T. H. MATHIAS.

MACHINE FOR REMOVING DEFECTIVE SURFACES OF METAL BARS.

APPLICATION FILED APR. 24, 1915. RENEWED MAY 11, 1920.

1,360,001. **Patented Nov. 23, 1920.**

4 SHEETS—SHEET 1.

Fig. 1.

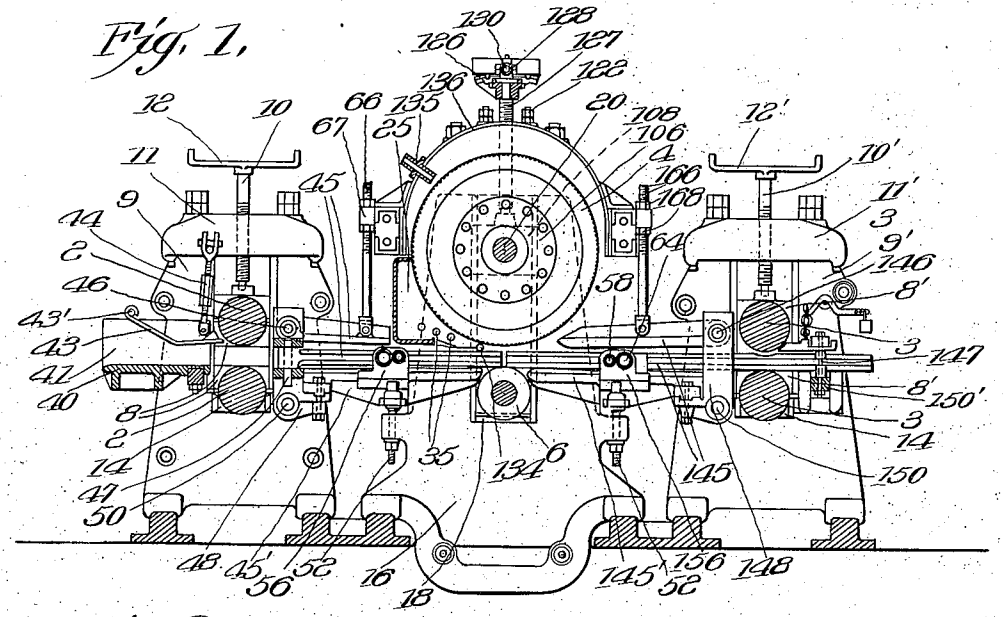


Fig. 3.

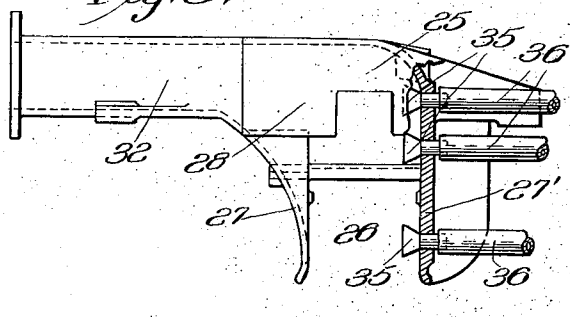


Fig. 4.

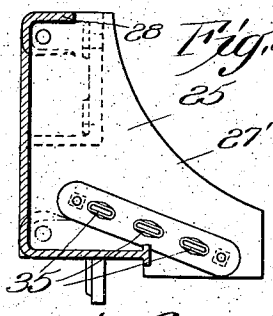


Fig. 5.

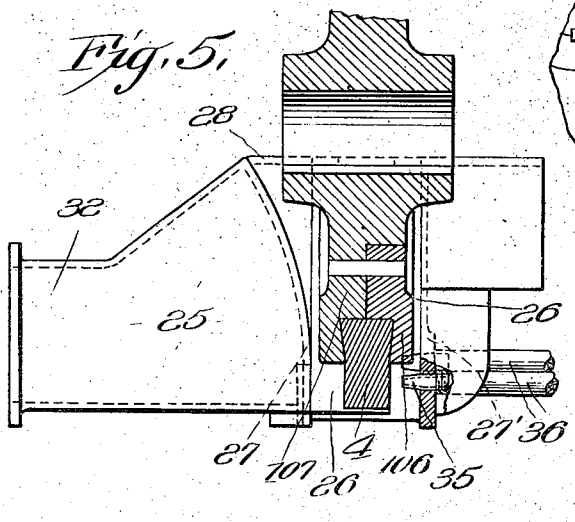
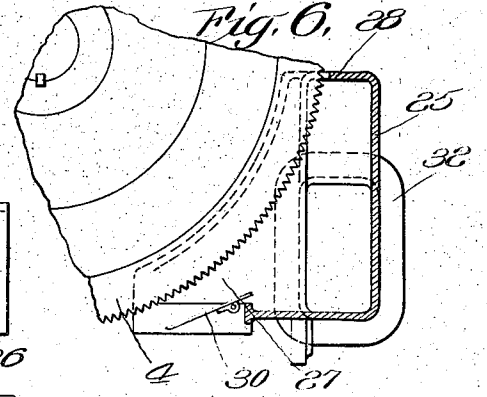


Fig. 6.



