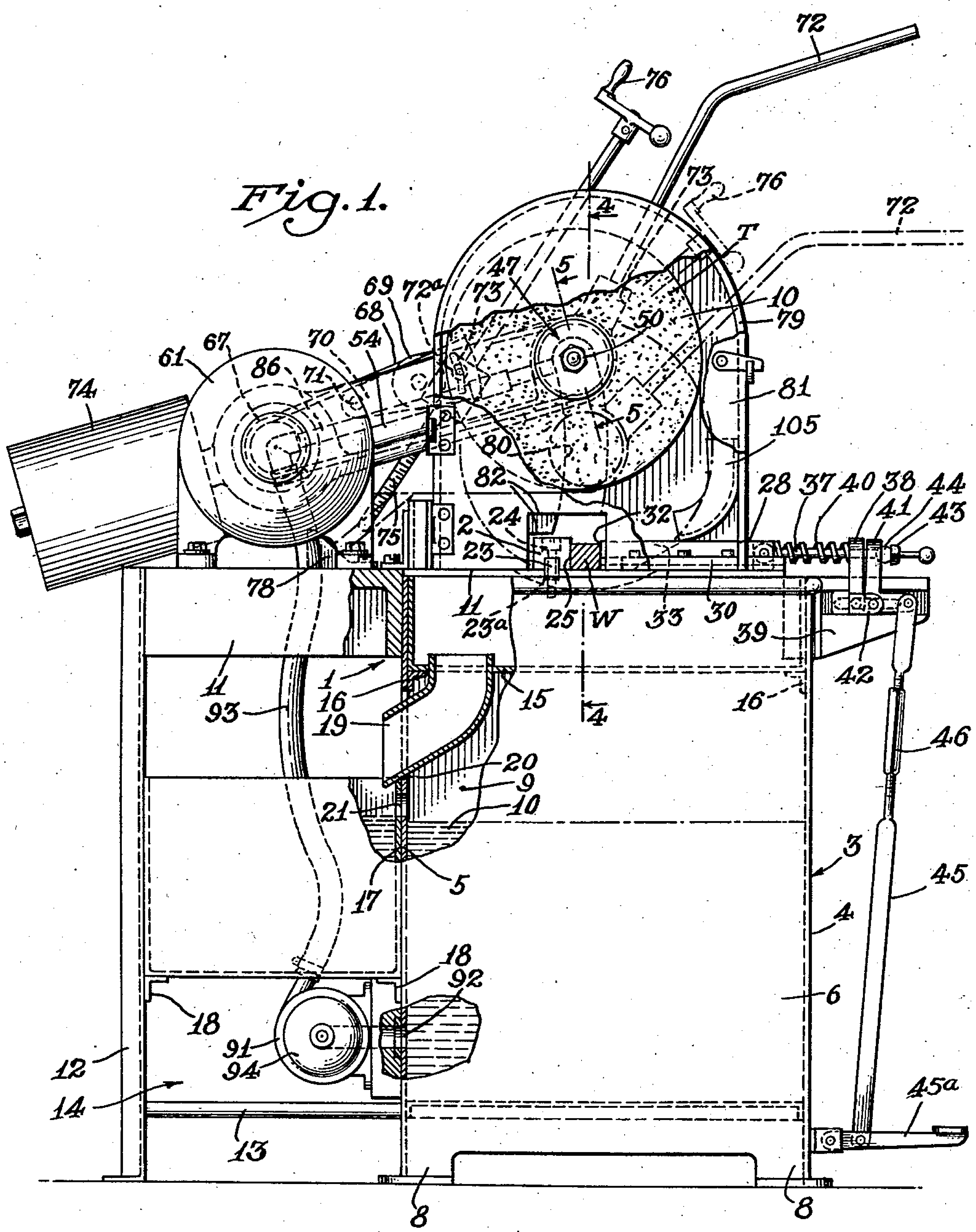
March 7, 1944. A. J. JACOBSEN 2,343,556

SEVERING MACHINE

Filed Jan. 29, 1942 4 Sheets-Sheet 1

Fig. 1.



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SEVERING MACHINE

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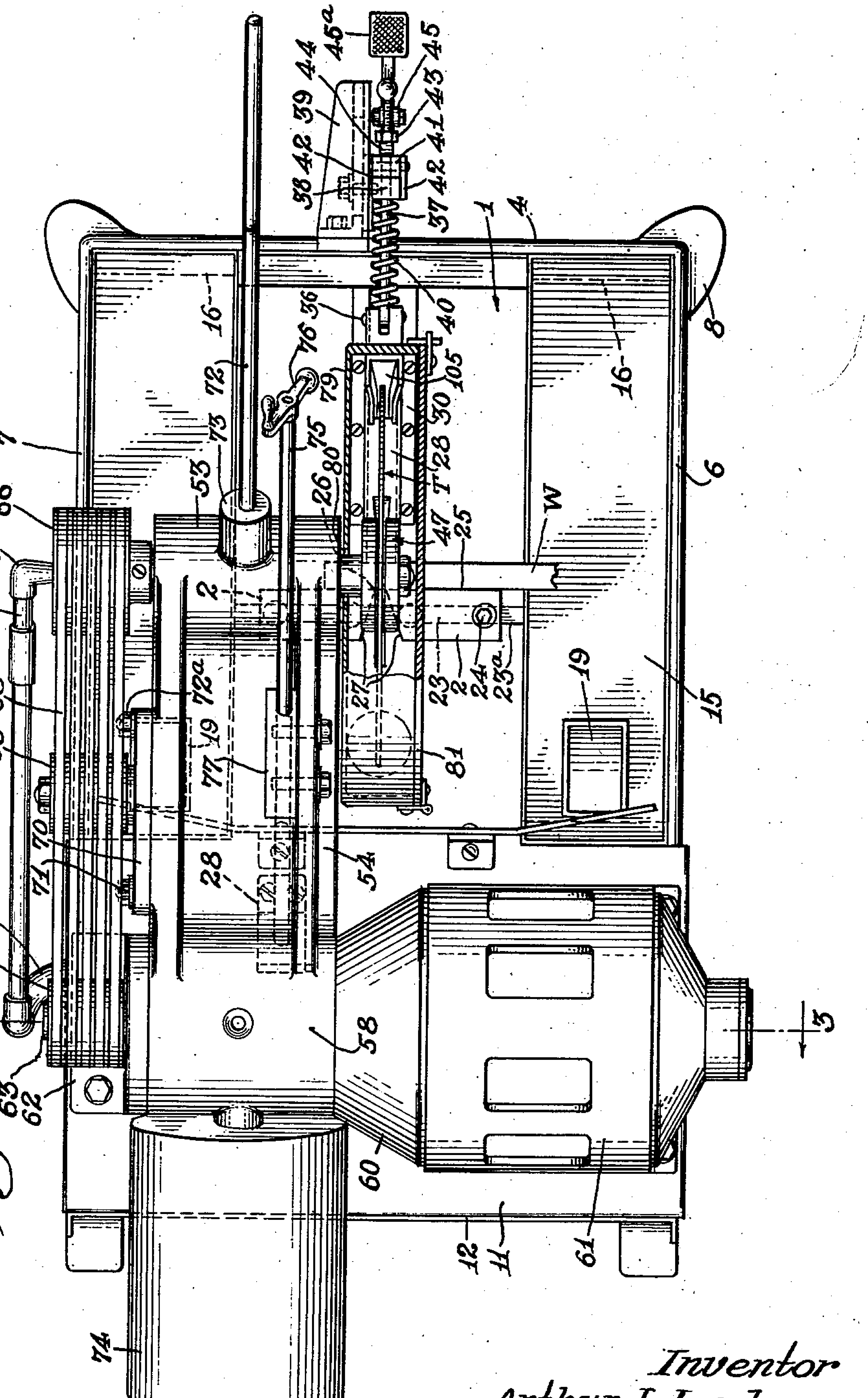

Fig. 2.

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SEVERING MACHINE

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Fig. 3.

