MODERN CUTTING-OFF MACHINES

Modern Cutting-Off Machines are single-spindle, lathe-type cut-off machines designed for production cutting to length of round tubing, pipe and solid bar stock. Stock is fed through the spindle to a stop which gages the cut length, held by a collet and rotated while being cut off with tools mounted on cross slides. Parts have square cut ends with minimum burr. Multiple cross slides permit deburring or chamfering the O.D. of both ends while cutting off. Any type of material that can be turned with standard tooling, can be cut off.

MODERN AUTOMATIC CUTTING-OFF MACHINES

Modern Automatic Cutting-Off Machines are operated by air cylinders actuated by limit switches and solenoid valves. The machines are equipped with live feed rolls that feed stock through the spindle to an adjustable stop. When lengths of stock are loaded between the feed rolls, the machine cycles automatically. Maximum rigidity is achieved by attaching all moving parts to a heavy cast iron body which is bolted solidly to a structural steel base. The broad range of spindle speeds, combined with heavy duty cross slides, rigid design and cutting close to the collet, permit using higher surface cutting speeds and tool feeds, which results in higher production. Carbide or cast alloy tooling can also be used, where applicable, for increased productivity.

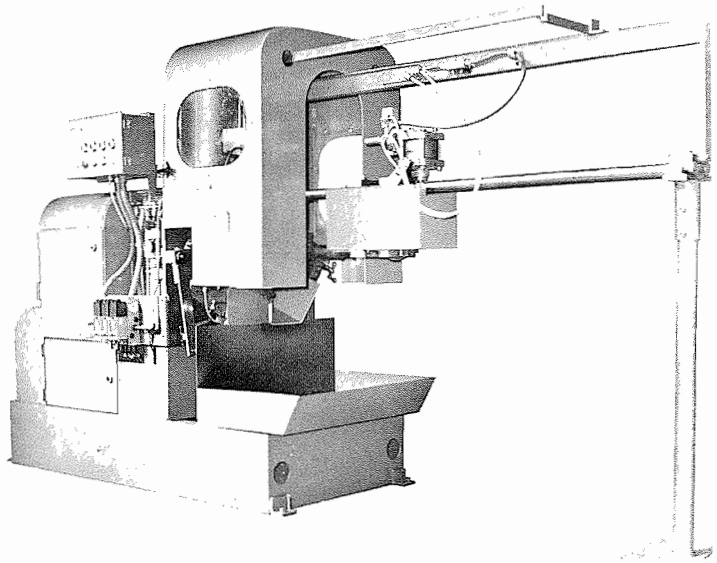
Use of standard lathe-type cut-off blades produces square cut ends, accurate lengths and minimum burr. As machines are equipped with multiple cross slides, the O.D. of both ends can be deburred or chamfered while cutting off. Machines can also be equipped to cut off with roller cutters for cutting lighter wall tubing where square end finish is not required.

Ease of setup and quick changeover provides for efficiency on short runs as well as long runs. Tools can be replaced or changed without disturbing the setup of other tools.

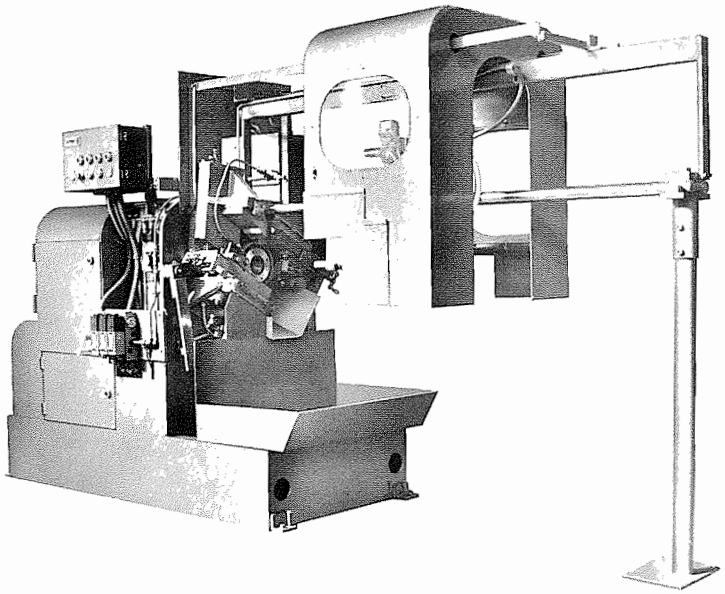
Special tooling, slides, or attachments are available for turning, forming or grooving the O.D. at the ends, or the deburring, chamfering, boring or grooving the I.D. of one end of tubing.

