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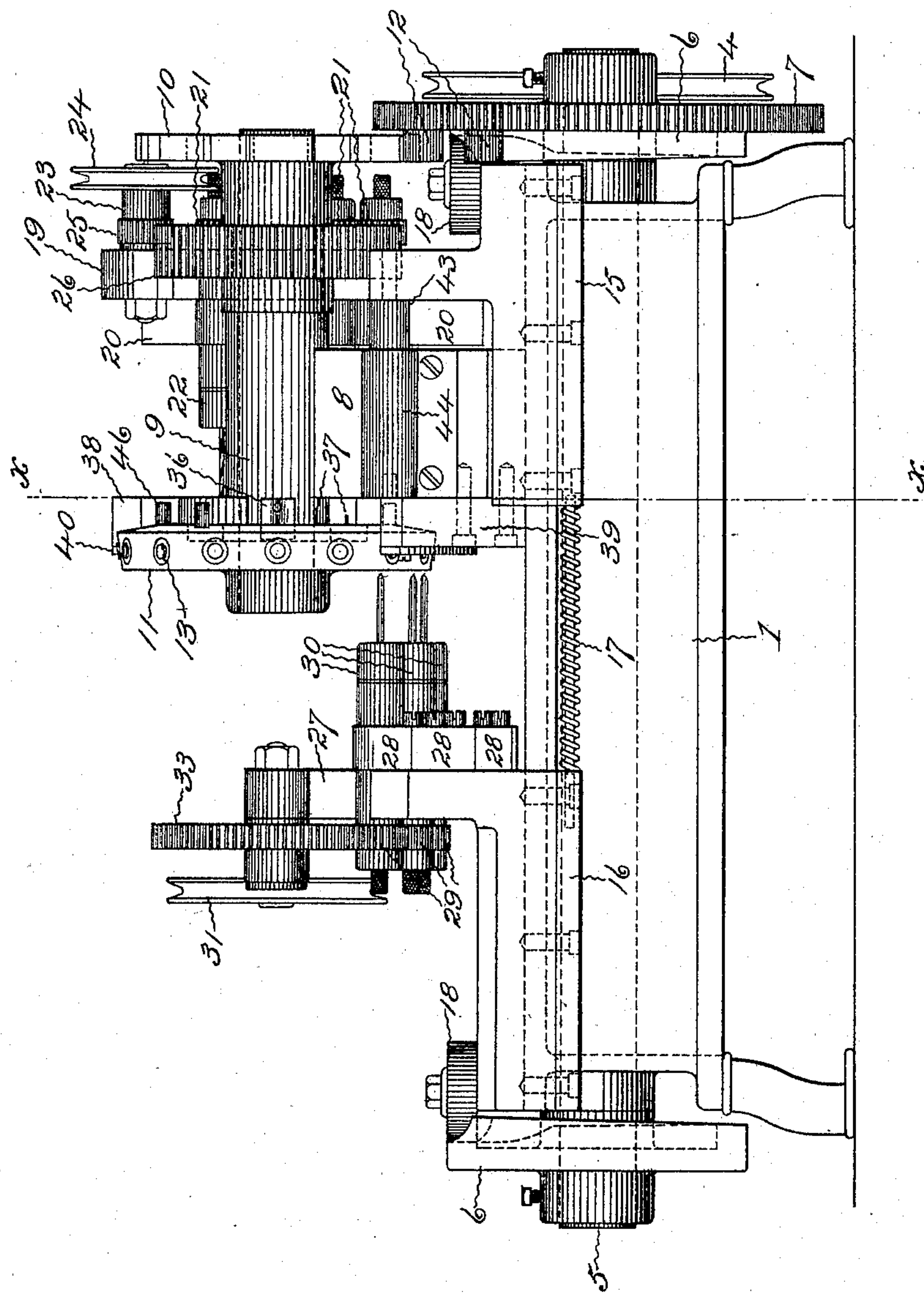
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A. I. JACOBS.  
STUD BORING MACHINE.

No. 585,763.

Patented July 6, 1897.