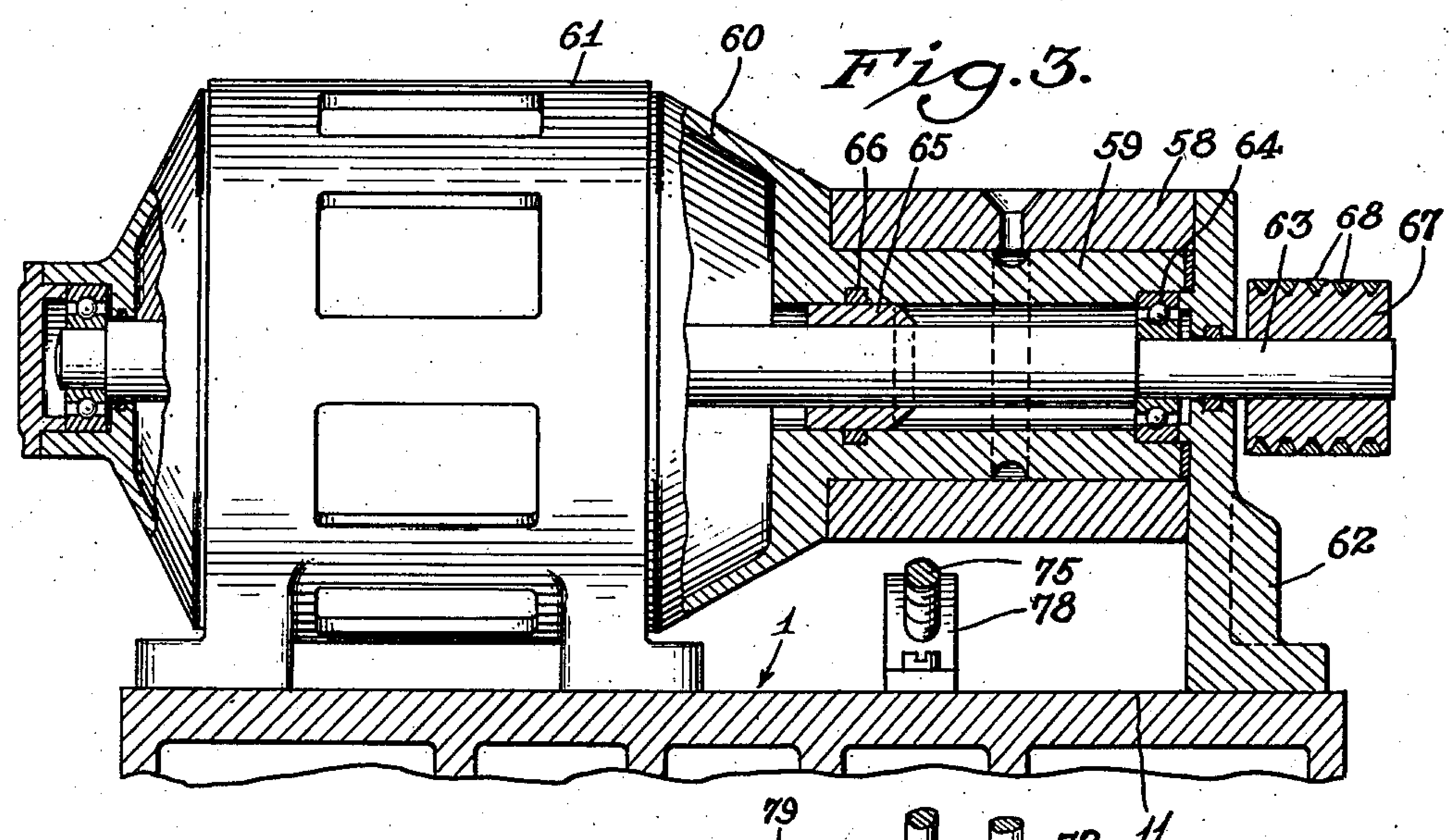

Fig. 4.

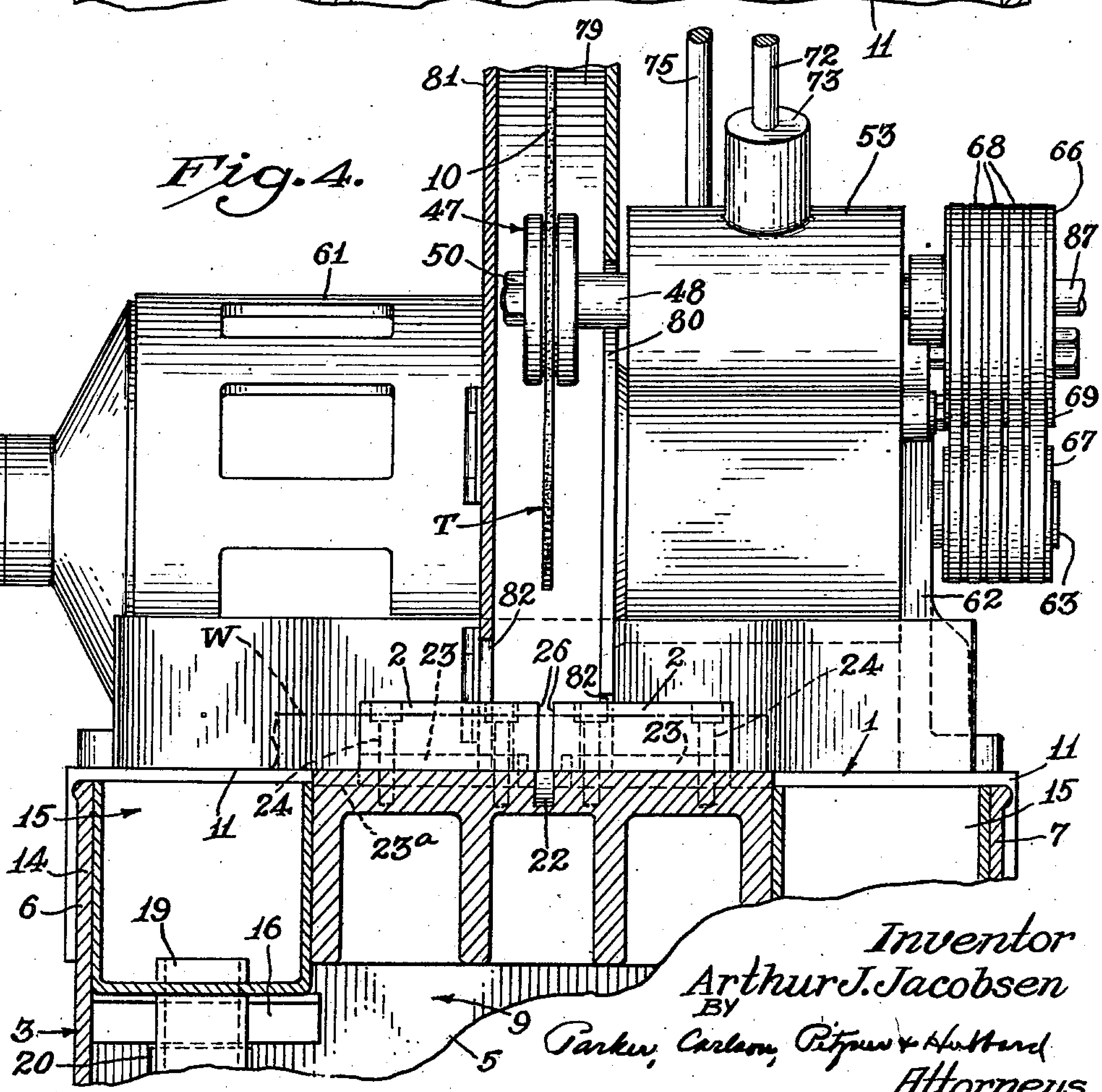

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Fig. 5.

