(No Model.) 2 Sheets—Sheet 1.

J. I. WARMAN & C. WINTER.

MULTIPLE DRILL.

No. 584,025. Patented June 8, 1897.

Fig. 1.

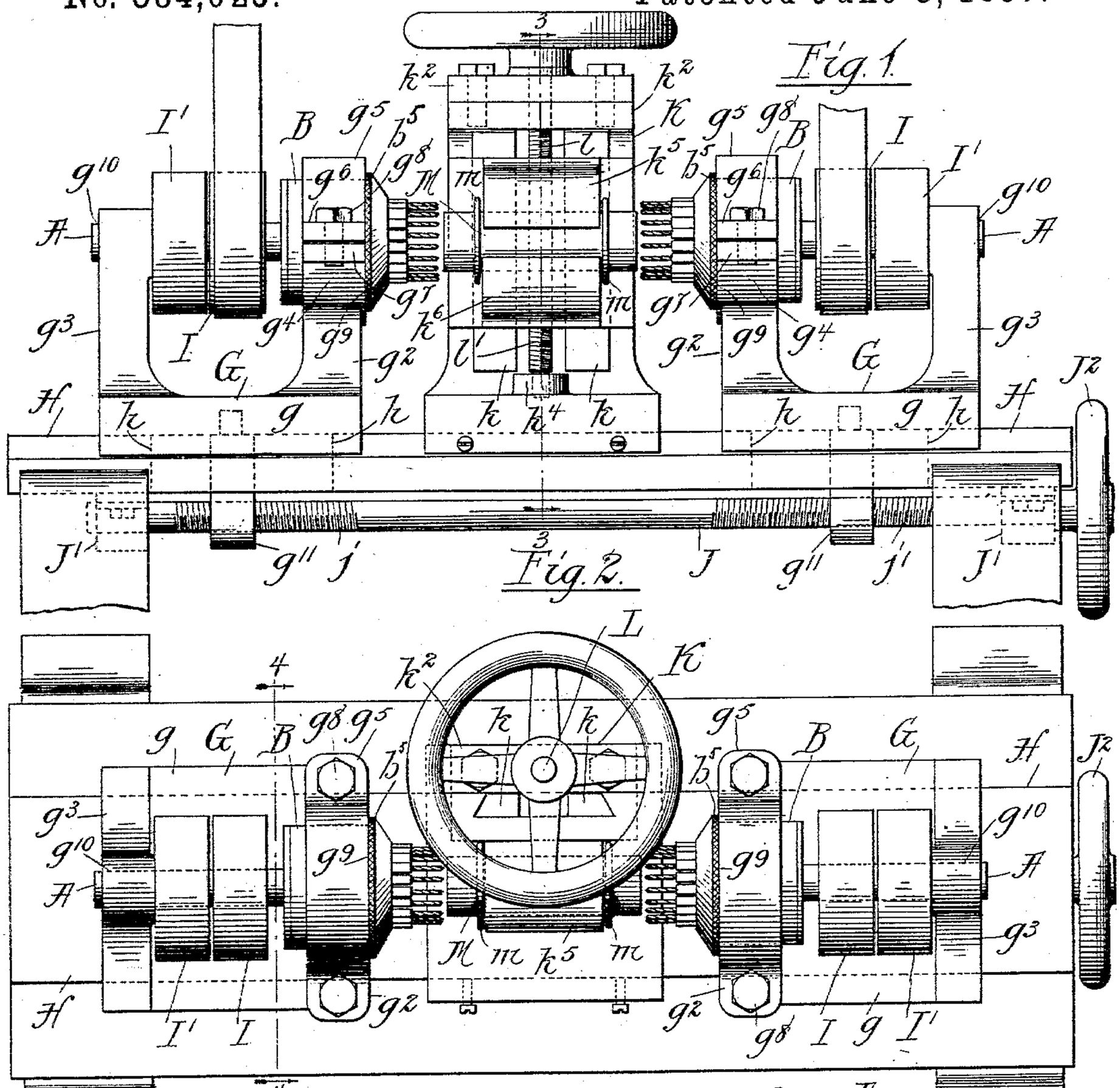


Fig. 2.

Fig. 10.