Fig. 1



Witnesses:

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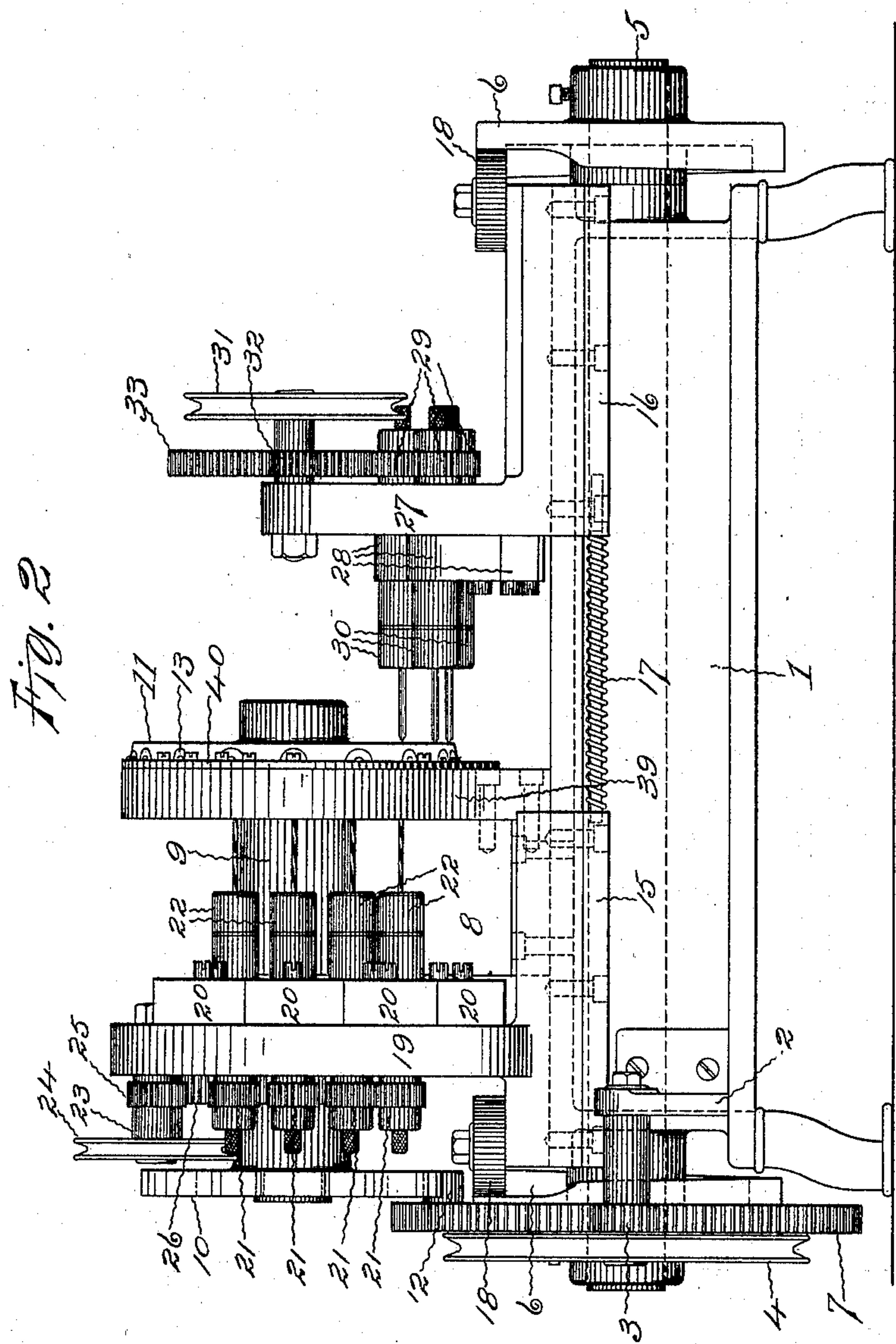
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(No Model.)

