No. 705,226. Patented July 22, 1902.

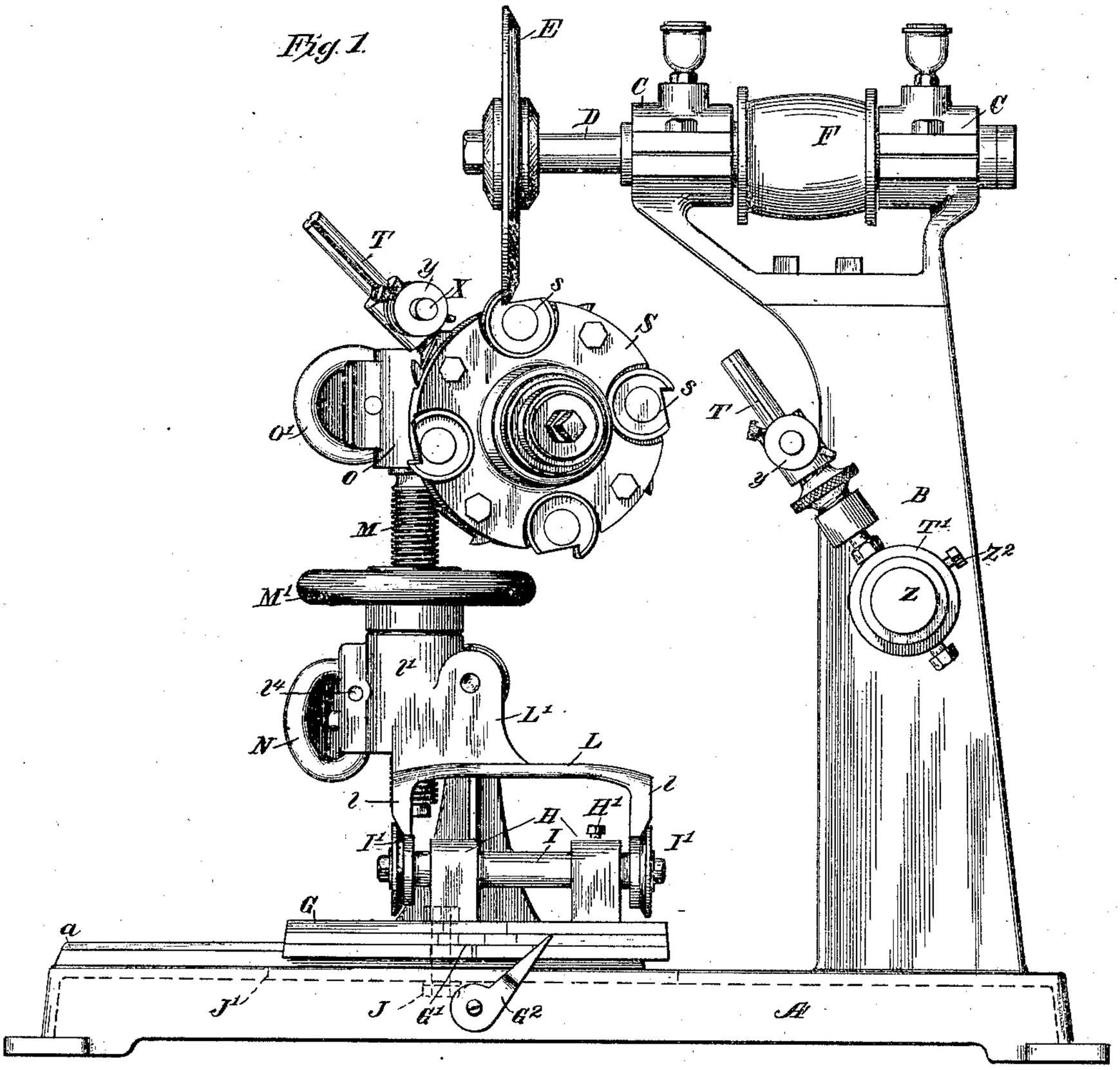
J. ETTINGER.

GRINDING MACHINE.

(Application filed May 3, 1902.)

(No Model.) 5 Sheets—Sheet 1.

Fig. 1.



Witnesses
H. S. Austin
A. M. Parkins

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(No Model.) 5 Sheets—Sheet 2.