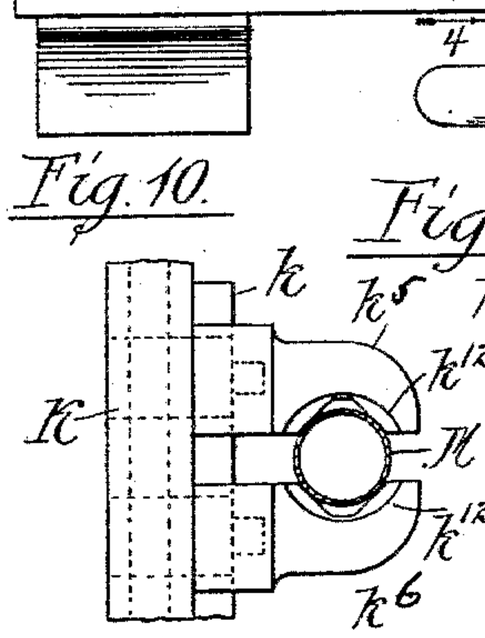


Fig. 3.

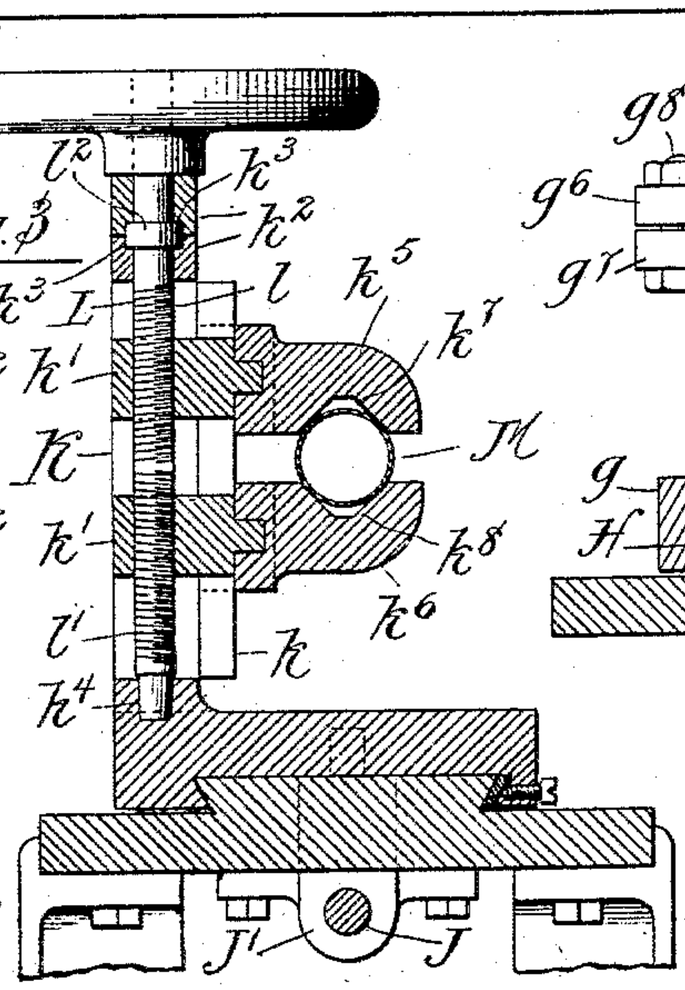
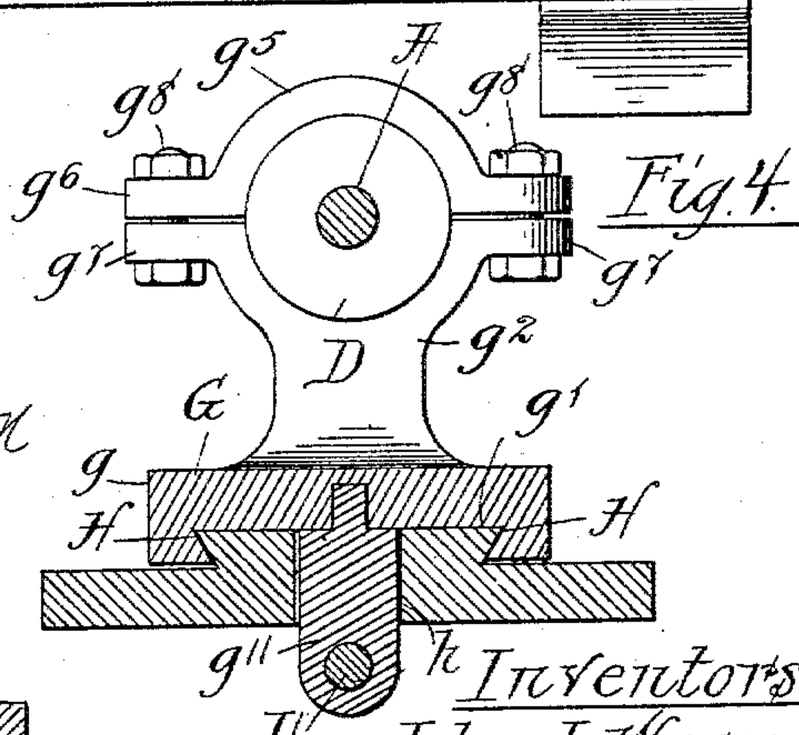


Fig. 4.