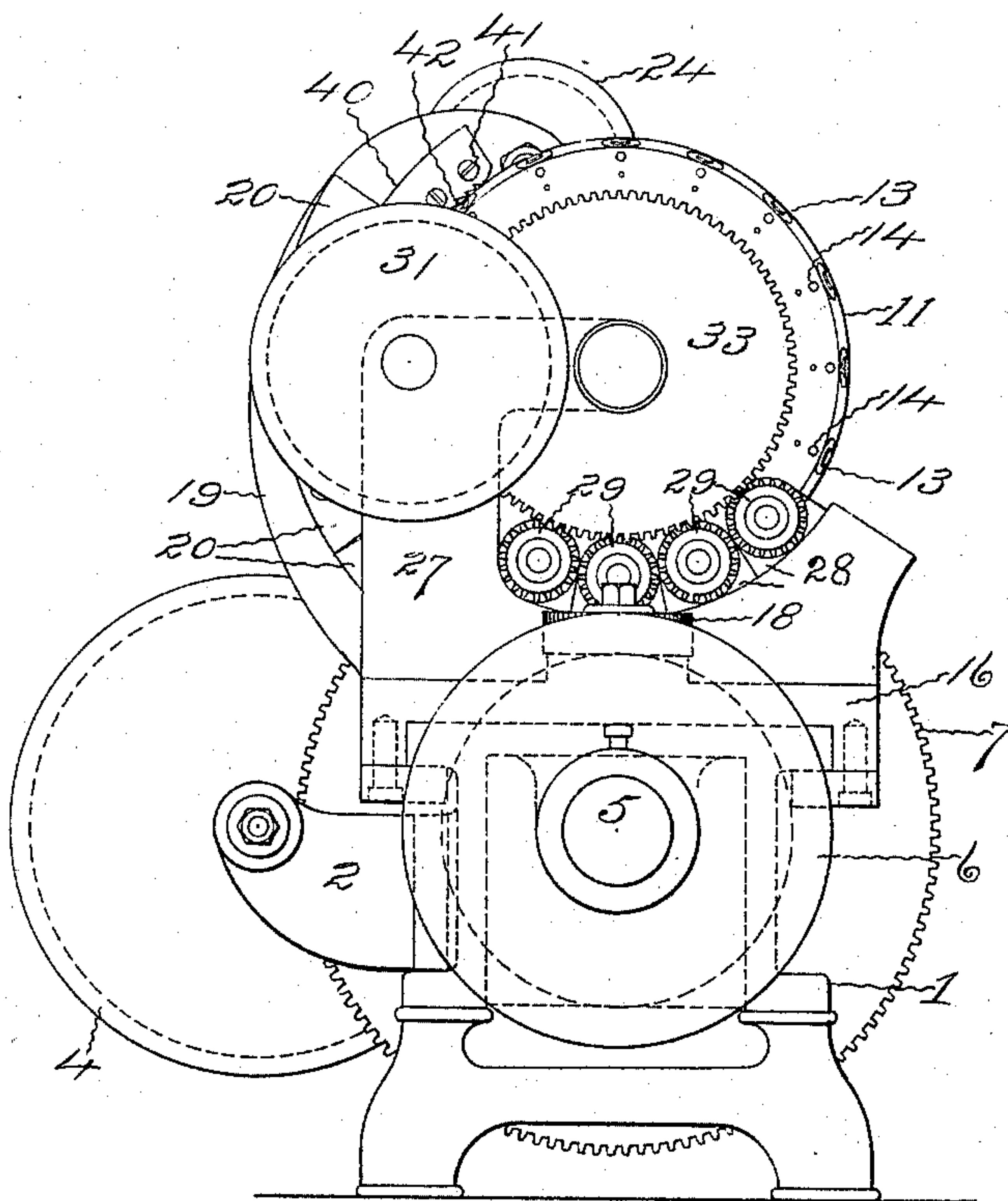
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Fig. 3



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(No Model.)

