R. H. HAZELTINE.

VALVE GRINDING DEVICE.

APPLICATION FILED MAR. 23, 1908.

918,050. Patented Apr. 13, 1909.

Fig. 1

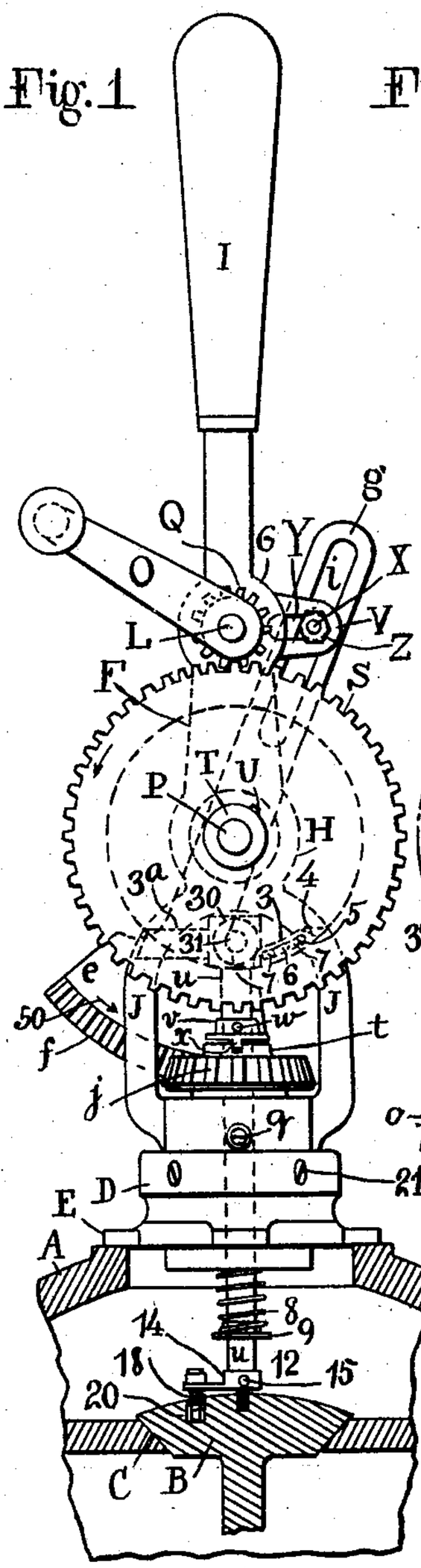


Fig. 2

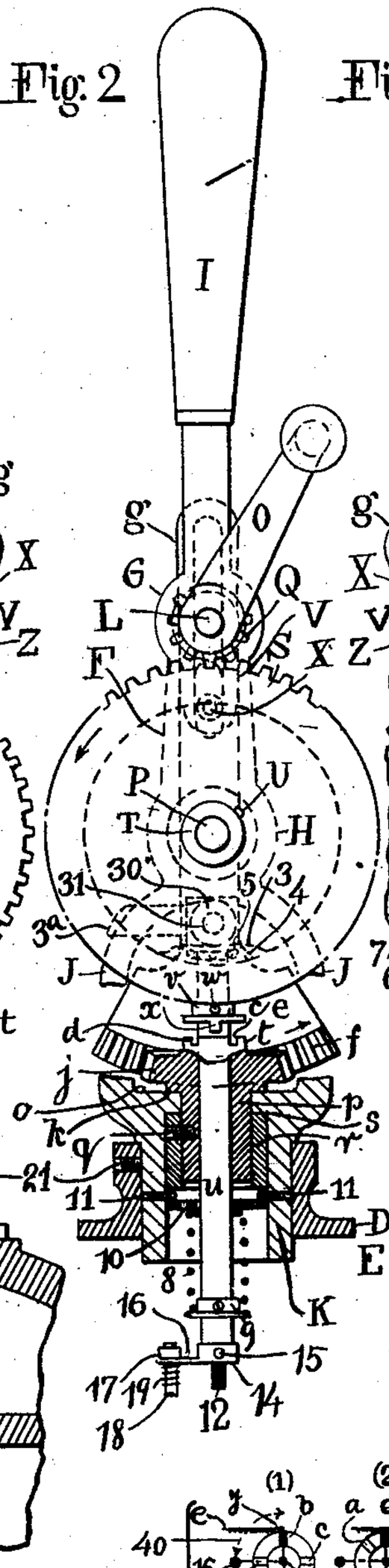


Fig. 3

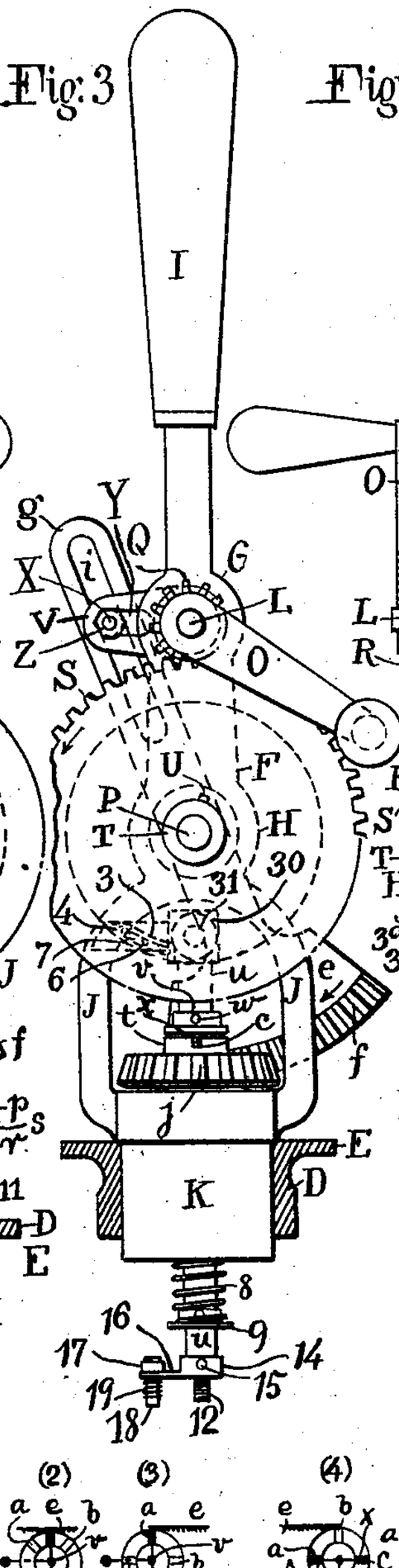


Fig. 4

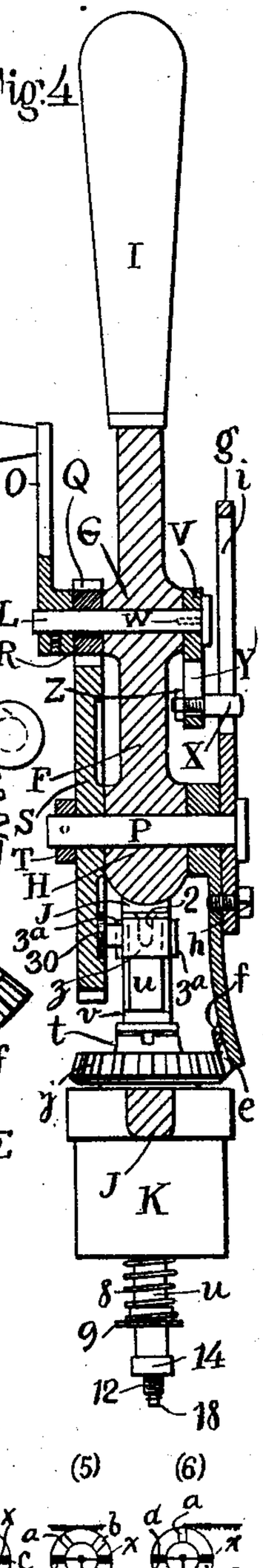


Fig. 5

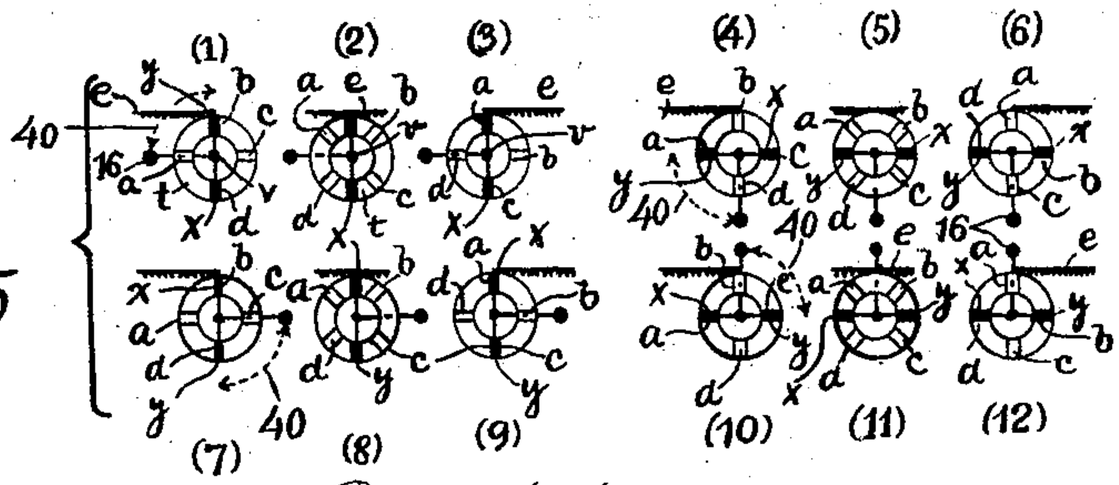
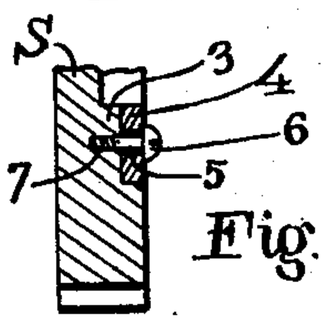


Fig. 6



WITNESSES

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VALVE-GRINDING DEVICE.

No. 918,050. Specification of Letters Patent. Patented April 13, 1909.

Application filed March 23, 1908. Serial No. 422,767.

To all whom it may concern:

Be it known that I, ROBERT H. HAZELTINE, a citizen of the United States, and a resident of the borough of Manhattan, city, county, and State of New York, have invented certain new and useful Improvements in Valve-Grinding Devices, of which the following is a specification, accompanied by drawings.

This invention relates to a valve grinding device and has for its objects to enable the valve to be evenly ground and accurately seated. Heretofore, devices of this character have been constructed to rotate a valve relative to its seat back and forth in one place, with a given position of the tool, but the disadvantage of this operation resides in the fact that the valve is ground more at one place than at another. According to my invention, the tool is constructed to automatically reciprocate the valve and intermittingly impart a progressive rotation to the same, whereby the grinding successively takes place between different parts of the valve and its seat, so that all parts are treated to the same degree.