OUTSTANDING FEATURES

- **SIMPLE DESIGN** — all moving parts are attached directly to a heavy main body casting which is bolted solidly to the fabricated steel base.
- **ONE SECOND INDEX TIME** for cut-off lengths up to 6 inches.
- **FAST SET-UP** — change from one diameter to another in 15-20 minutes — length only 2-3 minutes.
- **VERY LOW PRODUCTION COSTS**
- **16 SPINDLE SPEEDS** — in geometric ratios.
- **CIRCULATING OIL SYSTEM** — lubricates all spindle bearings.
- **CROSS SLIDE ADJUSTMENTS** — all cams and working parts are outside for quick and easy adjustment.



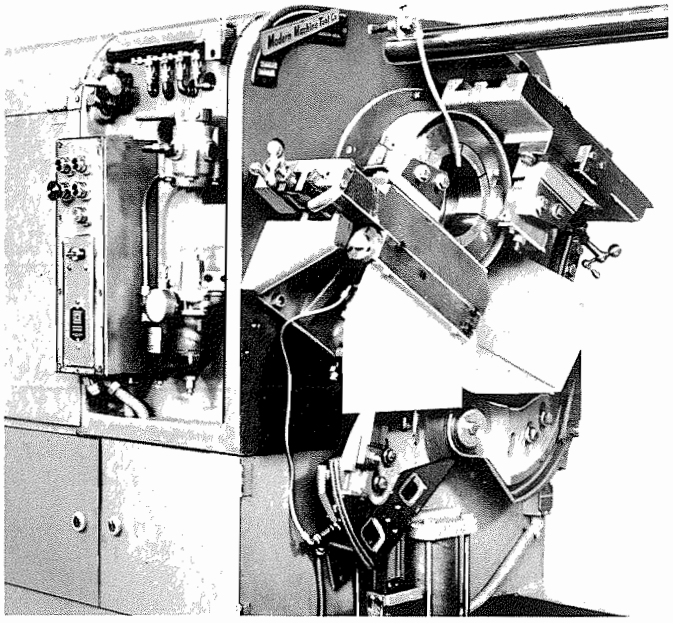
- **TOOL CHANGE** — any tool can be changed without disturbing set-up of other tools.
- **FEED ROLLS HANDLE ALL SIZE STOCK** within machine capacities.
- **CHIP PAN REMOVAL** — slides out for easy cleaning.
- **NO THRUST ON MAIN SPINDLE BEARINGS** — ball thrust bearings take all collet thrust — there is no thrust on main taper roller bearings.
- **ACCURATE CUT-OFF LENGTHS** with micrometer adjustable stop for cut-off tolerance ±.005".



STANDARD EQUIPMENT

DOUBLE CROSS SLIDES

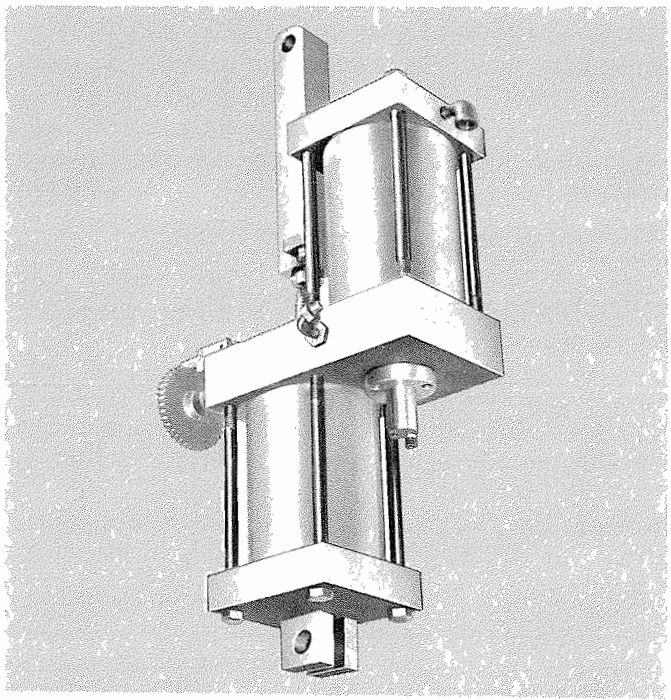
Machines are equipped with a front and rear cross slide bolted solidly to the main body casting. The front cross slide is used for cutting off and the rear cross slide for deburring, chamfering or plunge turning while cutting off. On heavy wall tubing or solid bar stock, both cross slides can be used for cutting off, which results in the advantage of two tools cutting for best production. Cross slides are fed by cams mounted on a rocker arm actuated by an air-hydraulic cylinder.