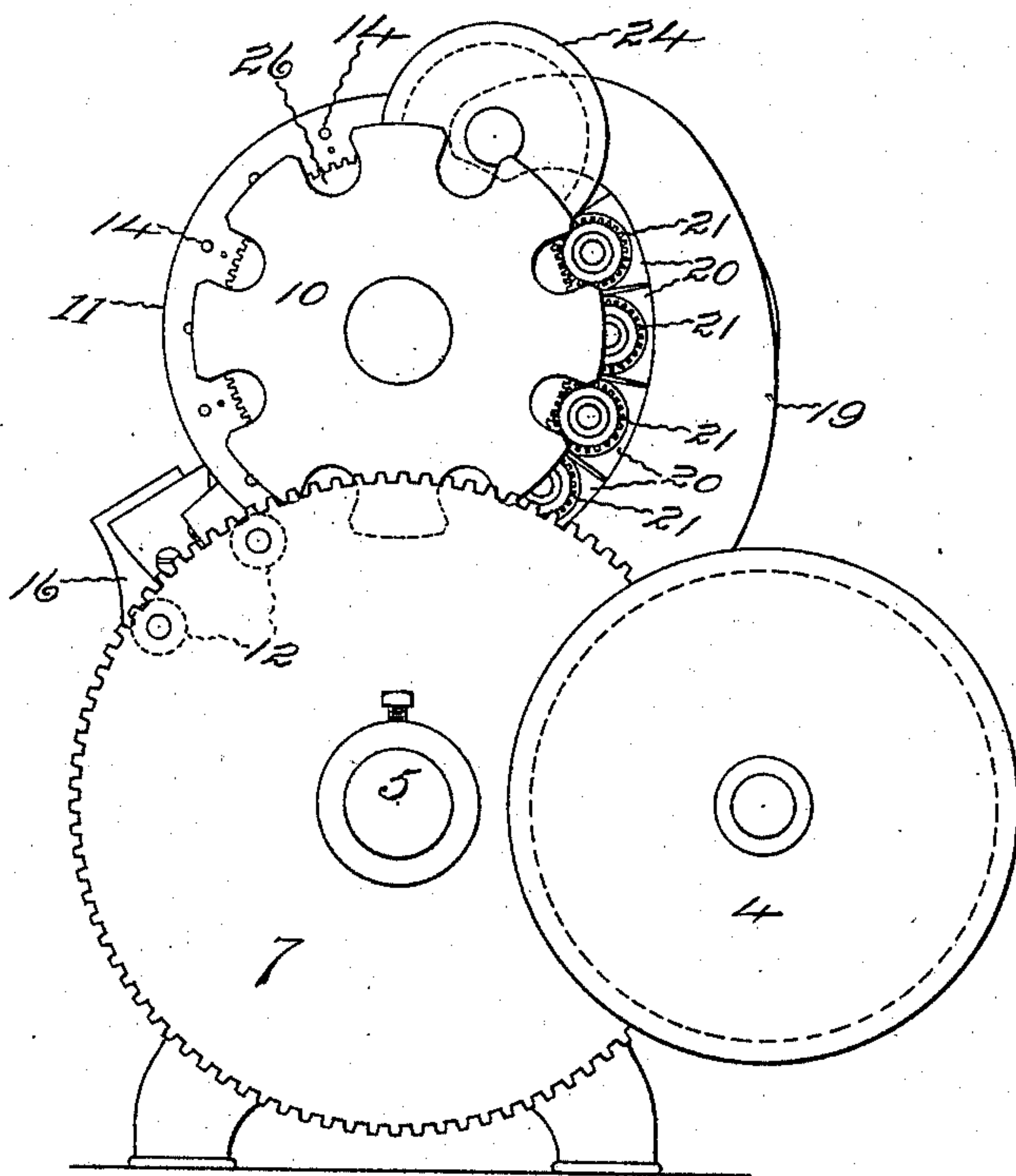
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A. I. JACOBS.  
STUD BORING MACHINE.

