

No. 850,085.

PATENTED APR. 9, 1907.

F. H. FRENCH.
BORING MACHINE.

APPLICATION FILED AUG. 8, 1906.

2 SHEETS—SHEET 1.

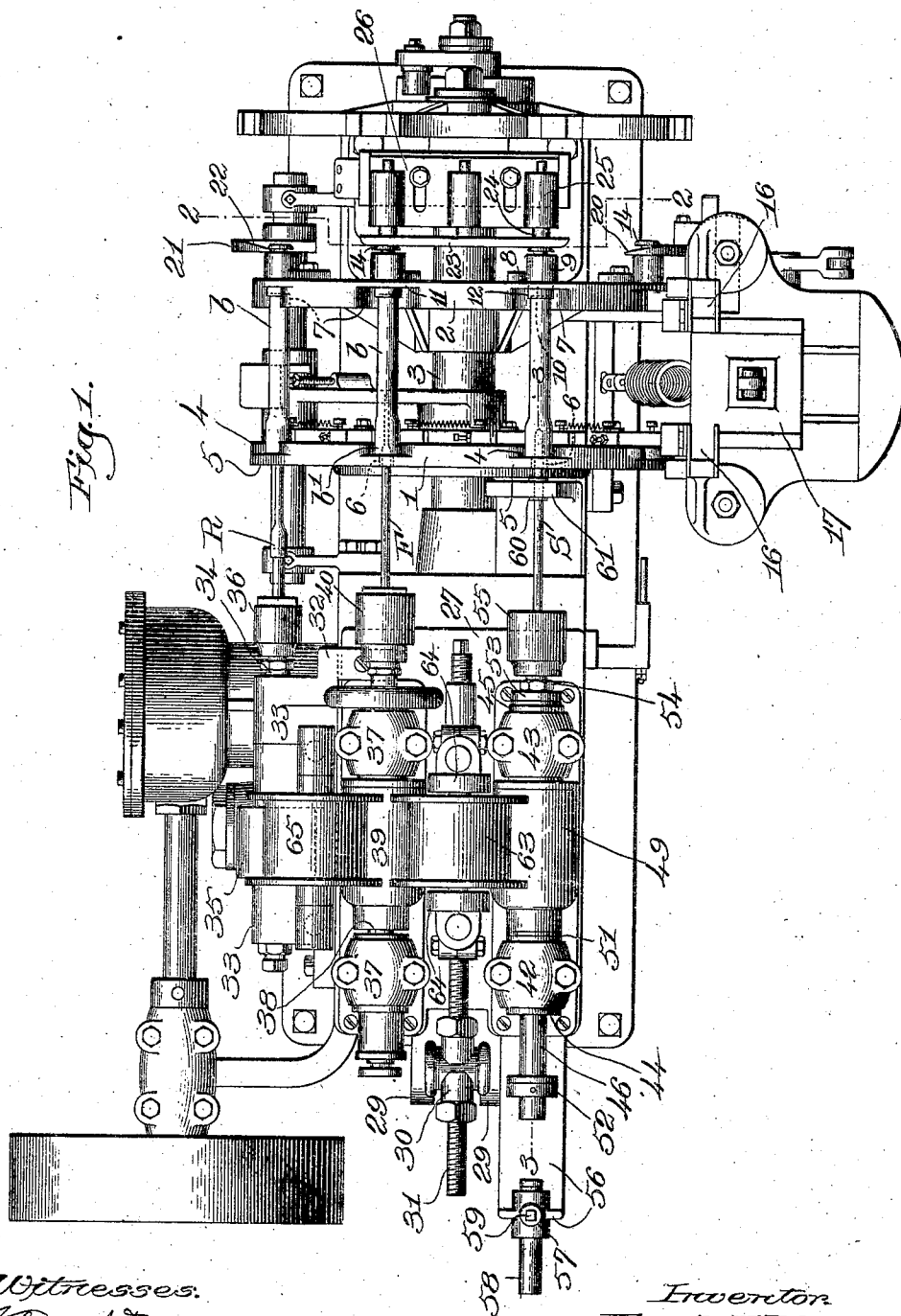


Fig. 1.

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2 SHEETS—SHEET 2.

Fig. 2.