Further objects of the invention will hereinafter appear, and the invention consists of a valve grinding device for carrying out all these objects, embodying the features of construction, combinations of elements, and arrangement of parts having the general mode of operation substantially as hereinafter fully described and claimed in this specification and shown in the accompanying drawings, in which—

Figure 1 is a side elevation of a valve grinding device embodying the invention, shown in connection with a portion of an engine cylinder illustrated in section. In this view the parts of the tool are in a given position starting a stroke. Fig. 2 is a side elevation of the tool partly in section, with the stroke half completed. Fig. 3 is a side elevation of the tool partly in section with the stroke completed and illustrating a different adjustment of the height of the tool. Fig. 4 is an end elevation of the tool partly in transverse section. Fig. 5 is a diagrammatic illustration of the operation of the tool, showing the progressive movement of the valve in its operation. Fig. 6 is a detail view of the cam.

This application is for the same invention as my copending application Serial No. 364,639, filed March 26, 1907, with additional features and improvements.

According to this invention the tool is adapted to be seated on the valve chamber A and suitably connected to the valve B which is to be ground. The valve is shown on its seat C and for purposes of illustration I have shown the valve of a gas engine, although any suitable valve may be ground by this tool and if desired, the valve holder may be suitably modified to hold any valve upon which it is desired to operate. In this instance, the rest or support D is shown in the form of a collar having feet E adapted to rest on the valve chamber A and this support D may be modified in any suitable manner for operating the tool in connection with other forms of valves.

Means are provided for imparting a reciprocating motion to the valve B back and forth through any desired arc as for instance through ninety degrees or one quarter of a revolution as illustrated in the drawings, but the angle of reciprocation may be adjusted to any desired amount. Means are also provided for automatically advancing the valve periodically farther in one direction than in the other, whereby the valve is given a progressive rotary movement at intervals, so that different surfaces between the valve and its seat are brought into contact, resulting in even grinding.

Referring more particularly to the drawings, F represents a suitable frame provided with the bosses G and H, a handle I, legs J, and a hollow socket K connected to the legs. This frame F may be constructed in any suitable form, not necessarily like that shown in the drawings, provided the different members of the tool are suitably supported and operatively connected. Journaled in the boss G is a driving shaft L provided with manually operated crank O at one end, and journaled in the boss H is a shaft P. The driving shaft L is provided with a pinion Q connected to rotate therewith as by means of a key R and meshing with this pinion is a gear S loose on the shaft P and held on the end thereof by any suitable means as a collar T pinned to the shaft by means of the pin U.