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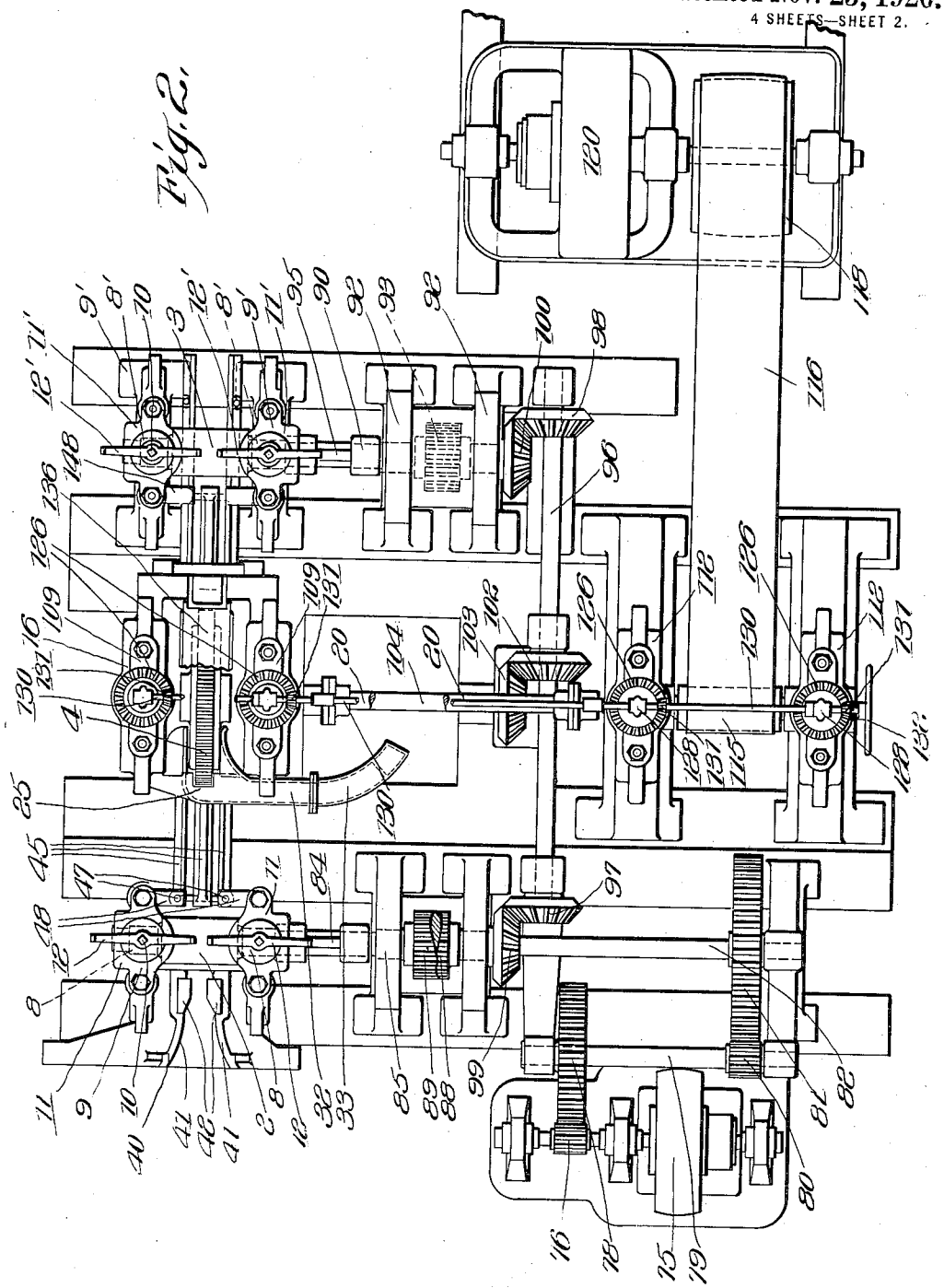
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4 SHEETS—SHEET 2.

Fig. 2.



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4 SHEETS—SHEET 3.

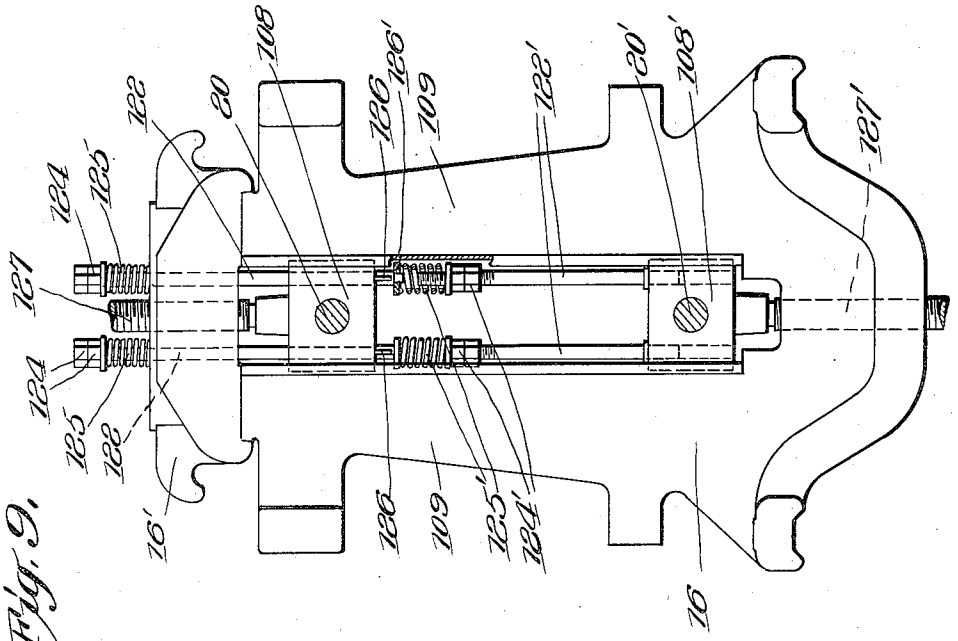


Fig. 9.

