(No Model.)

10 Sheets—Sheet 1.

# C. H. TRASK.

## GRINDING MACHINE.

No. 530,292.

Patented Dec. 4, 1894.

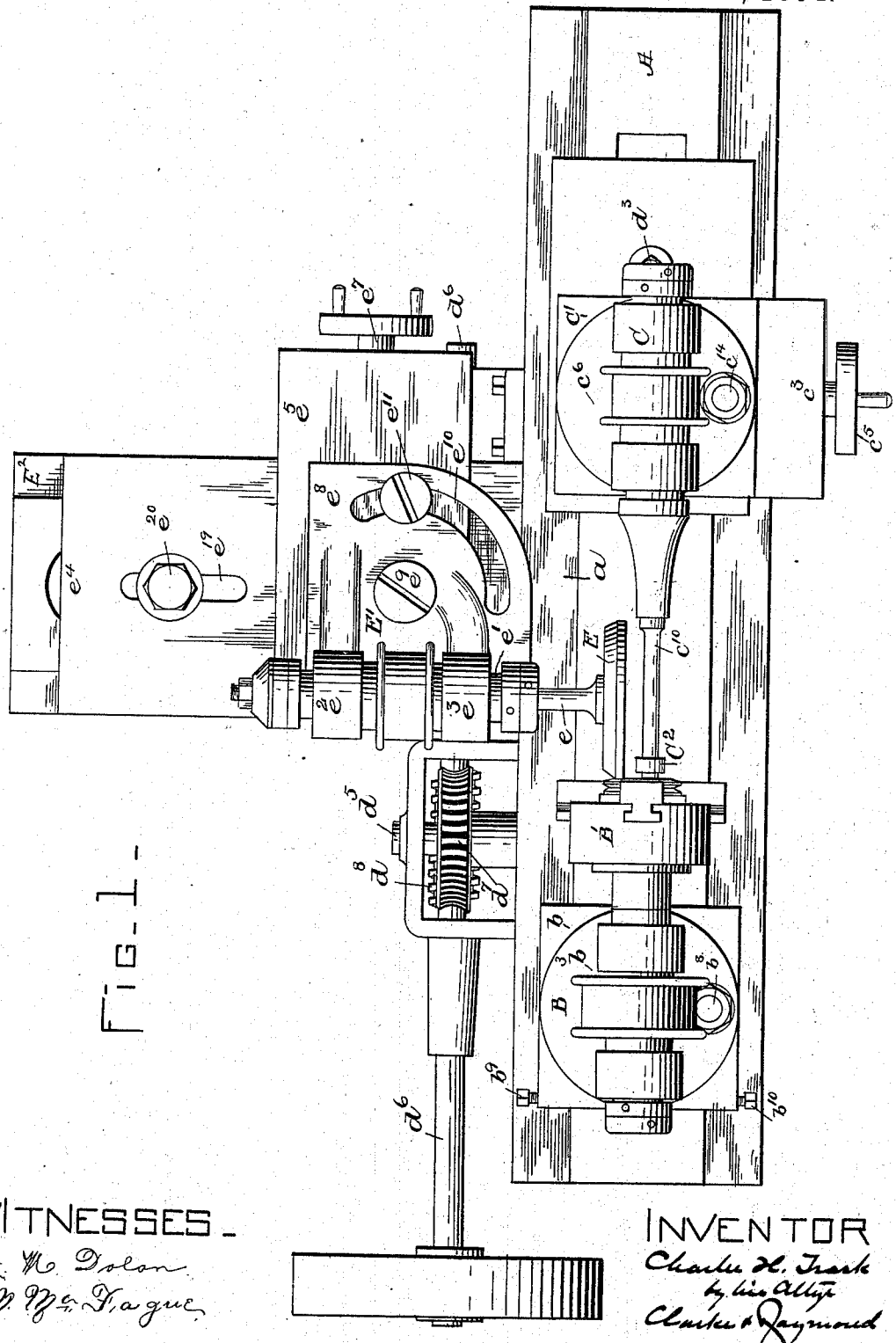

FIG. 1.

WITNESSES.

J. M. Dolan

W. W. Teague

INVENTOR

Charles H. Trask

by his Attys

Clarke & Raymond

(No Model.)

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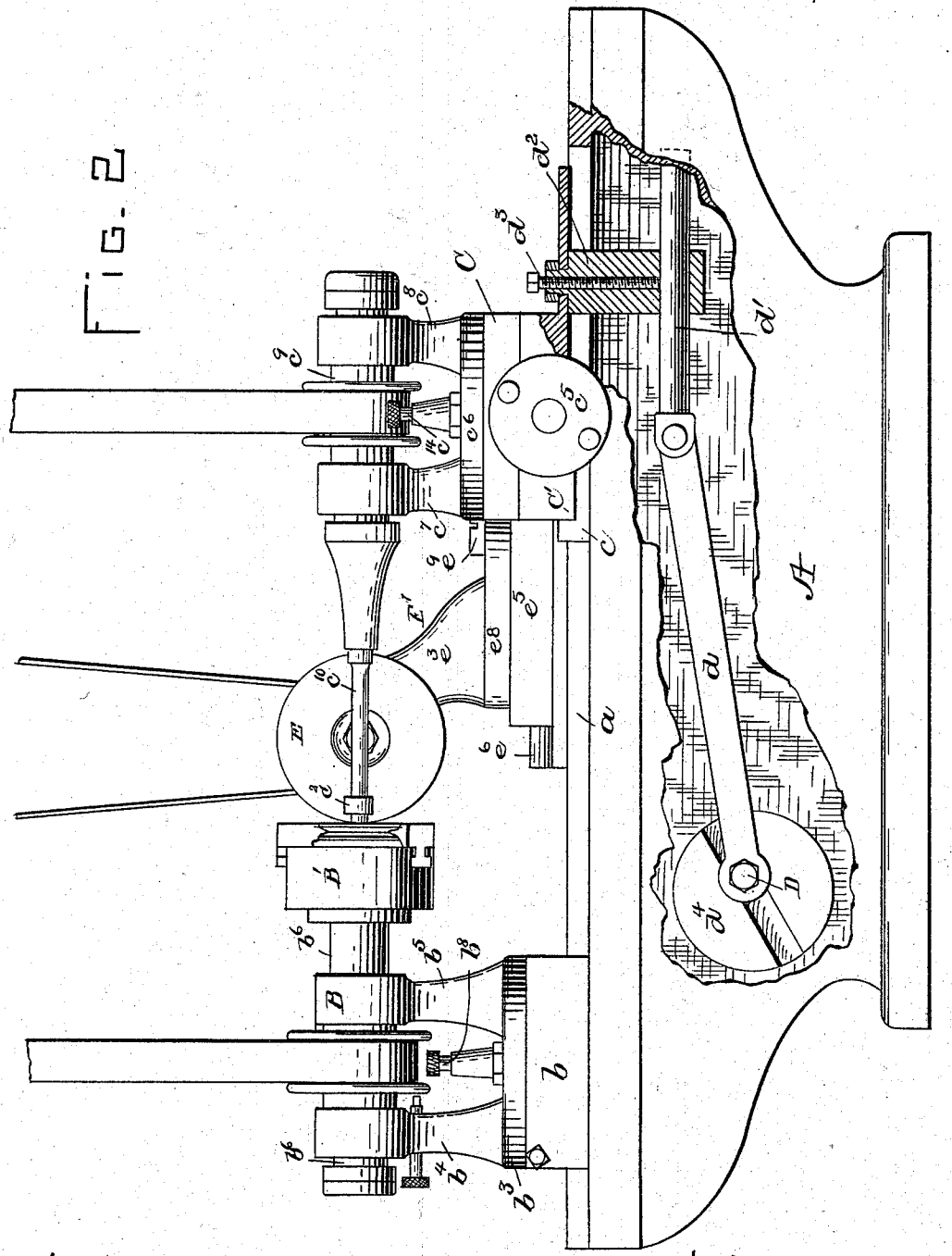
# C. H. TRASK.