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Fig. 4



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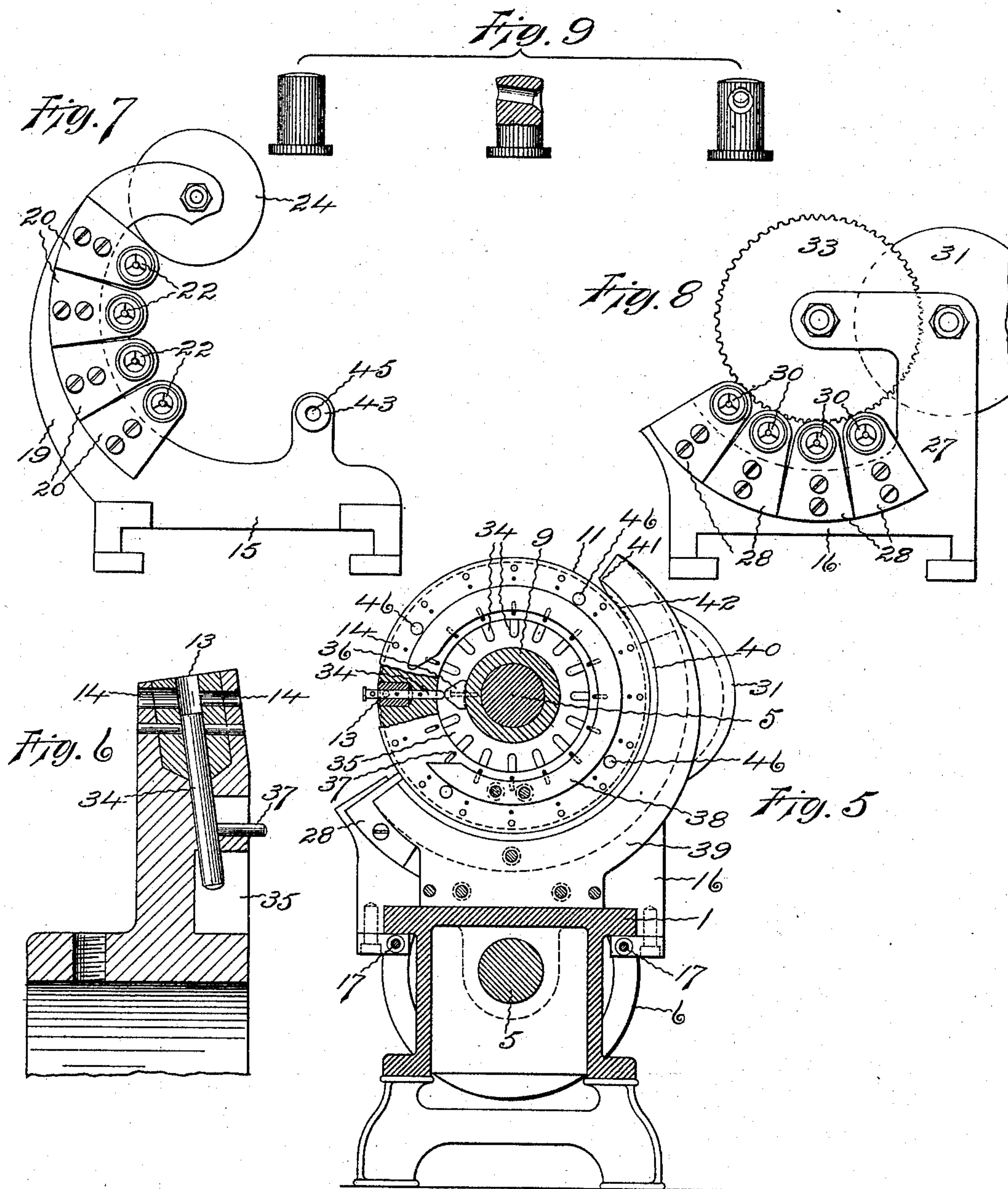
(No Model.)

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Witnesses:

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# UNITED STATES PATENT OFFICE.

ARTHUR I. JACOBS, OF HARTFORD, CONNECTICUT, ASSIGNOR TO THE POPE MANUFACTURING COMPANY, OF SAME PLACE AND PORTLAND, MAINE.

## STUD-BORING MACHINE.

SPECIFICATION forming part of Letters Patent No. 585,763, dated July 6, 1897.

Application filed November 18, 1896. Serial No. 612,623. (No model.)

*To all whom it may concern:*

Be it known that I, ARTHUR I. JACOBS, a citizen of the United States, residing at Hartford, in the county of Hartford and State of Connecticut, have invented certain new and useful Improvements in Stud-Boring Machines, of which the following is a specification.

The invention relates to those machines which are designed and constructed for boring small studs.

The object of the invention is to produce a comparatively inexpensive machine which will rapidly and accurately bore a number of small studs simultaneously in a manner that particularly adapts them for use in connection with the manufacture of hubs for bicycles and similar wire-spoke wheels.

The machine shown as embodying the invention has a bed which supports a carrier having sockets for receiving the studs to be bored, mechanisms for imparting to this carrier an intermittent rotary movement, so as to present the studs in line with the boring-tools, carriages bearing boring-tools movable upon the bed toward and from opposite sides of the carrier, mechanisms for reciprocating the carriages after each movement of the carrier, so as to bring the tools into engagement with the studs from opposite sides and after the tools have performed their functions withdrawing them, so that the carrier may be again advanced to present other studs in line with the tools, and devices for ejecting the bored studs from the carrier. In this machine the studs are located so that the perforations are made somewhat obliquely to the axes of the studs and the mechanisms are arranged so that four studs are drilled simultaneously from one side and then advanced so as to be simultaneously counterbored from the opposite side, but the movements are timed to permit the counterboring of one set to take place at the same time as the drilling of the following set.

Referring to the accompanying drawings, which illustrate a machine embodying the invention, Figure 1 is a front elevation. Fig. 2 is a rear elevation. Fig. 3 is an elevation as seen from the left of Fig. 1. Fig. 4 is an elevation as seen from the right of Fig. 1.