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by Dyer, Tibbles & Brown
their Att'ys

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

(No Model.) 2 Sheets—Sheet 2.

J. I. WARMAN & C. WINTER.

MULTIPLE DRILL.

No. 584,025. Patented June 8, 1897.

Fig. 5.

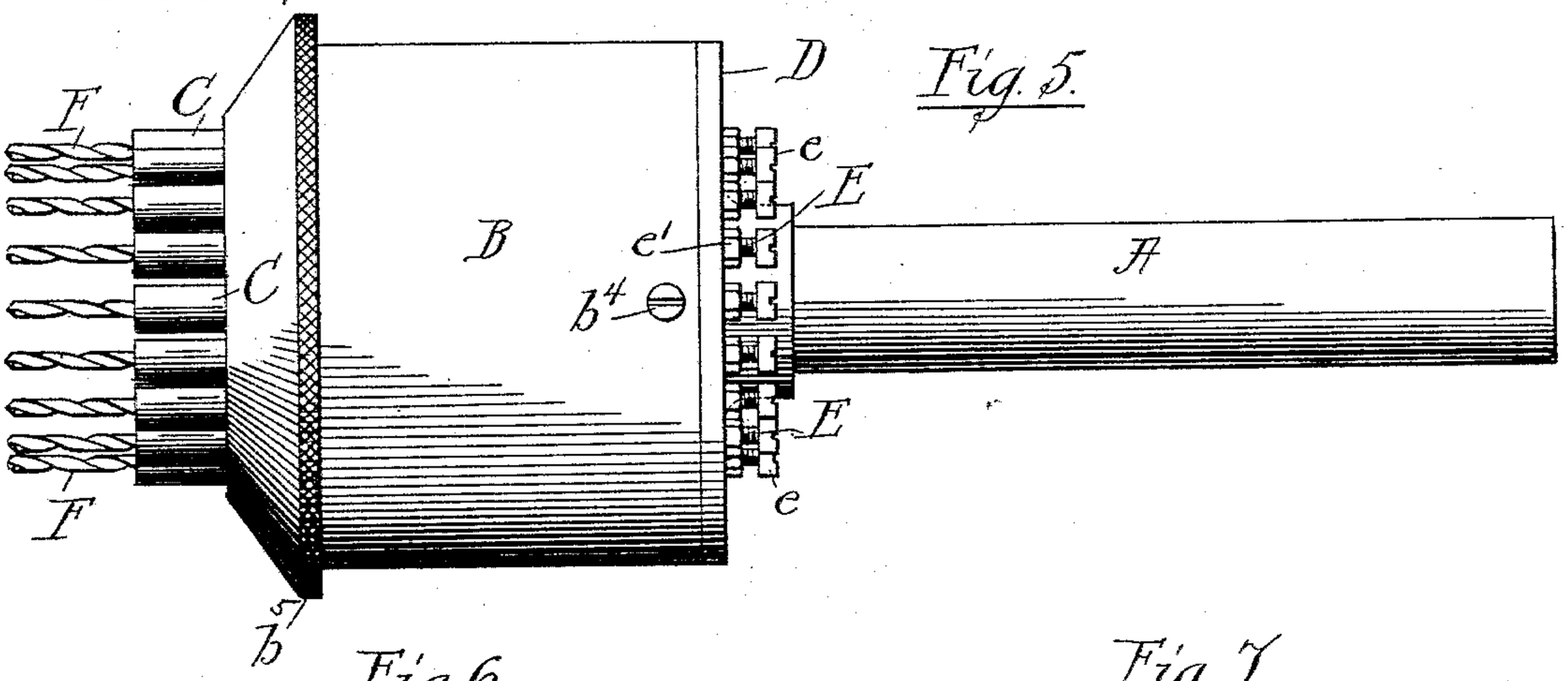


Fig. 6.