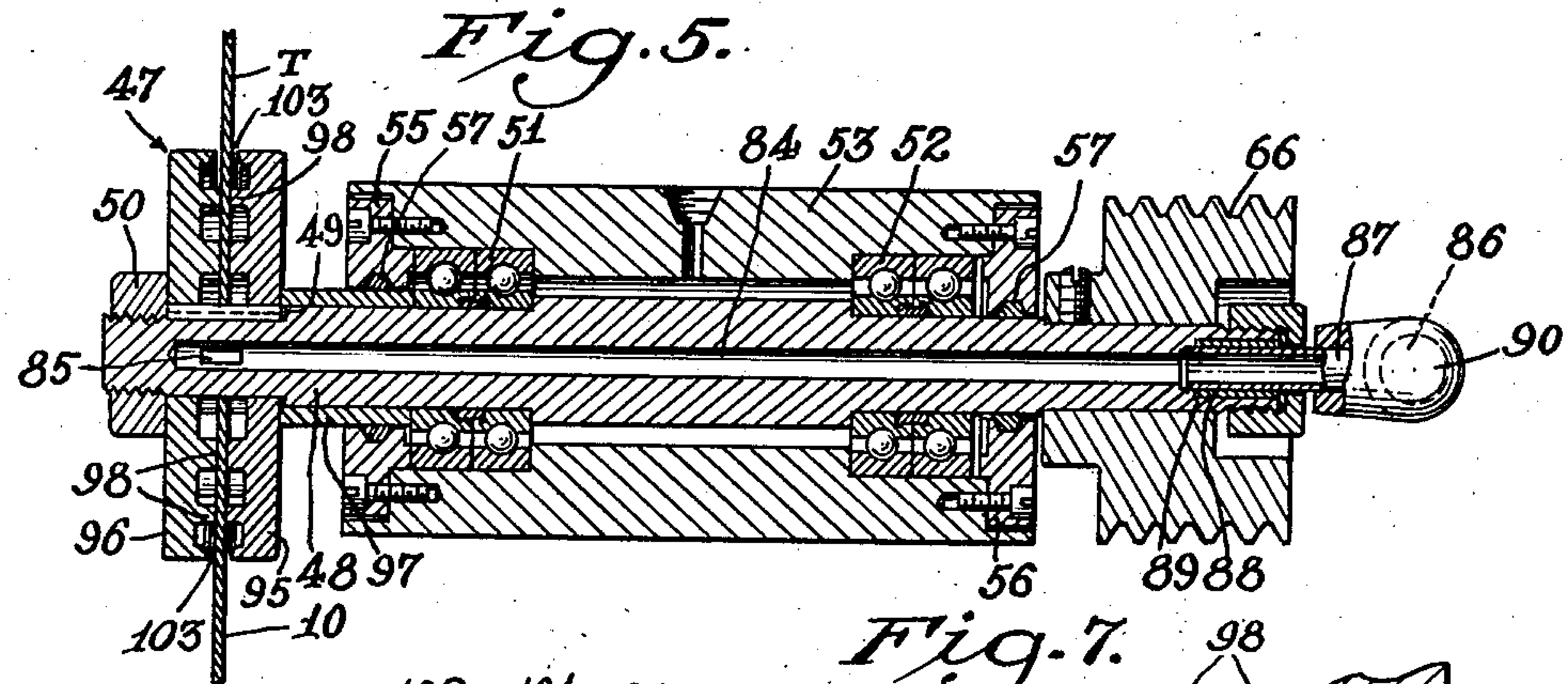


Fig. 6.

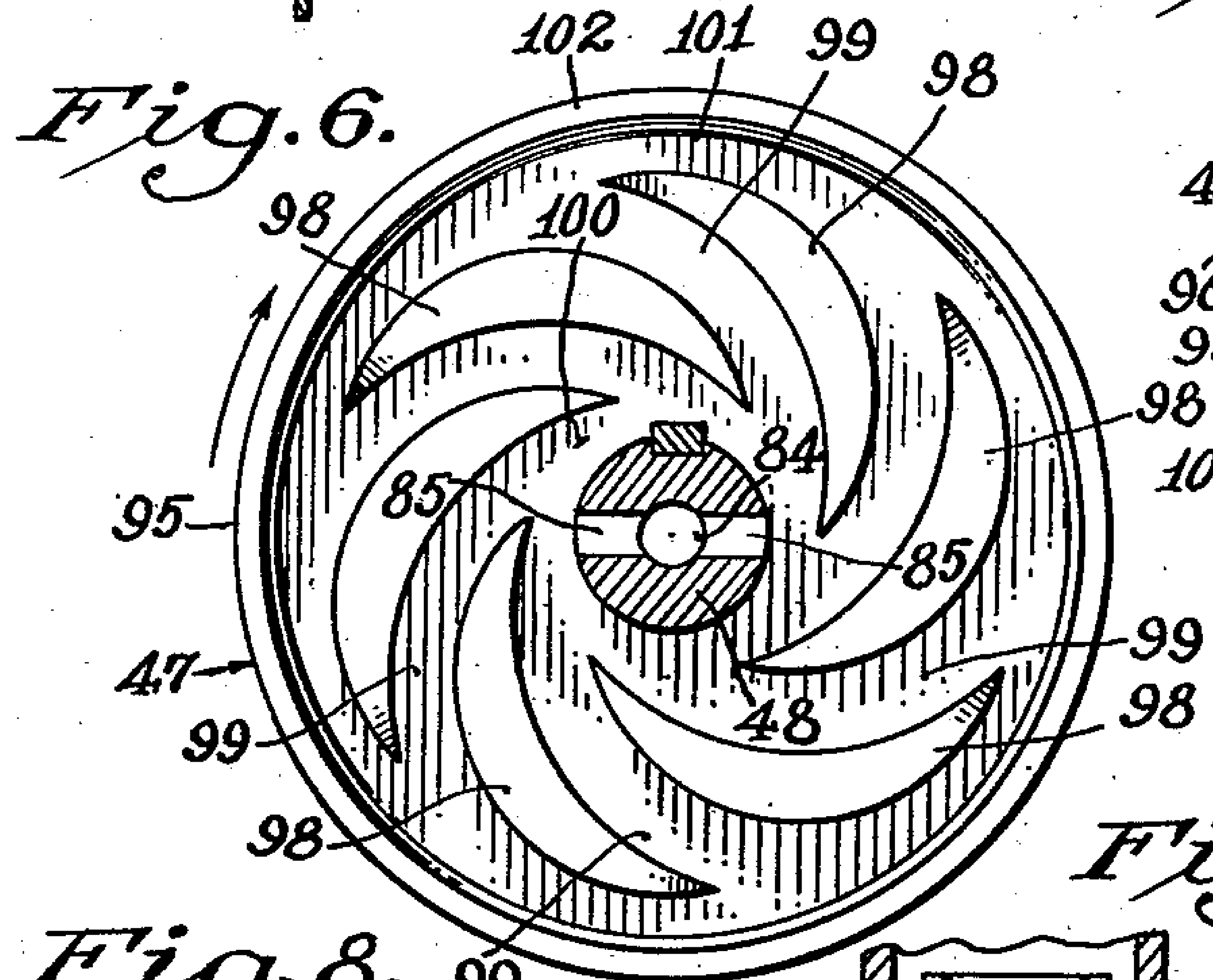


Fig. 7.