Fig. 5 is a vertical section taken on plane denoted by the broken line X X of Fig. 1, looking toward the left. Fig. 6 is an enlarged sectional view of a portion of the carrier. Fig. 7 is a detail elevation of one of the drill-carrying carriages. Fig. 8 is a detail elevation of the other of the carriages, and Fig. 9 shows detail views of the stud before and after being bored.

The bed 1 of the machine may be supported on any common form of legs. Secured to the back of the bed near one end is a bracket 2, that supports a bearing in which is held a shaft with a pinion 3 and a driving-pulley 4. Supported by bearings so as to extend longitudinally of the bed is a shaft 5, which near each end bears a cam 6. This shaft also bears a gear 7, that meshes with the pinion 3, so that when the pulley 4, which may be belted to any convenient source of power, is driven the cams 6 will be rotated, Figs. 1, 2, 3, and 4.

Supported by a block 8, secured to the top of the bed, is a bearing-sleeve 9. This sleeve holds a journal that upon one end bears a star-wheel 10 and upon the other end the stud-carrier 11. The teeth of the star-wheel are adapted to be engaged by rolls 12, attached to one face of the gear 7 in such manner that at each rotation of the gear the star-wheel is advanced two notches. There are preferably eight notches in the star-wheel. Therefore the carrier is advanced one-quarter of a rotation at each rotation of the gear—that is, the carrier has four intermittent movements while making one revolution, Figs. 1, 2, and 4.

The carrier 11 is made in the shape of a disk and has radial sockets 13. There are preferably sixteen of these sockets, and as it is desirable to have the perforations drilled obliquely to the axes of the studs the sockets are formed obliquely to the axis of the carrier, and the periphery of the carrier is beveled off, so that the edges of the studs will lie flat. Openings 14 are made transversely through the walls of the disk into the sockets for the passage from one direction of the drills that perforate and from the other direction of the drills that counterbore, Figs. 1, 5, and 6.

The carriages 15 and 16 are forced apart by springs 17 and are moved toward each other



at the proper time by the contact of the cams 6 with rolls 18, mounted on the carriages, Figs. 1 and 2.

The carriage 15 preferably bears four perforating-drills, and these are arranged on an arc the center of which coincides with the axis of the carrier. These drills are in line with four of the transverse openings 14, so that when this carriage is moved toward the carrier the drills will pass into the openings and simultaneously drill perforations in four of the studs. Rising from the carriage 15 is an arm 19, and attached to this are blocks 20, having bearing-sleeves in which are held spindles that bear pinions 21 and the chucks 22, that hold the perforating-drills. Held by a sleeve 23, attached to the upper end of the arm 19, is a spindle bearing a pulley 24 and a pinion 25. This pinion meshes with a gear 26, loosely mounted on the bearing-sleeve 9 and meshing with all of the pinions 21. When the pulley 24 is driven, as it can be from any suitable source of power by means of the gear and pinions, all of the perforating-drills are rotated. The gear 26 is made with a wide face, so that the pinions that move with the carriage 15 will always remain in mesh, Figs. 1, 2, 4, and 7.

There are preferably four counterboring-drills borne by the carriage 16, and these are arranged on the same arc as the perforating-drills, but in line with four of the transverse openings 14 next in advance of the four the perforating-drills are opposite, so that when this carriage is moved toward the carrier these drills will advance into openings and simultaneously counterbore the perforations in the four studs that have just previously been operated upon by the perforating-drills on the opposite side of the carrier. Projecting from the carriage 16 is an arm 27, and adjustably attached to this are blocks 28, having bearing-sleeves in which are held spindles that have pinions 29 and chucks 30 for holding the counterboring-drills. Held by a bearing near the top of this arm is a spindle with a driving-pulley 31 and a pinion 32, which meshes with a gear 33, that is in mesh with the pinions 29, so that when the pulley 31 is driven, through the gear and pinions, the counterboring-drills will be rotated together, Figs. 1, 2, 3, and 8.

With this machine four blank studs are placed in four sockets in the carrier. The first movement of the carrier under the impulse of the gear and star-wheel mechanism described presents these studs in line with the perforating-drills. The carriage which bears these drills is then advanced by the cam and the studs perforated. After the carriage with the perforating-drills has returned the carrier is again moved, and this presents the studs that have been perforated in line with the counterboring-drills. Then the carriage bearing the counterboring-drills is advanced and the perforations in the studs counterbored. The next movement of the

carrier causes the drilled and counterbored studs to be ejected, and the next movement presents the emptied sockets in position to be refilled. Of course while one set of studs are being perforated another set are being inserted in the vacant sockets, and when the machine is in full operation the feeding of one set, perforating of another set, counterboring of another set, and ejecting of still another set all take place in such manner that at each movement of the carrier four studs are completed and at each rotation of the carrier sixteen studs are completed and ejected.