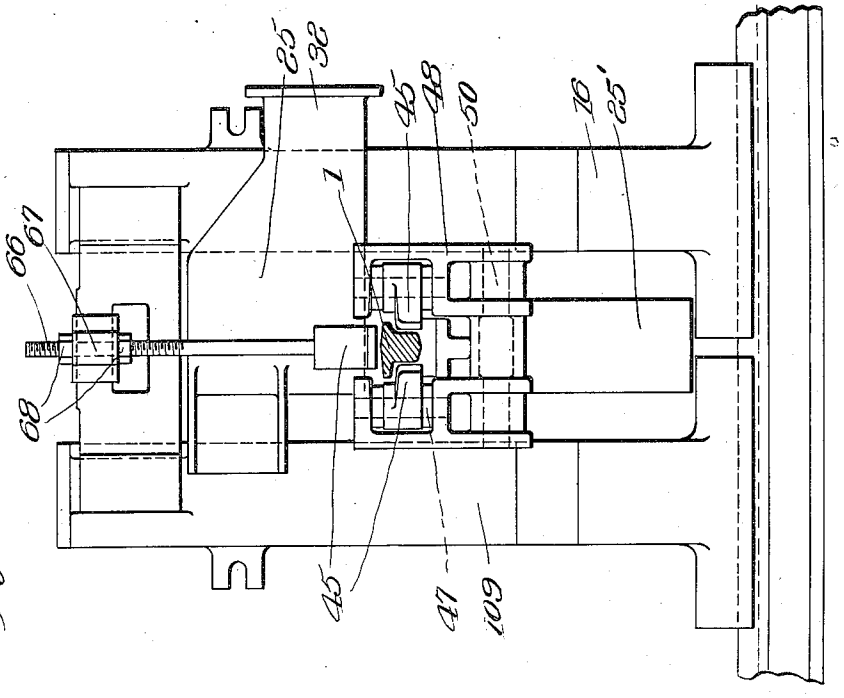


Fig. 8.

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4 SHEETS—SHEET 4.

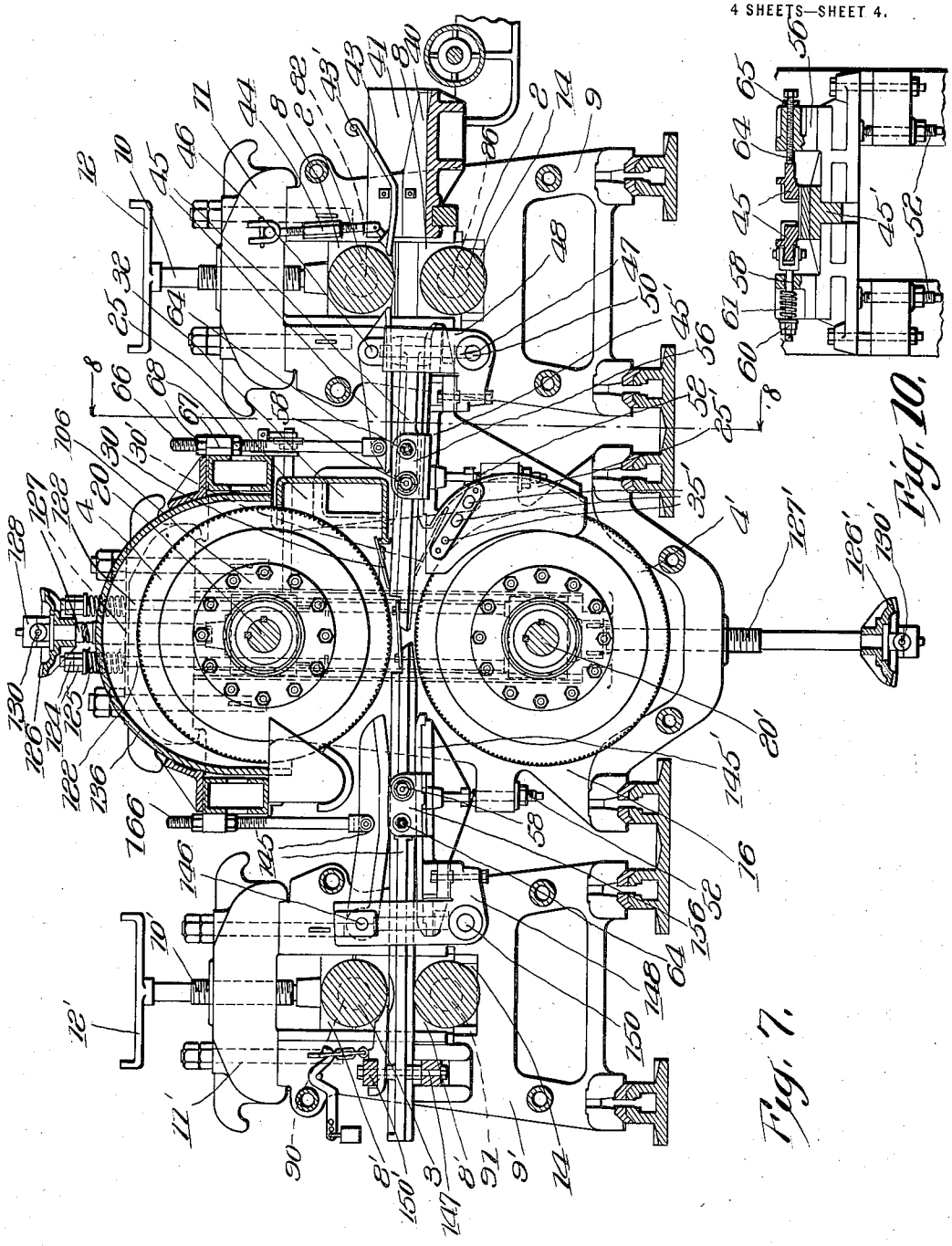


Fig. 7.

Fig. 10.

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UNITED STATES PATENT OFFICE.

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MACHINE FOR REMOVING DEFECTIVE SURFACES OF METAL BARS.