## GRINDING MACHINE.

No. 530,292. Patented Dec. 4, 1894.

Fig. 2.



WITNESSES.

J. M. Dolan

M. McVague.

INVENTOR

Charles H. Trask

by his Attys

Charles & Raymond

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# C. H. TRASK.

## GRINDING MACHINE.

No. 530,292. Patented Dec. 4, 1894.

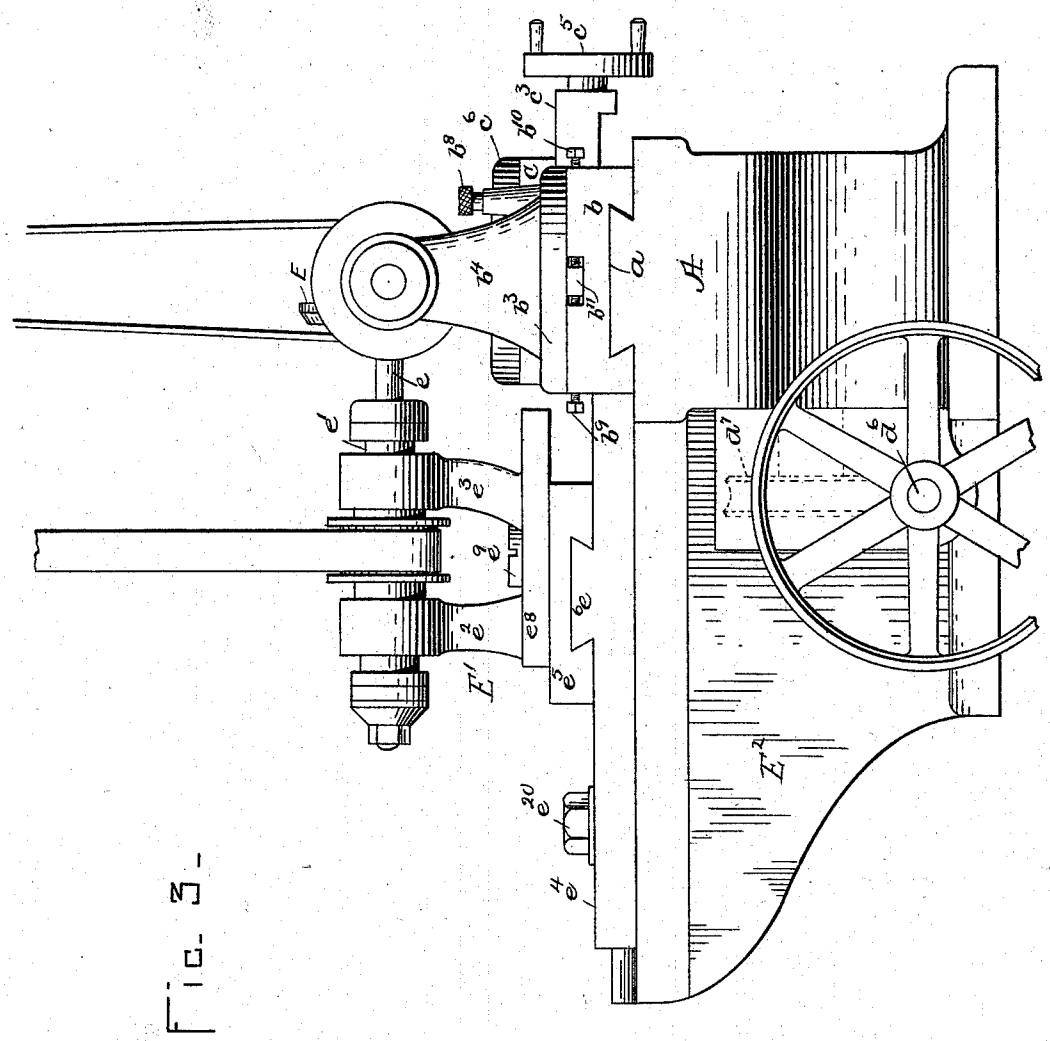

FIG. 3.

WITNESSES.

J. Mc Dolan

M. Mc Hague

INVENTOR.

Charles H. Trask

by his Attys

Clarke & Raymond

(No Model.) 10 Sheets—Sheet 4.

# C. H. TRASK.

## GRINDING MACHINE.

No. 530,292. Patented Dec. 4, 1894.