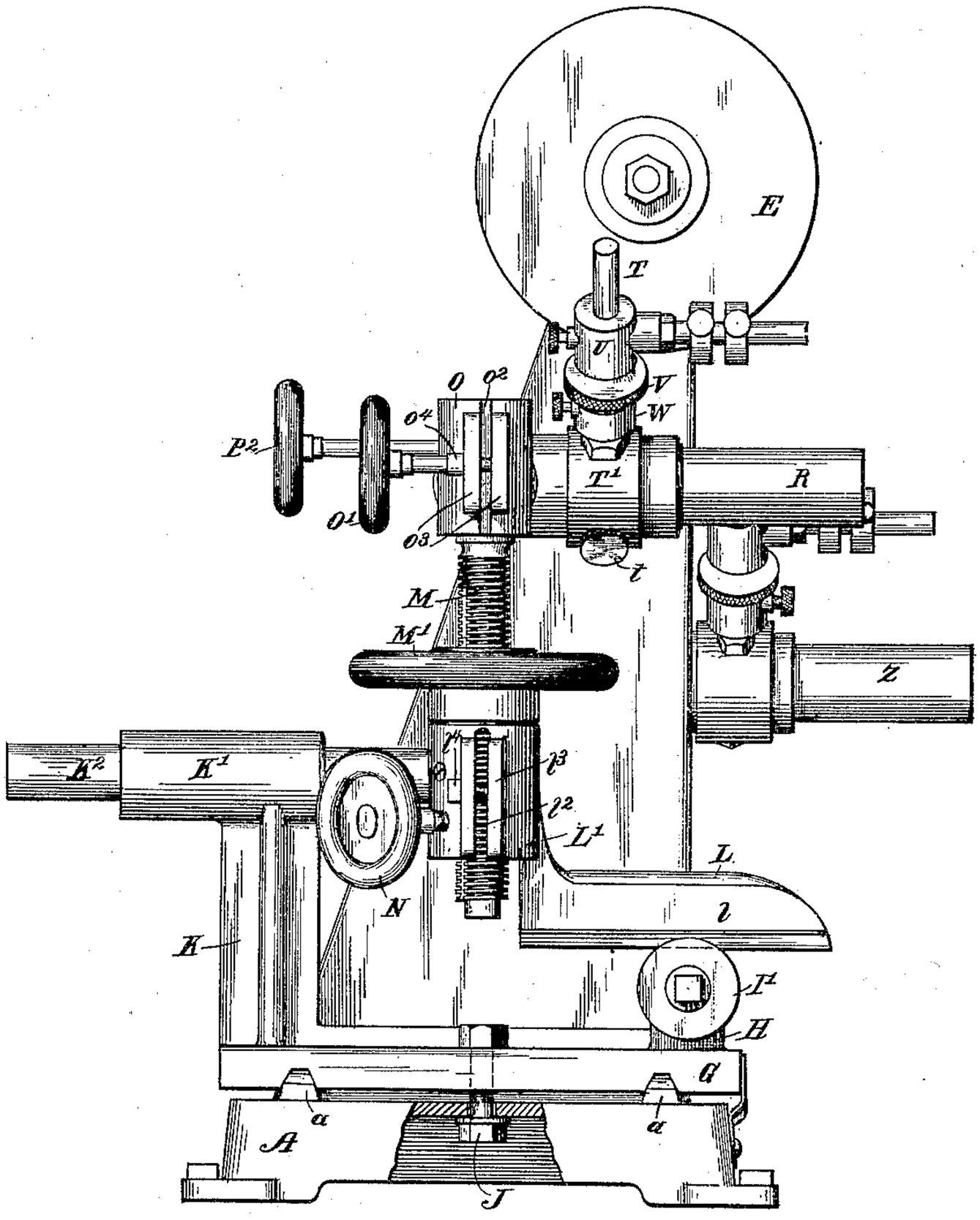

Fig. 2.

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(No Model.) 5 Sheets—Sheet 3.

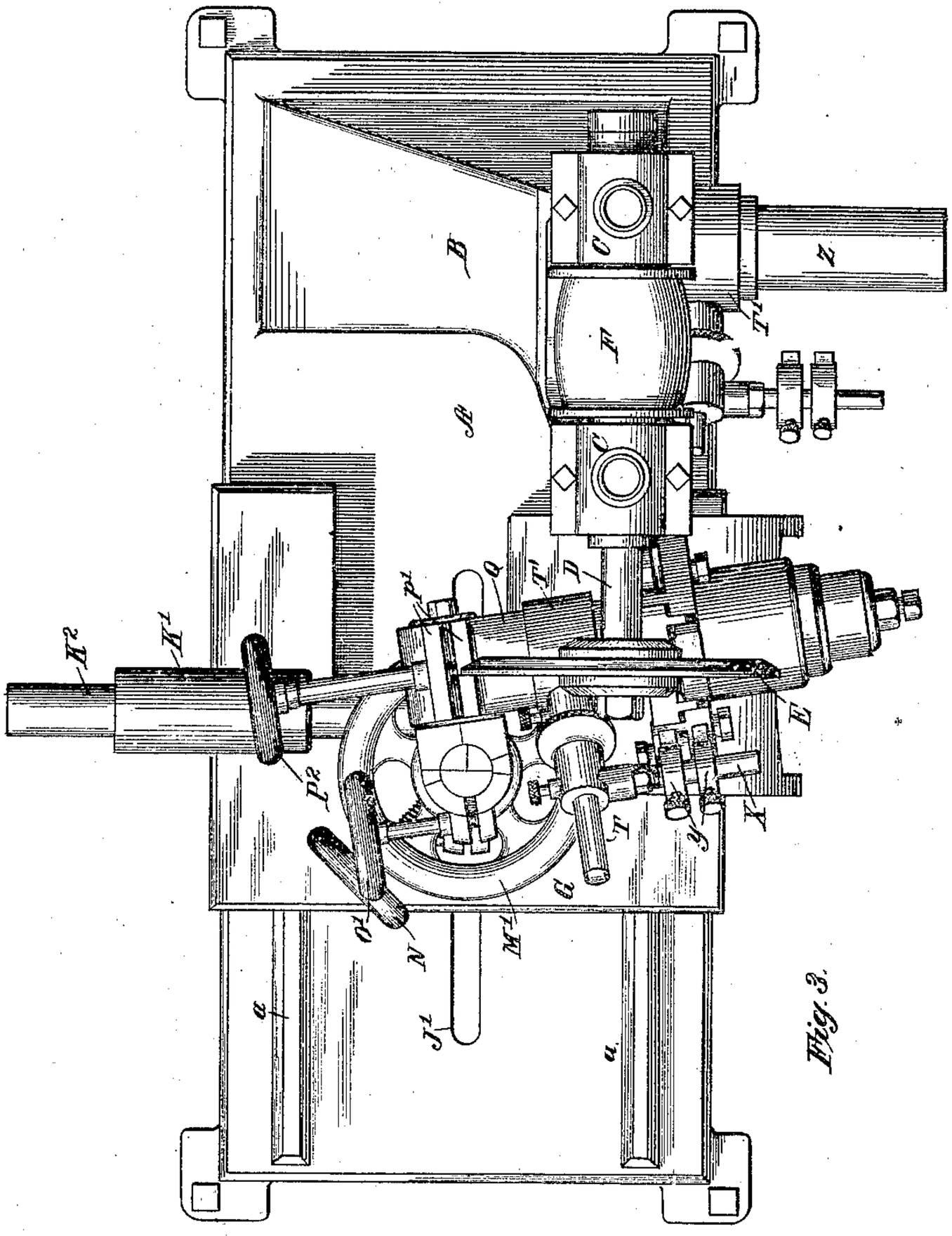

Fig. 3.

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(No Model.) 5 Sheets—Sheet 4.

Fig. 4.