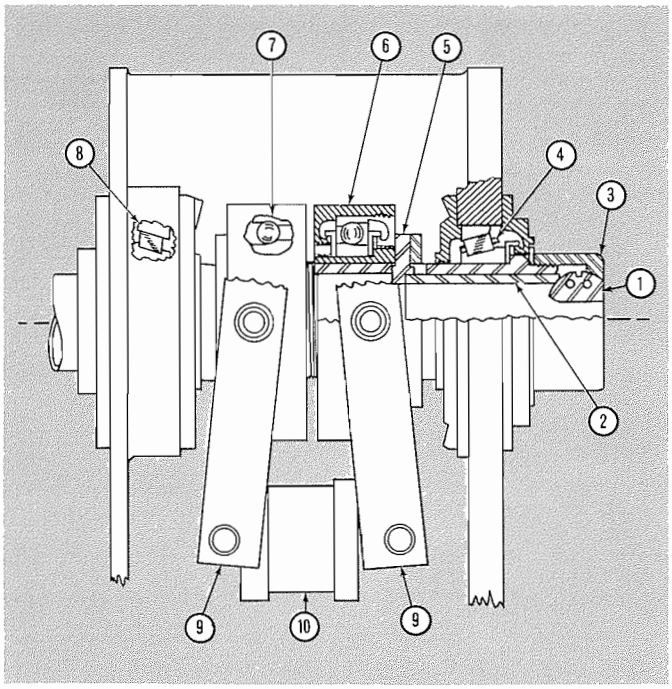
DOUBLE AIR-HYDRAULIC CYLINDER

A double air-hydraulic cylinder operates the cutting cycle of the machine. The lower, or working cylinder, feeds the cross slides, and the upper or storage cylinder returns the cross slides. Each cylinder has air on one side of the piston and hydraulic oil on the other side. The cylinders are mounted on a common head which controls the speed of the cylinders by a check valve and a regulating needle valve.

These controls provide for fast feed to the stock and adjustable controlled feed through the needle valve for cutting off. The cross slides are returned by the storage cylinder with the oil flowing through the check valve for quick return.



SPINDLE AND COLLET CLOSING MECHANISM



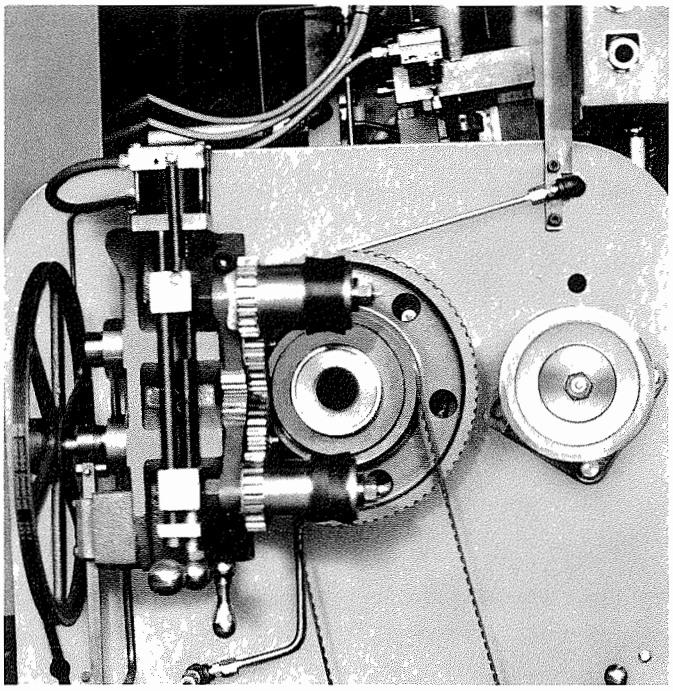
(1) Collet. (2) Inner tube. (3) Collet holder. (4) Front taper roller bearing. (5) Thrust pin. (6) Front outer ball bearing housing assembly, with bearing and front thrust ring. (7) Rear outer ball bearing housing assembly. (8) Rear taper roller bearing. (9) Collet cylinder arms. (10) Collet operating cylinder.

