J. T. McGRATH.

AUTOMATIC MACHINE FOR CUTTING OFF TUBES.

APPLICATION FILED SEPT. 25, 1909. RENEWED FEB. 3, 1912.

1,020,433. Patented Mar. 19, 1912.

2 SHEETS—SHEET 1.

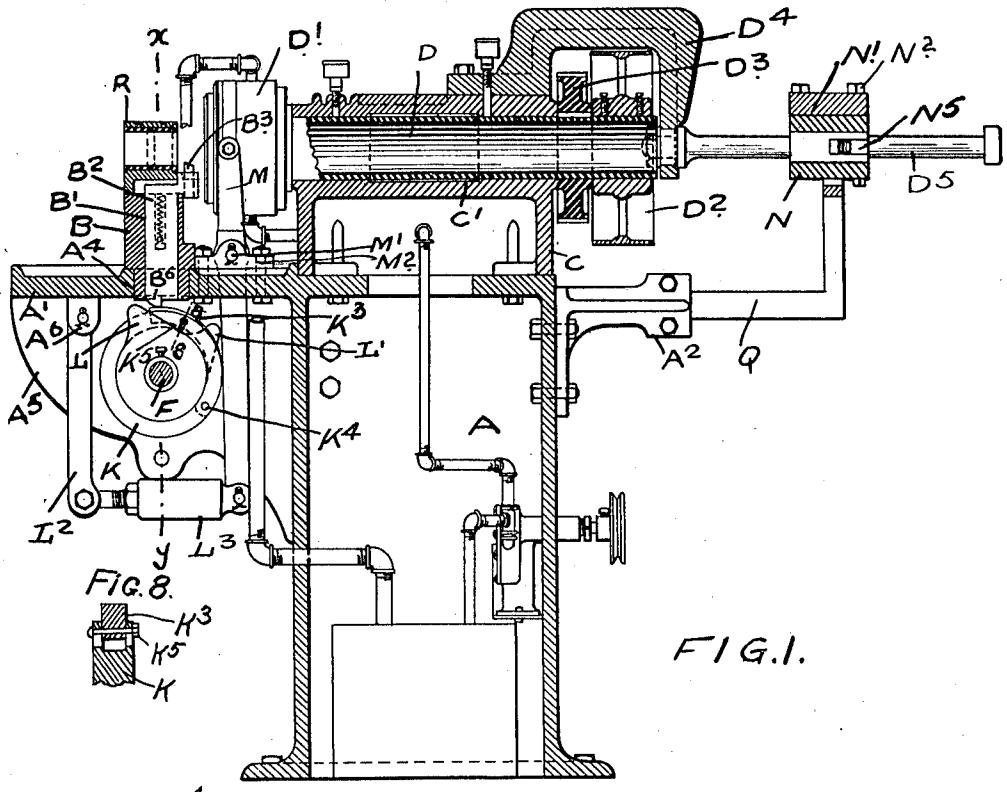

FIG. 8.

FIG. 1.

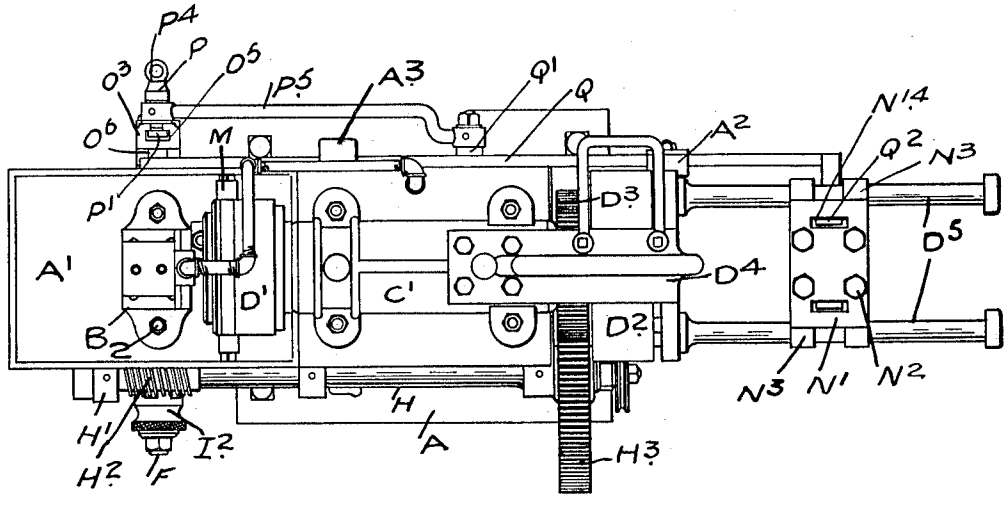

FIG. 2.