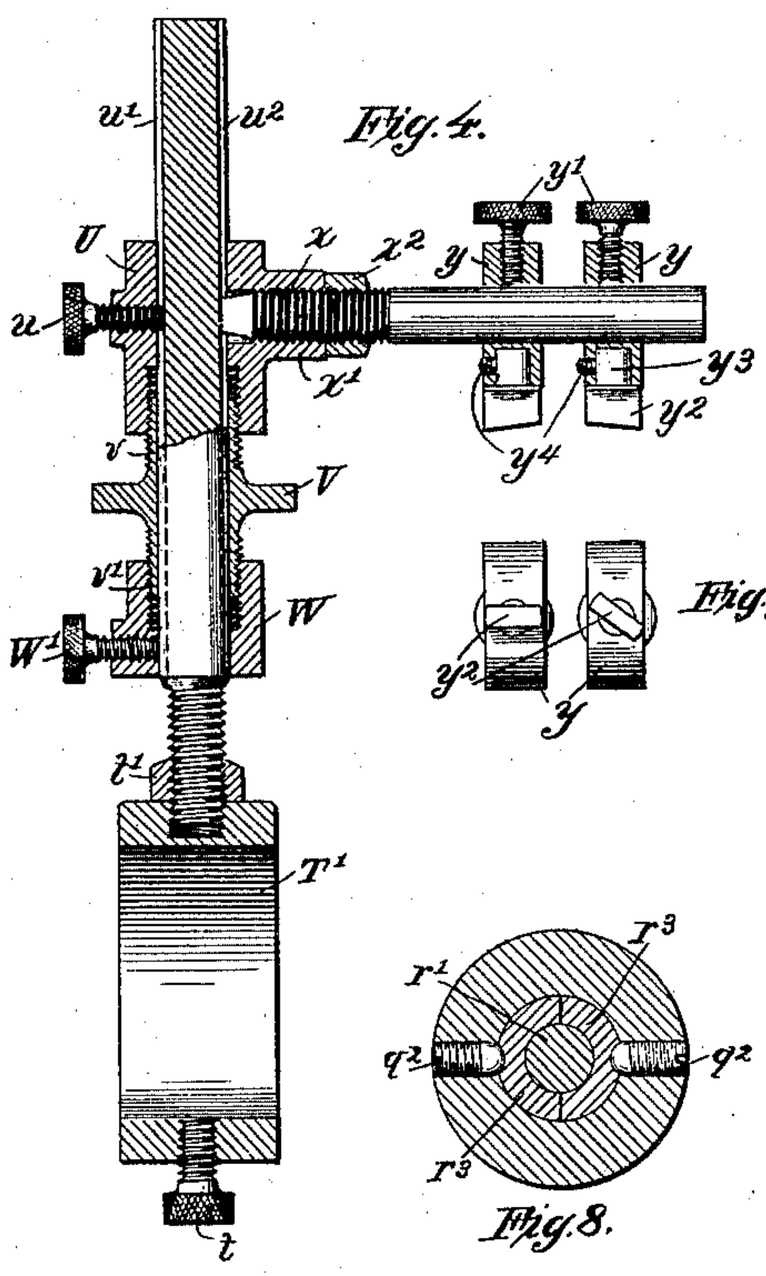


Fig. 7.

Fig. 8.

Fig. 5.

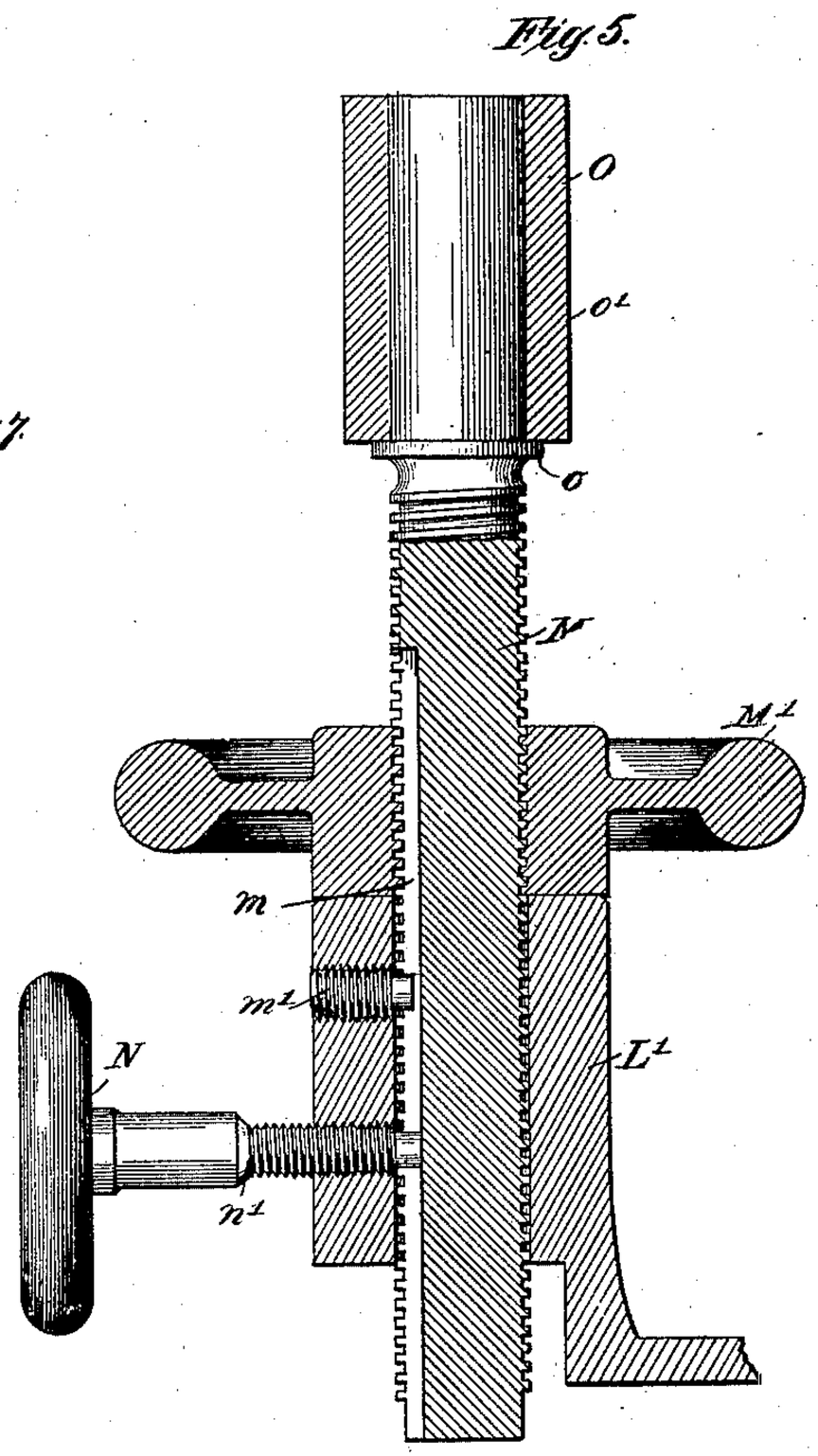
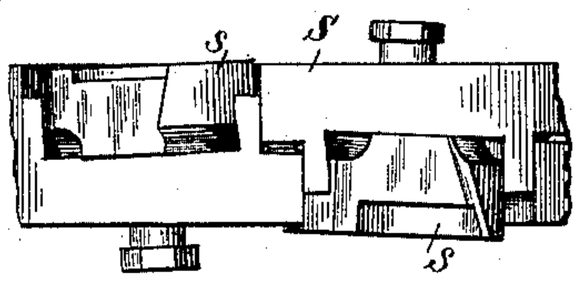


Fig. 9.