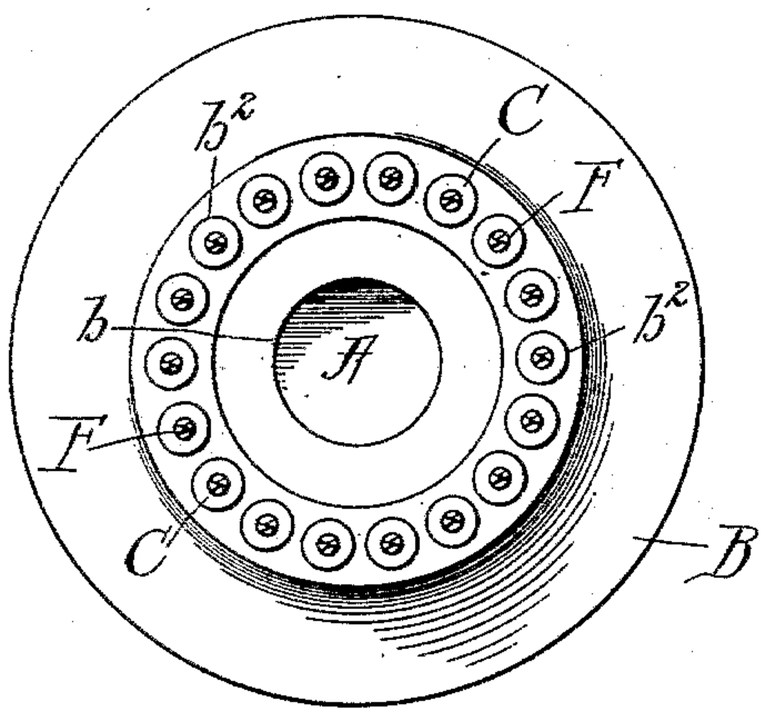


Fig. 7.