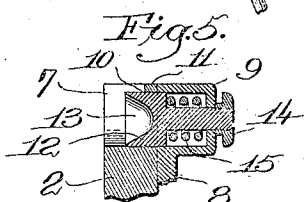
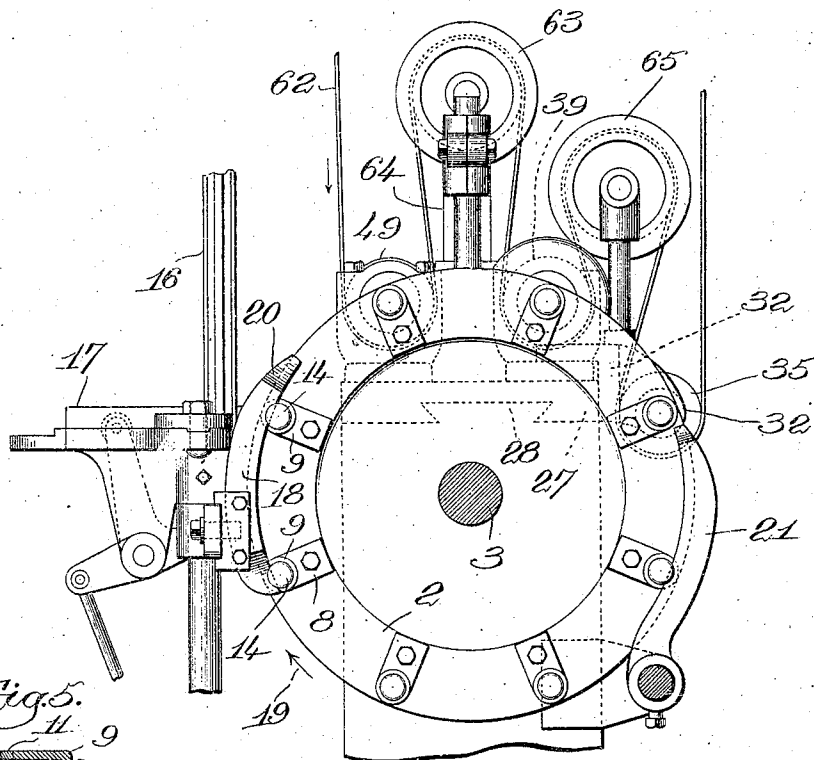


Fig. 3.

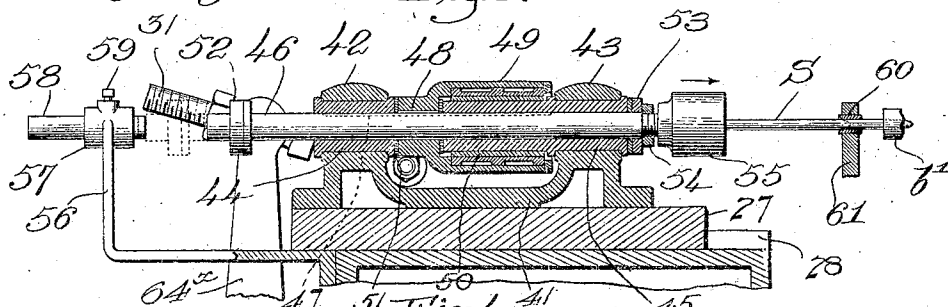
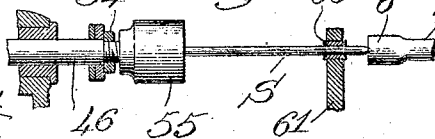


Fig. 4.



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UNITED STATES PATENT OFFICE.

FRANK H. FRENCH, OF HOPEDALE, MASSACHUSETTS, ASSIGNOR TO DRAPER COMPANY, OF HOPEDALE, MASSACHUSETTS, A CORPORATION OF MAINE.

BORING-MACHINE.

No. 850,085.

Specification of Letters Patent.

Patented April 9, 1907.

Application filed August 8, 1906. Serial No. 329,638.

To all whom it may concern:

Be it known that I, FRANK H. FRENCH, a citizen of the United States, residing in Hopedale, county of Worcester, and State of Massachusetts, have invented an Improvement in Boring-Machines, of which the following description, in connection with the accompanying drawings, is a specification, like letters on the drawings representing like parts.

This invention relates to boring-machines, and more particularly to machines for boring blanks for spinning-bobbins; and it has for its main objects the production of novel and efficient means for controlling the action of the boring-tool or drill, for preventing vibration of the tool at or near its point when running free or out of the work, and the production of means for holding the blanks in position to be drilled or bored.