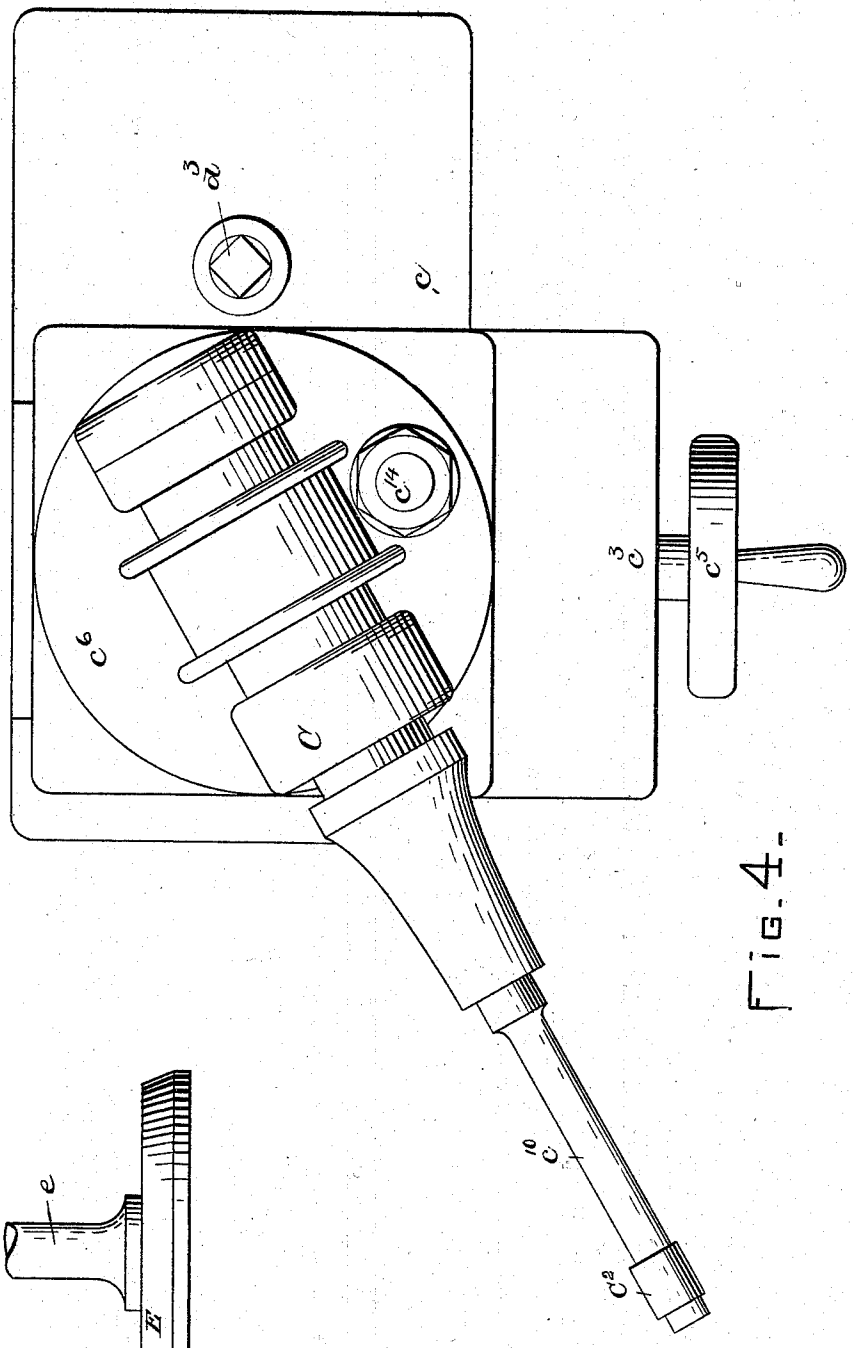


Fig. 4.




WITNESSES.
J. W. Dolan
M. McFague

INVENTOR.
Charles H. Trask
by his Attys
Clarke & Raymond

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# C. H. TRASK.

## GRINDING MACHINE.

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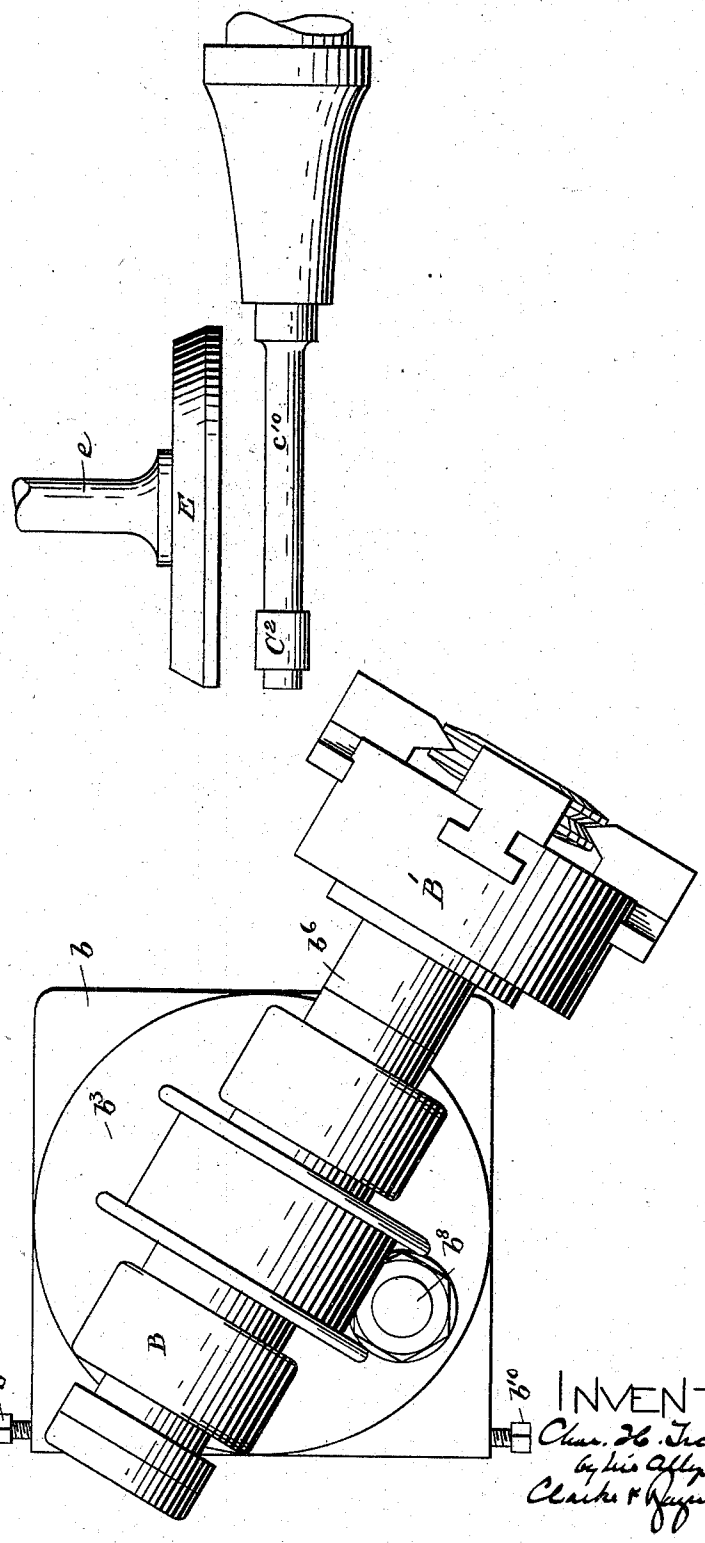



FIG. 5.

WITNESSES.
J. W. Dolan.
M. M. Prague.