The spindle is made of seamless steel tubing ground on the O.D. It is mounted on roller bearings in the main body casting. The collet closing mechanism consists of two housings with ball thrust bearings mounted on the spindle. The rear housing is threaded on the spindle to permit adjustment of the collet opening. The front housing slides on the spindle actuating the hardened inner tube that closes the collet. The front housing is actuated by an air cylinder attached to arms mounted on the two housings. The pressure for closing the collet and holding stock is transmitted through the ball thrust bearings and not through the roller bearings on which the spindle rotates.

AUTOMATIC OIL LUBRICATION OF MAIN SPINDLE BEARINGS

A pump operated by a linkage from the feed assembly continuously circulates oil through the main spindle bearings. The amount of lubrication is metered by sight gauges which also permit the operator to check on operation of the lubrication system. It is a closed system, recirculating the oil for economic performance.

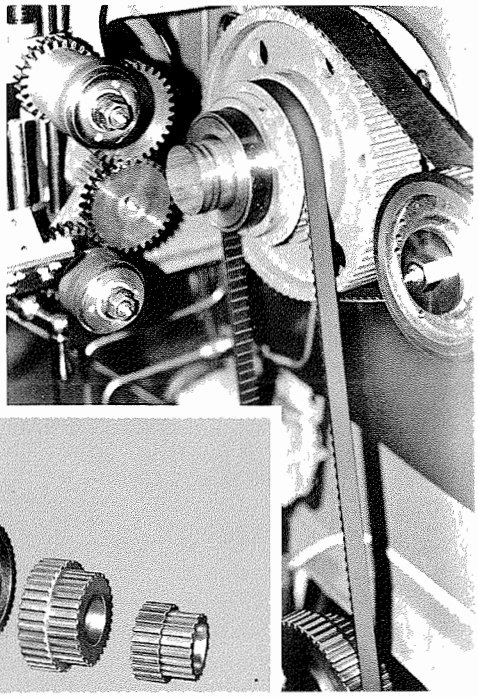
ROLLER FEED

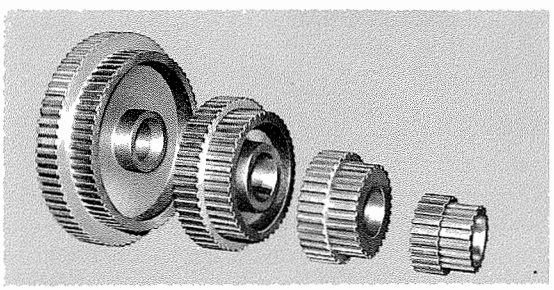


The feed assembly is mounted on the body casting just behind the spindle. Continuously running feed rolls, driven by a separate motor, close on the stock when the collet opens, feeding it throught the spindle to the stop. When the stock strikes the stop, the machine is cycled, closing the collet, opening the feed rolls and feeding in the cross slides.

16-SPINDLE SPEED DRIVE

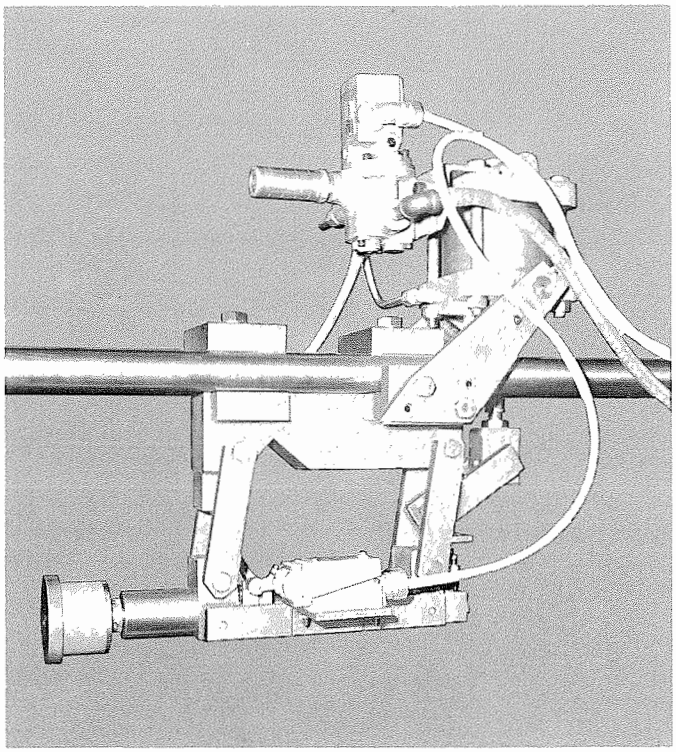
The spindle is driven by quick-change motor pulleys and positive drive belts. The main drive motor shaft is equipped with a special tapered motor bushing for