In drilling bobbin-blanks there is often a tendency of the boring-tool to "drift" or move away from the longitudinal axis of the blank during the feed movement, so that instead of the bore being true and coaxial with the center of the blank it is at more or less of an angle thereto. This necessitates discarding many blanks after they have been bored, causing a good deal of unnecessary waste.

In my present invention I have so constructed the apparatus that when the point of the drill or boring-tool is brought into engagement with the blank advance of the tool is stopped temporarily, giving the tool ample time to make a center for itself at the proper point. Thereafter the feed of the tool is resumed and the hole is bored, with the result that it will be practically coincident with the axis of the blank. The drills are of necessity quite long in order to drill the long blanks now largely used, and when the drill rotating at high speed is running free or out of the work there is considerable vibration, greatest at the point and gradually diminishing toward the chuck. This constant vibration not only tends to put the drill off center when brought into engagement with the blank, but it also has a very decided tendency to cause crystallization of the steel of which the drill is made, resulting in frequent breakage. I have overcome these very objectionable features by providing a guide which coöperates with the tool near its point when out of the work, the guide preventing

the vibrations and maintaining the drill-point in position to properly engage the work. The resulting advantages are twofold, for the life of the tool is increased about ten to one and the number of improperly-bored blanks is reduced to a minimum.

These and other novel features of my invention will be fully described in the subjoined specification and particularly pointed out in the following claims.

Figure 1 is a top plan view of a boring-machine with one embodiment of my present invention applied thereto. Fig. 2 is a transverse section on the line 2 2, Fig. 1, looking toward the left. Fig. 3 is a longitudinal detail, partly in section, on the line 3 3, Fig. 1, of the means for controlling the movement of the starting-drill, the latter being shown after the positive feed movement of the drill has begun. Fig. 4 is a similar view, but showing the drill in position to center itself on the work. Fig. 5 is an enlarged sectional detail of one of the tip-holding members, to be referred to hereinafter.

I have herein shown my invention applied to a boring-machine of the general character and mode of operation shown and described in United States Patent No. 828,176, granted August 7, 1906, to E. H. Bailey, administratrix, and such parts of the apparatus herein as are described in detail in said patent will be referred to herein only with such particularity as may be necessary to the proper understanding thereof. As in such patented mechanism, the hole in the bobbin-blank is bored at two operations, a hole of uniform diameter being bored part way through the blank by the first operation, and by the second operation the hole is completed with a smaller diameter. Herein I have provided a third tool (a reamer) which reams out the bore of the blank at the butt thereof, all of the bits or drills being mounted upon a reciprocating carriage. The intermittingly-rotatable holder for the blanks is generically such as shown in the patent referred to; but I have devised certain novel details of construction in the work-holder to be described.

The work-holder comprises disks 1 2, fast on an intermittingly-rotated shaft 3, governed as to its rotation by means substantially as shown and described in the patent referred to, the disk 1 having peripheral recesses or seats 4 to receive the butt-ends *b'* of

the blanks *b*, the sockets being backed by a portion 5 of the disk apertured at 6. (See dotted lines, Fig. 1.) Gripping-jaws are arranged to grip the butts of the blanks and hold them in the sockets, as in the before-mentioned patent, the construction and operation of the jaws being fully described and illustrated therein. The disk 2 is also peripherally recessed at 7 to receive the tip ends of the blanks, and socket members are mounted on the disk to engage the ends of the blank and press their butts firmly against the back walls 5 of the sockets 4.

Referring to Figs. 1 and 5, brackets 8, having each a hub 9, are bolted to the outer face of the disk, the hubs being opposite openings 10 in the end walls 11 of the sockets 7, each hub having mounted therein a socket member 12, provided with a concaved seat or socket 13 at its inner end and a head 14 at its outer end, a strong spring 15 acting to force the socket member inward. The inner ends of the members 12 are adapted to receive the tips of the blanks *b*, and when the springs are free to act they force the butts of the blanks firmly against the back walls 5. By making the seats 13 concaved the blanks are enabled to properly position themselves firmly and in coaxial alinement with the path of movement of the boring-tools. Said socket members 12 are automatically retracted one by one to permit the blanks to be inserted in the sockets of the disks 1 2, the machine being provided with a hopper 16 and a pusher 17, constructed and operated substantially as in the patent referred to and not of my invention.