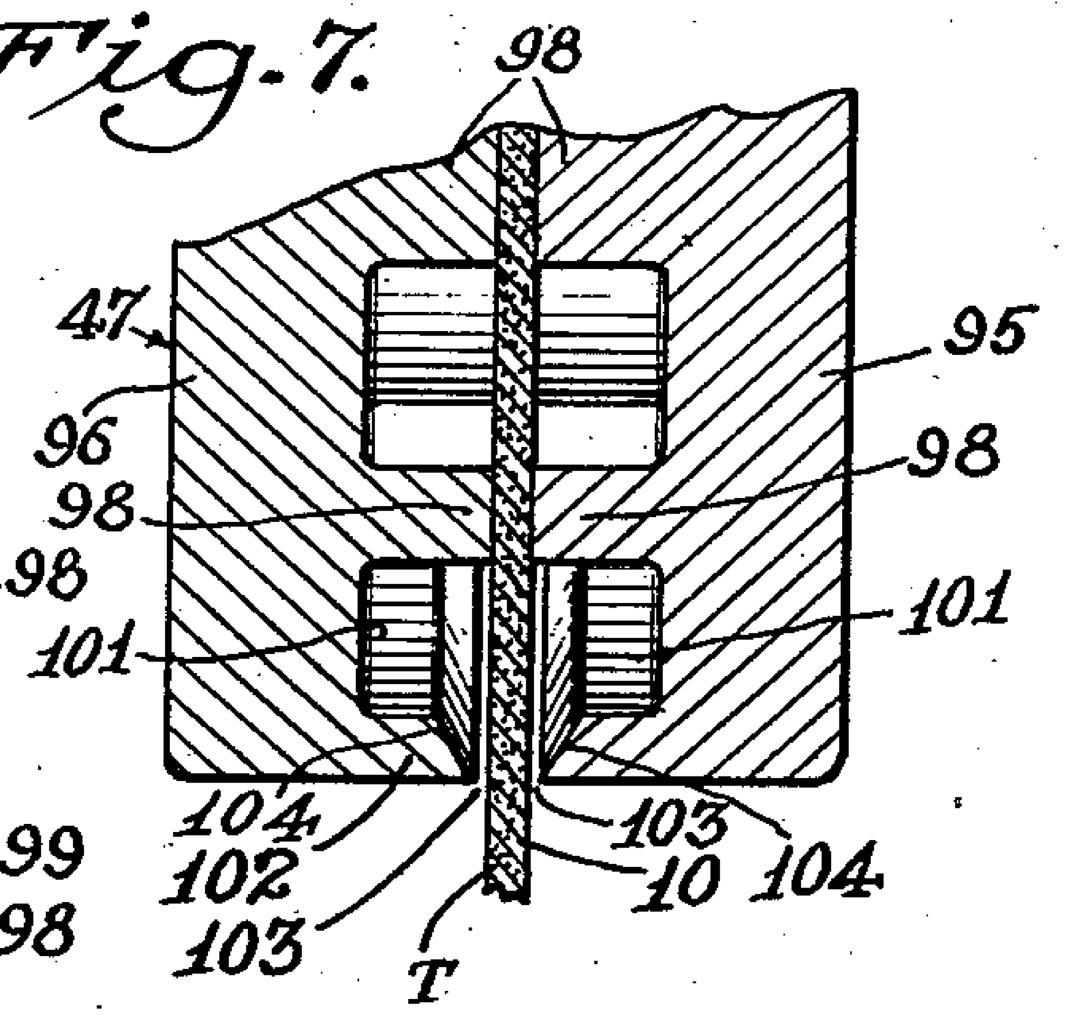


Fig. 8.

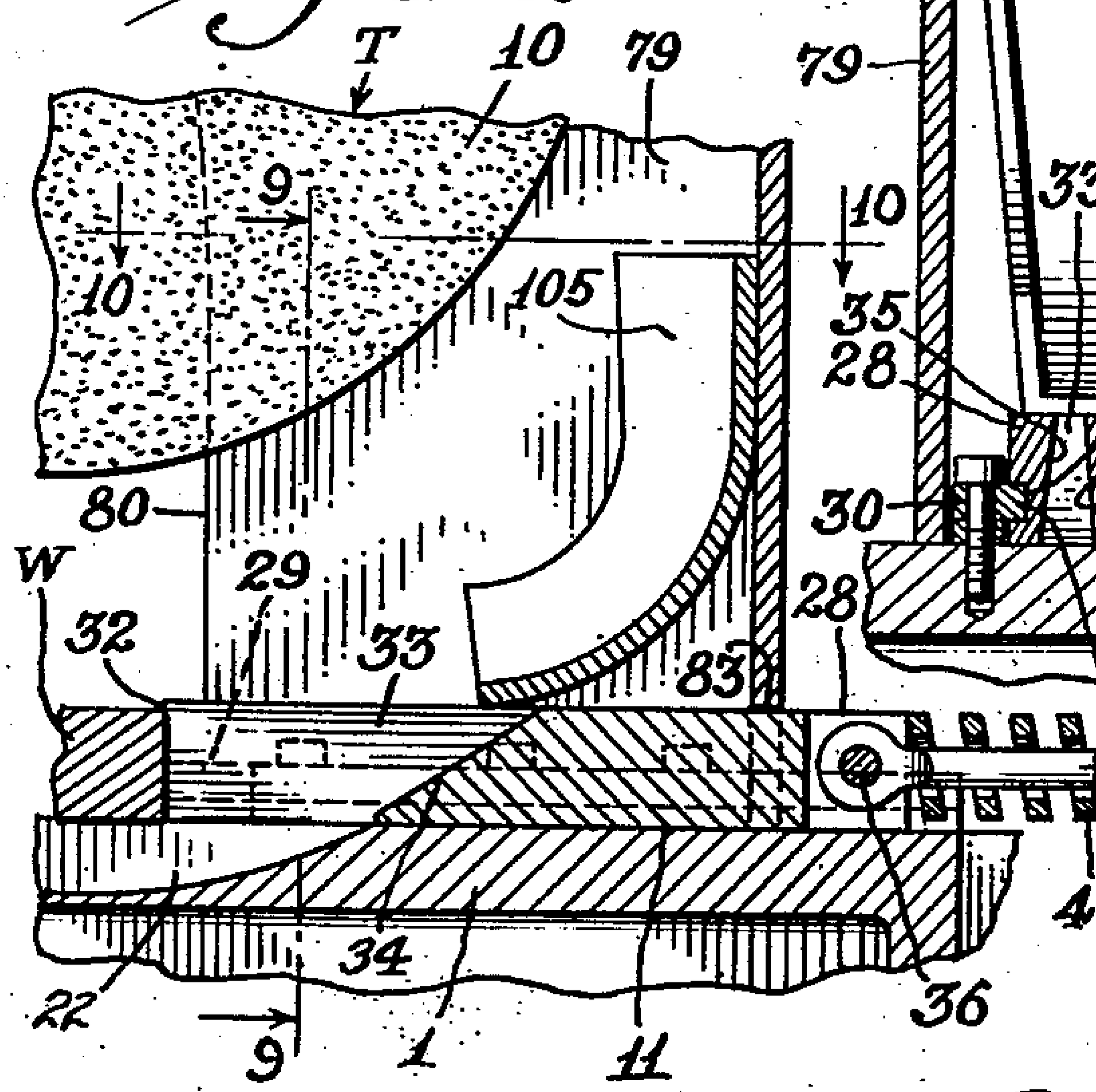


Fig. 9.