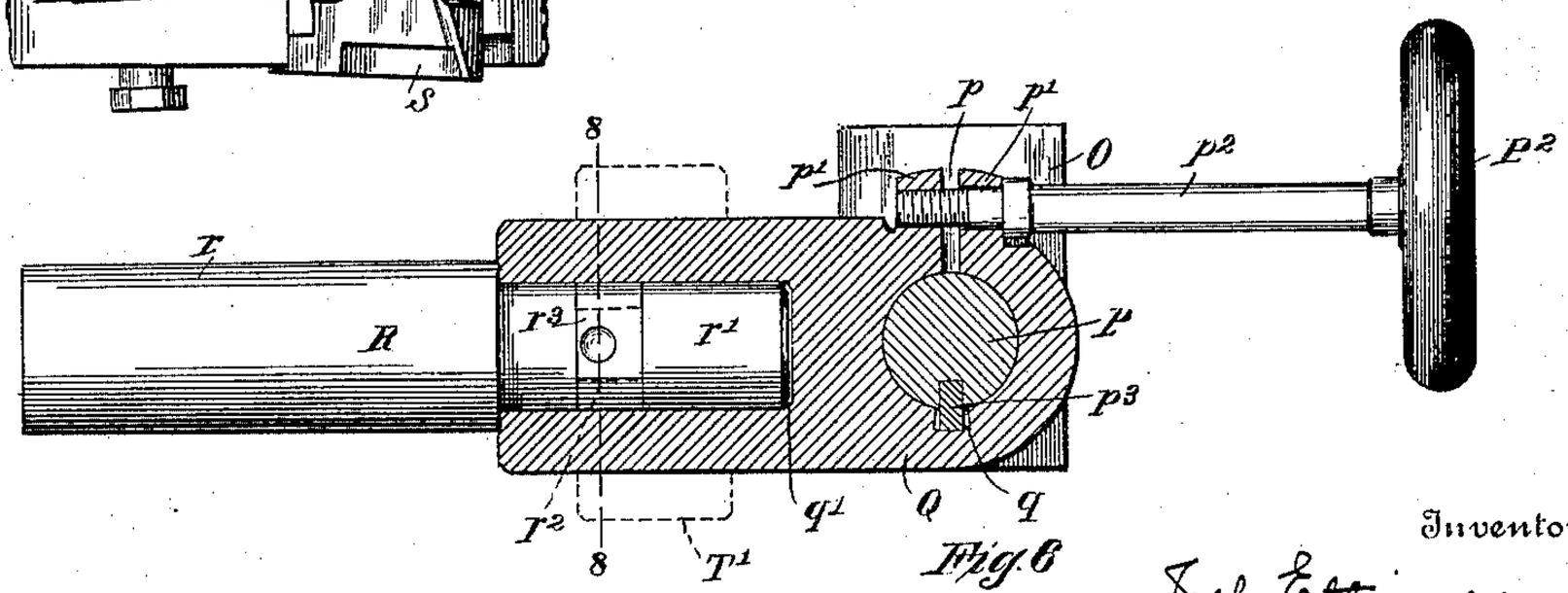


Fig. 6.

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(No Model.) 5 Sheets—Sheet 5.

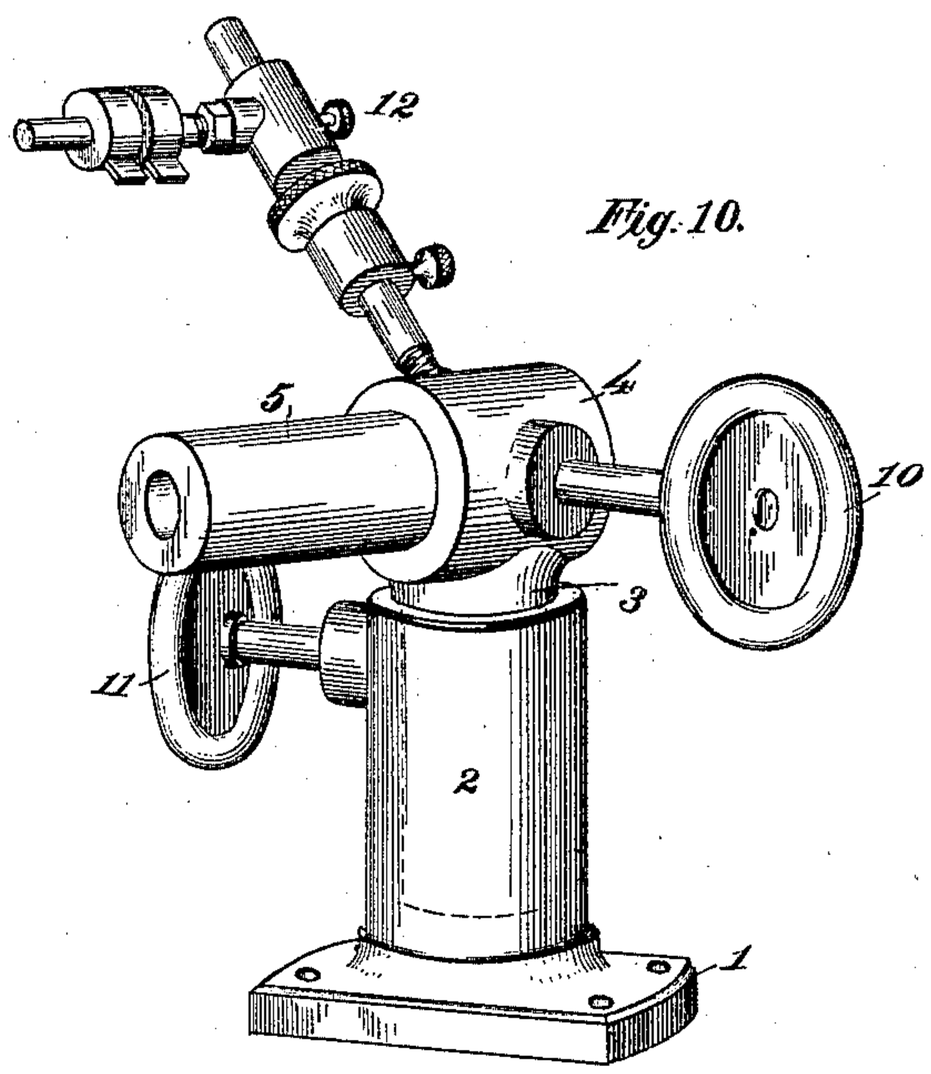

Fig. 10.