1,360,001. Specification of Letters Patent. Patented Nov. 23, 1920.

Application filed April 24, 1915, Serial No. 23,622. Renewed May 11, 1920. Serial No. 380,615.

To all whom it may concern:

Be it known that I, THOMAS H. MATHIAS, a citizen of the United States, residing at Buffalo, in the county of Erie and State of New York, have invented new and useful Improvements in Machines for Removing Defective Surfaces of Metal Bars, of which the following is a specification.

My present invention relates to the removing of defective surfaces from iron or steel bars, or blooms, which have first been worked down more or less from the ingot as described in my Patent No. 1,120,831 for a process and consists in a machine whereby that process may be conveniently practised.

The ingots from the soaking pit show a superficial skin lower in carbon than the body of the metal. As the ingot is worked down and elongated into a bar, by more or less rolling, this skin becomes thinner, but is always present in the finished rail or other product and is a source of weakness. Furthermore as the ingot is rolled out into the bar longitudinal seams develop in this skin extending substantially parallel and are another source of weakness. To remove this defective surface as the source of these weaknesses I invented my process, and to practise said process I have designed the machine here described.

Certain difficulties attend the removal of such surface due principally to the high temperature and the highly cohesive condition of the metal and my machine is particularly adapted to overcome said difficulties. Essential features of the machine are rotary cutting tools having peripheral teeth, means for rotating said tools at a high speed and means for feeding the bars operated upon to the tools and guiding them therefom. It is also important that the particles of the surface, or "spittings" be guided away from the bar and removed from the machine rapidly without danger of welding together, or of sticking to the parts of the machine, or of again coming in contact with the bar from which they have been removed. To that end I have devised means for cooling and expelling said spittings without affecting the temperature of the bar, or interfering with the functions of the machine, or with the operation of rolling. It is also desirable to provide means for adjusting the cutters and for cooling the various parts of the mechanism.

The described and other features of my invention are shown in the accompanying drawings wherein Figure 1 is a longitudinal vertical sectional view of a machine embodying the features of my invention. Fig. 2 is a plan view thereof showing the driving connections therefor. Figs. 3 to 6 are detail views of the deflecting box arrangement of which Fig. 3 is a plan view partially broken away; Fig. 4 is a vertical sectional view thereof showing the nozzles in elevation; Fig. 5 is a front elevation thereof and Fig. 6 is a vertical sectional view looking in the opposite direction to Fig. 4. Fig. 7 is a view similar to Fig. 1 illustrating a modified form of machine for operating on more than one surface of the bar. Fig. 8 is a front elevational view of the cutter housing showing the arrangement of guiding parts, as though taken on section line 8 of Fig. 1 looking toward the cutter; Fig. 9 is a side elevation illustrating the housings for the cutting tools of the machine of Fig. 7 with the cutters and other parts omitted; Fig. 10 is a detail view showing the manner of adjusting the guides.

In the embodiment of my invention illustrated in Figs. 1 to 6 I have shown an approved type and arrangement of cutting tool for removing the superficial skin from one side only of the bar. As there shown, the bar 1 is passed forwardly between the feed rolls 2—2 and 3—3 of the machine and beneath a rotary cutter 4 arranged intermediate of the rolls and above the bar. The bar 1 referred to may be understood as any bar being rolled as for instance a rail which has progressed in the rolling operation about one quarter toward completion. The cutter 4 desirably is rotated at high speed and is provided on its periphery with cutting teeth of suitable form as indicated in Fig. 6, to act upon the bar as it is passed beneath the cutter.

A supporting roller 6 is jounaled beneath the cutter 4 accurately and rigidly to support the bar as it is being cut and this roller 6 is arranged to be driven in unison with the rollers 2—2 and 3—3 through connections to be described. As all of the rolls are of a size they will act uniformly in advancing the bar.

The feed rolls 2—2 and 3—3 are journaled in suitable oppositely arranged bearings 8—8′ adjustably supported on standards or

housings 9—9′. The bearings are fitted to suitable ways in the housings and the upper bearings are supported in the customary manner upon the lower bearings with suitable spacing liners between them. Similarly, the lower feed rolls are arranged to be adjustable by the positioning of liners or distance bars 14 interposed between the housings and the lower bearings. The bearings so spaced and supported are rigidly clamped in position by means of the screw-down bolts 10—10′ provided with hand levers 12—12′ and threaded to the housing caps 11—11′. Similarly the supporting roller 6 is journaled in bearings fitted within the cutter or tool housing or standard 16 and adjustable by means of liners 18.

The cutting tool is carried by a tool shaft 20 adjustably journaled and driven in an improved manner hereinafter described and desirably it is rotated in a reverse direction to the movement of the bar upon which it operates. The removed particles of heated metal or "spittings" are therefore thrown forwardly of the cutter and an important feature of the present invention consists in the means employed for removing these spittings from the machine without danger of clogging by the welding tendency of the heated particles and consequent interruption of the proper operation of the machine.

The means which I have devised for the efficient and successful removal of the heated particles consists in an arrangement of deflection box or chute having associated therewith water jets in a manner whereby the particles are intercepted and cooled by the water so that they do not stick together, and under the impulse of the jets they are ejected from the machine. As the interior of the box is likewise continuously sprayed by the jets there is no possibility of the particles adhering thereto to cause a stoppage from that source. The box is here shown at 25 in Figs. 1 and 2 and is shown in detail in Figs. 3 to 6.

As best shown in Figs. 3 and 6 the deflection box 25 is open at its front and into this opening 26 the cutter 4 extends whereby the particles removed thereby are thrown directly into the box. The side walls 27—27′ and the top wall 28 of the deflection box are arranged to be in close proximity to the cutter so as to completely receive and retain the particles and at the bottom of the box there is arranged a hinged baffle plate 30 to guide the entry of the particles into the box at that point. This baffle is pivotally arranged to ride upon the bar at the lower edge as shown. A laterally extended chute portion 32 of the box is arranged to conduct the particles from the machine through a chute 33 attached to its end as shown in Fig. 2.