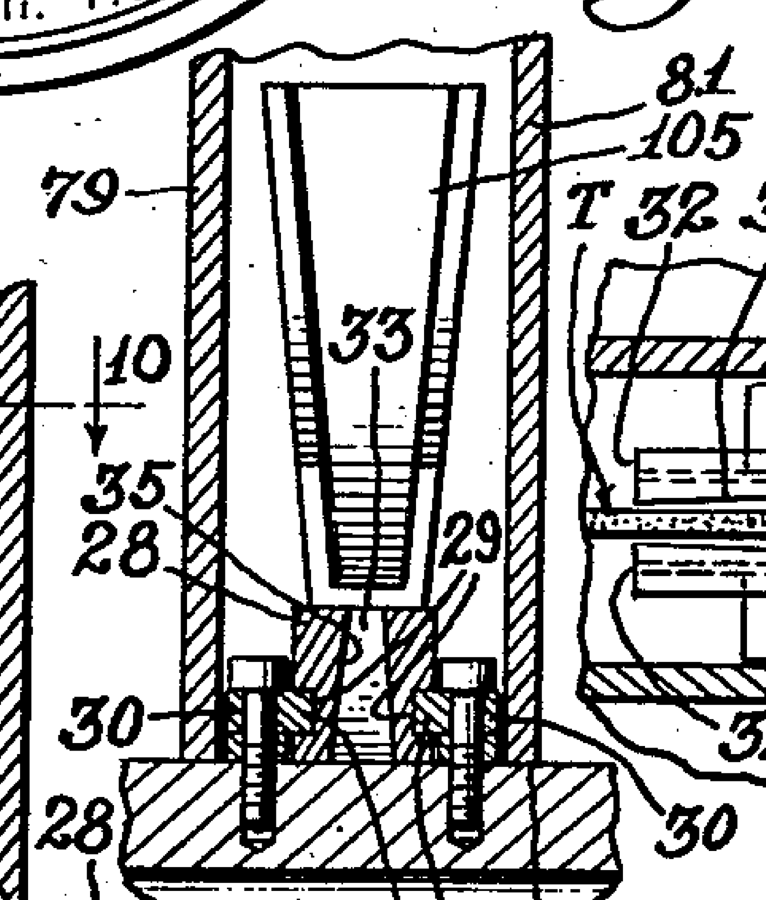
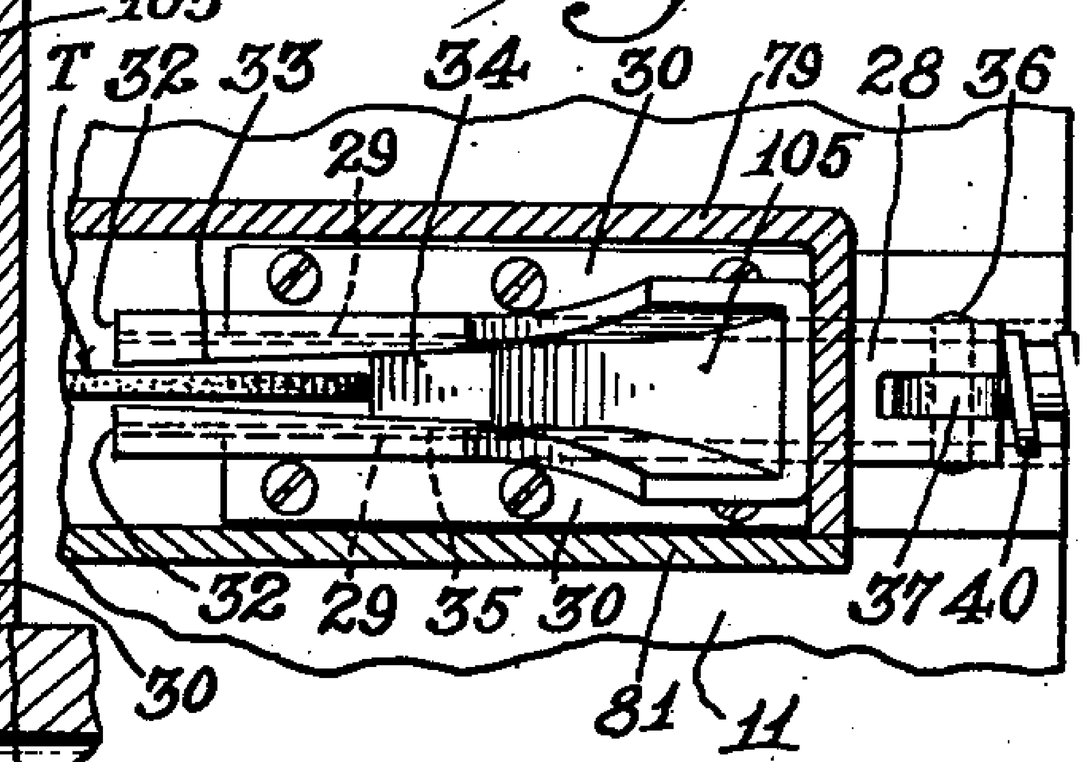


Fig. 10.



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Patented Mar. 7, 1944 **2,343,556**

UNITED STATES PATENT OFFICE

2,343,556

SEVERING MACHINE

Arthur J. Jacobsen, Oak Park, Ill.

Application January 29, 1942, Serial No. 428,677

21 Claims. (Cl. 51—98)

The present invention relates to a machine for cutting or severing hard materials, such for example as metal parts, by abrasive action, and is an improvement of the machine disclosed in my Patent No. 2,163,687 issued June 27, 1939.

One of the objects of the present invention is to provide a machine of the foregoing character having novel means for cooling the abrasive cutting element and the work, so as to prevent undue expansion and wear of the element, and to avoid any tendency to burn the work at the point of cut.

Another object is to provide novel means for supplying an abundant quantity of coolant, such as water, to both sides of the grinding element over the entire diameter instead of a localized area thereof, and to concentrate the coolant and cause it to penetrate the cut in the work under pressure whereby to preserve the form and increase the life of the element, and to avoid deleterious changes in the metallurgical and physical characteristics of the work.

A further object is to provide new and improved means for rigidly supporting, locating and clamping the work at both sides of the grinding element and close to the line of cut.

Other objects and advantages will become apparent as the description proceeds.

In the accompanying drawings, Figure 1 is an end elevational view, partially in section, of a metal severing machine embodying the features of my invention.

Fig. 2 is a plan view, partially in section, of the machine.

Fig. 3 is an axial sectional view of the motor drive taken along line 3—3 of Fig. 2.

Fig. 4 is a fragmentary vertical sectional view through the work support, taken along line 4—4 of Fig. 1.

Fig. 5 is an axial sectional view of the tool spindle structure, taken along line 5—5 of Fig. 1.

Fig. 6 is a view of the inner face of one of the impeller disks associated with the grinding element.

Fig. 7 is an enlarged fragmentary sectional view of the grinding element and impeller assembly.

Fig. 8 is a fragmentary sectional view taken substantially along line 8—8 of Fig. 2, and illustrating the work supporting and clamping means.

Figs. 9 and 10 are sectional detail views taken respectively along lines 9—9 and 10—10 of Fig. 8.

While the invention is susceptible of various modifications and alternative constructions, I have shown in the drawings and will herein describe in detail the preferred embodiment, but it is to be understood that I do not thereby intend to limit the invention to the specific form disclosed, but intend to cover all modifications and alternative constructions falling within the spirit and scope of the invention as expressed in the appended claims.

Referring more particularly to the drawings, the severing machine, constituting the exemplary embodiment of the present invention, is especially adapted for cutting or severing very hard materials, such for example as tool steels and alloys, by the use of a thin abrasive rotary cutting element or disk T at a high rate of speed.

The work, which may be in the form of a bar W, is mounted on a stationary support or table 1, and is located and secured by a heavy clamping pressure, but without deflection, in position against two rigid and sturdy fence or guide blocks 2 at opposite sides of the grinding disk T. The grinding disk is movable transversely into and through cutting engagement with the work.

A suitable coolant, such as water, in an abundant amount is directed by an impeller associated with the grinding disk T in sheet form evenly over both side faces of the disk, from the center to the outer periphery, and serves to prevent the disk from heating up and expanding, and hence to insure minimum wear and a long life. The binder for the abrasive particles in the disk T does not soften up, and the disk retains its straight form and can be worn down in use to its minimum size. The coolant also plays upon the work and is caused to penetrate the cut to provide a free running grinding disk. Such penetration is effected by hydraulic pressure which is created by the rotation of the disk at high speed, and which increases as the speed is increased. Penetration is further promoted by entrainment of coolant in the pores of the abrasive element. As a result, burning of the work is avoided, and metallurgical and physical changes, such as spots, cracks or checks in the work, do not develop even at high speed operation. The resultant finish on the work is free of burrs and is exceptionally smooth.

The machine comprises a hollow base or pedestal 3 having front, rear and side walls 4 to 7, and having legs 8 adapted to rest on a suitable foundation. The interior of the base 3 constitutes a large reservoir 9 adapted to contain a suitable coolant 10, such as water. The work support 1 consists of a horizontal T-shaped frame mounted in the top of the base 3 and spaced from the side walls 6 and 7. The rear end of the frame 2 is coextensive in width with the base 3, and constitutes a base extension 11. A spaced wall or outboard support 12 is attached to the base extension 11, and is connected through tie bars 13 to the lower portion of the base 3. The rear wall 5 of the base 3 and the spaced wall 12 thus define a compartment 14.