The end of the driving shaft L opposite to the crank O is provided with a crank V suitably connected to the shaft as by means of the key W and this crank V is provided

with a pin X adjustably mounted in a slot Y as by means of the nut Z.

On the end of the shaft P opposite to the gear S is loosely pivoted a toothed segment *e* provided with the teeth *f*. Connected to the segment as by means of the screw *h* is an arm *g* provided with a slot *i* into which the pin X extends, so that the arm *g* and segment *e* are reciprocated on the shaft P as a pivot when the crank O is rotated. I am not to be understood as limiting the invention to the mechanism shown and described, as any other suitable connections may be provided for carrying out the objects of this invention.

A bevel gear *j* is suitably mounted to rotate on the frame of the tool in the socket portion K and means are provided for taking the downward thrust of the operating parts of the tool on this gear and for preventing longitudinal movement of the gear. As shown, the gear is provided with the boss or shoulder *k* adapted to be seated on the surface *o* of the frame and the shank *p* of the gear is suitably connected as by means of a set screw *q* to a sleeve *r*, adapted to rotate in the socket K and seated under the shoulder *s* of the socket. The bevel gear *j* as shown is provided with the boss *t* on its upper surface having four slots or apertures *a*, *b*, *c*, *d* therein forming one member of the clutch.

Extending longitudinally and loosely through the gear *j* and its shank *p* is a vertical shaft or spindle *u* provided with means for holding the valve at its lower end and also provided intermediate its length with a collar *v* suitably connected to the spindle as by means of a pin *w*. This collar *v* is provided in this instance with two teeth *x* and *y* adapted to coöperate with the slots *a*, *b*, *c*, *d* of the gear. The collar *v* thus forms the other member of the clutch and when the clutch members *t* and *v* are in an engagement, the spindle *u* is reciprocated back and forth with the gear *j*. During the time that the collar *v* is disengaged from the opposite clutch member, the gear *j* is operated without operating the spindle, and by this means the valve holder and the valve connected thereto may be held from reciprocation during a predetermined stroke of the segment *e*, so that when the clutch members are again engaged the valve is positively advanced or rotated to a different position relatively to its seat. Means are provided for accomplishing this automatic adjustment of the device and means are also provided for guiding the upper end of the spindle *u*. A collar *z* is loosely carried on the upper end of the spindle *u* as by means of the screw 2 and this collar as shown is provided with fingers 3ª extending outwardly at each side of one of the legs J of the frame to prevent the collar from turning. The inner side of the gear S is slightly hollowed as shown, and provided with the cam or high portion adapted to be adjusted in length. Any suitable cam may be provided, but in this instance, I have shown the gear S provided with a projection 3 cast within the rim and a plate 4 adapted to slide relatively to the projection 3 and of the same height. The plate 4 is provided with a slot 5 through which a set screw 6 projects into suitable spaced apertures 7 in the cast portion 3, so that the high portion of the gear may be made longer or shorter as desired, and thus vary the interval during which the clutch members *t* and *v* are disengaged. By this means the progressive movement of the valve is varied through any desired arc.

In order that the spindle *u* shall be raised by engagement with the cam 3, 4 a roller or follower 30 is provided on a stud 31 connected to the collar *z*. This roller is of sufficient width to extend over both of the members 3, 4 of the cam on the gear S and as the cam passes under said roller 30 the spindle *u* is raised a sufficient distance to disengage the teeth *x* and *y* from the apertures of the member *t* and maintain them out of engagement until the cam has passed from beneath the roller. Preferably the roller 30 should be adjusted at such a height that it does not touch the inner surface of gear S except when the cam 3, 4 comes under the roller. This is to insure that the spindle is free.

A retracting spring 8 is provided on the spindle *u* for pressing the spindle downwardly and as shown in this instance, the spring is compressed between a collar 9 on the spindle and a plate 10 surrounding the spindle and located within the socket K against set screws 11, so that the plate 10 does not press frictionally upon the base of the revolving collar *p*. Any other suitable means may be provided for forcing the spindle downwardly.