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2 SHEETS—SHEET 2.

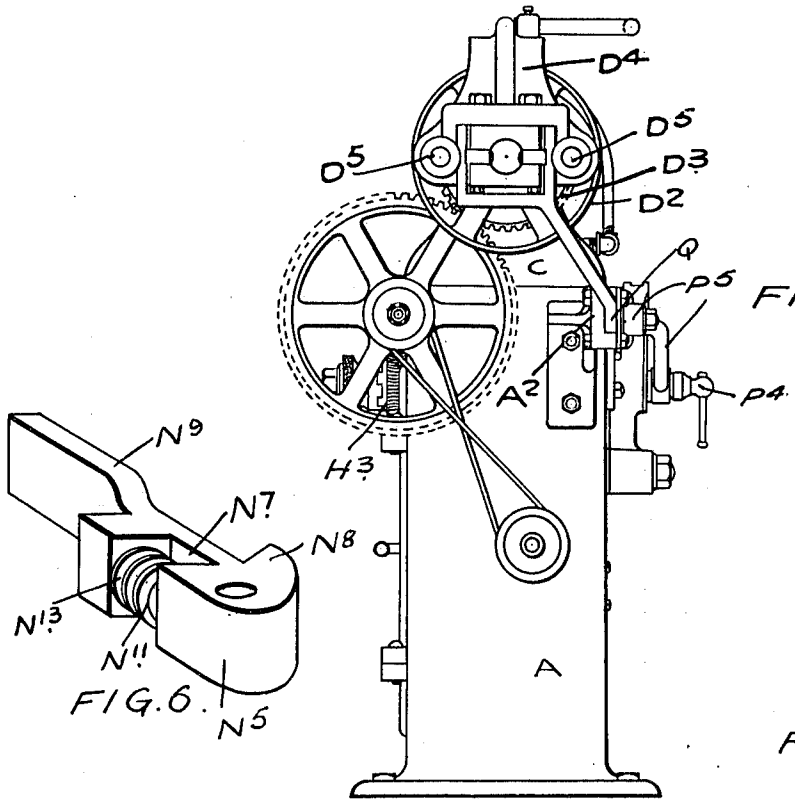

FIG. 3.

FIG. 6.

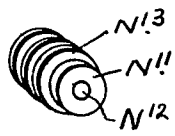

FIG. 7.

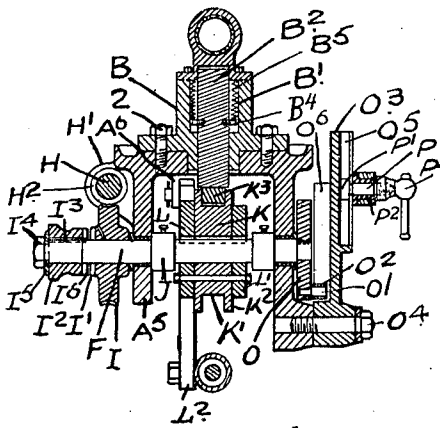

FIG. 4.

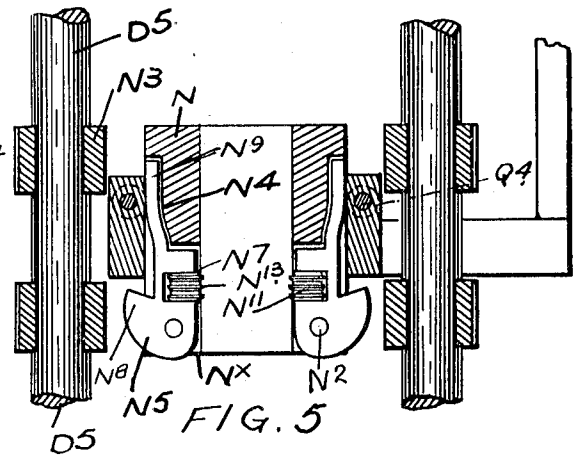

FIG. 5.