Mounted in the top of the base 3 alongside the work support 1 to receive the spent coolant are two settling tanks 15. Suitable angle bars 16 attached to the base walls 4 and 5 underlie and support the ends of the tanks 15. A secondary settling tank 17 is mounted in the compartment 14 at a level below the tanks 15, and is supported by angle bars 18 on the spaced walls 5 and 12. Coolant from the tanks 15 overflows through inclined ducts 19 into the tank 17. The ducts 19 extend through openings 20 in the rear base wall 5, and their upper ends project somewhat above the bottom walls of the tanks 15. Coolant from the secondary tank 17 flows from near the top through an opening 21 in the wall 5 into the reservoir 9. Most of the sludge will collect in the bottom of the tanks 15, and any suspended solids passing over with the coolant through the ducts 19 will settle out in the tank 17 so that the coolant in the reservoir 9 will be clear.

The guide blocks 2 which constitute the work fence are disposed end to end in slightly spaced relation at opposite sides of a cutting slot 22 in the table 1 to receive the periphery of the disk T, and are accurately located by keys 23 engaging in a keyway 23ª in the top of the table and rigidly secured in position by means of clamp bolts 24 extending through the keys into threaded engagement with the table. The blocks present a guide face or surface 25 on one vertical side for locating the work accurately in position during the cutting operation. The contiguous ends of the blocks 2 have two edges 26 which are spaced apart in the plane of the guide face 25 just enough to receive the grinding disk T, and which are relieved rearwardly by diverging surfaces 27 to provide clearance for the coolant. As a result, the work is supported and backed up to resist the cutting action, and to permit a strong clamping force without work deflection at closely spaced points immediately adjacent the opposite edges of the cutting periphery of the grinding disk. Thus, the work is clamped closely to the line of cut so that very thin pieces of work can be severed.

To provide means for securely clamping the work against the fence blocks 2, a rectangular clamp bar 28 is slidably mounted on the top of the work table 1 for movement transversely of the blocks. Preferably, the clamp bar is rectangular in cross section and formed in opposite sides with longitudinal guide grooves 29. The block is confined for longitudinal adjustment against the table 1 by two parallel guide bars 30 engaging in the grooves 29. Preferably, each guide bar consists of two superimposed plates bolted to the top of the work table 1, and with the upper plate projecting along one edge beyond the lower plate to provide a tongue 31. The inner end of the clamp bar 28 is bifurcated to provide two closely spaced clamping jaws 32 adapted for engagement with the work at opposite sides and closely to the grinding disk T. The space between the jaws constitutes a slot 33 adapted to receive the peripheral margin of the grinding disk T and also to direct coolant to the cutting zone. The closed end of the slot 33 is formed with a downwardly inclined root surface 34, and the sides of the slot converge along their upper edges toward the free end, and are undercut at 35 to provide clearance, facilitating the flow of coolant and concentrating it under pressure against the work at the point of cut.

Pivotally connected to the forward end of the block at 36 is a draw bar 37 which extends loosely through an upstanding bracket arm 38 adjustably bolted on a clamp bracket 39 on the front of the base 3. A heavy coiled compression spring 40 encircles the draw bar 37, and abuts at opposite ends, respectively, against the forward end of the clamp bar 28 and the opposed bracket arm 38. The spring 40 acts to urge the bar toward the fence 2 to clamp the work quickly and with a heavy pressure. By reason of the rigid construction of the fence, no deflection of the work or of the clamp parts occurs.

To release the work after the cutting operation and to permit indexing thereof or the insertion of new work, suitable means is provided for retracting the clamp bar 28 against the pressure of the spring 40. This means comprises a bell crank lever 41 pivotally mounted on the bracket 39 between two ears 42. The vertical arm of the bell crank lever 41 receives the forward end of the draw bar 37, and coacts with an adjustable stop nut 43 threaded on the latter. A roller 44 is seated between the lever 41 and the nut 43 to insure full surface engagement in different angular positions of the lever. The horizontal arm of the bell crank lever 41 is pivotally connected through a link 45 including a turn buckle 46 to a foot treadle 45ª mounted on the lower portion of the machine base 3.

By the foregoing arrangement, the pressure of the spring 40 may be adjusted by shifting the position of the bracket arm 38 along the bracket 39. Also, the range of movement of the clamp bar 28 may be adjusted to suit the width of each particular piece of work. This is accomplished by slightly separating the arm 38 and the vertical arm of the lever 41, and then adjusting the nut 43 to locate the jaws 32 substantially in clamping position. Upon reelasing the lever 41 for engagement with the arm 38, a slight overtravel is permitted so that the full force of the spring pressure is available.

The grinding element T and the coolant impeller 47 are secured on one end of a tubular spindle 48 against an end shoulder 49 by means of a clamp nut 50. The spindle 48 is suitably journaled at spaced points in anti-friction bearings 51 and 52 in a tubular sleeve or housing 53 mounted on the free end of a rocker arm 54. Suitable end plates 55 and 56 with oil seals 57 are removably secured to opposite ends of the spindle sleeve 53 to close the latter.

The rocker arm 54 is mounted for oscillation on an axis extending generally parallel to the fence 2. In the present instance, the rear end of the rocker arm 54 is formed with a swivel sleeve 58 rotatable on a bearing sleeve 59 forming part of a bell housing 60 on an electric drive motor 61. The outer end of the sleeve 59 is supported by an outboard bracket 62 mounted on the base extension 11.

The electric motor 61 is also mounted on the base extension 11, and has a drive shaft 63 extending in freely spaced relation through the sleeve 59 and supported in the outer end thereof by a ball bearing 64. A sleeve 65 is fixed on the shaft 63 in the inner end of the sleeve 59, and is engaged by an oil seal 66 to prevent the escape of oil or grease into the motor housing.

Fixed on the outer ends of the spindle 48 and the motor shaft 63 are two multiple groove pulleys 66 and 67 which are connected by a plurality of V-belts 68 to provide a high speed rotary drive for the grinding disk T. An idler pulley 69 rotatably mounted on a bracket 70 engages the undersides of the top flights of the belts 68 to maintain them under proper tension. The bracket 70 is pivotally secured at one end by means of a bolt 71 to one side of the rocker arm 54, and is adapted to be clamped in different angular positions at the other end by a bolt 72 extending through an arcuate slot 73. Since the pulley 67 is located on the pivotal axis of the rocker arm 54, the belt drive for the spindle 48 will be unaffected by the pivotal or swinging movement of the grinding disk T into and out of cutting engagement with the work.

To provide means for oscillating the grinding disk T, a hand bar 72 is rigidly secured in a boss 73 on the spindle housing 53, and projects outwardly and forwardly for convenient grasp by the operator. A counterweight 74 is connected to the swivel sleeve 58 oppositely to the bar 72 and tends to elevate the grinding disk T away from the work support 1. Downward movement of the grinding disk T into and through cutting engagement with the work is adapted to be effected manually by grasping and lowering the bar 72 against the force of the counterweight 74. To limit the downward swinging movement of the disk T, a stop pin 75 with an adjusting handle 76 is threaded through a block 77 bolted to the rocker arm 54 for end engagement with an abutment 78 on the base extension 11.

Mounted on the work table 1 and enclosing the grinding disk T and impeller 47, is a guard or hood 79. One side wall of the hood 79 is formed with an arcuate slot 80 concentric with the pivotal axis of the rocker arm 54, and receiving the spindle 48 between the impeller 47 and the adjacent end plate 55 of the spindle housing 53. The other side wall of the hood 79 is hinged to constitute a door 81 adapted to be opened when access to the grinding disk T is required. Both side walls of the hood 79 are formed in their lower edges with notches or openings 82 to receive the work in normal operation and to receive the fence blocks 2. Similarly, the lower forward edge of the peripheral wall of the hood is formed with a notch 83 to accommodate the clamp bar 28.