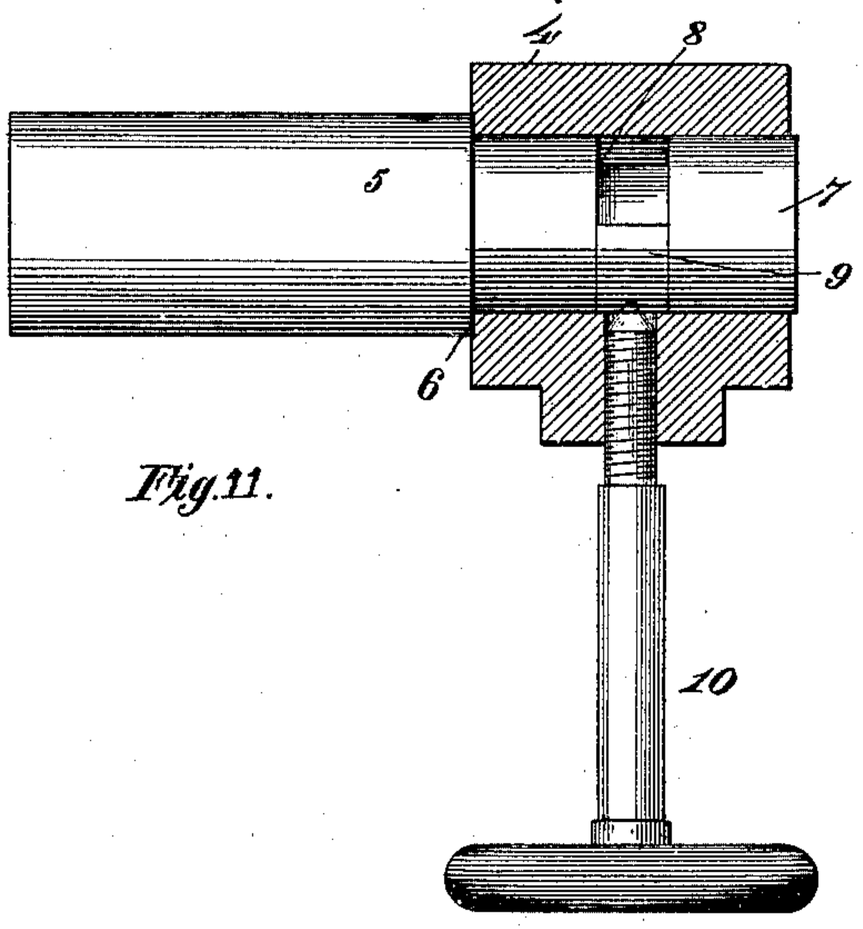

Fig. 11.

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UNITED STATES PATENT OFFICE.

JOEL ETTINGER, OF CHESTER, PENNSYLVANIA, ASSIGNOR TO THE ETTINGER MACHINE COMPANY, LIMITED, OF CHESTER, PENNSYLVANIA.

GRINDING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 705,226, dated July 22, 1902.

Application filed May 3, 1902. Serial No. 105,817. (No model.)

To all whom it may concern:

Be it known that I, JOEL ETTINGER, a citizen of the United States, residing at Chester, in the county of Delaware and State of Pennsylvania, have invented certain new and useful Improvements in Grinding-Machines, of which the following is a specification.

My invention particularly relates to grinding-machines adapted to grind or sharpen the bits of rotary cutters, and more especially to that class of such machines which are adapted to grind or sharpen the circular bits employed for cutting the tongues and grooves on boards.

In carrying out my invention I provide a suitable grinding-wheel which may be mounted and driven at a high speed in any approved manner. The cutter-head carrying the circular bits is supported on a carriage provided with devices for holding the bits in proper position to be ground or sharpened, and a gage of novel construction is employed to insure the uniform grinding of the bits to the same radius and to the proper shape. The bed-plate of the machine is provided with rails, on which slides in a direction parallel with the axis of the grinding-wheel a platform provided with bearings for an axle carrying wheels, on which rests one end of a carriage, the opposite end of the carriage being supported by a horizontal arm, which extends through a guide-opening formed in a standard rising from the platform. The carriage is provided with a stub or upwardly-projecting extension having a vertical opening which receives a vertical screw-threaded spindle operated by a screw-threaded wheel resting on the top of the stub. On the upper end of the spindle above the hand-wheel is a clamp-socket, which may be turned about the axis of the spindle and secured thereto in any desired position, and this socket-piece carries an arm, upon which is supported a casting formed with a socket for one end of an arbor, to which the cutter-head is attached. The casting is clamped to the laterally-projecting arm of the socket-piece and has a limited movement about the axis of said laterally-projecting arm. The arbor which carries the cutter-head is adapted to revolve in the socket in the casting, but is prevented from endwise movement therein. From the casting projects laterally a supporting-rod for the gage-fingers. This rod may be rigidly attached to the casting, or it may be attached to a collar adjustable in an arc around the axis of the casting. To the supporting-rod is attached a horizontally-projecting arm, which may be adjusted radially with reference to the axis of the cutter-head or longitudinally on the supporting-rod, and this arm carries one or more gage-fingers, each of which may be clamped in any desired position on the arm—that is, it may be moved longitudinally on the arm or about the axis thereof and it may also be moved about an axis perpendicular to the axis of said arm and also radially with reference to said arm. The arrangement of the mechanism is such that the cutter-head, by means of the sliding platform, may be moved in a direction parallel with the axis of the grinding-wheel toward and from the grinding-wheel, and it may be moved transversely to the axis of the grinding-wheel by means of the carriage. It may be adjusted vertically toward and from the grinding-wheel by means of the hand-wheel, before referred to. It may be given the desired horizontal inclination in a horizontal plane by means of the clamp-socket and a vertical inclination by means of the devices employed for connecting the casting, before referred to, to the laterally-projecting arm of the clamp-socket. Suitable indexes are provided for enabling the operator to adjust the mechanism to the proper position before the grinding is started. I also preferably employ an additional gage for the purpose of setting the cutters preliminary to grinding. My improved gage or "tracker" is also adapted for use in connection with a support, which is adapted to hold a cutter-head while the bits are being filed by hand in the ordinary way.

Further details of the construction, organization, and operation of the mechanism will be hereinafter more fully described, and the subject-matter deemed novel will be set forth in the claims.