quick change of drive pulleys. The high range of eight speeds uses a single belt direct from the motor to the spindle. The lower range of eight speeds uses two belts, one from the motor to the back shaft and the other from the back shaft to the spindle. The same quick-change motor pulleys are used for both speed ranges.

MICROMETER STOCK STOP



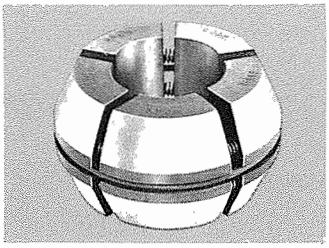
The stop is mounted on two overhead shafts. It is easily moved for quick changes in cut-lengths. A micrometer adjustment, graduated in thousandths, is used for fine adjustment of cut-off lengths. Under normal operating conditions, the cut length can be held to a tolerance of ±.005". The stop is air operated and retracts to clear the stock during cut off permitting the cut pieces to drop clear. Stop support shafts are furnished for cut-off lengths up to two feet.

Longer shafts can be furnished for cut-off lengths over two feet. One stop support stand is furnished with the machine. Additional supports may be required for long stop support shafts. When the machine is equipped with stop support shafts for cut off lengths over two feet, the machine must be equipped with a steady rest to support the longer cut lengths.

COOLANT PUMP AND PIPING

The machine is equipped with a tank for coolant and a circulating pump and piping. The coolant tank is removable for cleaning.

COLLET AND GUIDE TUBE



The collet used in automatic machines is a double-tapered segmented collet. As the collet holder and inner tube have matching tapers, the collet closes straight down gripping the stock by the full width of the collet. The closing assembly can be adjusted so the collet will open approximately 7/32" over the stock size to allow distorted or burred ends to feed through. The collet closes approximately 5/64" under the stock size to grip undersize stock and compensate for collet wear. We recommend a collet for each stock size. Guide tubes are mounted inside the spindle to guide the stock through the spindle and into the collet. One collet and one guide tube is furnished with the machine.

STOCK SUPPORTS

Models 2L and 3L are furnished with 3 stock feed support standards with adjustable "V"s for attaching boards to make a "V"-trough to hold stock being fed into the machines. Models 4L, 6L and 8L are not furnished with any type of stock support as standard equipment since they require more than a simple "V"-trough for their wide range of stock sizes and weights. Special stock supports for specific applications will be quoted on request.

SPECIFICATIONS

MODEL	2L	3L	4L	6L	8L
CAPACITY	1/4" - 2-1/8" OD	1/4" - 3-1/8" OD	1/2" - 4-3/4" OD	3/4" - 7" OD	3/4" - 8" OD
	(Maximum Wall 1-1/2". Maximum Solid Bar 3".)				
MAIN DRIVE MOTORS	7-1/2 HP, 1800 RPM	5 HP, 1200 RPM	7-1/2 HP, 1200 RPM	7-1/2 HP, 1200 RPM	7-1/2 HP, 1200 RPM
16 SPINDLE SPEEDS	197 - 3030	130 - 2000	89 - 1392	59 - 912	59 - 912
FEED & COOLANT PUMP MOTORS	1/2 HP, 1200 RPM	1/2 HP, 1200 RPM	3/4 HP, 1200 RPM	1 HP, 1200 RPM	1 HP, 1200 RPM
FLOOR SPACE	32" x 75-1/2"	32" x 75-1/2"	32" x 78"	32" x 78"	32" x 78"
WEIGHT (Approx.)	3520 lbs.	3520 lbs.	4475 lbs.	4725 lbs.	4775 lbs.