INVENTOR
Chas. H. Trask
by his Attys
Clarke & Raymond

(No Model.) 10 Sheets—Sheet 6.

# C. H. TRASK.

## GRINDING MACHINE.

No. 530,292. Patented Dec. 4, 1894.

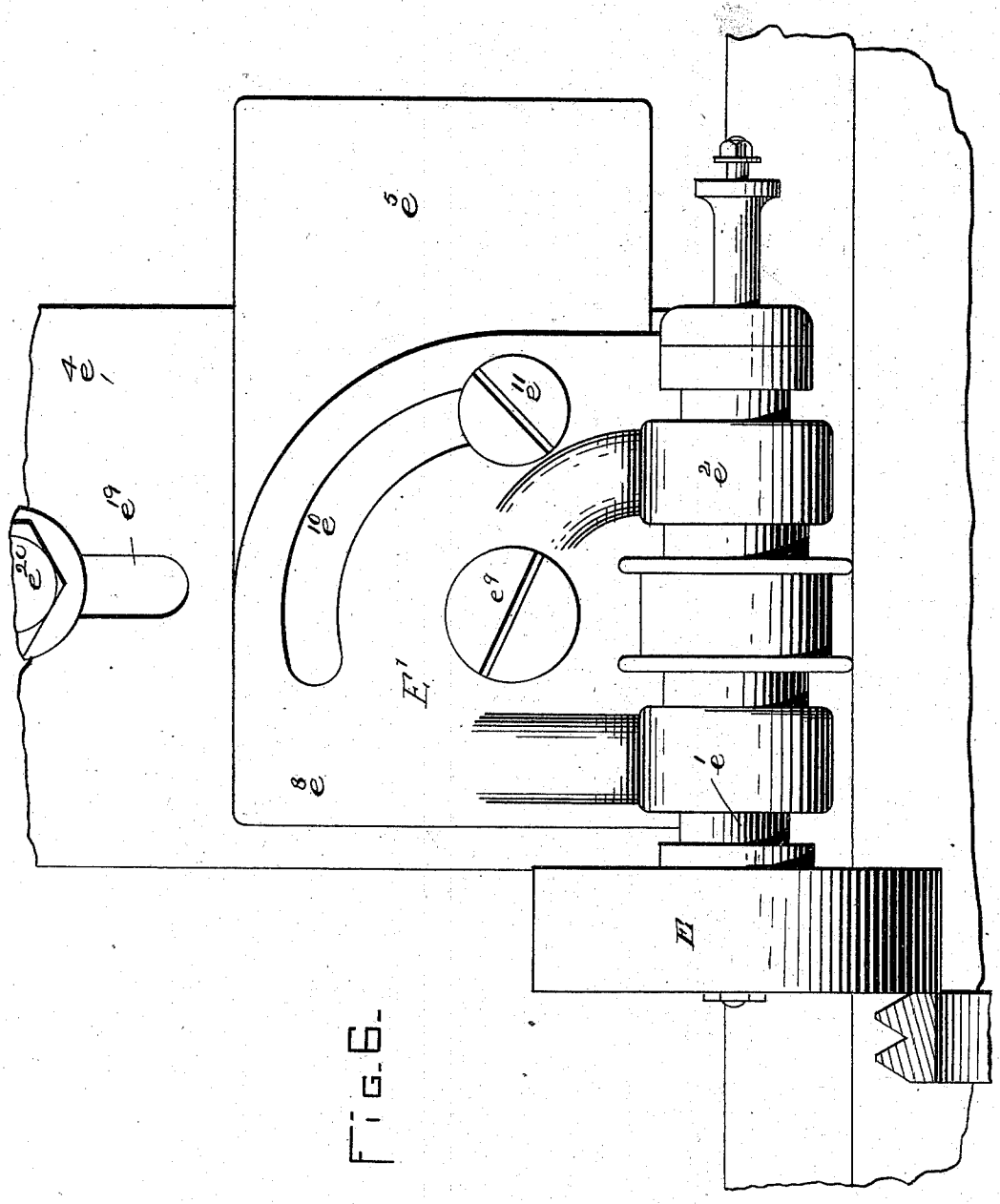



Fig. 6.

WITNESSES_

J. H. Dolan

M. M. Fague

INVENTOR_

Charles H. Trask

by his Attys

Charles J. Raymond

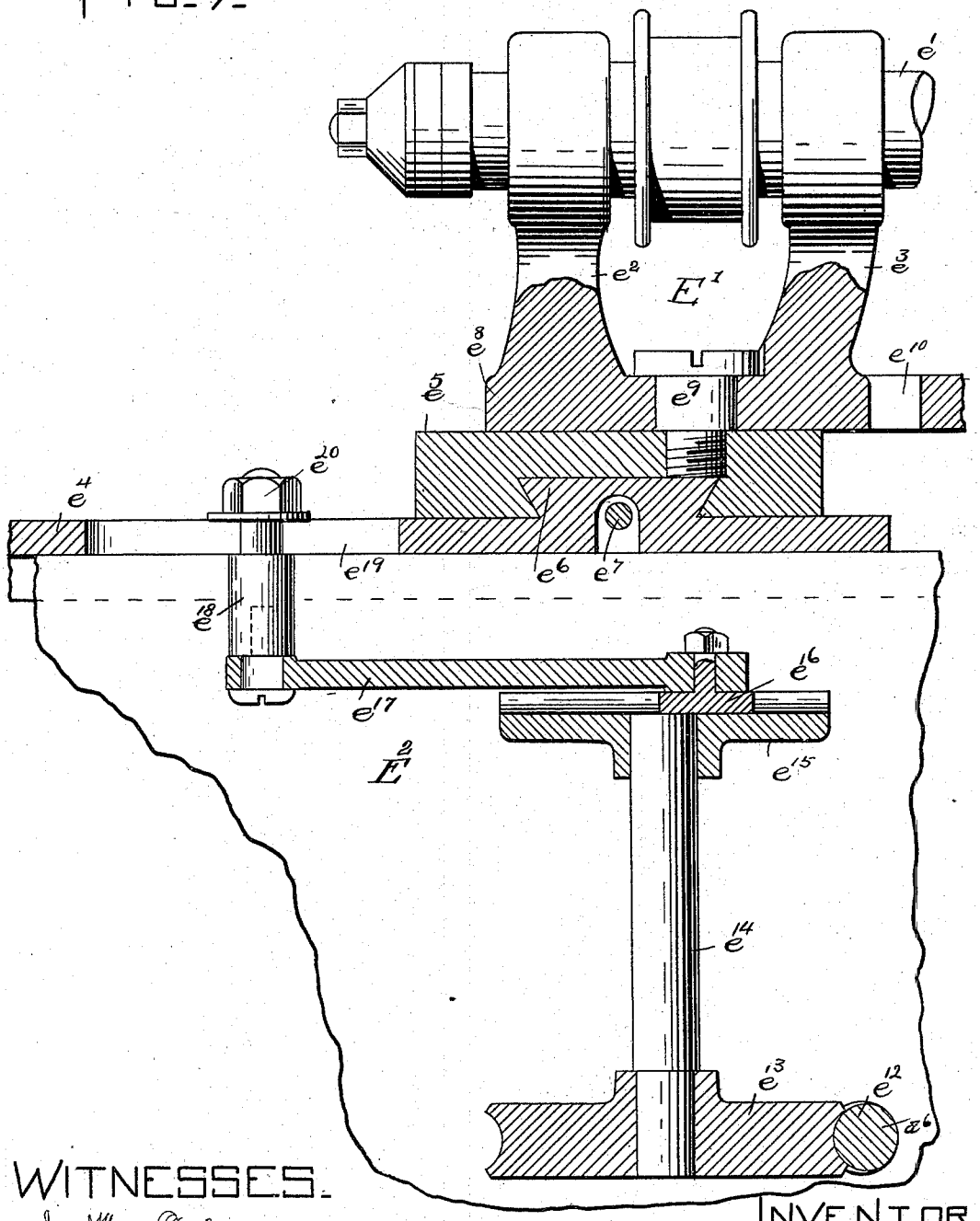
(No Model.) 10 Sheets—Sheet 7.