To retract the socket members, there is a segmental retractor 18, rigidly attached to a fixed part of the machine and beveled at its ends, the edge of the retractor being so located that as the work-holder is rotated in the direction of arrow 19, Fig. 2, the lower beveled end enters between the head 14 of a member 12, and the advance of the work-holder causes the retractor to draw outward the socket member then engaged until its inner end is out of the path of a blank being transferred by the pusher 17 to the work-holder.

In Fig. 1 the member 12, which is fully retracted, is in readiness to permit the insertion of a blank, and the beveled upper end 20 of the retractor permits gradual return of said member 12 to operative position as the work-holder makes its next advance. After the blanks have been drilled the socket members are again retracted one by one to release the blanks, a retractor 21 being mounted on the machine at the back of the work-holder, Fig. 2, its beveled end 22 acting to gradually withdraw a socket member from operative position. Herein I have provided a starting-drill or boring-tool and a finishing-drill to complete the hole or bore of the bobbin-blank, and the enlargement in the butt of the

blank is made by a reamer, so that three tools are employed and these tools act simultaneously on three blanks. The two blanks being drilled are subjected to increased endwise pressure to hold them firmly, and for this purpose a presser 23 is mounted on spring-controlled guides 24, Fig. 1, movable in bosses 25, formed on a bracket 26, fixedly secured on the machine, the presser being so placed as to bear against the heads 14 of the two socket members which are opposite the two drills. The force of the springs 15 is thereby augmented by the spring-plungers, and the blanks being drilled are held securely against endwise or rotative movement while being bored.

The means for holding the work having been described, I will now describe the means for boring or drilling the holes in the blanks. A carriage 27, mounted to slide longitudinally on a guideway 28 (see dotted lines, Fig. 2) on the bed of the machine, is reciprocated by any suitable means and conveniently by mechanism such as shown in the patent hereinbefore referred to, the machine-frame having ears 29, Fig. 1, on which is fulcrumed a rocker-arm 64^x, having its upper end 30 arranged to receive a screw-threaded rod 31, Figs. 1 and 3, operatively connected with the carriage, as in the patent hereinbefore mentioned. The carriage has attached to it a rearwardly-extended bracket 32, having bearings 33 for a shaft 34, having an attached pulley 35 and a chuck 36, the shaft and chuck constituting a rotatable tool-carrier. A reamer *R*, Fig. 1, is held in the chuck 36 and is rotated by or through the pulley 35, as will be referred to hereinafter. The carriage 27 is provided with two sets of bearings arranged in parallelism, one set, as 37, Fig. 1, supporting a shaft 38, provided with a pulley 39, and a chuck 40, the latter holding a finishing-tool *F*, said chuck and shaft constituting a tool-carrier for said tool. The reamer and finishing-tool shafts 34 and 38 move toward and from the work-holder in unison with the carriage; but the starting tool or drill *S*, Fig. 1, which makes the initial hole or bore in the blank, has a peculiar movement in that it is first moved forward into engagement with the end of a blank and is temporarily arrested, after which it is positively moved forward to complete the feed movement of the starting-drill. During the temporary arrest of such drill it centers itself on the work, so that when the positive feed movement is taken up the drill will follow a path coincident with the axis of the blank.

Referring to Figs. 1, 3, and 4, the carriage has rigidly secured to it a stand 41, having alined bearings 42 43, the former receiving a bushing 44 and the latter supporting a long sleeve-bearing 45. A shaft 46 is rotatably mounted in and supported by the sleeve and

bearing, the shaft having an elongated key-way 47, with which coöperates a key 48 on the hub of a pulley 49, the pulley rotating on a bushing 50, interposed between the sleeve-like bearing 45 and the interior of the pulley. A suitable washer 51 is preferably interposed between the bearing 44 and the adjacent end of the pulley. The shaft 46 has rigidly attached to it annular enlargements or collars 52 53, the latter being set up by a nut 54, and a drill or tool holding chuck 55 is secured to the inner end of said shaft, the shaft 46 and the chuck 55 constituting a rotatable tool-carrier for the starting tool or drill.

The main frame of the machine at its left-hand end is provided with a rigidly-attached upturned bracket 56, having a boss 57 to receive a stop 58, adjustably held in place by a set-screw 59, the stop being located in the path of movement of the shaft 46 and limiting the outward movement of the shaft, or to the left, viewing Figs. 1, 3, and 4. When the carriage is on its retracting-stroke, the shaft is moved longitudinally with it until its outer end abuts against the stop 58, and such movement is usually due to the frictional contact between the shaft and the bearings 44 45, though at times positive engagement of the outer end of the bearing 44 with the collar 52 will retract the shaft.