In the accompanying drawings, Figure 1 shows a front elevation of a grinding-machine embodying my improvements with a

cutter-head in position to be ground. Fig. 2 shows a left-hand elevation thereof. Fig. 3 shows a top plan view of the same. The remaining figures are on an enlarged scale. Fig. 4 is a view of the gage, partly in section and partly in elevation and with some parts broken away. Fig. 5 is a sectional view illustrating the construction and operation of the vertically-adjustable spindle on which is mounted the clamp-socket that carries the casting which supports the arbor for the cutter-head. Fig. 6 is a view, partly in elevation and partly in section, of the arbor which carries the cutter-head and the casting which supports the arbor. Fig. 7 shows bottom plan detail views of the gage-fingers and their supporting-collars. Fig. 8 shows a cross-section on the line 8 8 of Fig. 6. Fig. 9 is a detail view of a part of a cutter-head carrying circular bits of the kind for which my grinding-machine is especially organized. Fig. 10 is a perspective view of a support adapted to hold a cutter-head while it is being filed with my improved gage or tracker applied; and Fig. 11 is a detail view, on an enlarged scale, showing the devices for supporting and clamping the arbor on which the cutter-head is mounted.

Referring to Figs 1 to 9, inclusive, from the bed-plate A rises a standard B, carrying lubricated bearings C for a shaft D, to which the grinding-wheel E is removably secured. The shaft D also carries a band-pulley F, which may be driven in any suitable way. The bed-plate A is provided with rails a, which support a platform G, from which rise lugs H, supporting an axle I, on the ends of which are mounted the wheels I′. The axle is preferably held rigidly in the lugs H by means of a screw H′ and the wheels revolve about the axle. The platform may be moved back and forth in a direction parallel with the axis of the grinding-wheel and may be set in any desired position by means of clamping devices J, extending through a slot J′ in the bed-plate. A standard K rises from the rear end of the platform, and at its upper end is formed with a sleeve K′, through which projects an arm K^2, extending rearwardly from a stub L′, projecting upwardly from the rear end of the carriage L. The carriage at its front end is formed with downwardly-projecting flanges l, which rest on the rollers or wheels I′. In this manner the carriage is supported so that it may move freely back and forth in a direction at right angles to the axis of the driving-shaft, and it is prevented from movement in a direction parallel with the direction of the driving-shaft relatively to the platform J.

The stub L′ is formed with a socket-piece l' for the spindle M. This socket-piece is slotted at l^2, as indicated in Fig. 2, the slot extending vertically from the bottom of the socket-piece nearly to the top thereof, and on opposite sides of the slot are formed flanges l^3, carrying a clamping-bolt l^4, by means of which the area of the socket may be increased or diminished. The vertical spindle M is screw-threaded, as indicated, and extends vertically through the socket-piece l'. It engages a hand-wheel M′, which rests on the top of the socket-piece l'. The spindle is formed on one side with a vertical groove m, into which extends a screw m', that enters a screw-threaded opening in the socket l'. By this means the spindle M may be raised and lowered by the wheel M′, but it is prevented from turning about on its own axis. It is important that when the spindle is once adjusted it should be held firmly in place against movement in any direction. If the hand-wheel M′ were accidentally moved, it might change the adjustment of the mechanism, and as a safeguard I therefore employ the hand-wheel N, having a screw-threaded spindle n', entering a screw-threaded opening in the socket-piece l' and extending into the groove m of the spindle M. By means of this hand-wheel the spindle may be securely locked in the socket-piece l', so that it cannot be moved relatively thereto even by the hand-wheel M′. By means of the clamping-bolt l^4 the spindle may be made to fit closely the socket-piece, so that it may be prevented from wabbling or tilting, as it might do if the socket were much larger than the spindle.

The upper end of the spindle M is formed with a shoulder o, and above this shoulder the spindle is made smooth and cylindrical to receive the sleeve portion o' of the clamp-socket O. This clamp-socket is split, as indicated most clearly in Fig. 2, and on opposite sides of the slot o^2 is formed with flanges o^3, with which engages the screw-threaded portion of a spindle o^4, carried by a hand-wheel O′. The clamp-socket may be turned in a horizontal plane about the axis of the spindle M and may be clamped firmly in place on the spindle M by means of the hand-wheel O′. A cylindrical arm P projects laterally from the clamp-socket O, and on this arm is supported a casting Q, that carries the arbor R, to which the cutter-head is attached. The casting Q is formed with a socket that receives the arm P, and the casting is split at p and provided on opposite sides of the slotted or split portion with flanges p', with which engages the screw-threaded spindle p^2 of the hand-wheel P^2, by means of which hand-wheel the casting Q may be firmly attached to the arm P, or it may be loosened thereon, so that it may be turned relatively thereto. Only a limited movement can, however, be given to the casting Q relatively to the arm P, inasmuch as the arm P is provided with a feather p^3, which enters a groove q in the casting Q. This groove is only slightly wider than the feather p^3, and therefore the casting Q can only be tilted either upwardly or downwardly to a very slight extent, the purpose of this adjustment being to so hold the cutter-head relatively to the grinding-wheel that

the frame of the cutter-head may be held out of contact with the grinding-wheel when the bits or cutters are being sharpened.

The arbor R is provided with a cylindrical front portion r, to which the cutter-head may be attached in any suitable way. The rear portion r' of the arbor is somewhat reduced in diameter and extends into a socket q' in the casting Q. The rear portion r' is formed with an annular groove r^2, which receives two semicircular shoes r^3, that are held in the groove by means of screws q^2, extending laterally through the casting Q and into recesses in the outer faces of the shoes. The parts within the socket q' are made smooth, so that the arbor may revolve or be turned easily; but endwise movement of the arbor in the socket is prevented by means of the shoes and the set-screws q^2.

By the mechanism thus far described the cutter-head S (illustrated in Fig. 1) may be moved in any desired direction relatively to the grinding-wheel E, and by moving the carriage L back and forth transversely of the axis on the revolving grinding-wheel the bits s may be sharpened. It is important, however, that the bits should be uniformly sharpened—that is, that they should be sharpened in such manner that their outer cutting-faces shall all be of the same radius relatively to the axis of the cutter-head—and as the bits have their cutting edges inclined in the manner illustrated in Fig. 9 it is important that these inclined edges should be uniform throughout the series of bits. I have provided a gage, or, as I call it, a "tracker," by means of which the operator may determine when the bits are being properly ground and which will enable him to make proper adjustments of the mechanism should the original adjustment not produce the desired result.