# C. H. TRASK.

## GRINDING MACHINE.

No. 530,292. Patented Dec. 4, 1894.

FIG. 7.




WITNESSES.

J. M. Dolan

W. Mc. Fraguer

INVENTOR

Charles H. Trask

by his Attys

Clarke & Raymond

(No Model.) 10 Sheets—Sheet 8.

# C. H. TRASK.

## GRINDING MACHINE.

No. 530,292. Patented Dec. 4, 1894.

Fig. 8.

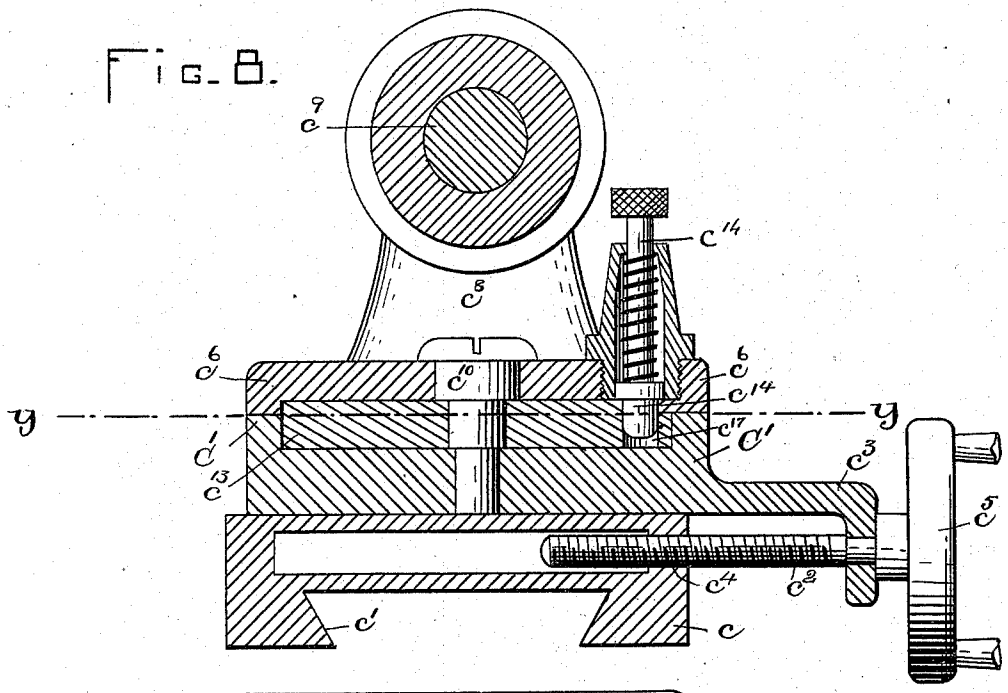
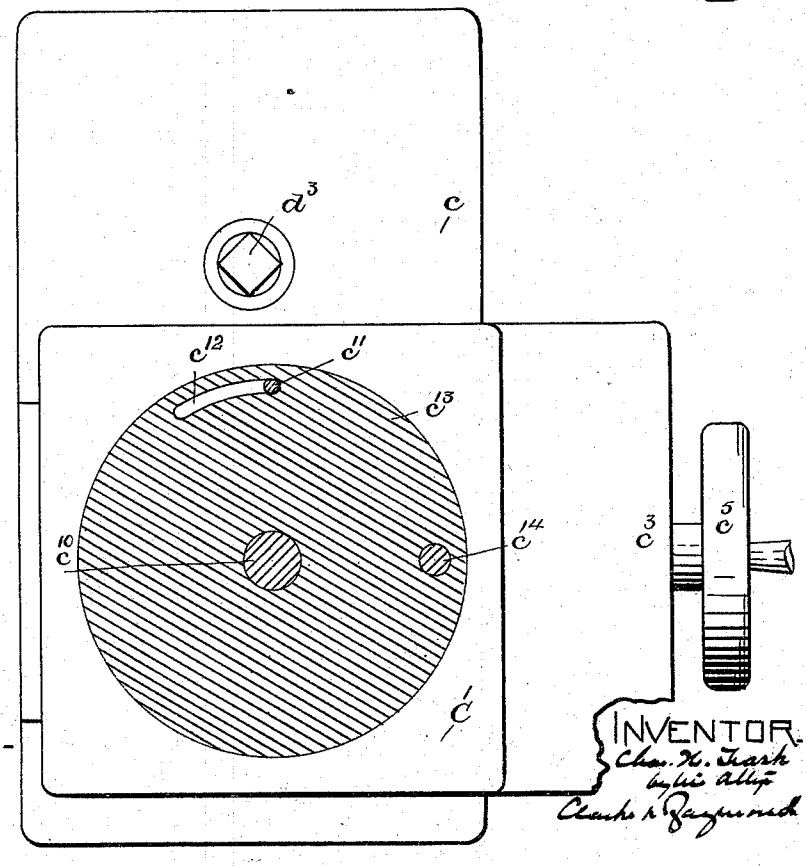



Fig. 9.




WITNESSES.
L. M. Dolan.
M. McNaguen.

INVENTOR.
Chas. H. Trask
by his Attys
Clarke & Raymond

(No Model.) 10 Sheets—Sheet 9.

# C. H. TRASK.

## GRINDING MACHINE.

No. 530,292. Patented Dec. 4, 1894.

