods or screw bolts 3 adapted for holding the casing 1 between closure plates 4 and 5, the latter having an interposed wear or bearing plate 6. The closure plate 4 is carried by the lower end of an attaching sleeve 7 by which the drill head is connected to the usual form of spindle sleeve 8 forming part of a drill press or other machine, said spindle sleeve containing a mandrel adapted for imparting rotary movement to a drive shaft 9 journaled in the closure plates 4 and 5. The drive shaft 9, within the attaching sleeve 7, is interlocked for rotative continuity with the mandrel, and the lower end of said drive shaft has provision for receiving the tang of the drill spindle or similar tool.

The casing 1 has its inner wall provided with a vertical concave recess 10 and a similar recess 11 is provided by a vertical partition or block 12 set in the casing 1, against the inner wall thereof and held by dowel pins or studs 14 and screw bolts 13. The recesses 10 and 11 are in proximity to each other and said recesses serve somewhat as cylinders, as will hereinafter appear.

In the upper part of the casing 1 and in spaced relation to the upper closure plate 4 is a horizontal irregularly shaped partition 15 which is supported from the side walls of the casing and extends over the upper end of the vertical partition or block 12. The partition 15 serves as a guide bearing for the drive shaft 9 and cooperates with the wear plate 6 and the lower closure plate 5 in providing bearings for driven shafts 16 and 17 and idler shafts 18 and 19. The bearings within the horizontal partition 15 for the driven shafts 16 and 17 may be in the form of ball bearings, as indicated at 20, and these driven shafts have teeth 21 meshing with the teeth 22 of the idler shaft 19. The teeth 21 of the driven shaft 16 also mesh with teeth 23 of the idler shaft 18, which in turn meshes with the teeth 24 of the drive shaft 9.

In this manner power is transmitted from the drive shaft 9 through the idler shafts to the driven shafts, and provision has been made in connection with the lower ends of the driven shafts for holding drill chucks or other tools, as clearly shown in Figs. 1 and 2.

By reference to Fig. 4, it will be noted that the idler shaft 19 and the driven shaft 17 have toothed peripheries that revolve in the recesses 10 and 11 and these two shafts cooperate in closing off a portion of the casing 1, from the remaining portion thereof, so

that the closed-in portion will serve as a lubricant well or chamber 25. The bottom of the chamber 25 has a drain port 26 in the plates 5 and 6, said drain port being normally closed by a plug 27. The top of the lubricant chamber 25 is closed by the partition 15 and said partition has an opening 28 communicating with the chamber 25, so that lubricant may pass out of the top of the chamber on to the upper face of the partition 15. This upper face of the partition has irregularly shaped lubricant basins 29 and grooves 30, said grooves extending from the basins 29 to the bearings of the driven shafts 16 and 17 in the partition 15 for conducting lubricant to said bearings. Since the upper ends of the idler shafts 18 and 19 are also journaled in the partition 15, it is obvious that these ends of the shafts will also be lubricated.

The partition 15, adjacent the drive shaft 9 and at a point remote from the lubricant chamber 25, has a depending ported portion or conduit 31. It is through this port or conduit that lubricant flows from the upper face of the partition 15 into the bottom portion of the casing 1, and assuming that a suitable lubricant has been placed in the chamber or well 25, through a normally closed filling opening 32 in the upper plate 4, the circulation of the lubricant is as follows.

When the drill head is placed in operation, the lubricant within the lower portion of the casing 1 is carried into the chamber 25 by the teeth of the shafts 17 and 19, said shafts serving somewhat as rotary pistons or abutments in conducting or forcing lubricant from the greater part of the casing 1 to the chamber 25. The lubricant will be carried between the teeth of the shafts 17 and 19 and the walls of the recesses 10 and 11, said shafts continually supplying the chamber 25 with a lubricant. As the chamber 25 fills and overflows through the opening 28 on to the partition 15, all of the bearings in the partition are thoroughly oiled before the lubricant eventually flows downwardly through the port or conduit 31 into the lower portion of the casing 1, from there it is again carried into the chamber 25 and this circulation continues as long as the drill head is in operation.

The toothed drive, driven and idler shafts within the casing 1 serve functionally as a train of gear wheels, and the direction of rotation necessary on the part of said gear wheels to conduct the lubricant into the chamber 25 may necessitate operating the spindle carrying shafts in one direction, but such a direction of rotation can be changed by installing additional idle gear wheels. With this thought in mind, it is obvious that the drill head may be designed for more than three spindles or drilling tools, and it is only a question of arranging some of the gear wheels between the bottom of the casing and the partition therein so as to afford a lubricant chamber or reservoir into which a lubricant may be forced by the rotary action of certain gear wheels within the drill head.

Again, it is apparent that the arrangement of gear wheels, particularly the idlers, is such as to prevent crowding or jamming of the gear wheels, since the direction of rotation is such as to produce outward movement by the idlers should a driven shaft be momentarily retarded. This, together with the thorough lubrication, constitutes an important part of my invention.

It is thought that the operation and utility of the lubricant circulating means will be apparent without further description, and while in the drawings there is illustrated a preferred embodiment of my invention, it is to be understood that the structural elements are susceptible to such variations and modifications as fall within the scope of the appended claims.

What I claim is:—

1. The combination of a casing, a vertically disposed lubricant chamber in said casing having its lower end opening into said casing, a partition in a plane with the top of said casing and provided with basins to receive lubricant from the upper end of said chamber, and power transmitting elements journaled in said partition adapted to maintain lubricant in said chamber and cause the lubricant to flow upwardly into said chamber in a direction parallel to the axes of said power transmission elements.

2. A multi-spindle drill head comprising a casing having recesses therein, power transmitting elements in the recesses of said head and cooperating with the wall thereof in providing a lubricant chamber, and a partition in the upper part of said head affording bearings for said power transmitting elements and adapted to receive lubricant from said chamber and distribute the lubricant to the bearings of said power transmitting elements.

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

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Witnesses:
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T. C. STIRLING.