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UNITED STATES PATENT OFFICE.

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AUTOMATIC MACHINE FOR CUTTING OFF TUBES.

1,020,433. Specification of Letters Patent. Patented Mar. 19, 1912.

Application filed September 25, 1909, Serial No. 519,553. Renewed February 3, 1912. Serial No. 675,341.

To all whom it may concern:

Be it known that I, JOHN THOMAS McGRATH, a citizen of the United States, and a resident of the city of Battle Creek, in the county of Calhoun, State of Michigan, one of the United States of America, have invented certain new and useful Improvements in Automatic Machines for Cutting Off Tubes, of which the following is the specification.

My invention relates to improvements in automatic machines for cutting off tubes, and the object of the invention is to provide a machine which will automatically cut off the tubing in required lengths and such a machine as will be adaptable for scarfing safe ends for boiler flues for repairing the same and it consists essentially of a main bearing casting, a tubular shaft journaled within the casting, a holding chuck secured to one end of the tubular shaft, a pulley and gear secured on the opposite end of the tubular shaft, a tool holder held in a vertical bearing, a steady rest support located in proximity to the tool holder in line with the stationary chuck, means for automatically feeding the tool to the work, means for automatically opening and closing the stationary chuck before and after the operation of the cutting tool, a horizontally movable chuck slidably supported on suitable bearing rods, means for automatically gripping the work held in the chuck and imparting a forward movement to the chuck immediately after the cutting tool has receded from the work as hereafter more particularly explained.

Figure 1, is a sectional elevation of my machine. Fig. 2, is a plan view of my machine. Fig. 3, is a rear end elevation of the machine. Fig. 4, is a cross sectional view taken on line X—Y Fig. 1. Fig. 5, is a plan sectional view of the feeding chuck. Fig. 6, is an enlarged perspective detail view of one of the rocking arms of the feeding chuck, Fig. 7, is an enlarged perspective detail of one of the gripping rollers of the feeding chuck. Fig. 8 is a sectional view on line 8—8, Fig. 1.

In the drawings like letters of reference indicate corresponding parts in each figure.

A is a base casting of the machine provided with a forward table A′ and a rearwardly extending casting A^2 forming a horizontal guideway.

A^3 is a horizontal guide-way forming part of the base casting A.

The table A′ of the base casting is provided with an opening A^4 in which is secured by bolts 2 a casting B having a vertical guide-way B′ therein.

C is the main bearing casting provided with a horizontal bearing C′.

D is a hollow shaft journaled in the bearing C′ of the casting C.

D′ is a stationary chuck secured on the hollow shaft D at one end. D^2 is a pulley suitably secured on the opposite end of the shaft D and D^3 is a gear also secured on the opposite end of the shaft D between the pulley D^2 and the bearing casting C.

D^4 is a supplemental bearing arm secured on the main bearing casting C and extending over the gear D^3 and pulley D^2 and depending at the rear of the pulley D^2 to each side thereof.

D^5 are guide rods extending rearwardly from each branch of the bearing castings D^4.

A^5 are webbings extending downwardly between the table A′ and the side of the main portion of the base casting A.

F is the cam shaft journaled in proximity to each end in the webbing A^5.

H is a worm shaft journaled in bearings H′ extending from the base casting.

H^2 is a worm secured on one end of the worm shaft H, H^3 is a gear secured on the opposite end of the worm shaft H and meshing with the gear D^3 secured on the hollow shaft D.

I is a worm gear loosely mounted on the cam shaft F and meshing with the worm H^2. The outer face of the worm gear I is provided with clutch teeth I′.

I^2 is an opposing clutch member slidably connected to the cam shaft F by a feathered key I^3. The clutch member I^2 is held on the shaft by a nut I^4 and a washer I^5. The clutch member I^2 is provided with clutch teeth I^6 designed to engage with the clutch teeth I′ of the worm gear I.

J are collars secured on the cam shaft F and designed to hold the cam shaft from longitudinal movement within the bearings formed in the web A^5.