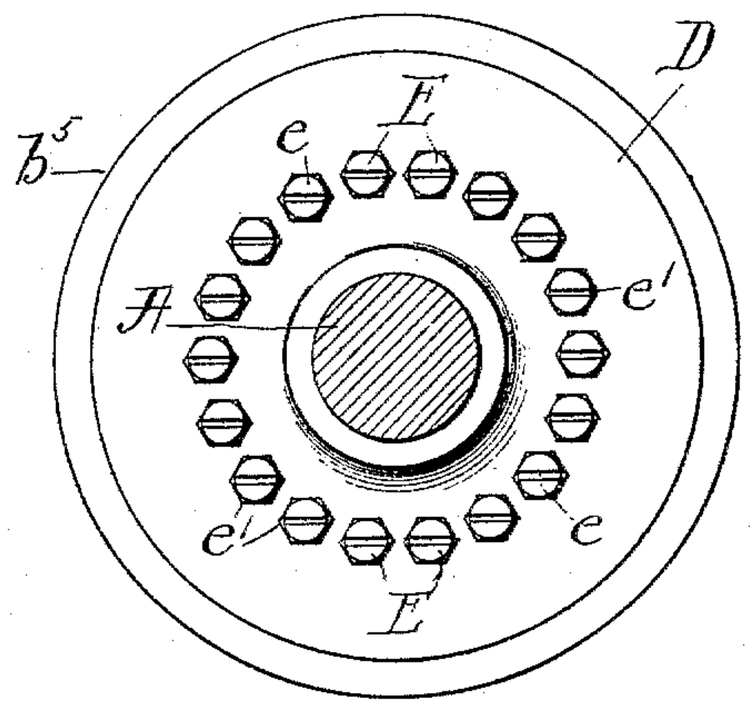


Fig. 8

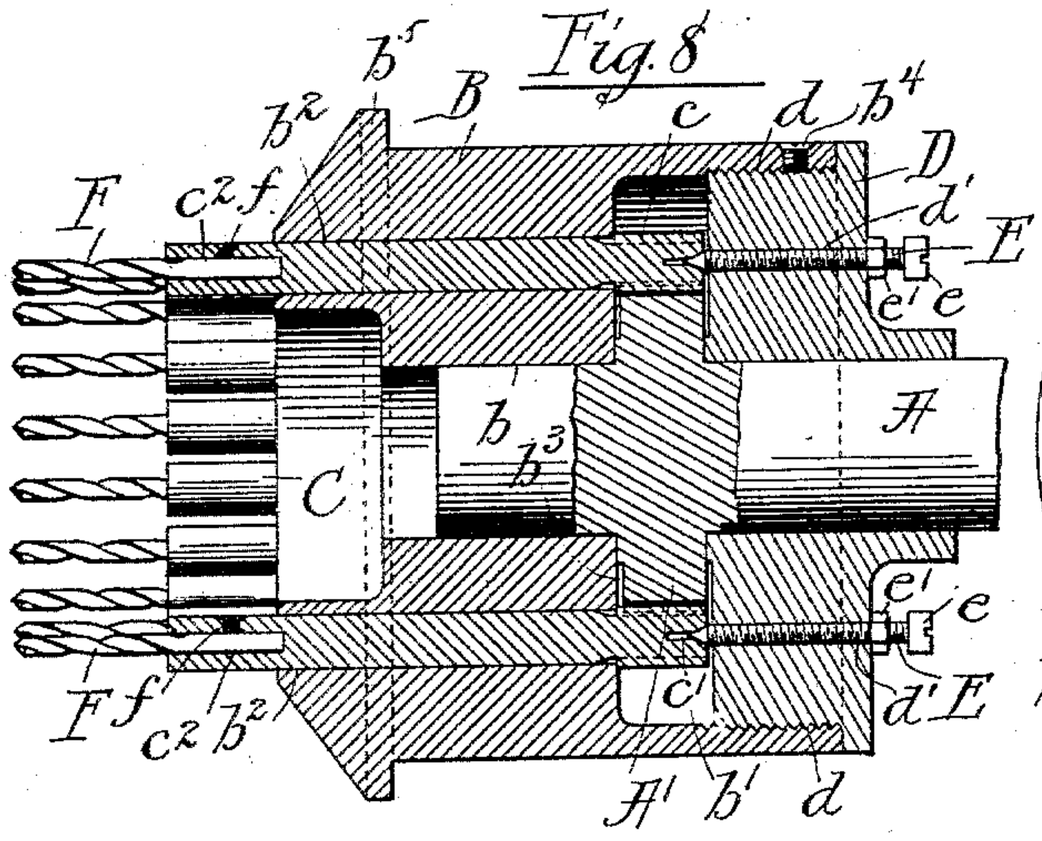
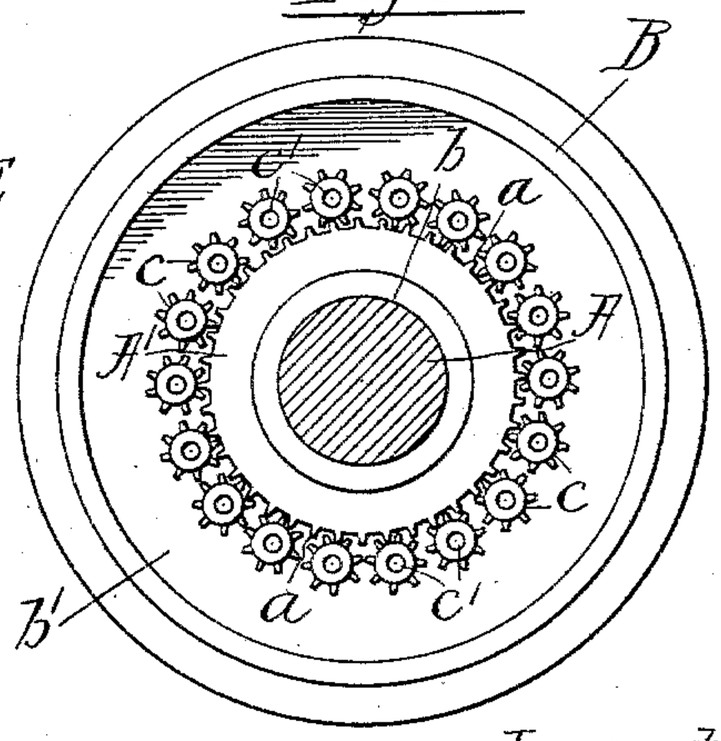


Fig. 9



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by: Dayton, Poole & Brown their Attys.

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

JOHN I. WARMAN AND CARL WINTER, OF CHICAGO, ILLINOIS.

MULTIPLE DRILL.

SPECIFICATION forming part of Letters Patent No. 584,025, dated June 8, 1897.

Application filed September 30, 1895. Serial No. 564,104. (No model.)

To all whom it may concern:

Be it known that we, JOHN I. WARMAN and CARL WINTER, of Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Multiple Drills; and we do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form a part of this specification.

This invention relates to boring-machines, and pertains more specifically to improvements in multiple drills of that class in which a plurality of drill-spindles are actuated simultaneously from a single circular driving element.

The object of the invention is to provide an improved device of the character above referred to embracing a novel adjustable thrust-bearing for the drill-spindles and a novel arrangement of the parts, whereby the principal operative members are completely housed and protected from dust and cuttings, together with other features of improvement, as will hereinafter more fully appear.