The particles as they enter the deflection box are met by jets of water entering through the nozzles 35—35 and feed pipes 36—36 arranged in the wall 27′ of the box. The water jets are directed toward and into the outlet chute so that the action of the water is to intercept and cool the particles and to propel them outwardly through the chute at high velocity and in a wetted condition whereby there is no danger of clogging of the passage.

As will be readily understood the action of the water thus cools and lubricates the particles and also ejects them from the machine without permitting them to freeze to the chute which would interrupt the operation or to cling to each other in which condition they would be difficult to handle.

The nozzles as shown are suitably flared or flattened and the rear wall of the box is suitably curved to deflect the particles outwardly through the chute. The deflecting box is suitably supported in position, as shown being bolted to the cutter housing 16. From the discharge opening of the chute the particles drop into a hopper, whence they may be removed mechanically by any suitable means.

Suitably supported on the housing 9, in advance of the rolls 2—2, an entry guide 40 is arranged to guide the bars as they enter between the rolls. The guide 40 is formed with curved side guide flanges 41—41 and is provided with hardened metal bearing inserts 42—42 as shown. A top entry guide 43 is pivotally supported at 43′ and adjustable by means of a turn buckle support 44 as shown.

Desirable guides are also employed to guide the advancing bar with relation to the cutter and to the rear feed rolls 3—3. I have devised guides therefor comprising suitable guide arms held in position to engage the bar on all four sides whereby it is positively guided in its passage without danger of deflection. The advance tool guides are indicated at 45—45 pivotally supported for adjustment with relation to the cutter. To that end the upper guide is pivoted upon a pin 46 and the side guides are pivoted upon pins 47—47; the pins 46 and 47 being carried by a supporting frame 48. This frame 48 is itself pivotally supported on a pin 50 carried by suitable brackets of the housing 9. The lower guide 45′ is rigidly secured to the frame 48 and is arranged to be engaged from beneath by an adjustable rest shoulder or screw 52 threaded into a projection of the cutter housing 16. Thus by adjusting of the screw 52 the lower guide 45′ and with it the supporting frame 48 are rocked to adjust the vertical relation of the guide arms to the cutter.

For laterally adjusting the side guides 45 I have arranged for supporting these guides

at their free ends in a frame or bracket 56 integrally formed with the lower guide arm 45′. The manner of support thus afforded permits of adjusting the bottom and side guides as a unit and of adjusting the latter relatively to each other. Referring to Fig. 10 it will be seen that the side guides 45 are connected to the bracket 56 by means of screw studs 58 pivotally connected to the arms and extended outwardly through apertures in the frame 56 and having nuts 60 threaded on their outer ends and confined between these nuts and the frame coiled compression springs 61 are fitted to the studs to exert an outwardly directed force on the studs and arms. In consequence the guides are normally held in an outward position. Opposed to the action of the springs 61 I have provided adjusting or set screws 64 threaded to the frame 56 to engage the guides and by their adjustment accurately to maintain the guides in position. The set screws 64 have squared heads for the use of a wrench thereon and locking nuts 65 are threaded thereon for securing them when adjusted.

The upper guide 45 is supported at its free end to be independently adjustable relative to the lower guide 45′ by means of a threaded rod 66 attached thereto at its lower end and received at its upper end in a lug 67 of the frame 16 to be adjustably secured by the nuts 68—68 threaded on the rod.

The front guides referred to are extended toward the cutter to be in substantially as close proximity thereto as is permissible so as to insure greater accuracy in guiding the bar thereto. Similarly constructed but reversely arranged guiding parts are provided to the rear of the cutter of which rear guides 145 are forwardly extended from a frame 148 to be in guiding engagement with the bar at their forward ends immediately behind the cutter. The frame 148 is similar to frame 48 and is similarly supported upon a pin 150. Likewise the lower guide arm 145 is carried on the bracket 148 and has thereon the frame 156 corresponding to frame 56. The upper guide 145 is pivoted on pin 146 carried in the bracket 148 and the side guides 145 are adjusted in the frame 156 in similar manner to the adjustment of the side guides 45 in frame 56 described but these rearward side-guides, as shown, are extended rearwardly between the rolls 3 and pivoted upon vertical pins 147 carried by a supporting bracket 150′. The side guides 145 being long and pivotally supported at the front may be adjusted in and out without substantially changing their angle to the work.

The manner of driving the rolls for feeding of the bars and for driving the rotary cutter are best illustrated in Fig. 2. The feed rolls 2 and 3 and the supporting roller 6 are driven in unison and the cutter preferably is driven independently thereof. The rolls are driven from a suitable source as the motor 75 indicated, through connections here shown comprising a drive-gear 76 on the motor shaft in mesh with a gear 78 on suitably journaled counter-shaft 79. Upon shaft 79 is a small gear 80 in engagement with a larger gear 81 on shaft 82 and the power is transmitted directly from this latter shaft to the rolls 2. For that purpose the shaft 82 is arranged to be in parallel alinement with the upper of the rolls 2 and is coupled thereto by a suitable coupling 84. The shaft 82 is journaled at one end in a standard 85 and beneath it within the same standard, is journaled a shaft 86 parallel to the lower of the rolls 2 and coupled thereto by a suitable coupling and the two shafts 82 and 86, are rotatably connected by gears 88—89 on the respective shafts by means of which the lower roll is driven. A similar manner of driving the rear pinch rolls 3—3 is employed wherein upper and lower shafts 90—91 are journaled in a standard 92 and rotatively connected by gears 93 and are arranged in parallel relation to the upper and lower pinch rolls respectively and connected directly thereto by suitable couplings 95. A connecting shaft 96 is suitably journaled at right angles to the shafts 82 and 90 and has affixed thereon miter gears 97—98 in engagement with similar gears 99—100 respectively on the shafts 82 and 90 whereby the latter shaft is driven from and in unison with the shaft 82 and the forward and rearward feed rolls are given a like rotation. A corresponding movement is imparted to the supporting roller 6 through the engagement of the miter gear 102 with coacting gear 103 on a roll drive shaft 104 journaled in parallel relation to and coupled with the roller.