In order to eject the bored studs, rods 34 are loosely located in the radial sockets in the carrier. The inner ends of these rods extend into a recess 35 in the carrier, and are secured to the bearing-sleeve 9, so as to project into this recess in the path of the ends of the rods, is a wedge-block 36. When the end of a rod in the moving carrier reaches the proper position, it engages this wedge and is thrust outwardly in such manner as to force the stud in front of it from the socket. To withdraw the rod thus thrust out, so that the socket will be free for the insertion of another blank stud, the rod may be provided with a pin 37. This pin projects in such manner that it engages with the inner edge of the curved plate 38 as the carrier advances. The plate 38 is secured to the stationary block 8 on the bed and its end is shaped to surely force back the pins and rods, so the sockets will be free, Figs. 1, 5, and 6.

To keep the studs in their sockets while they are being perforated and counterbored, an arm 39 is secured to the bed, and attached to this is a curved plate 40. The edge of this plate encircles the periphery of the carrier in such position as to engage the surfaces of the heads of the studs from before the time they pass to the perforating-drills until after they pass from the counterboring-drills. The end 41 of this plate is beveled, so that the heads of the studs will be surely forced into the sockets, and the edge of the plate near this end is preferably provided with a few teeth 42. These teeth abrade each head sufficiently to form a slight groove, which will follow the edge of the plate and keep the stud from rotating in the socket, so the drilling and counterboring will be performed accurately, Figs. 2, 3, and 5.

Connected with the carriage 15 is a rod 43, which is guided in its movement with the carriage by a bearing 44, attached to the block 8. The end of this rod is provided with a recess 45, and when the carriage moves forward the recess in the rod receives the end of one of the pins 46, that project from the face of the carrier, so as to lock the carrier in the proper position for the drills to accurately operate. When the carriage returns, of course the rod is withdrawn from the registering-pin, leaving the carrier free to be moved, Figs. 1, 5, and 7.



With this machine a large number of studs can be rapidly and accurately perforated and counterbored, for all of the operations are performed simultaneously upon a number of studs, which, when bored, are quickly ejected from the machine. The perforations are made obliquely to the axes of the studs and the counterboring is accomplished on exactly the same angle as the perforation. All of the drills for perforating and counterboring advance with their axes parallel, so that the perforating is uniform and true. As the carriages move up upon opposite sides of the carrier the perforations are made from one side and the counterbores from the other side, so that the counterboring-drills will remove any bur left by the perforating-drills.

I claim as my invention—

1. In a stud-boring machine, in combination, a disk rotarily supported upon the bed and provided with sockets formed from the periphery radially inward for holding the studs, mechanisms for imparting to the disk an intermittent rotary movement, carriages movable upon the bed toward and from each side of the disk, mechanisms for reciprocating the carriages, operating-tools mounted upon the carriages in the arc of a circle, the tools on one carriage being in a different section of the arc from that occupied by the tools on the other carriage and having a movement at an angle with the axes of the stud-holding sockets in the disk, and mechanisms for rotating the tools, substantially as specified.

2. In a stud-boring machine, in combination, a disk rotarily supported upon the bed and provided with sockets formed from the periphery radially inward obliquely to the axis of the disk-shaft, mechanisms for imparting to the disk an intermittent rotary movement, carriages movable upon the bed toward and from each side of the disk, mechanisms for reciprocating the carriages, operating-tools mounted upon the carriages in the arc of a circle the center of which is in line with the axis of the disk, and means for rotating the tools, substantially as specified.

3. In a stud-boring machine, in combination, a carrier rotarily supported upon the bed and having a beveled periphery with holding-sockets formed from the periphery radially inward obliquely to the axis of the carrier-shaft and at right angles to the beveled periphery, mechanisms for imparting to the carrier an intermittent rotary movement, carriages movable upon the bed toward and from each side of the carrier, mechanisms for reciprocating the carriages, operating-tools mounted upon the carriages in the arc of a circle the center of which is in line with the axis of the carrier, and mechanisms for rotating the tools, substantially as specified.