The invention consists in the matters hereinafter described, and more particularly pointed out in the appended claims, and the same will be readily understood, reference being had to the accompanying drawings, in which—

Figure 1 is a front elevation of a machine embodying our invention. Fig. 2 is a top plan view of the same. Fig. 3 is a transverse vertical section taken on line 3 3 of Fig. 1. Fig. 4 is a similar view taken on line 4 4 of Fig. 2. Fig. 5 is a side elevation of one of the drill-heads removed from its bearings. Figs. 6 and 7 are front and rear end elevations, respectively, of the same. Fig. 8 is an axial sectional view; and Fig. 9 is a rear end view of the drill-head with the end-closing member removed, showing more particularly the relative arrangement of the gears. Fig. 10 is a side or end view of the clamping-jaws.

The invention is shown herein as embodied in the form of a duplex machine adapted for boring the two spoke-flanges of a bicycle or velocipede hub simultaneously for the reception of the spokes, but, as will be obvious from the following description, the main features of the invention may be embodied in other machines for doing drilling of analogous character, the present machine constituting but one application of the invention.

First describing the drill-head proper, A designates a main driving spindle or shaft provided near one end with a gear A′, mounted rigidly concentrically thereon and provided with straight peripheral teeth *a a*.

B designates a housing bored axially, as at *b*, to receive the spindle A and provided in one end with an annular cylindric enlargement or chamber *b′* of sufficient diameter to accommodate the gear A′ and provide additional space radially outside the said gear.

Through the body of the drill-head are formed a plurality of drill-spindle apertures b^2 b^2, arranged in a series concentric and parallel with the shaft A and extending from the gear-chamber *b′* through to the front end of the drill-head. Within these apertures b^2 are mounted drill-spindles C, provided on their inner ends with pinions *c*, which are arranged to intermesh with the periphery of the gear A′. Said drill-spindles C and the pinions *c* are herein shown as formed integral with the spindles, the latter being turned down to a diameter somewhat less than the diameter of the pinions and inserted within their sockets or apertures b^2 from the rear end of the drill-head. The inner end of the pinion thus acts as a shoulder which rests in contact with the inner end wall of the gear-chamber and serves to limit the forward movement of the drill-spindle. The forming of the pinion integral with the drill-spindle is, obviously, a mere incident of construction, and said pinions might be made separate from and secured upon the drill-spindles, if found desirable.

D designates an annular end-closure member adapted to close the end of the gear-chamber *b′*, said member D being centrally apertured to fit upon the main shaft A and screw-threaded at its periphery, as at *d*, to fit within and engage the correspondingly-threaded interior of the end portion of the gear-chamber *b′*. The member D is adapted to be screwed inward until its inner end rests in contact with the gear A′ and holds the latter in suitable bearing contact between said inner end of the member D and the opposed face b^3 of the body of the drill-head, and is held in this

position by any suitable means, that herein shown consisting of a set-screw b^4, inserted through the outer wall of the gear-chamber and impinging at its inner end upon the periphery of the member D.

E E designate thrust-bearing screws threaded within suitable apertures d' formed through the member D in axial alinement with the several drill-spindles C, the inner end of said bearing-screws being cone-shaped and arranged to engage correspondingly-shaped recesses c', formed in the ends of the respective drill-spindles C. At their outer ends each of said bearing-screws is provided with a suitable head e, to which any suitable tool may be applied to adjust the screw, and check-nuts e' are arranged between said heads and the body of the member D, by means of which the bearing-screws may be positively locked from movement after the adjustment. From the foregoing description it will be obvious that the member D constitutes as a whole a bearing-ring which receives the thrust of the drill-spindles in forcing the latter to their work.

Drills F may be connected with the several drill-spindles C in any suitable or desired manner, but are herein shown as simply inserted in suitable rectangular sockets c^2, formed in the outer ends of the drill-spindles and secured therein by means of set-screws f.

The drill-head constructed as above described may obviously be mounted upon any suitable support by means of which the outer housing is secured from rotation, while the main spindle A is suitably driven from any source of power; but in the present instance two duplicate drill-heads are shown as mounted upon traveling carriages, (designated as a whole by G G,) which are in turn mounted to slide upon suitable ways H H, arrrnged in alinement with each other, so that the drill-heads may be caused to approach and recede from each other in direct lines.