To the casting Q, I attach a rod T, which supports the gage-fingers or trackers. This rod may be rigidly attached to the casting Q; but it is preferably attached to a collar T', that may be adjusted about the axis of the arbor R by means of a set-screw t. The purpose of this adjustment is to hold the gage-fingers or trackers in any desired position about the axis of the arbor to accommodate variations in the light. Sometimes the light strikes the gage-fingers when they are in one position better than when they are in another position. This adjustment of the supporting-rod enables me to hold the gage-fingers in the best light obtainable. The rod T is preferably attached to the collar T' by a screw-threaded connection, as shown, a clamping-nut t' being employed, so that the rod cannot turn about its own axis. The rod carries a sleeve U, which slides longitudinally on the rod toward and from the axis of the arbor which carries the cutter-head. It is necessary to provide a very fine adjustment, and the means which I employ for moving the sleeve U longitudinally on the rod T consist of a sliding nut V, having bosses v v', provided on their exterior with right and left hand screw-threads. The upper boss v extends into a screw-threaded socket in the lower end of the sleeve U, while the lower boss v' extends into a screw-threaded socket in the upper end of a sliding sleeve W. The sleeves U and W are provided with set-screws u and W', respectively. When the set-screws u W' are loose, the nut V and the sleeves U and W may be moved quickly along the rod to approximately the desired position. Then the screw W' should be tightened, and a fine adjustment may be obtained by means of the nut V. After the desired adjustment is reached the set-screw u is tightened.

The gage-fingers are carried by a rod or arm X, projecting laterally in a horizontal plane from the sleeve U. The screw-threaded end x of the rod enters a screw-threaded socket in the boss x' of the sleeve U. The extreme inner end of the rod X is shaped to enter a longitudinal groove u^2 in the rod T, by which means the sleeve U is prevented from turning on its supporting-rod. A clamping-nut x^2 is employed to prevent the rod X from turning in its socket when once adjusted to the proper extent. The gage-fingers are carried by collars y, provided with set-screws y', by means of which the fingers may be adjusted longitudinally on the rod X, and also may be turned about the axis of the arm and held firmly in the desired position. Each finger consists of a portion y^2, preferably rectangular in cross-section, but having a beveled or inclined outer end. The inner end of the finger is formed with a cylindrical stud y^3, entering a corresponding socket in the collar y and held therein by a set-screw y^4. By this means the finger may be adjusted about an axis perpendicular to the axis of the rod or arm X, which adjustment enables the finger to be inclined to correspond with the inclination of the edge of the bit s, as indicated in Fig. 9. The construction also enables the fingers to be adjusted in their sockets toward and from the arm X. I preferably employ two gage-fingers, but one only need be used. One of the gage-fingers is used for gaging or "tracking" the bits on one side of the cutter-head, while the other finger is employed for gaging or tracking the bits on the opposite side of the cutter-head. But one finger, as before stated, may be employed, being properly adjusted when the grinding operation is transferred from one set of bits to the other set.

As indicated particularly in Fig. 1, I employ an additional gage. This is for the purpose of enabling the operator to adjust the bits on the cutter-head in such manner that they will be in proper position to be ground and will require very little, if any, adjustment after they are applied to the arbor R. This gage is similar in all respects to that above described. The collar T' is attached to an arbor or mandrel Z, projecting laterally from the front of the standard B. The cut-

ter-head may be mounted on the arbor Z in such position as to be gaged by the fingers Y Y′. After the bits are properly adjusted the cutter-head may be removed from the arbor Z and attached to the arbor R, and then when the mechanism is properly adjusted the grinding of the bits may be proceeded with, the carriage L being moved back and forth, so as to cause the proper surfaces of the bits to pass back and forth in contact with the revolving grinding-wheel. Preferably a clamping device Z^2 is employed for holding the arbor Z stationary when it is desired to tighten up the bits on the cutter-head.

The gage-fingers may be adjusted and firmly held in such manner that they may gage the bits on a series of cutter-heads—that is to say, after once adjusting the gage-fingers the bits on the cutter-head may be properly ground, and then another cutter-head may be attached to the arbor and ground without changing the position of the gage-fingers, which may be set to gage a series of cutters of the same pattern and of the same size.

The operation of the mechanism has been described while describing the construction thereof. The operation of the mechanism employed for adjusting the cutter-head relatively to the grinding-wheel need not be enlarged upon. As to the adjustments of the gage-fingers, it may be further stated that the devices which I employ enable me to bring the gage-fingers in such position relatively to the edges of the cutters that the operator may readily determine when the cutters have been ground to a sufficient extent. The fingers are so mounted that they may be adjusted in radial lines relatively to the axis of the cutter in lines parallel therewith and also about axes perpendicular to the axis of the cutter-head.

Fig. 1 shows the machine in the act of grinding one of the bits of the cutter-head S. In order to gage this bit, the operator turns the cutter-head slightly to the left until the bit comes under the appropriate gage-finger. When the bit just clears the gage-finger to a uniform extent from end to end of such finger, then the operator knows that the bit has been properly ground and he proceeds to grind another bit. If, however, the bit touches the gage-finger at any point thereof, the grinding of this bit is continued. If the operator cannot clearly see the relation of the gage-finger to the bit when the finger is in the position shown in Fig. 1, he may adjust the collar T′ on its support in such manner as to move the gage-finger to a horizontal plane either above or below that indicated in Fig. 1, where a better light may be obtained. It will be observed that the front end of the carriage is provided with an index G′, which is used in connection with a pointer G^2, and it will also be observed by reference to Fig. 3 that the upper end of the spindle M and the tops of the clamp-casting O are provided with indexes. The longitudinal adjustment of the carriage determines the hook of the bit—that is to say, by adjusting the carriage longitudinally to the proper extent in the proper direction more or less hook may be given to the bits, adapting them for working on either hard or soft wood. Bits intended to work on soft wood require more hook than those intended to work on hard wood. The adjustment of the clamp-casting O about the spindle M enables the operator to set the cutter-head at the proper inclination to accommodate the slant or inclination of the bits, and the indexes on the upper ends of the clamp-casting and the spindle enable him to make this adjustment before the cutter-head is applied to its arbor or after it is applied thereto. The vertical adjustment of the spindle M of course regulates the depth of the cut and accommodates the machine to different-sized cutter-heads or bits of various sizes.

The machine is shown as operating upon the cutter-head-carrying bits adapted to cut tongues on boards; but the machine is adapted also to sharpen bits adapted to cut grooves, in which case the grinding-wheel, which is beveled, as shown, should be removed and reversed.