Suitable means are provided for holding the valve B, in this instance the lower end 12 of the spindle *u* being reduced and screw threaded and adapted to be inserted in a screw threaded aperture in the valve. A collar 14 is preferably pinned to the spindle by means of the pin 15 and provided with an arm 16 having a boss 17 through which extends a pin 18 having a spring 19 secured at one end to the pin and at the other end to the arm 16. This pin is adapted to be seated in an aperture 20 bored in the valve for this purpose. I have illustrated one suitable form of device for holding the valve and causing it to move with the spindle, but any other suitable device may be provided.

The seat or rest may be adjusted on the socket K as by means of the set screw 21, so that the effective length of the spindle *u* may be varied in placing the tool upon the

support. In Fig. 2 the feet E are shown on the lower rim of the rest D, while in Fig. 3 the rest is reversed, placing the feet R uppermost, so that an additional adjustment is obtained.

The number of teeth on the various parts of the device may be chosen as desired, but in this instance, I have shown the gear S provided with forty-eight teeth and the pinion G provided with twelve teeth, so that four revolutions of the crank O and pinion G will effect one revolution of the gear S. The bevel gear *j* in this instance is provided with fifteen teeth, and the segment *e* forms a portion of a gear of sixty teeth, so that one stroke of the segment in one direction will rotate the bevel gear through a predetermined distance. In the adjustment of the parts shown in the drawings, the segment is designed to rotate the bevel gear through one quarter of a revolution at each stroke in one direction. By varying the position of the pin X in the arm V the stroke of the segment will be varied and the rotation of the bevel gear will be varied.

In the construction and adjustment of the tool shown in the drawings, the length of the cam 3, 4 is adjusted to sub-tend six teeth on the gear S, so that the clutch members *t* and *v* are disengaged during one eighth of a revolution of the gear S, and during one half of a revolution of the pinion R and crank O. This disengagement of the clutch members also occurs for one stroke of the segment *e* in one direction and for one quarter of one revolution of the bevel gear *j*.

The pressure of the valve B on its seat C during the operation of grinding is controlled by the spring 8. To this end the slots *a*, *b*, *c*, *d* are slightly deeper than the length of the teeth *x* and *y* on the clutch member *v*. When the tool is seated on the engine frame or other part upon which it is to rest, with the clutch members in engagement, one member will be slightly separated from the others as illustrated in Fig. 1, thereby bringing the entire pressure of the spring to bear upon the valve seat. The weight of the valve and the weight of the spindle and its attached parts also presses the valve upon its seat.

The operation of the device is as follows:—The valve B is first attached to the holder as illustrated in Fig. 1, and then the rest or support D is adjusted on the socket K so that when the valve is seated with the support D on the valve chamber, there is a slight clearance between the clutch members *t* and *v* to enable the spring 8 to press the valve upon its seat. The handle I is grasped with one hand and the crank O is continuously rotated whereby the arm V and pin X reciprocate the arm *g* and segment *e* connected thereto. The bevel gear *j* is reciprocated back and forth through one quarter of one revolution in each direction as the parts are adjusted in the drawings. The pinion R rotates the gear S, and once at each revolution of said gear, the cam 3, 4 passes under the roller 30 connected to the spindle *u* and raises the spindle and clutch member *v*, disengaging the clutch members *t*, *v*, during one stroke of the segment *e*, again releasing the spindle *u* and connecting the clutch members at the end of said stroke of the segment. During the time that the clutch members *t*, *v* are disengaged, the spindle *u* will remain stationary, but the bevel gear *j* is being actuated so that on the return stroke of the segment *e* with the clutch members *t*, *v*, engaged, the reciprocation of the valve B is continued, but with the valve advanced through one quarter of one revolution. In the continued operation of the device the valve is advanced through one quarter of one revolution at every fourth revolution of the crank O. It is, of course, to be understood that I have described my invention with a particular adjustment of the parts of the tool, but various adjustments may be made, and combinations of varying number of teeth may be used so that a periodic advance of the valve may be obtained at any interval desired and through any desired arc.

The reciprocation and progressive movement of the valve in the operation of the device may be best illustrated diagrammatically as shown in Fig. 5, in which there are twelve diagrams shown. Of these diagrams 1, 2 and 3 correspond to the three positions of the parts illustrated in Figs. 1, 2 and 3. The remaining diagrams in groups of three illustrate the completion of the cycle. In these diagrams the lower clutch member is illustrated at *t* and the upper clutch member at *v*. The lower clutch member *t* is provided with the apertures *a*, *b*, *c*, *d* and the upper clutch member *v* is provided with the teeth *x*, *y* shown in black. The arm 16 is illustrated diagrammatically and is connected to move with the upper clutch member *v*. The segment *e* is represented diagrammatically and the dotted arrow 40 represents the arc of reciprocation of the valve during the different periods.