Each carriage G comprises a base g, provided in its under side with a longitudinal dovetail groove g', which engages the correspondingly-shaped way H, and two pillow-block standards g^2 g^3, rising from opposite ends of said base and within the upper ends of which the drill-head is mounted. The standard g^2 is provided in its upper end with a yoke g^4, adapted to receive the cylindric drill-head B, and a strap g^5, adapted to embrace the upper side of the drill-head and provided with apertured ends g^6 g^6, arranged to register with corresponding lugs or ears g^7 g^7, through which are passed bolts g^8 g^8, by means of which said member B may be clamped within the yoke. In order to provide a positive bearing to prevent endwise movement of the drill-head within the yoke under the working pressure of the drill, said drill-head is provided with a bearing-flange b^5, which engages the inner vertical face g^9 of the yoke and strap. The other pillow-block standard g^3 is provided with a bearing-aperture g^{10}, adapted to receive the end of the main spindle A. I and I' designate fast and loose pulleys, respectively, mounted upon said main spindle A between the yoke-standards g^2 g^3 and adapted for belt connection with any suitable counter-shaft. In order that said traveling carriages may be caused to approach and recede from each other simultaneously, each is provided with an eye-lug g^{11}, which depends from the lower side of the base g through a suitable longitudinal slot or mortise h, formed in the way H, said lugs being internally screw-threaded and engaged with right and left screw-threaded portions j j' of a feed-screw J, mounted in suitable bearings J' J', so as to extend longitudinally beneath the ways H H. One end of said feed-screw J is provided with a suitable hand-wheel J^2, by means of which it may be turned to advance or retract the carriages G G.

Now, describing the work-holding devices. K designates a standard suitably mounted upon the ways H centrally between the carriages G and provided with vertical guideways k k, upon or between which are arranged to slide upper and lower blocks k' k'. Cross-bars k^2 k^2 are arranged to extend across the end of said standard K, within which cross-bars is rotatably mounted a vertically-arranged screw-shaft L, provided with right and left screw-threaded portions l l', with which said upper and lower sliding blocks k' k' are operatively engaged. The screw-shaft L is prevented from endwise or vertical movement within its bearings by means of a collar l^2, secured thereon and arranged within suitable recesses k^3 k^3, formed in the adjacent surfaces of the cross-bars k^2 k^2, and engages at its lower end with a step-bearing k^4, formed in the lower part of the standard K. Each block k' carries a clamping-jaw k^5 k^6 rigidly mounted thereon, which jaws are recessed in their proximate faces, as at k^7 k^8, to receive and hold the cylindric side of a bicycle or velocipede hub M interposed between said jaws. The width of the jaws k^7 k^8 may be somewhat less than the distance between the radial flanges m m of the bicycle-hub, so as to permit the drills to pierce the flanges without coming into contact with the jaws, or, preferably, the jaws may be made of the same width as the distance between the flanges and provided in their side faces with annular rabbets k^{12}, of slightly less diameter than the exterior diameter of the hub-flanges, within which the points of the drills may enter without contacting with the said jaws, while at the same time those portions of the side faces of the jaws radially outside of the said rabbets will serve as positive supports for said flanges during the drilling process.

The operation of the machine above described will be obvious, but may be briefly described as follows: Assuming the parts to be in position shown in Fig. 1, the clamping-jaws are first opened by means of the screw

L, so as to permit the insertion of a hub in the position shown, and the jaws are thereafter brought into clamping engagement, so as to hold the hub rigidly from movement, and adjusted centrally between the carriages. The belts are now shifted to start the drills, and the latter are fed forward by means of the feed-screw until the drills have pierced the respective flanges, when the direction of the feed-screw is reversed and the drills retracted, whereupon the hub is removed from the clamping-jaws and the operation repeated.

The machine described is applicable for drilling holes through or into various other pieces of work, as will be manifest, and the clamping-jaws will be adjusted or replaced by other common forms of clamping devices, as occasion may require. It is further to be noted that a single movable drill-head carrying a plurality of drills may be used instead of two such heads, and, further, that when one such head is used it may be fed to the work, or the work may be fed to the drills, as is done in many well-known forms of drills, simple and multiple, now in common use. We therefore do not desire to be limited to the precise details of construction shown nor to the particular application of our invention above described, since many changes in detail will naturally occur to the skilled mechanic and which may be included within the scope of our invention. The machine shown and described is believed, however, to be specially desirable not only in the general invention, but in the matter of detail.

We claim as our invention—

1. A multiple drill, comprising a main driving-spindle, a spur-gear integral therewith, a concentric housing having in one end a cylindric chamber inclosing said gear and provided with a plurality of parallel drill-sockets extending from such chamber outward through the other end of said housing, drill-carrying spindles extending through the said sockets, a pinion on the inner end of each spindle operatively engaged with said gear, a removable end-closure for said chamber provided with adjustable thrust-bearings for each of said spindles, comprising conical-pointed bearing-screws passing through apertures in said closure in axial alinement with the drill-carrying spindles and engaging conical recesses in the ends of the latter, substantially as described.