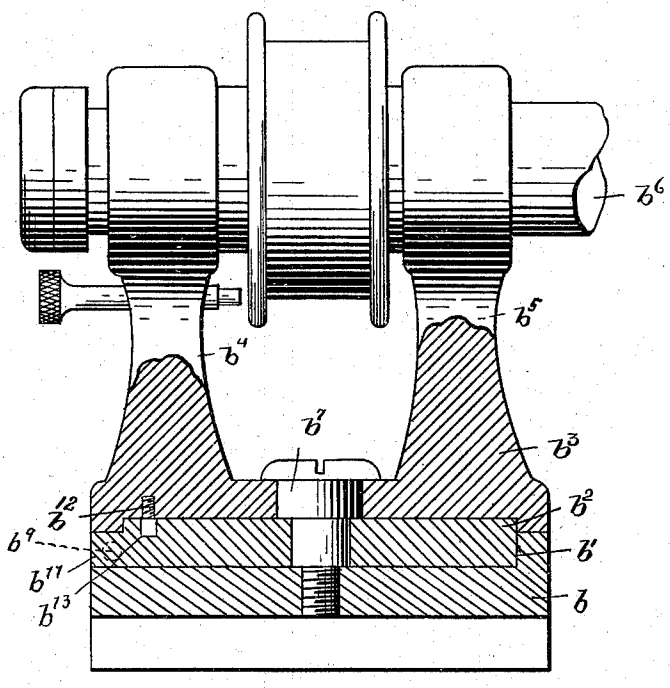



FIG. 10.

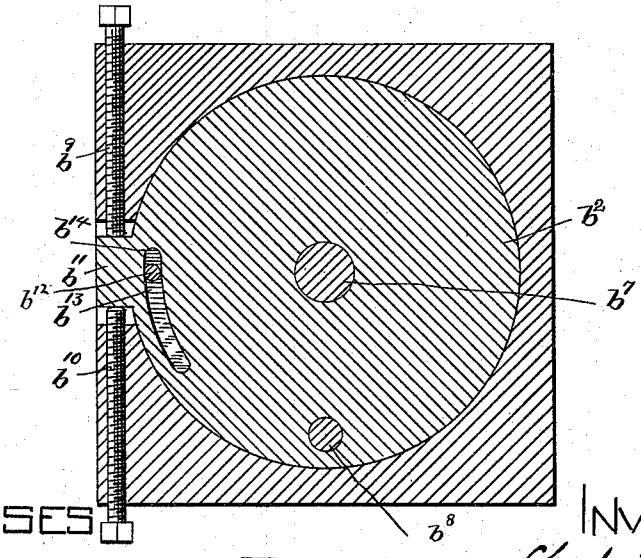



FIG. 11.

WITNESSES

J. M. Dolan

M. McGrague

INVENTOR.

Charles H. Trask

by his Attys

Clarke & Raymond

(No Model.) 10 Sheets—Sheet 10.

# C. H. TRASK.

## GRINDING MACHINE.

No. 530,292. Patented Dec. 4, 1894.

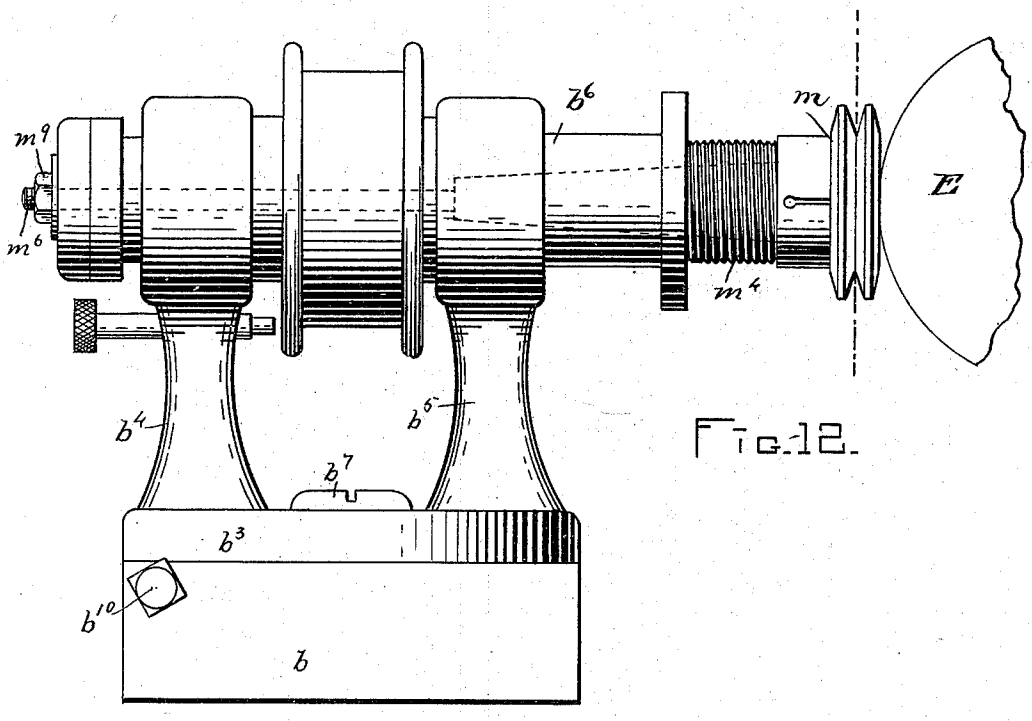
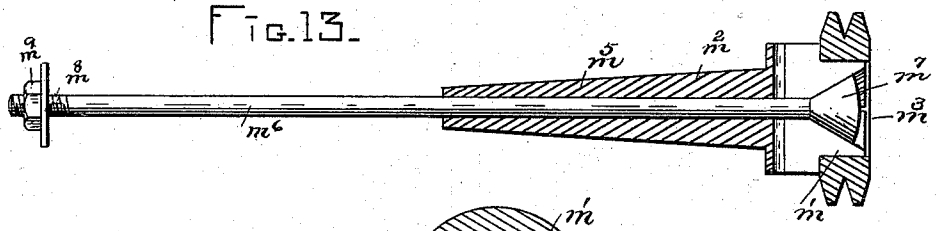



Fig. 12.

Fig. 13.



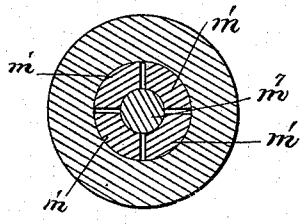




Fig 14

WITNESSES.

J. M. Dolan.

J. M. McFarlane.

INVENTOR.

Charles H. Trask

by his Attys

Clarke & Raymond

# UNITED STATES PATENT OFFICE.

CHARLES H. TRASK, OF LYNN, MASSACHUSETTS.