It will be seen that the shaft has a limited longitudinal movement relatively to the carriage, and this relative movement enables me to impart the peculiar action to the starting-drill when the carriage is moving toward the work—that is to say, when the carriage begins its inward stroke, the tool running free, the shaft will move with the carriage because of frictional engagement between the shaft and its bearings until the point of the tool engages the end of the blank, and thereupon the forward movement of the tool and shaft 46 is arrested, while the carriage continues to move inward until the right-hand end of the sleeve-like bearing 45 abuts against the enlargement 53, whereupon both shaft and bearing will be moved in unison, the shaft and its attached drill then being fed forward positively to drill the initial hole in the blank. When the rotating tool is arrested by the blank, it forms a center for itself during the time that the carriage is taking up the lost motion between itself and the drill-carrying shaft 46, so that any tendency of the drill to drift or move away from the true axis of the blank is eliminated. The primary movement of the drill, therefore, is due to frictional engagement between the shaft 46 and its bearings on the carriage, while the secondary or feed movement of the drill is positively effected. When the drill is retracted from one blank preparatory to being moved forward into engagement with the next blank, there is a very decided tendency to vibration of the drill, particularly at its

point, and such vibration not only tends to crystallize the steel of the drill, but it also tends to set the point off center when brought up against the blank. To obviate these objections, the former of which causes frequent drill breakage and the second of which spoils blanks, I provide a guide to co-operate with the starting-drill at or near its point when the latter is running free or out of the work. To this end a tubular guide 60 is provided mounted on a fixed stand 61, suitably attached to the machine-frame, the guide being so arranged that the starting-drill passes through it and freely rotates therein; but when the drill is out of the work the guide coöperates with the drill at or near its point and completely prevents vibration. The point of the drill is held by friction in the work as the carriage is retracted, the carriage then moving relative to the drill in the direction of its length, and when the bearing 44 engages the collar 52 the drill will be withdrawn from the work, but the point of the drill is not drawn out of the guide. Hence there is no danger of breakage of the drill or other trouble, as would be the case if the drill were drawn out and then had to reënter the guide on the next forward stroke. Consequently when the drill is moved forward into engagement with the work the drill-point is in accurate position to center itself properly. As the vibrations are prevented, the life of the drill is very greatly increased, and by combined action of the guide and the arrest of the drill permitting it to form a center in the work the number of improperly-drilled blanks is reduced to a minimum.

In Figs. 1 and 3 the parts are shown after the positive feed movement of the drill has begun; while in Fig. 4 the parts are shown with the drill in position to center itself on the blank. No guide is necessary for the finishing-drill F, which is much longer than the starting tool or drill, as it enters a blank in which the starting-drill has already made the initial bore, the finishing-drill acting to bore the small part of the hole at the tip of the blank.

The several tools are rotated by a single belt 62, Fig. 2, the belt passing around the pulley 49, thence over an idler 63, suitably supported on a stand 64, attached to the carriage, the belt passing downward from the idler 63, around the pulley 39 of the finishing-drill, then up over a second idler 65, also mounted on the carriage, and finally down around the reamer-driving pulley 35 and back to the main overhead pulley. (Not shown.) The idlers serve to carry the belt well around the several tool-driving pulleys, and a single belt is utilized to rotate all of the tools in unison.

My invention is not restricted to the particular construction and arrangement herein

shown and described, as the same may be modified or rearranged in various details without departing from the spirit and scope of my invention.

5 Having described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In a boring-machine, a holder for the blank, a rotatable tool-carrier, a boring-tool
10 carried thereby, means to support and frictionally cooperate with the tool-carrier and by such frictional cooperation move the tool-carrier longitudinally to effect engagement of the tool and the end of the blank, to center
15 the tool, and a device on the tool-carrier with which said means thereafter cooperates positively, to effect feed of the tool by such positive cooperation.

2. In a boring-machine, a holder for the
20 blank, a rotatable tool-carrier, a boring-tool carried thereby coaxial with the blank and movable longitudinally thereof, and means supporting the tool-carrier and movable with and also relatively to the same, to first move
25 said tool-carrier and bring the tool into engagement with the blank, to center the tool, and after a predetermined movement of said means longitudinally relatively to the tool-carrier to resume control thereof and positively continue the longitudinal movement
30 of the tool-carrier and tool, to feed the latter into the blank.