K is a cam wheel secured on the cam shaft F and provided with a peripheral groove K′ formed by the side flanges K^2.

K^3 is arc-shaped cam piece pivotally secured between the flanges K^2 by the cross

bolt K^4. The opposite end of the cam piece K^3 is adjustably held between the flanges K^2.

K^5 is a bolt designed to hold the cam piece K^3 in the position in which it is adjusted.

B^2 is a tool holder. In the upper end of the holder B^2 is secured the cutting tool B^3.

B^4 are screw pins extending laterally from the tool holder and from each side thereof.

B^5 are compression springs inserted within the guide-way B′ between the screw pins B^4 and the top of the guideway.

The bottom of the tool holder is provided with a suitable bearing projection B^6 designed to rest on the cam piece K^3 hereinbefore described.

L and L′ are supplemental cams secured one at each side of the cam wheel K.

L^2 is a depending link pivotally connected at the top between the lugs A^6 forming part of the table A′. The link depends in such a position as to extend into the path of the cam L.

M is a chuck lever designed to operate the stationary chuck D′ in the usual manner. The chuck lever M is swingably supported upon the cross pin M′ journaled in bearings M^2 secured to the top of the table A′. The lower end of the lever depends through a suitable slot formed in the table A′ into the path of the cam L′. The depending portion of the lever M and the depending link L^2 are connected together at their lower ends by an adjustable link connection L^3.

N is a horizontal movable chuck.

N′ is a chuck holder to which the chuck N is secured by bolts N^2. The chuck holder N′ is provided at each side with laterally extending bearing lugs N^3 through which the bearing rods D^5 are designed to pass and thereby slidably hold the chuck so that it can be moved back and forth to feed the work to the cutting tool. The movable chuck N is provided with notches $N^\times$ at the rearward end thereof such notches $N^\times$ connecting with recesses N^4 extending toward the front of the chuck.

N^5 are gripping levers partially supported within the notches $N^\times$ upon the rearmost bolts N^2.

N^7 are notches formed on the inner end of each of the gripping levers.

N^8 are projections extending outwardly from the outer end of each of the gripping levers and N^9 are arms extending forwardly from the gripping levers into the recesses N^4.

N^{11} are gripping rollers journaled on pins N^{12} within the notches N^7. The gripping rollers N^{11} are provided with peripheral teeth N^{13} extending circumferentially around the same. It will be seen that as the gripping arms are swung inwardly upon their pivots the teeth N^{13} of the gripping rollers will grip the work and yet allow of such work revolving by reason of the gripping rollers revolving upon the pins N^{12}.

I will now describe the means by which the gripping levers are operated to feed the work immediately after the cutting tool recedes therefrom.

O is a crank wheel secured on the cam shaft F and provided with a crank pin O′ on which is journaled the roller O^2.

O^3 is a rocking arm swung upon a screw stud O^4 projecting from one of the webs A^5. The rocking arm O^3 is provided with a front vertical guide-way O^5 formed T-shaped as may be seen in Fig. 2 of the drawings. The rocking arm O^3 is also provided at its rear end with a vertical guide-way O^6 in which the crank pin O′ and roller O^2 operate.

P is a clamping bolt provided with a head P′ which is slidably held in the guide-way O^5 of the arm O^3.

P^2 is a bearing sleeve provided at its inner end with an annular flange designed to rest against the outer face of the guide-way O^5. The bearing sleeve P^2 is loosely mounted upon the clamping bolt P and secured thereon by clamping nuts P^4 threaded on to the outer threaded end of the clamping stud P.

P^5 is a link rod swung upon the journal sleeve P^2 at one end.

Q is a slide bar slidably held in the bearings A^2 and A^8 provided intermediately of its length with a laterally extending stud Q′ upon which the opposite end of the link bar P^5 is swung.

Q^2 are fork arms extending upwardly from and forming part of the slide bar Q. The fork members are designed to extend into and through slots N^{14} formed in the rear chuck holder N′. The fork arms are provided with friction rollers Q^4 designed to bear against the arms N^9 of the gripping member N^5 when the parts are in their operative position.

R is a steady rest through which the work passes after passing through the chuck D′.