A desirable arrangement of the rotary cutter is, as shown best in Fig. 5, with the circular cutting tool 4 clamped by annular flange 106 to a suitable cutter disk 107 keyed onto cutter shaft 20. The shaft 20 is journaled in bearing blocks 108 fitted to vertical ways in the opposite standards 109 of housing 16 and at its other end is similarly journaled in bearings fitted to ways in opposite standards 112—112. Between the standards 112—112 the cutter shaft 20 carries a fixed pulley 115 driven from a drive pulley 118 on the axle of a driving motor 120. The driving power is thus communicated from the motor to the cutter whereby the latter is driven preferably at a high speed.

The bearing arrangement of the cutter shaft provides for simultaneous adjustment of all of the bearings 108 and the similar bearings in the standards 112—112 (not shown) vertically within the standards so as to shift the cutter therewith when de-

sired to change its relation to the bar for removing more or less of the metal as required.

Each of the cutter shaft bearings is supported upon suspended supporting rods 122—122 as best shown in Fig. 9. These rods 122 are passed upwardly through the cap 16′ of the housing 16 and have threaded on their upper ends the nuts 124—124 beneath which are arranged the coiled compression springs 125 fitted to the rods. The springs 125 are thus confined between the nuts 124 and the cap 16′ to rest upon the latter for supporting the cutter bearings 108 which rest upon supporting keys 126 carried by the rods. Adjusting of the bearings is directly effected by means of threaded adjusting rods or stops 127 threaded to the caps 16′ to bear upon the upper surface of the bearings and thereby determine the position of cutter. All of the bearings for the cutter shaft are supported in the same manner and are arranged to be simultaneously adjusted by connections now to be described.

Fitted to the upper end of each of the adjusting rods 127 is a bearing bracket 128 providing horizontal bearings for an elongated adjusting shaft 130 horizontally supported in the bearings so provided. This adjusting shaft 130 has affixed thereon small bevel gears 131 in engagement with gears 126 affixed to each of the adjusting rods 127 whereby upon turning of the shaft a like rotative movement will be imparted to each of the adjusting rods to adjust its related bearings and upon one end of the shaft 130 is provided a hand wheel 132 to conveniently effect this adjustment.

At points 134 and 135 (Fig. 1) water jets are directed against the active surface of the cutter to prevent adhering of the heated metal thereto and the water, which is introduced in sufficient volume for that purpose, also has a desirable cooling action on the cutter which contributes to the successful operation of the machine. A suitable protective hood 136 is supported above the cutter as shown. The lowermost jet 135 also performs an important function of cooling the particles and wetting them and also the baffle plates so that the particles do not adhere to the latter.

While the machine described employs but a single cutter for removing the superficial skin from one surface of the bar only it will be readily understood that a plurality of such cutters may be employed simultaneously to operate upon two or more surfaces of the bar if desired. In Fig. 7 I have shown such a machine wherein the supporting roller 6 of the machine first described is replaced by a second cutter 4′ arranged to operate upon the under surface of the bar as shown. This lower cutter may be driven in any desirable manner not necessary to be shown.

This lower cutter may be driven from any source of power not necessary to be shown. It is here shown carried by a cutter shaft 20′ arranged to be adjustable by being supported in similar manner to the support of the upper cutting tool 4. Referring to Fig. 9, 108′ indicates one of the bearings for the cutter shaft 20′, these bearings operating in the guide-ways of the standards. The adjusting connections provide for adjusting the bearings 108′ from beneath and comprise adjusting rods 127′ threaded to the standards, as 16, and having thereon bevel gears 126′ by which the several bearings are adjusted in unison by means of a connecting shaft 130′ corresponding to shaft 130 and connections described relatively to the upper cutter tool bearings. The adjustang rods 127′ determine the elevation of the lower cutter bearings by engaging the under sides thereof and the bearings are held down by the action of springs 125′ fitted to the upper ends of the rods 122′ carried by the bearings. The springs 125′ are confined between nuts 124′ threaded onto the rods 122′ and washers 126′ received on the lower ends of the upper rods 122. The bearing arrangement for the lower cutting tool is thus generally similar to that for the upper tool whereby it may be adjusted with reference to the bar upon which it acts.

A deflection box 25′ is associated with this lower cutting tool for ejecting of the particles removed from the bar and may be in the form of a curved hood, as shown in Fig. 7, to deflect and discharge the spittings downwardly beneath the cutter. At 35′ is indicated the nozzles for directing the jets of water into the deflection box to intercept and cool the particles and lubricate the sides of the box in the manner described. At 30′ I have indicated a suitable resilient baffle plate to engage the under surface of the bar and guide the particles into the box 25′. The position of the nozzles 35′ is such that the jets therefrom will impinge both on the baffle 30′ and on the teeth of the cutter 4′ whereby they are lubricated to the end of preventing the particles adhering thereto.