3. In a bobbin-boring machine, a holder for the blank, a boring-tool, a rotating tool-carrier, means to effect frictional engagement
35 therewith, and move the tool against the end of the blank to center the tool, means to provide positive engagement with the tool-carrier thereafter, to positively feed the tool and bore the blank, and a fixed guide for and adjacent the point of the tool when the latter is running free.

4. In a bobbin-boring machine, a holder for the blank, a tool-carrier having annular
45 enlargements thereon, a boring-tool on the carrier, bearings in which the latter is rotatable and also movable longitudinally, a reciprocating carriage in which the bearings are mounted, and means to rotate the tool-carrier movement of the carriage toward the
50 blank first causing friction-induced movement of the tool-carrier with its bearings until the tool engages the blank, the bearings thereafter moving into engagement with one of the enlargements on the tool-carrier, to
55 positively move the latter forward and effect feed of the tool.

5. In a boring-machine, a reciprocating carriage, a plurality of rotating tools mounted
60 thereon, one of the tools being movable longitudinally with and also relatively to the carriage, means to move that one of the tools with the carriage into engagement with the work, to center the tool, means to act upon
65 the said tool after an interval of rest thereof,

to again move it with the carriage and effect positive feed of the tool, and a work-holder to present the work successively to the action of the several tools.

6. In a bobbin-boring machine, a reciprocating carriage, a starting and a finishing drill mounted thereon, a reamer also mounted on the carriage, means to rotate said drills and reamer, an intermittingly-movable work-holder to present blanks in succession opposite the drills and reamer, means to permit limited longitudinal movement of the starting-drill relatively to the carriage, whereby said drill is moved into engagement with the blank and temporarily stopped thereby, and
75 means whereby said drill is thereafter positively moved forward with the carriage to effect feed of said drill.

7. In a bobbin-boring machine, a reciprocating carriage, a starting-drill and a finishing-drill of greater length mounted thereon, means to rotate them, a work-holder to present blanks to be drilled, a fixed guide to cooperate with the shorter, starting-drill, and prevent vibration of the point thereof when
90 out of the work, and means connecting the starting-drill and the carriage to reciprocate the said drill by the carriage but with a stroke of less amplitude.

8. In a bobbin-boring machine, an intermittingly-movable blank-holder to present the blanks one by one in position to be bored, a carriage movable toward and from the blank-holder, a rotatable drill mounted on the carriage, and a lost-motion connection
100 between said carriage and drill, whereby after the drill is brought into engagement with the work the carriage continues its movement a predetermined distance and then positively moves the drill in unison to effect feed
105 of the drill.

9. In a bobbin-boring machine, a holder for the blank to be bored, a carriage movable toward and from the holder, a rotatable drill mounted on the carriage, a friction connection between the drill and the carriage, and means providing a positive engagement between the drill and carriage, whereby the drill is first moved longitudinally against the end of the blank by or through the friction
110 connection, and afterward by the means providing the positive engagement, to effect thereby feed of the drill.

10. In a boring-machine, a reciprocating carriage, a plurality of tools rotatably
120 mounted thereon, means to rotate said tools, an intermittingly-movable work-holder to present blanks in succession opposite the tools, means to permit limited longitudinal movement of one of said tools relatively to
125 the carriage, whereby said tool is moved into engagement with the blank and temporarily stopped thereby, and means to thereafter positively move said tool forward with the carriage to effect feed of the tool.

11. In a boring-machine, a reciprocating carriage, a plurality of tools rotatably mounted thereon and of different lengths, an intermittingly-movable work-holder to present blanks in succession opposite the tools, a fixed guide to coöperate with the short tool and prevent vibration of the point thereof, and means connecting the said tool and the carriage, whereby the tool is reciprocated by the carriage, but with a stroke of less amplitude to maintain said tool within the guide throughout the reciprocation of the carriage.

12. In a boring-machine, a rotatable drill, its shaft, a reciprocating carriage on which the shaft is mounted and relatively to which it is movable longitudinally, and a fixed

guide to coöperate with the point of the drill and prevent vibration thereof when out of the work, said drill being held by friction in the work when the carriage is retracted until the relative movement between the carriage and drill is taken up, the point of the drill remaining in the guide when the drill is fully retracted.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

FRANK H. FRENCH.

Witnesses:

FRANK J. DUTCHER,
CLARE H. DRAPER.