To provide means for supplying coolant from the reservoir 9 to the impeller 47, the spindle 48 is formed with an axial passage 84. One end opens through a plurality of radial ports 85 to the impeller 47. The other end of the passage 84 has a swivel connection with a supply pipe 86. The connection consists of a swivel tube 87 journaled in a bearing sleeve 88 pressed into a counterbore 89 in the passage 84. The outer end of the tube 87 is connected by an elbow 90 to the pipe 86. A coolant pump 91 mounted in the compartment 14 has an inlet line 92 opening from the lower part of the reservoir 9, and discharges to a flexible conduit 93 connected to the pipe 86. Preferably, the pipe 86 extends along the rocker arm 54, and is connected to the flexible conduit 93 substantially on the swivel axis of the sleeve 58 so that the connection is not appreciably affected by the pivotal or oscillatory movement of the grinding disk T. The pump 91 may be driven by any suitable means, such as an electric motor 94.

The impeller 47 serves to direct coolant from the spindle passage 84 uniformly in thin sheets in direct contact with and outwardly over the entire side faces of the grinding disk T under extremely high pressure. In its preferred form, the impeller 47 comprises two similar disks 95 and 96 securely clamped against opposing sides of the central or hub portion of the grinding disk T for rotation therewith. More particularly, the grinding disk T is confined between the impeller disks 95 and 96, and the assembly is suitably keyed to the spindle 48. A spacer sleeve 97 on the spindle 48 extends through the end plate 55 into abutment with the inner raceway of the adjacent bearing 51, and engages the inner impeller disk 95 to locate the assembly in proper relation to the cutting slot 22 in the work support 1.

Each of the impeller disks comprises a plurality of peripherally spaced vanes or ribs 98 on the inner side face directly contacting the grinding disk T. These ribs are eccentrically disposed relative to the axis of rotation, and are generally crescent-shaped with the convex sides arranged to force the coolant outwardly upon rotation in the direction of the arrow in Fig. 6. The interdental passages 99 between the vanes 98 open at their inner ends to a central annular space 100 about the spindle 48 and in communication with the radial ports 85, and at their outer ends to an annular groove 101 defined by a marginal annular flange 102 on the disk. The marginal flange 102 is slightly spaced from the adjacent side of the grinding disk T to define therewith an uninterrupted peripheral outlet opening or port 103 for the coolant, and the end face 104 of the flange is inclined radially outwardly toward the grinding disk so as to cause the coolant to issue in a thin sheet in direct contact with the side surface of the grinding disk.

Coolant under pressure is supplied in an abundant amount and is caused by the impeller 47 to stream outwardly over both sides of the grinding disk T. As a consequence, the grinding disk T is virtually flooded with coolant and is free running in the work being severed. The grinding disk thus is prevented from becoming heated so that the bonding material for the abrasive particles does not soften up, and the disk remains straight throughout its useful life.

The coolant is also caused to penetrate the cut in the work, thereby preventing burning and the formation of spots, cracks and checks. Such penetration is effected in part by entrainment of coolant with the grinding disk T into the cut. The coolant which is flung through centrifugal force from the grinding disk T is caused to impinge against the interior of the hood 79 and is directed by a curved channel-shaped deflector 105 in a concentrated stream under considerable pressure against the work at the point of cut. In particular, the deflector 105 directs the high velocity stream of coolant to the slot 33 in the clamp bar 28 from which the coolant issues and impinges against the work at both sides of the grinding disk T.

It will be seen that I have provided a novel and advantageous machine for serving workpieces of hard material. The machine is capable of accurate and high speed operation. The grinding element retains its correct form and has a long life. The work does not suffer any deleterious metallurgical and physical changes, and the severed ends have a smooth finish and are free of burrs.

I claim as my invention:

1. A material serving machine comprising, in combination, a base, a work support on said base

and having a narrow cutting slot, a fence on said support extending generally transversely of said slot and defining a recess in registration with said slot, means for clamping the workpiece against said fence in position across said recess, a rotary spindle mounted on said base for oscillatory movement about a fixed axis toward and from said support, a thin abrasive disk fixed on one end of said spindle for swinging movement therewith and in registration with said slot and recess, two circular impeller disks rigidly mounted on said spindle in direct abutment against opposite sides of said abrasive disk, each of said impeller disks having a plurality of uniformly peripherally spaced passages opening outwardly and having a marginal flange slightly spaced from said cutting disk and defining an annular groove in communication with said passages and opening peripherally at said abrasive disk to discharge a continuous sheet of coolant, and means for supplying coolant under pressure to said passages.

2. In a material severing machine, in combination, a frame having a flat horizontal work supporting surface formed with a fence locating groove, two alined fence blocks mounted on said surface in closely spaced end to end relation along said groove, each block being formed in the under side with a longitudinal keyway in registration with said groove, a key pressed in said keyway and engaging in said groove, and clamp bolts extending through said blocks and said keys into threaded engagement with said frame to secure said blocks in position.

3. In a material severing machine, in combination, a work support formed with a cutting slot, two fence blocks mounted on said support in end to end relation respectively at opposite sides of said slot and defining a recess in registration with said slot, a clamping bar mounted on said support for endwise reciprocation toward and from said fence blocks and the leading end of said bar being bifurcated to define closely spaced jaws separated by an intermediate clearance slot in registration with said recess, said clearance slot being tapered toward the free end and being undercut, means for actuating said bar in opposite directions, and a thin grinding disk mounted for movement toward said support into said slots and recess to sever the work.

4. In a material severing machine, in combination, a work support, a fence on said support for locating the work, means for severing the work when in position against said fence, a clamping member reversibly movable for clamping said work against said fence during the severing operation, a bracket arm mounted on said support for adjustment toward and from said fence, spring means interposed between said clamping member and said arm for urging said member into clamping engagement with the work, a bell crank lever pivotally mounted on said arm, means coacting with said bell crank lever for limiting the movement of said member toward the work, and means for oscillating said lever to retract said member from said work.

5. In a material severing machine, in combination, a base, a work support on said base, a fence on said support for locating the work, a material severing element mounted on said base for movement toward and from said support to sever the work, a reciprocable clamping bar mounted on said support for movement transversely of said fence to clamp the work in position, a drawbar secured to the outer end of said clamping bar, spring means acting on said clamping bar to urge the latter toward the work, a bell crank lever pivoted on said base and receiving said drawbar through one arm, a nut adjustably secured on said drawbar for engagement with said arm to limit the forward movement of said clamping bar, a roller interposed between said arm and said nut, and means connected with the other arm of said lever for oscillating the lever to withdraw said clamping bar from said work against the pressure of said spring means.

6. In a material severing machine, an impeller comprising, in combination, a rotary spindle, an abrasive cutting element secured to said spindle for rotation therewith, and two impeller disks secured to said spindle at opposite sides of said cutting element and for rotation therewith, each of said disks coacting with said element to define a coolant chamber and having an outer peripheral edge spaced from said element to provide a restricted peripheral outlet arranged to discharge a continuous sheet of coolant under high pressure from said chamber outwardly over the adjacent side of said element and in intimate contact therewith, and means for supplying coolant to said chamber.

7. In a material severing machine, an impeller comprising, in combination, a rotary spindle, an abrasive cutting element secured to said spindle for rotation therewith, and two impeller disks secured to said spindle at opposite sides of said cutting element and for rotation therewith, each of said disks coacting with said element to define a coolant chamber and having a plurality of angularly arranged vanes in said chamber contacting the adjacent side of said element, the outer peripheral edge of each disk being spaced from said element to provide an outlet for said chamber through which coolant is adapted to be discharged by centrifugal force in a continuous sheet outwardly over the adjacent side face of said element, and means for supplying coolant to said chamber.