In Figs. 10 and 11 I have shown my improved gage or tracker applied to a simple support adapted to hold a cutter-head while the bits are being filed in the ordinary way. 1 indicates a base, from which rises a tubular standard 2, that receives the downwardly-projecting arm 3 of the mandrel-socket 4. The mandrel 5 is adapted to receive a cutter-head on its outer end, while its inner portion is shouldered at 6 and reduced in diameter at 7, where it enters the socket 4. The inner portion of the mandrel is formed with an annular groove 8, in which fits a semicircular shoe 9, engaged by a set-screw 10, extending through the socket 4. By this arrangement when the set-screw 10 is loose the mandrel may be turned about its axis, by which the set-screw is tightened and the mandrel is held against movement. The socket 4 may be turned to any convenient position about the axis of the arm 3 when the set-screw 11 is loose. By tightening the screw 11 the socket is held firmly in place. The gage or tracker 12 is of the same construction as that hereinbefore described. The cutter-head should be securely fastened to the mandrel 5 and the bits filed or sharpened one after the other, the operation being tested from time to time by the tracker.

I claim as my invention—

1. The combination with a support for the cutter-head; of a gage for the cutters which is adjustable radially with reference to the axis of the cutter-head and also in a direction parallel with such axle.

2. The combination with a support for the cutter-head; of a gage for the cutters adjustable radially with reference to the axis of the

cutter-head, and also in an arc about an axis parallel with the axis of the cutter-head, but outside the arc in which the cutter moves.

3. The combination with a support for the cutter-head; of a gage for the cutters adjustable radially with reference to the axis of the cutter-head, and also in an arc outside of the plane of rotation of the cutters but struck from the axis of the cutter-head.

4. The combination with a support for a cutter-head; of a gage for the cutters adjustable radially with reference to the axis of the cutter-head in a direction parallel with said axis, in an arc about the axis of the cutter-head, and also about an axis perpendicular to the axis of the cutter-head.

5. The combination with a support for a cutter-head; of a gage-finger having an inclined edge or face next the cutters, and means for adjusting said gage-finger toward and from the axis of the cutter-head, and also in a direction parallel therewith.

6. The combination with a support for a cutter-head; of a collar surrounding the axis of the cutter-head; a rod projecting therefrom; an arm projecting laterally from said rod; a gage-finger carried by said arm; means for adjusting the collar about the axis of the cutter-head, and devices for adjusting the laterally-projecting arm on its supporting-rod.

7. The combination with a support for a cutter-head; of a rod projecting radially with reference to the axis of the cutter-head; a laterally-projecting arm on said rod; a sliding sleeve carried by said rod; devices for clamping the sleeve to the rod; a sliding sleeve on the rod to which the laterally-projecting arm is attached; a nut interposed between the two sleeves for adjusting the sleeve carrying the arm; and a gage-finger carried by the laterally-projecting arm.

8. The combination with a support for a cutter-head; of a rod projecting laterally with reference to the axis of the cutter-head; a laterally-projecting arm supported by said rod; a collar on said arm adjustable longitudinally thereon, and also about the axis thereof; and a gage-finger carried by said collar adjustable about an axis perpendicular to the axis of said collar-supporting arm, and also toward and from said arm.

9. In a grinding-machine the combination with a grinding-wheel and a support for the cutter-head; of means for adjusting the support for the cutter-head relatively to the grinding-wheel; and a gage for the cutters outside their path of rotation which is adjustable radially with reference to the axis of the cutter-head, and also in a direction parallel with said axis.

10. In a grinding-machine the combination of a grinding-wheel; a platform adjustable in a direction parallel with the axis of the grinding-wheel; a carriage mounted on the platform and movable thereon in a direction perpendicular to the axis of the grinding-wheel; a vertically-adjustable spindle carried by the carriage; means for holding the spindle in its adjusted position; a clamp-socket on the upper end of the spindle and adapted to turn thereon without moving the spindle; means for clamping the socket on the spindle; a casting carried by said clamp-socket and turning therewith, and an arbor carried by said casting.

11. In a grinding-machine the combination of a grinding-wheel; a platform adjustable relatively thereto; a guiding-standard rising from said platform; a carriage having an arm guided by said standard at one end; means for supporting and guiding the opposite end of the carriage; a vertically-adjustable spindle carried by the carriage; means for preventing the spindle from turning; devices for clamping the spindle in its adjusted position; a clamp-socket carried on the upper end of the spindle and adapted to turn thereon without moving the spindle, means for clamping the socket on the spindle, a casting carried by said clamp-socket and turning therewith, and an arbor carried by said casting.

12. In a grinding-machine the combination of a grinding-wheel; a platform; a carriage supported thereon and guided thereby; a socket-piece on the carriage; a vertically-adjustable spindle extending from said socket-piece; means for enlarging or decreasing the vertical opening in said socket-piece; a screw-threaded hand-wheel resting on the socket-piece and engaging the vertically-adjustable screw-threaded spindle; devices for preventing the spindle from rotating; means for clamping the spindle in its adjusted position; and an arbor for a cutter-head supported on the upper end of said spindle.

13. In a grinding-machine the combination of a grinding-wheel; a carriage movable transversely to the axis of the grinding-wheel; a vertically-adjustable spindle supported on the carriage; a clamp-socket adjustable about the axis of the spindle; a casting connected with said clamp-socket; an arbor for a cutter-head carried by said axis; and devices for tilting or adjusting the casting about an axis perpendicular to the axis of the vertically-adjustable spindle.

14. In a grinding-machine the combination of a grinding-wheel; a carriage movable in a direction perpendicular to the axis of the grinding-wheel; a vertically-adjustable spindle carried by the carriage; a clamp-socket carried by the spindle, and having a laterally-projecting arm; a casting supported on said arm; an arbor for a cutter-head carried by said casting, and means for adjusting the casting about the axis of its supporting-arm to a limited extent, and for clamping it securely to said arm.

15. In a grinding-machine the combination of a grinding-wheel; a carriage movable transversely with reference to the axis of the grinding-wheel; a vertically-adjustable spindle

mounted on the carriage; a casting connected with and supported by said spindle and provided with a socket for one end of an arbor which supports a cutter-head; semicircular shoes entering recesses in that end of the arbor within the casting, and set-screws for preventing endwise movement of the shoes.

In testimony whereof I have hereunto subscribed my name.

JOEL ETTINGER.

Witnesses:
W. A. NEAGLEY,
A. L. ANDERSON.