Having described the principal parts involved in my invention I will briefly describe the operation of the same.

The tube which it is desired to cut into lengths when in position to be operated upon is held in the rear chuck N, hollow shaft D, and front chuck G′ and rest R. The machine is put into operation and driven through the main driving pulley D^2 which revolves the shaft D, chuck D′ and the gear D^3 which drives the gear H^2 thereby driving the worm shaft H, worm H^3 and worm wheel I. The clutch member I^2 is then moved longitudinally over the cam shaft F into engagement with the clutch teeth I′ and worm wheel I, thereby connecting the worm wheel with the cam shaft. By this means the cam L′ is revolved and brought into engagement with the lever M swinging it forward at the top and opening the chuck to receive the work. By the same movement of the cam shaft the tool holder B^2 is car-

ried off the cam piece K allowing the tool to drop and the tube forming the work to pass through the rest R. By the continued rotation of the cam shaft F the cam L is carried against the link L^2. The cam piece K^3 then comes into engagement with the tool holder B^2 carrying the tool upwardly into engagement with the work so as to cut the required length of tube therefrom. Immediately this has been accomplished the cam L′ engages with the depending lower end of the chuck lever M thereby swinging the same rearwardly and operating the chuck to throw the same out of engagement with the work. The tool holder B^2 then drops off the end of the cam piece K^3 allowing the tool to recede from the work. The crank pin O′ of the crank wheel O engaging with the vertical guide-way O^6 rocks the arm O^3 forwardly and carries the link bar P^5 and slide bar Q and the forks Q^2 in the same direction thereby bringing the gripping arms N^5 into the position shown in the drawing so that the annular teeth N^{13} grip the work. By the further forward movement of the forks K^2 the chuck is carried forward upon the bars B^5 carrying the work with it through the hollow shaft D and stationary clutch D′ into a position ready for the tool B^3 to again operate to cut off a new length. The stationary chuck D′ is then operated and closed by the cam L and the tool B^3 operated by the cam piece K^3 to cut a fresh length from the body of the tube. During the cutting operation the crank pin O′ operates in the guide-way O^6 to rock the arm O^3 in the opposite direction to that before described. By this means the forked ends of the slide bar Q are carried into engagement with the projecting portion N^8 of the gripping arms N^5 so as to swing them outwardly into the position shown by dotted lines in Fig. 5 and thereby carry the annular teeth N^{13} away from the work and the chuck rearwardly over the tube to a fresh place ready for feeding forward another length upon the cutting operation being completed when the forked ends of the slide bar Q are again carried forwardly to bring the gripping arms into an operative position to grip the work so as to again carry it forward. The stud P may be adjusted to any position in the slot O^5 of the arm O^3 to vary the throw of the arm in accordance with the length of tube desired to be cut.

From this description it will be seen that I have devised a very simple automatic device whereby the safe ends may be cut from tubing ready for repairing boiler flues.

It will of course, be understood that my device may be used for cutting solid bars into lengths if so desired.

What I claim as my invention is:

1. In an automatic machine for cutting off tubes, the combination with the rotatable stationary chuck, of a suitably supported tool and tool holder, means for automatically and alternately feeding and withdrawing the tool from the tube, means for opening the stationary chuck after each withdrawal of the tool, means for then feeding the tube through the stationary chuck, and means for regulating the length of feed of the tube, as and for the purpose specified.

2. In a device of the class described, the combination with the main frame of the machine, a vertical guide forming part of the main frame and a holder mounted therein having its lower end projecting through the bottom of the vertical guide, of a cam shaft located below the projecting end of the tool holder, a peripheral cam mounted therein upon which the lower end of the tool holder is designed to rest, and spring means designed to insure the return of the tool holder after each cut, as and for the purpose specified.

3. In a device of the class described, the combination with the main frame, of a vertical guide forming part of the main frame and having an open lower end, a tool holder capable of vertical movement within the guide provided with laterally extending pins, spring extending between such pins and the upper end of the guide-way, a cam mechanism journaled in a suitable portion of the frame beneath the tool holder, a cam wheel mounted upon the cam shaft, and a segmental cam piece pivotally connected at one end to the cam wheel and adjustably connected at the other end to the cam wheel, as and for the purpose specified.