## GRINDING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 530,292, dated December 4, 1894.

Application filed November 6, 1891. Serial No. 411,041. (No model.)

*To all whom it may concern:*

Be it known that I, CHARLES H. TRASK, a citizen of the United States, residing at Lynn, in the county of Essex and State of Massachusetts, have invented a new and useful Improvement in Grinding-Machines, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings forming a part of this specification, in explaining its nature.

The invention relates to an improvement in grinding machines organized to grind automatically and simultaneously the hole and one side face of a disk, cutter or other thing. To accomplish this end the disk is mounted in a chuck which is adapted to be rotated in the ordinary way, and an internal grinding wheel is mounted upon a spindle carried by a head which has a movement on the bed of the machine to and from the chuck. This grinding wheel or disk is adapted to grind the internal surface of the disk or cutter. Another grinding wheel is mounted upon another spindle carried by a head which has a traversing movement in a direction at right angles to that of the first spindle and head, and this grinding wheel serves to act upon the face of the disk or cutter. The respective movements of the two grinding wheels are so timed that they do not interfere with each other. Either grinder can be used independently if desired and the extent of the traversing movement of each is independently adjustable.

The invention further relates to various features of organization and construction, all of which will hereinafter be described.

In the drawings—Figure 1 is a view in plan of a machine having the features of my invention. Fig. 2 is a view principally in side elevation, a portion of the frame of the machine being broken out to show a portion of the operative mechanism. Fig. 3 is a view in end elevation of my improved machine. Figs. 4, 5 and 6 are detail views to show various adjustments of the parts to which reference is hereinafter made. Fig. 7 is a detail view enlarged principally in section to show the mechanism for operating the head carrying the face grinding wheel. Fig. 8 is a vertical section showing the head which carries the spindle operating the internal grinding wheel. Fig. 9 is a section upon the dotted line $y$ $y$ of Fig. 8. Figs. 10 and 11 represent means for adjusting the head carrying the chuck. Fig. 12 is a view in side elevation of a clutch for holding a tool blank or disk having a hollow center by its inner edge. Fig. 13 is a longitudinal section of the clutch. Fig. 14 is a cross section upon the dotted line of Fig. 12 representing the tool blank as held by the internal clutch.

Referring to the drawings A is the frame of the machine. It has at its top the longitudinal bed $a$. Upon this bed at one end is the head B carrying the chuck and at the other end a reciprocating or traversing head C carrying the internal grinder wheel or tool $C^3$. The head B carrying the chuck preferably is attached or secured to the bed $a$ in a manner to permit of variation upon a horizontal plane of the chuck from and to the central line of its spindle for the purpose of adjusting the chuck and disk or cutter carried thereby either to a central position or to a position which shall move the spindle and chuck to any desired angle in relation to said central line, either to the one side or the other. This is for the purpose of presenting the disk or cutter being ground at any desired angle or position to the grinding wheels. In addition to this adjusting movement the head is also provided with a swinging movement horizontally whereby it is adapted to be turned from its operative position or that shown in Fig. 1, to the position shown in Fig. 5. This permits the clutch and the disk or cutter which it holds to be moved away from the grinding wheels or tools to a position to be readily inspected and measured by the operator.

The adjustment and swinging movement of the clutch head are accomplished as follows: The clutch head is mounted upon the block $b$ which is secured to the bed of the machine. In its upper surface there is a cylindrical recess $b'$ which receives and holds the circular block $b^2$. Over this circular block and mounted upon the block $b$ is the plate $b^3$ from which rise the standards $b^4$ $b^5$ which support the shaft $b^6$ which carries at its forward end the chuck B'. The plate $b^3$ is secured to the block $b$ by a stud $b^7$, and the plate is adapted to be turned upon this stud. It is fastened to the plate $b^2$ by a spring pin $b^8$ which may be similar in form and construction to the spring

pin $c^{14}$. Shown in Fig. 8. When the spring pin is disengaged from the plate $b^2$ the plate $b^3$ and the shaft $b^6$ and clutch are adapted to be turned upon the stud $b^7$ to the position represented in Fig. 5. The circular plate $b^2$ is adapted to be adjusted by means of the adjusting screws $b^9$ $b^{10}$ carried by the block $b$ which bear upon each side of a tongue $b^{11}$ extending from the edge of the plate $b^2$ (see Fig. 11), and as the plate $b^3$ has a pin $b^{12}$ which enters a grooved slot $b^{13}$ in said plate $b^2$ and as the end $b^{14}$ of the slot in connection with the spring pin $b^8$ determines the position of the plate $b^3$ in relation to the plate $b$, it follows that if the plate $b^2$ is rotated or moved by the adjusting screws $b^9$ $b^{10}$ that the angle of the shaft $b^6$ upon a horizontal plane from the central line of the chuck spindle will be varied.

The head C not only has a reciprocating movement toward and from the chuck but it is laterally adjustable and is also adapted to be turned from its straight or operative position represented in Fig. 1 to the position represented in Fig. 4. The head comprises as a whole the slide $c$ (see Fig. 8) which has a dovetail way $c'$ in its under face to fit dove tail guides of the bed $a$. Upon this slide is another or cross slide C′ which is mounted upon the slide $c$ by a dove-tail connection to have a traversing movement thereon, the said movement being accomplished by means of an adjusting screw $c^2$ carried by the extension $c^3$ of the slide and screwing into a nut $c^4$ in the slide $c$. This screw is turned by the handle $c^5$. (See Fig. 2.) This slide C′ carries the plate $c^6$ from which rise the standards $c^7$ $c^8$ supporting the shaft $c^9$ to which the spindle $c^{10}$ carrying the internal grinding wheel $C^2$ is attached, and the plate is secured to the slide C′ by a central stud $c^{10}$ in a manner to permit it to be horizontally rotated thereon a portion of a revolution, the extent of said rotation being limited by a stop pin $c^{11}$ (see Fig. 9) which extends into a slot $c^{12}$ in the plate $c^{13}$ carried by the slide C′.

To hold the plate $c^6$ in operative position upon the slide C′ I have used the spring pin $c^{14}$ carried by said plate $c^6$ and adapted to engage the hole $c^{17}$ in the plate $c^{13}$. To turn the upper portion of the head, the spindle and grinding wheel from the position shown in Fig. 1 to that shown in Fig. 4, it is simply necessary to move upward the spring pin $c^{14}$ from its engaging hole $c^{17}$ and turn the plate upon the center of the stud. The spindle shaft $c^9$ carries a pulley from which an operating belt runs.