While the process of my said Patent No. 1,120,831 was intended to be practised in any manner that might be desired without reference to any particular machine, yet the machine here described is particularly adapted to the practice of said process. By means of this machine the surface may desirably be cut from blooms and bars of various sorts. This machine has proved successful in practical use for a considerable period and is particularly adapted for use in connection with the production of different

shapes by rolling, but it is not necessarily so used, for it may be used independently, and the rolling take place at a different time or place. It will be understood that the mechanism and arrangement of parts of the machine here shown may be modified within the scope of the appended claims without departing from the spirit of my invention.

I claim—

1. A machine of the character described comprising a rotary cutting tool suitably journaled, means for advancing the work to the cutting tool, a deflecting box arranged to receive the particles removed by the tool, said box having an opening toward the cutting tool and a discharge opening, flared sides on the box partially inclosing the tool, a baffle plate supported to ride on the surface of the work to direct the particles into the box and means to direct a stream of water into the box toward the discharge opening to cool and eject the particles removed from the work substantially as described.

2. A machine of the character described comprising forward and rearward feed rolls, a tool standard arranged between the feed rolls adjustable bearings fitted to the standards, a tool shaft journaled in the bearings, a rotary cutting tool on the shaft, means simultaneously to adjust the bearings to adjust the relation of the tool to the work, a deflecting box arranged to receive the particles removed by the tool, said box having an opening toward the cutting tool and a discharge opening, flared sides on the box partially inclosing the tool, a baffle plate supported to ride on the surface of the work to deflect the particles into the box, and flattened nozzles arranged to direct a stream of water into the box toward the discharge opening to cool and eject the particles removed from the work substantially as described.

3. A machine of the character described comprising forward and rearward feed rolls, a plurality of cutting tools journaled between the feed rolls, means to drive the tools, guiding elements arranged intermediate of the feed rolls and the cutting tools to guide the work with relation to the cutting tools, and baffle plates associated with each of the cutting tools arranged to ride upon the surface of the work and to deflect the particles removed therefrom, substantially as described.

4. In a machine for cutting surfaces from hot iron or steel blooms or bars, the combination with supports for the parts of the machine and supports for the work while being operated upon, of a rotary cutting tool, means to feed the work to the tool, means to rotate the tool in a reverse direction to the feed, a deflecting box arranged adjacent the point, of cutting, said box having an open front to receive the edge of the rotating tool between the sides of the box, an open space in its base at front to receive the cut away particles, side walls arranged adjacent the sides of the tool with an outlet opening in one side wall and nozzles in the opposite side wall to deliver jets of cooling fluid, transversely against the stream of cut away particles to cool the same and eject them through the opening.

5. In a machine for cutting surfaces from hot iron or steel blooms or bars, the combination with supports for the parts of the machine and supports for the work, of a rotary cutter or cutting tool, means to feed the work to the tool, means to rotate the tool, a deflecting box arranged adjacent the point of cutting, said box having an open front to receive the edge of the rotating tool between the sides of the box, an open space in its base at front to receive the cut away particles, side walls arranged adjacent the sides of the tool, an outlet opening in one side wall adjacent the rear and base walls, an outlet chute to the opening to receive and guide outwardly the cut away material, and nozzles in the opposite side wall to deliver jets of cooling liquid, transversely against the stream of cut away particles, to cool the same and eject them through the opening and chute said nozzles being flared or flattened substantially parallel to the stream of cut away particles, substantially as described and shown.

6. In a machine for cutting surfaces from hot iron or steel blooms or bars, the combination with supports for the parts of the machine and supports for the work while being operated upon, of a rotary cutting tool, means to feed the work to the tool, means to rotate the tool in a direction opposed to the feed, a deflecting box arranged adjacent the point of cutting, said box being provided with an open front to receive the edge of the rotating tool between the sides of the box, with an open space in its base at front to receive the separated particles, with side walls arranged adjacent the sides of the tool, with a top wall arranged adjacent the edge of the tool, with an outlet opening in one side wall, adjacent the rear and base walls, an outlet chute to receive and guide outwardly the cut away material with nozzles in the opposite side wall to deliver jets of cooling fluid, transversely against the stream of cut away material to cool the same and direct it through the opening and chute said nozzles being flared or flattened transversely substantially parallel to the stream of separated material, a deflector plate pivoted in the base of the box and having its front end engaging the work to guide the separated material into the box, said box having its upper portion on the chute side inclined down to the opening

and its rear wall curved to guide the cut away material toward the opening, substantially as described and shown.

7. In a machine for cutting the surface from hot bars and billets the combination with a suitable supporting frame, of entry guides initially to receive the work and engage it on the four sides, the bottom and side guides being fixed and the top guide vertically adjustable, a pair of primary feed rolls to receive the work and feed it forward, advance guides to receive the work from the feed rolls and engage it on the four sides, the lower and upper advance guides being vertically adjustable and the side advance guides being laterally adjustable, a rotary toothed cutter or cutting tool to engage with the work, means for vertically adjusting said cutter with reference to the work, means for rotating the cutter reversely to the feed, rear guides to receive the work from the cutter and engage the work on four sides, the upper and lower rear guides being vertically adjustable and the side rear guides being laterally adjustable, and secondary feed rolls to receive the work from the rear guides and deliver it outwardly from the machine, substantially as shown.

8. In a machine for cutting the surface from hot metal blooms and bars, the combination with means for supporting the parts of the machine and work, of a cutting tool, means to feed the work to the tool and means to direct jets of water at high velocity transversely of the work to intercept and quench the particles in space to convey them from the machine and said jets being directed to avoid contact with the work substantially as described.

9. In a machine for cutting the surface from hot metal blooms and bars the combination with supports for the work and for the parts of the machine, of a rotating cutting tool, means to feed the work to the tool, means to rotate the tool in a reverse direction to the feed, a deflecting box adjacent to the point of cutting to receive the separated particles, said box having a closed rear, an open front, a delivery chute extending from one side and nozzles in the other side adjacent the point of cutting to deliver jets of liquid at high velocity to intercept the severed particles in space to cool the same and wash them outwardly through the chute and said jets being directed to avoid contact with the work.