4. In a device of the class described, the combination with the rotatable stationary chuck provided with a depending operating lever and the main frame supporting the chuck, of a link depending from a suitable portion of the main frame, a cam shaft journaled in the main frame and located between the link and the lower depending end of the stationary chuck lever, a link connecting the lower end of the link and the chuck lever, and cams mounted upon the cam shaft and designed to alternately operate against the opposing edges of the depending link and the depending lower end of the chuck operating lever, as and for the purpose specified.

5. In an automatic machine for cutting off tubes, the combination with the main frame and a rotatable stationary chuck supported in the main frame, of a vertical guide-way forming part of the main frame and having an open lower end, a tool holder supported in the vertical guide-way, a cam shaft and peripheral cam located on the shaft and designed to operate the tool holder, a depending chuck operating lever located at one side of the cam shaft, a de-

pending link located at the opposite side of the cam shaft, a link connecting the depending link with the depending end of the chuck operating lever, and a cam located to each side of the tool operating cam, said cams being designed to alternately engage with the opposing edges of the depending link and depending chuck operating lever, as and for the purpose specified.

6. In an automatic machine for cutting off tubes, the combination with the main frame, a rotatable stationary chuck designed to support one end of the tube, and a longitudinally movable chuck designed to support the opposite end of the tube, of means for automatically opening the stationary chuck, means for closing the movable chuck during its forward movement so as to feed the tube through the open stationary chuck, and means for closing the stationary chuck during the rearward movement of the movable chuck, as and for the purpose specified.

7. In a device of the class described, the combination with the main frame and the stationary chuck designed to support one end of the tube, of means for automatically opening and closing the stationary chuck, a movable chuck designed to support the opposite end of the tube, gripping arms supported in the movable chuck provided with toothed surfaces designed to grip the periphery of the tube, and means for automatically swinging the arms inwardly to grip the tube on each forward movement of the movable chuck, as and for the purpose specified.

8. In a device of the class described, a longitudinally movable chuck having a central tube supporting opening and notches located to each side of such opening, of toothed gripping levers pivotally supported within the notches at their one end and designed to engage with the tube held in the chuck, and means for automatically swinging the lever inwardly and outwardly so as to carry the teeth in and out of engagement, as and for the purpose specified.

9. In a device of the class described, a movable chuck having a central tube supporting orifice and notches extending through the wall of the chuck into such orifice, lever pivoted on the notches and provided with opposing recesses, journal pins extending through such recesses, and toothed sleeves mounted upon the journal pins, as and for the purpose specified.

10. In a device of the class described, a movable chuck having a central tube supporting orifice and notches extending through the wall of the chuck into the orifice, gripping levers pivotally supported in the notches and provided with opposing recesses, sleeves having annular teeth, journal pins extending through the recesses and on which the sleeves are mounted, and means for imparting an inward and outward movement to the levers so as to carry the teeth into and out of engagement with the tube, as and for the purpose specified.

11. In an automatic machine for cutting off tubes, the combination with the main frame, of a slide bar slidably held in the main frame and provided with a forked upwardly extending end, a movable chuck supported on suitable guide bars and having slots into which the forked ends of the slide bars are designed to extend and a central orifice and notches extending through the side walls of the chuck into the orifice, levers having inwardly opposing recesses, pivot pins extending through the recesses and on which the levers are supported, projecting portions extending outwardly in proximity to the pivot end of the levers, cam surfaces forming part of the opposite end of the levers, and mans for carrying the forked end of the slide bar alternately into engagement with the projections of the lever and with the cam surfaces so as to throw such levers outwardly and inwardly, as and for the purpose specified.

12. In a device of the class described, the feeding chuck provided with a central orifice, notches extending through the side wall of the chuck into the orifice, levers pivotally supported within the notches and having opposing recesses, journal pins extending through the recesses, and sleeves mounted on the pins and provided with annular toothed projections, as and for the purpose specified.

13. In a device of the class described, the combination with the main frame of the machine, and a suitably driven cross shaft and a longitudinally movable chuck, of an arm swung beneath the cross shaft having a vertical guide-way on its inner face, a link mounted on the cross shaft, a crank pin extending from the crank wheel into the vertical guide-way, a slide bar, means operated by the slide bar for operating the movable chuck, and a link connection between the slide bar and swingable arm, as and for the purpose specified.