The head C is reciprocated by means of a crank pin D, pitman $d$, spindle or rod $d'$ and a block $d^2$ secured to the spindle and to the end of the slide C′. (See Fig. 2.) This block $d^2$ is made adjustable upon the spindle or rod $d'$ by means of a set screw $d^3$ and this varies the point to which the grinding wheel is adapted to be moved each reciprocation of the slide and therefore provides a means for adjusting the grinding wheel to the internal surface of the disk upon which it is to operate. The length of stroke of the head C is varied by means of a crank pin D, the pin being mounted upon a wheel $d^4$ (see Fig. 2) in a manner to permit it to be moved in or out from the center thereof in the ordinary way. The wheel or disk $d^4$ is rotated by means of a shaft $d^5$ (see Fig. 1) which is connected with the main driving shaft $d^6$ by means of a worm wheel $d^7$ at its end and a worm $d^8$ upon the shaft $d^6$. The facing grinder E is mounted upon the spindle $e$ carried at the end of a shaft $e'$ mounted in the standards $e^3$ $e^3$ of the head E′. This head E′ comprises a slide $e^4$ mounted upon the lateral extension $E^2$ of the frame of the machine, the slide having a dovetail recess to receive a dovetail guide. It has mounted upon it a cross slide $e^5$ which is connected with the slide $e^4$ by a dovetail tongue $e^5$ and recess. (See Fig. 7.) This slide is adjustable laterally upon the slide $e^4$ by means of an adjusting screw $e^7$ carried by the plate $e^5$ and screwing into a nut carried by or formed in the slide $e^4$. Upon this slide $e^5$ is mounted a plate $e^8$ from which rise the standards $e^2$ $e^3$. This plate $e^8$ is secured to the slide $e^5$ by a stud $e^9$ so that the plate is adapted to be turned upon the slide $e^5$. The plate $e^8$ has the grooved slot $e^{10}$ through which extends a clamping screw $e^{11}$ to the slide $e^5$, and this clamping screw serves to lock the plate $e^8$ in any desired position upon the slide $e^5$. The slide plate $e^4$ is provided with a reciprocating movement by means of a worm $e^{12}$ upon the shaft $d^6$, (see Fig. 7,) a worm wheel $e^{13}$ which engages said worm $e^{12}$ and which is at the lower end of the vertical shaft $e^{14}$ and the disk $e^{15}$ upon which is mounted the adjustable crank pin $e^{16}$. The crank pin is connected with the slide $e^4$ by the pitman $e^{17}$ and the block or stud $e^{18}$, the stud extending through a slot $e^{19}$ in the rear end of the plate $e^4$ and being clamped to the plate between a washer and a shoulder of the stud by a nut $e^{20}$. (See Figs. 1 and 7.) The slot $e^{19}$ and adjustable crank pin $e^{16}$ provide means for adjusting the position of the slide and the extent of its reciprocation.

While I prefer as a rule that the grinding wheel E which grinds one face of the disk or cutter held by the chuck be mounted so that the periphery of the grinding wheel be used for grinding instead of a face of the wheel, thus necessitating that the shaft $e'$ be at right angle to the shaft $c^9$, I would say that I do not confine myself to this construction, as by turning the plate $e^8$ to the position represented in Fig. 6 the shaft $e'$ is turned a quarter revolution and the grinding wheel E then brought into such a position that a face instead of the periphery is brought into contact with the face of the cutter or disk to be ground.

It will be understood that the operation of the various devices is as follows: First the

disk or cutter to be ground is mounted in the chuck carried by the head B and properly centered and the grinding wheels adjusted to the work. The machine being set in operation the chuck and the disk or cutter which it carries are rapidly rotated and the grinding wheel $C^2$ is rotated and at the same time moved into and out of the central hole of the disk or cutter, and at the same time the face grinding wheel E is rapidly rotated and moved back and forth upon the face of the cutter or disk to be ground, the time of the movement of the two grinding wheels being such that they do not interfere with each other, one being out of operative position while the other is active. As it is often desirable to grind both faces of the disk or tool blank, I have provided the chuck head with a chuck for holding the disk or tool blank by the surface about the hole instead of its outer edge. This construction is represented in Figs. 12, 13 and 14. When it is employed it is desirable to first finish the inner surface about the hole and one side of the disk or tool blank and the disk or tool blank at its finish is then mounted upon the chuck as shown in Figs. 12, 13 and 14 with its finished face against the shoulder $m$ of the chuck and the sections $m'$ of the chuck in the hole in the disk or tool blank. These sections are formed upon the end of the wedge spindle $m^2$ by means of slits cut in from its end $m^3$ and the spindle $m^2$ fits a conical cavity in the shaft $m^4$. (See Fig. 12.) There extends through a hole $m^5$ in the spindle and a hole in the shaft a rod $m^6$ having at its front end a conical wedge $m^7$ which shuts between members $m'$ of the chuck, and at its opposite end a screw thread $m^8$ which receives a nut $m^9$ at the rear end of the shaft $m^4$ and by means of which lengthwise movement is given the rod $m^6$ and the wedge brought to bear against the sections $m'$ of the chuck sufficiently to cause them to expand in the hole of the tool blank or disk, and clamp it firmly by its inner surface. The tool blank or disk so held has its unfinished face presented to the action of the face grinder E, the interior grinder not being used at this time.

Having thus fully described my invention, I claim and desire to secure by Letters Patent of the United States—

1. The combination in a grinding machine, of a rotary chuck adapted to hold blanks and other articles to be ground, a grinding wheel having its axis in line with the axis of the chuck and movable in the line of its axis, and a second grinder movable in a direction at an angle to the axis of the chuck the supports for each wheel and the chuck being adjustable on an axis at a right angle to its line of movement, and means for reciprocating said grinders in their respective directions, substantially as described.

2. The combination in a grinding machine of the rotary chuck, the reciprocating and rotary grinding wheel, and a support or head for the chuck, said head being pivotally connected with a plate and adapted to be turned upon said plate to move the chuck out of operative relation to the grinding wheel, and independent means for adjusting said plate on its axis, whereby said plate and the head carried by it may be adjusted to suit different requirements, and the head may be turned independently of the plate, substantially as described.

3. The combination in a grinding machine of a rotary chuck, its supporting head mounted upon the bed of the machine, the carriage $c$, the head carried by and adjustable thereon, its shaft and the grinding wheel with the adjustable crank pin D, pitman $d$ adjustably connected to the carriage and connecting rod $d'$, as and for the purposes described.

4. The combination in a grinding machine of a rotary chuck, a rotary, reciprocating interior grinding wheel and means for varying the extent of its reciprocation and the place of its reciprocating, with a rotary, reciprocating face grinding wheel and means for varying the extent of its reciprocation and place of its reciprocation, as and for the purposes described.

CHARLES H. TRASK.

Witnesses:
F. F. RAYMOND, 2d,
J. M. DOLAN.