10. In a machine of the character described, the combination with suitable supporting means, a rotary cutting tool, means to advance the relation of the work and the cutting tool, means for directing a jet of fluid at high velocity to intercept the cuttings in space to eject them from the machine and arranged to avoid contact with the work and means to direct a jet of liquid to impinge against the active surface of the cutting tool to lubricate the same, substantially as described.

11. A machine of the character described comprising a rotary cutting tool suitably journaled, means for advancing the relation of the work to the cutting tool, a deflecting box arranged to receive the particles removed by the tool and means to direct a stream of water at relatively high velocity into the deflection box to intercept and quench the particles in space and said stream being directed to avoid contact with the work substantially as described.

12. A machine of the character described comprising a rotary cutting tool suitably journaled, means for advancing the work to the cutting tool, a deflecting box arranged to receive the particles removed by the tool, a baffle plate supported to ride on the surface of the bar and to deflect the articles into the box and means to direct a stream of water at relatively high velocity into the deflection box to intercept and quench the particles in space and said stream being directed to avoid contact with the work, substantially as described.

13. A machine of the character described comprising a rotary cutting tool suitably journaled, means for advancing the work to the cutting tool, a deflecting box arranged to receive the particles removed by the tool, means to direct a stream of water at relatively high velocity into the deflection box to intercept and quench the particles in space and said stream being directed to avoid contact with the work, and means to direct a jet of liquid to impinge against the active surface of the cutting tool to lubricate the same, substantially as described.

14. A machine of the character described comprising a rotary cutting tool suitably journaled, means for advancing the work to the cutting tool, a deflecting box arranged to receive the particles removed by the tool, said box having an opening to receive the cutting tool and a discharge opening and means for directing a stream of water at relatively high velocity into the deflecting box toward the outlet to intercept the particles in space and carry them off, said stream being directed to avoid contact with the work, substantially as described.

15. A machine of the character described comprising a rotary cutting tool suitably journaled, means for advancing the work to the cutting tool, a deflecting box arranged to receive the particles removed by the tool, said box having an opening to receive the cutting tool and a discharge opening, means for directing a stream of water at relatively high velocity into the deflecting box toward the outlet to intercept the particles in space and carry them off, said stream being directed to avoid contact with the work, and

means to direct a jet of liquid to impinge against the active surface of the cutting tool to lubricate the same, substantially as described.

16. In a machine for cutting surfaces from hot iron or steel blooms or bars, the combination with suitable supporting means, a rotary cutting tool and means for directing cooling fluid at relatively high velocity to intercept and quench the cuttings in space and convey them from the machine and to avoid contact with the bar substantially as described.

17. In a machine for cutting surfaces from hot iron or steel blooms or bars, the combination with suitable supporting means, a rotary cutting tool, means for directing cooling fluid at relatively high velocity to intercept and quench the cuttings in space and convey them from the machine and to avoid contact with the bar and means to direct a jet of liquid to impinge against the active surface of the cutting tool to lubricate the same substantially as described.

18. A machine of the character described comprising a plurality of rotary cutting tools, means to feed the work with relation to the cutting tools, means to drive the cutting tools and means associated with each of the cutting tools to direct a stream of cooling liquid at relatively high velocity to intercept the removed particles in space and eject them from the machine and said stream being directed to avoid contact with the work substantially as described.

19. A machine of the character described comprising a rotary cutting tool suitably journaled, means for advancing the work to the cutting tool, means associated with the cutting tool to direct a jet of cooling fluid at high velocity to intercept and quench the particles in space and to avoid contact with the work and means arranged in close proximity to the cutting tool for supporting the work with reference thereto.

20. A machine of the character described, comprising a plurality of cutting tools suitably journaled, feed rollers journaled forwardly and rearwardly of said tools, means to drive the tools, guiding elements arranged intermediate of the feed rolls and the cutting tools to guide the work with relation to the cutting tools, baffle plates associated with each of the cutting tools and arranged to ride on the surface of the work to deflect the particles removed therefrom and means associated with each of the tools to direct a stream of cooling liquid at high velocity to intercept the particles and remove them from the machine and to avoid contact with the work substantially as described.

21. A machine of the character described comprising a plurality of cutting tools suitably journaled, feed rollers journaled forwardly and rearwardly of said tools, means to drive the tools guiding elements arranged intermediate of the feed rolls and the cutting tools to guide the work with relation to the cutting tools baffle-plates associated with each of the cutting tools and arranged to ride on the surface of the work to deflect the particles removed therefrom, means associated with each of the tools to direct a stream of cooling liquid at high velocity to intercept the particles and remove them from the machine and to avoid contact with the work, and means associated with each of the cutters to direct a jet of liquid to impinge against the active surface of the cutting tool to lubricate the same substantially as described.

22. In a machine for cutting surfaces from hot iron or steel blooms or bars, the combination with suitable supporting means, a rotary cutting tool, means for advancing the relation of the work and cutting tool and means for directing a jet of fluid at high velocity to intercept the cuttings in space to eject them from the machine and arranged to avoid contact with the bar, substantially as described.

23. In a machine for cutting surfaces from hot iron or steel blooms or bars, the combination with suitable supporting means, a rotary cutting tool supported above the work to operate on the upper surface thereof, a supporting roller for the work journaled beneath the cutter and means for directing a jet of fluid at high velocity to intercept the cuttings in space to eject them from the machine and said jet being arranged to avoid contact with the bar, substantially as described.

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

THOMAS HERBERT MATHIAS.

Witnesses:

WALTER J. BRYAN,

JULIA WUNSCH.