14. In a device of the class described the combination with the main frame and cross shaft journaled in the main frame, of a longitudinally movable chuck supported on suitable bearings forming part of the main frame, an arm swingably supported beneath the cross shaft, vertical guides formed on its outer and inner faces, a crank wheel secured on the cross shaft, a crank pin extending from the crank wheel into the inner guide-way of the swingable arm, a slidable bar for operating the movable chuck, a link connected at one end to the slide bar, and an adjustable means for connecting the opposite end of the link to the outer guide-

way of the swingable arm, as and for the purpose specified.

15. In an automatic machine for cutting off tubes, the combination with the main frame and the tool and tool holder, and a horizontal bearing supported on the main frame, of a stationary chuck and suitably driven tubular shaft forming part of the stationary chuck and journaled in the main frame, a gear mounted on one end of the tubular shaft, a worm shaft, a worm mounted at one end thereof and a gear mounted at the opposite end thereof and meshing with the gear of the tubular shaft, a cross shaft, cams mounted on the shaft designed to operate the stationary chuck and feed the tool mounted in the tool holder against the tube, as and for the purpose specified.

16. In an automatic machine for cutting off tubes, the combination with the main frame, a horizontal bearing supported on the main frame, a stationary chuck and a suitably driven tubular shaft forming part of the stationary chuck and journaled in the main frame, of a gear mounted on one end of the main tubular shaft, a worm shaft, a worm mounted at one end thereof and a gear mounted at the opposite end thereof and meshing with the gear of the tubular shaft, a cross shaft and worm gear held thereon designed to mesh with the aforesaid worm, a tool holder held in suitable guide-ways above the cross shaft, cams mounted on the cross shaft designed to operate the stationary chuck and feed the tool mounted in the tool holder against the tube, a movable chuck designed to support the opposite end of the tube, and means operated from the cross shaft for imparting a forward movement to the movable chuck after opening the stationary chuck, as and for the purpose specified.

17. In automatic machine for cutting off tubes, the combination with the main frame, a horizontal bearing supported on the main frame, a stationary chuck, and a suitably driven tubular shaft forming part of the stationary chuck and journaled in the main frame, of a gear mounted on one end of the tubular shaft, a worm shaft, a worm mounted at one end thereof and a gear mounted at the opposite end thereon and meshing with the gear of the tubular shaft, a cross shaft, a worm gear mounted thereon and meshing with the worm, a tool holder held in suitable guide-ways above the cross shaft, cams mounted thereon designed to operate the stationary chuck and feed the tool mounted in the tool holder against the tube, an arm swung on a suitable portion of the main frame and having a vertical guide therein, a crank wheel mounted on the cross shaft and provided with a crank pin designed to extend into the vertical guide-way, a longitudinal movable feeding chuck suitably supported on the main frame a slide bar for operating the feeding chuck and a link connected at one end to the slide bar and at its opposite end to the swingable arm, as and for the purpose specified.

18. In an automatic machine for cutting off tubes, the combination with the main frame, a horizontal bearing supported on the frame, a stationary chuck and a suitably driven shaft forming part of the stationary chuck and journaled in the main frame, of a gear mounted on one end of the tubular shaft, a worm shaft and worm mounted at one end thereof and a gear mounted at the opposite end thereof and meshing with the gear of the tubular shaft, a cross shaft, a worm gear mounted on the cross shaft and meshing with the worm, a tool holder held in suitable guide-ways above the cross shaft, cams mounted on the cross shaft and designed to operate the stationary chuck, a tool and tool holder mounted in a suitable guide-way, an arm swung upon a suitable portion of the main frame and having a vertical guide therein, a crank wheel mounted on the cross shaft and provided with a crank pin designed to extend into the vertical guide-way, a longitudinal movable feeding chuck suitably supported on the main frame, a slide bar for operating the feeding chuck, a link connected at one end to the slide bar and at its opposite end to the swingable arm and means for radially adjusting the link on the swingable arm, as and for the purpose specified.

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Witnesses:

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