In Fig. 1, the segment *e* is shown just starting its stroke to the right in the direction of the arrow 50 and the clutch members *t* and *v* are shown in engagement. The arm 16 of the valve holder is shown extending horizontally to the left. This position of the parts is shown in Fig. 5 diagram 1. As the segment *e* moves to the right the gear S rotates clockwise and the cam 3, 4 starts to pass under roller 30 to lift the spindle *u*. Previous to this time the valve B has been reciprocated back and forth through the arc represented by the arrow 40 in diagram 1 of Fig. 5.

In Fig. 2, the segment *e* is shown in mid position and the cam is under the roller 30. The clutch member *v* has been disengaged from member *t* and diagram 2 of Fig. 5 illustrates this position of the parts. The arm 16 of the valve holder remains in position extending to the left as the segment *e* completes its stroke.

In Fig. 3, the segment *e* has completed its stroke to the right and the cam 3, 4 has passed from beneath the roller 30 thereby permitting the clutch members *t* and *v* to become engaged again. This position of the parts is illustrated in diagram 3 of Fig. 5. It will be seen that during the stroke of the segment *e* described, from the position of Fig. 1 to position of Fig. 3, the spindle *u* has been left at rest, while the bevel gear *j* has been rotated through one quarter of one revolution. On the next return stroke of the segment *e* to the left, starting from the position in Fig. 3, the gear *j* and with it the spindle *u* will first be rotated through one quarter of a revolution in the reverse direction, thus moving the arm 16 forward through one quarter of a revolution as illustrated in the diagram 4 of Fig. 5. The valve will be reciprocated through the arc represented by the arrow 40 in diagram 4 until the cam 3, 4 once more raises the clutch member *v* out of engagement with member *t*. This disengagement starts to take place when the segment *e* is beginning one stroke to the right as illustrated in diagrams 4, 5 and 6. During this period of operation the arm 16 is left in the position indicated in diagrams 4, 5 and 6 until the next return stroke of segment *e* which moves the valve forward through one quarter of one revolution bringing the arm 16 into the position indicated in diagram 7 of Fig. 5. Reciprocation of the valve 6 takes place through the arc indicated by arrow 40 in diagram 7, until the next disengagement of the clutch members. When this has occurred, the parts are in position to rotate the valve through the last quarter of one revolution as indicated in diagram 10 of Fig. 5. Reciprocation of the valve then takes place through the arc indicated by the arrow 40 in diagram 10 and the cycle is complete and ready for the commencement of a new cycle when the valve starts to reciprocate through the original arc illustrated in diagram 1 of Fig. 5.

I claim and desire to obtain by Letters Patent the following:

1. A valve grinding device, comprising means for reciprocating a valve through an adjustable arc, and means for periodically advancing the valve through an adjustable arc.

2. A valve grinding device, comprising means for reciprocating the valve, means for adjusting the arc through which said valve is reciprocated, means for advancing the valve periodically, and means for adjusting the arc through which said valve is advanced.

3. A valve grinding device, comprising a spindle, a valve holder connected thereto, a gear, means for continuously reciprocating said gear, and adjustable means for connecting and disconnecting the spindle and gear.

4. A valve grinding device, comprising a valve holder, means for reciprocating said holder, and an adjustable seat or support on said valve grinding device.

5. A valve grinding device, comprising a valve holder, means for reciprocating the same, a seat or support, and means for adjusting the distance between said seat or support and the valve holder.

6. A valve grinding device, comprising a valve holder, a gear connected to said holder, and means for operating said holder through the following cycle: reciprocating the holder back and forth through substantially equal arcs, periodically advancing the valve always in the same direction, whereby a progressive intermittent rotation is imparted to the valve, and again reciprocating the valve through equal arcs, and repeating the cycle continuously.

7. A valve grinding device, comprising a valve holder, and mechanism for automatically operating the valve holder through the following cycle: first reciprocating the valve holder through substantially equal arcs, then after a given interval of time, rotating the holder through a given arc in one direction, and again reciprocating the holder through equal arcs, then advancing the holder in the same direction of rotation as before, and continuing the cycle, whereby the valve holder is periodically advanced on its seat, and reciprocated.

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

ROBERT H. HAZELTINE.

Witnesses:
HERBERT G. OGDEN,
GEO. A. HOFFMAN.