4. In a stud-boring machine, in combination, a carrier with radial holding-sockets, rotarily supported upon the bed, ejecting-rods movable in the holding-sockets and adapted to be moved outwardly by a stationary part

at one period of their travel with the carrier, mechanisms for imparting to the carrier an intermittent rotary movement, carriages movable upon the bed toward and from each side of the carrier, mechanisms for reciprocating the carriages, operating-tools mounted upon the carriages in the arc of a circle the center of which is in line with the axis of the carrier, and mechanism for rotating the tools, substantially as specified.

5. In a stud-boring machine, in combination, a carrier with radial holding-sockets, rotarily supported upon the bed, ejecting-rods movable in the holding-sockets and adapted to engage with and be moved outwardly by a stationary part at one period of their travel with the carrier, said rods bearing pins that are adapted to engage with and be held from outward movement by a stationary part during most of their travel with the carrier, mechanisms for imparting to the carrier an intermittent rotary movement, carriages movable upon the bed toward and from each side of the carrier, mechanism for reciprocating the carriages, operating-tools mounted upon the carriages in the arc of a circle the center of which is in line with the axis of the carrier, and mechanisms for rotating the tools, substantially as specified.

6. In a stud-boring machine, in combination, a carrier with radial holding-sockets, rotarily supported upon the bed, mechanisms for imparting to the carrier an intermittent rotary movement, carriages movable upon the bed toward and from each side of the carrier, mechanisms for reciprocating the carriages, operating-tools mounted upon the carriages in the arc of a circle the center of which is in line with the axis of the carrier, mechanisms for rotating the tools, and a holding-plate attached to the bed and arranged to partially encircle the periphery of the carrier adjacent to the sockets to prevent the removal of the studs while they are being operated upon, substantially as specified.

7. In a stud-boring machine, in combination, a carrier with radial holding-sockets, rotarily supported on the bed, mechanisms for imparting to the carrier an intermittent rotary movement, carriages movable upon the bed toward and from each side of the carrier, mechanisms for reciprocating the carriages, operating-tools mounted upon the carriages in the arc of a circle the center of which is in line with the axis of the carrier, mechanisms for rotating the tools, and a holding-plate attached to the bed and arranged to partially encircle the periphery of the carrier adjacent to the sockets, said holding-plate having teeth which are adapted to engage and groove the heads of the studs whereby they are held from rotating while the tools are operating, substantially as specified.

8. In a stud-boring machine, in combination, a disk rotarily supported upon the bed and provided with sockets formed from the periphery radially inward, mechanisms for



imparting to the disk an intermittent rotary movement, a carriage movable upon the bed toward and from one side of the disk, a shaft supported by the bed and bearing a cam near one end, said cam engaging a part borne by the carriage for reciprocating the carriage, drills mounted upon the carriage in the arc of a circle at an angle with the axes of the stud-sockets in the disk, the spindles of said drills bearing pinions, and a gear meshing with all the pinions whereby the drills are rotated simultaneously as the carriage reciprocates, substantially as specified.

9. In a stud-boring machine, in combination, a disk rotarily supported upon the bed and provided with sockets formed from the periphery radially inward, mechanisms for imparting to the disk an intermittent rotary movement, a carriage movable upon the bed toward and from one side of the disk, a shaft supported by the bed and bearing a cam near one end, said cam engaging a part borne by the carriage for reciprocating the carriage, drills mounted upon the carriage in the arc of a circle at an angle with the axes of the stud-sockets in the disk, the spindles of said drills bearing pinions, a gear borne by the carriage and meshing with said pinions, and mechanisms for rotating the gear borne by

the carriage whereby all of the drills are rotated simultaneously as the carriage reciprocates, substantially as specified.

10. In a stud-boring machine, in combination, a carrier having a beveled periphery and holding-sockets formed from the periphery inward obliquely to the axis of the carrier, rotarily supported upon the bed, ejecting-rods movable in the holding-sockets and adapted to be moved outwardly by a stationary part at one period of their travel with the carrier, mechanisms for imparting to the carrier an intermittent rotary movement, carriages movable upon the bed toward and from each side of the carrier, mechanisms for reciprocating the carriages, operating-tools mounted upon the carriages in the arc of a circle, the tools on one carriage being in a different arc from the arc occupied by the tools on the other carriage, pinions mounted upon the spindles of the operating-tools, gears mounted adjacent to the pinions and meshing therewith, and pinions connected with the driving-pulleys meshing with the gears, substantially as specified.

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