8. In a material severing machine, an impeller comprising, in combination, a rotary spindle, an abrasive cutting element secured to said spindle for rotation therewith, and an impeller disk secured to said spindle at one side of said cutting element and for rotation therewith, said disk being formed on one side with a plurality of crescent-shaped vanes about the axis and extending toward the periphery, a peripheral flange on said disk and spaced from said element to define a continuous discharge opening, and means for supplying coolant through said spindle to the space between said element and said disk, said vanes serving to throw the coolant outwardly through said opening at a high pressure and in a continuous sheet to flood the entire adjacent side face of said element.

9. In a material severing machine, a rotary spindle having an axial coolant supply passage opening at one end through radial ports, a thin rotary grinding disk secured to said spindle, two similar impeller disks secured to said spindle at opposite sides of and in direct contact with the hub portion of said disk, each of said impeller disks being formed with a series of peripherally spaced impeller vanes in direct contact with the contiguous side of said grinding disk to define flow passages extending generally outwardly toward the periphery, the inner ends of said passages being in communication with said ports, the outer periphery of each impeller disk being spaced from said grinding disk to define an annular outlet port in communication with the outer

ends of said passages, whereby in the rotation of said spindle coolant from said ports is flung outwardly by said vanes under high pressure and caused to issue in a thin uniform sheet over and in direct continuous contact with the contiguous side of said grinding disk.

10. In a material severing machine, in combination, a work support adapted to locate and support the work in a cutting position, a rotary grinding disk movable into and out of cutting engagement with the work, and means for completely flooding both side faces of said disk substantially from the center to the periphery with a coolant, said means being formed with spiral vanes for flinging said coolant against the side faces of said disk and outwardly in thin sheets under heavy centrifugal force.

11. In a material severing machine, in combination, a work support adapted to locate and support the work in a cutting position, a rotary grinding disk movable into and out of cutting engagement with the work, and an impeller associated with the hub of said disk for directing coolant under a relatively high pressure and in thin continuous sheets radially outwardly over and in direct contact with the opposite side faces of said disk, said impeller having substantially continuous peripheral outlets through which said coolant is adapted to issue and which outlets have beveled edges inclined radially outwardly toward the side faces of said disk.

12. In a material severing machine, in combination, a work support adapted to locate and support the work in a cutting position, a rotary grinding disk movable into and out of cutting engagement with the work, and an impeller associated with the hub of said disk for directing coolant under a relatively high pressure and in thin streams radially outwardly over and in direct contact with the opposite side faces of said disk, a hood enclosing said disk and impeller, and means in said hood for directing a concentrated stream of the coolant leaving said disk against the work at the point of cut.

13. In a material severing machine, in combination, a work support, a fence on said support formed with a central recess and arranged to locate the work in position, a clamping bar movable on said support transversely of said fence and being formed in the forward end with a slot having an inclined root surface and in registration with said recess, a thin rotary grinding disk mounted for movement transversely of said fence into and out of said recess and slot, a hood enclosing said recess, means for directing coolant against opposite sides of said disk, and deflector means in said hood for directing coolant thrown from said disk through centrifugal force into and through said slot in a concentrated stream against the work at the cutting zone.

14. A material severing machine comprising, in combination, a base, a work support on said base, a rearward extension on said base, an electric motor mounted on said extension and having a bell housing with a tubular sleeve, the motor shaft extending through and being journaled in said sleeve, a rocker arm having a swivel sleeve on one end rotatably supported on said tubular sleeve, an outboard support on said extension for said shaft and acting to confine said swivel sleeve in position, a spindle mounted in the other end of said rocker arm in parallel relation to said shaft, belt drive means connecting said shaft to said spindle, a rotary cutting element mounted on said spindle and being movable through oscillation of said rocker arm toward and from said support, a counterweight integral with said rocker arm and tending to move said cutting element away from said support.

15. A material severing machine comprising, in combination, a base, a work support on said base, a rearward extension on said base, an electric motor mounted on said extension and having a bell housing with a tubular sleeve, the motor shaft extending through and being journaled in said sleeve, a rocker arm having a swivel sleeve on one end rotatably supported on said tubular sleeve, an outboard support on said extension for said shaft and acting to confine said swivel sleeve in position, a spindle mounted in the other end of said rocker arm in parallel relation to said shaft, belt drive means connecting said shaft to said spindle, a rotary cutting element mounted on said spindle and being movable through oscillation of said rocker arm toward and from said support, a counterweight integral with said rocker arm and tending to move said cutting element away from said support, and adjustable stop means for limiting the movement of said cutting element toward said support.

16. A material severing machine comprising, in combination, a base, a work support on said base, an electric motor mounted on said base and having a housing with a tubular sleeve, the motor shaft extending through and being journaled in said sleeve, a rocker arm having a swivel sleeve rotatably supported on said tubular sleeve, a spindle mounted in said rocker arm in parallel relation to said shaft, belt drive means connecting said shaft to said spindle, an idler pulley on said rocker arm for tensioning said belt drive, a rotary cutting element mounted on said spindle and being movable through oscillation of said rocker arm toward and from said support, and means tending to move said cutting element away from said support.

17. A material severing machine comprising, in combination, a base, a work support on said base, a rocker arm mounted on said base for pivotal movement about a fixed axis, a tubular spindle mounted in said rocker arm in parallel relation to said axis, means for driving said spindle, a rotary cutting element mounted on said spindle and being movable through oscillation of said rocker arm toward and from said support, a pipe mounted on said arm for movement therewith and being connected at one end to the interior of said spindle, a flexible coolant supply conduit connected to the other end of said pipe substantially in line with said axis, and an impeller mounted on said spindle in association with said element, and connected to receive coolant from the interior of said spindle and to discharge the coolant over said element.

18. In a material severing machine, in combination, a horizontal work support formed with a cutting slot, a fence on said support for locating the work to be severed in position across said slot, a clamping bar mounted on said support for movement longitudinally of said slot into and out of engagement with the work, the forward end of said bar being formed with spaced clamping jaws arranged to engage the work at opposite sides of said slot, a rotary disk grinding element mounted for oscillation through cutting engagement with the work, means for flooding both sides of said grinding element with an abundance of a cooling liquid at high velocity and pressure, a hood enclosing said grinding element, and a deflector in said hood for directing cooling liquid from said

element in a concentrated stream under pressure through the space between said jaws and into said slot to penetrate the cut in the work during the severing operation.

19. In a material severing machine, in combination, a work support adapted to locate and support the work in a cutting position, a rotary grinding disk movable into and out of cutting engagement with the work, and an impeller associated with the hub of said disk for directing coolant under a relatively high pressure and in thin streams radially outwardly over and in direct contact with the opposite side faces of said disk, and means for directing a concentrated stream of the coolant leaving said disk against the work at the point of cut.

20. In a material severing machine, an impeller comprising, in combination, a rotary spindle, an abrasive disk secured to said spindle for rotation therewith, an impeller disk secured to said spindle at one side of said abrasive disk and for rotation therewith, one side face of said impeller disk being formed intermediate its inner and outer circumferential edges with a plurality of peripherally spaced vanes extending generally outwardly and inclined to the radial, said vanes contacting the contiguous side face of said abrasive disk and serving to define a series of spiral passages, and means for directing coolant to the inner ends of said passages, the coolant from the outer ends of said passages being adapted to issue in a thin sheet from between said abrasive disk and the outer peripheral edge of said impeller disk.

21. In a material severing machine, an impeller comprising, in combination, a rotary spindle, an abrasive disk secured to said spindle for rotation therewith, an impeller disk secured to said spindle at one side of said abrasive disk and for rotation therewith, one side face of said impeller disk being formed intermediate its inner and outer circumferential edges with a plurality of peripherally spaced vanes extending generally outwardly and inclined to the radial, said vanes contacting the contiguous side face of said abrasive disk and serving to define a series of spiral passages, and means for directing coolant to the inner ends of said passages, the coolant from the outer ends of said passages being adapted to issue in a thin sheet from between said abrasive disk and the outer peripheral edge of said impeller disk, said outer edge having a side face spaced from and inclined radially outwardly toward said disk to define the outlet for said coolant.

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