2. A multiple drill for drilling bicycle-hubs and the like, comprising a stationary work holder or support, provided with clamping-jaws operated to advance or recede simultaneously, whereby the work is locked or clamped in axial alinement and concentric with the drills, a drill-head on each side of said holder, means for simultaneously advancing the drill-heads to and from said holder, a plurality of drills rotatably mounted in each of said heads in circular series and parallel with each other, and means for rotating each set of drills as the latter are advanced to their work, substantially as described.

3. A multiple drill, comprising a frame, a stationary support or work-holder thereon provided with oppositely-arranged clamping-jaws, means for simultaneously moving the jaws together to clamp the work in axial alinement and concentric with the drills, a carriage movably mounted on said frame on each side of said holder, means for simultaneously advancing each carriage to and from the work-holder, a cylindric housing in each of said carriages, a central rotatable head mounted in each housing, a plurality of drill-carrying spindles arranged within each housing in circular series and parallel with each other and operatively engaged with said head, and means for rotating each of said heads as they are advanced to their work.

4. In a multiple drill, the combination of a main frame having a work holder or support, oppositely-extending ways arranged parallel with the axis of the work to be drilled, a traveling carriage mounted in each of said ways, each carriage being provided with drill-heads, comprising a housing, a plurality of parallel-extending drills arranged in circular series, a central driving-spindle provided with a pinion which has engagement with each of said drill-spindles, means for rotating the central driving-spindle, clamping-jaws movably mounted upon the work-support, and arranged to be moved simultaneously to and from the work to clamp the same in alinement with the drills, and means for simultaneously moving both drill-carrying carriages toward and from the work, substantially as described.

5. A machine for drilling the flanges of vehicle-hubs, comprising an upright support within which a hub may be supported in horizontal position, a horizontal way extending parallel with the axis of the hub, a traveling carriage mounted upon said way and carrying a multiple-drill head provided with a plurality of drills arranged in a circular series concentric with the axis of the hub and parallel with each other, means for driving said drills, and means for advancing and retracting the drill-heads, comprising a feed-screw having operative engagement with the traveling carriage, substantially as set forth.

6. A machine for drilling the flanges of vehicle-hubs, comprising an upright support within which a hub may be supported in horizontal position, oppositely-extending horizontal ways arranged parallel with the axis of the hub, a traveling carriage mounted upon each of said ways and carrying a multiple-drill head provided with a plurality of drills arranged in a circular series concentric with the axis of the hub and parallel with each other, means for driving each set of drills, and means for advancing and retracting the carriages simultaneously comprising a feed-

screw having right and left screw-threaded portions operatively engaged with the respective carriages, substantially as set forth.

7. In a multiple drill, the combination with a housing adapted to rest in any suitable journal and having an interior chamber extending through one end of said housing, and a plurality of apertures extending from said interior chamber through the other end of said housing, a plurality of drill-carrying spindles journaled in said apertures, their outer ends being provided with drills and their inner ends with a pinion each, said pinions being within said chamber, an apertured member removably secured to the housing to close the end of said chamber, adjustable thrust-bearings on said members for each drill-carrying spindle, a central gear-wheel in said chamber in engagement with said pinions, and means for actuating said gear, substantially as described.

8. A multiple drill comprising a main frame, a stationary work-support on said frame, means for clamping the work in said support, a traveling carriage on each side of said support mounted in ways formed on the frame, a drill-head in each carriage, carrying a circular series of drills extending in parallel relation to each other, and actuated by a common main spindle, and means for simultaneously moving the carriages toward and from said support, comprising a lug extending from each carriage through a longitudinal slot in the main frame, apertures in each lug in alinement with each other, and a right and left screw-threaded shaft mounted in said apertures and engaging interior screw-threads therein, substantially as described.

9. In a multiple drill, the combination with a frame, a traveling carriage on said frame carrying a circular series of parallel-extending drills, and means for moving said carriage on the frame, of a work-support mounted on the frame provided on its side adjacent to said carriage with an annular recess which is adapted to receive the drills when the carriage is at the extreme inner limit of its movement.

In testimony that we claim the foregoing as our invention we affix our signatures, in presence of two witnesses, this 27th day of September, A. D. 1895.

JOHN I. WARMAN.
CARL WINTER.

Witnesses:
JNO. FILMAN,
S. I. YODER.