PRODUCTION RATES
PIECES PER HOUR USING HIGH SPEED TOOLS

Stock O.D.	Using single cut-off tool			Using double cut-off tools			
	Wall Thickness of Tubing						
	.035"	.049"	.065"	.109"	.156"	.187"	250"
1/2"	2050	1830	1610	1700	1410	—	—
1"	1350	1150	980	1125	820	720	570
1-1/2"	1100	920	775	855	635	550	435
2"	860	710	590	750	475	410	320
2-1/2"	665	620	440	545	415	360	275
3"	560	520	430	535	400	350	270
3-1/2"	535	460	375	470	355	300	235
4"	485	390	315	400	300	255	200
4-1/2"	460	330	270	340	255	220	165
5"	395	315	255	330	245	210	160
5-1/2"	380	300	230	315	235	200	150
6"	335	265	215	275	200	175	130
7"	280	225	180	230	170	145	110
8"	235	185	150	190	140	120	90

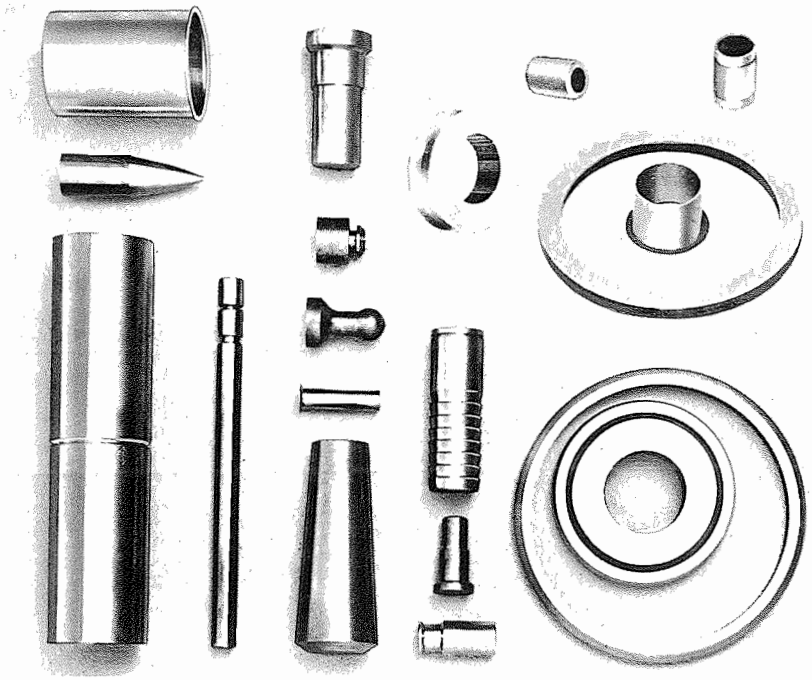
Production is based on mild free cutting steel and on pieces of 6" or less in length. Over 6" the production should be decreased by about 10 percent for each additional 6".

By using carbide or cast alloy cut-off blades production rates can be greatly increased. Figures will be furnished on request.

BAR STOCK

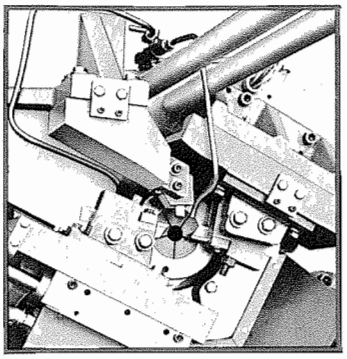
SOLID ROUND	
Diam.	Per Hour
1/4"	1610
1/2"	1100
3/4"	530
1"	330
1-1/4"	240
1-1/2"	145
1-3/4"	130
2"	110

For cutting bar stock we recommend using front and rear cross slides, giving the advantage of two tools for cutting.

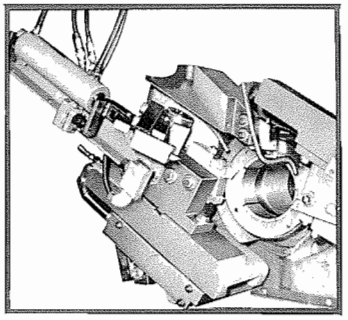


Illustrated are typical parts machined using Modern Lathe-Type Cut-Off Machines. With special tooling, parts may be formed, grooved, flanged or chamfered in a single operation —at a high rate of speed — while being cut to length.

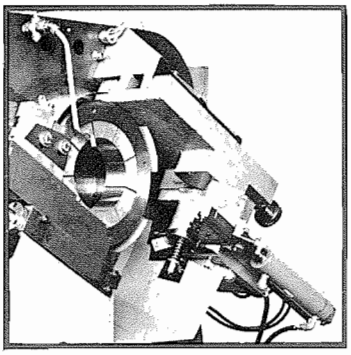
OPTIONAL EQUIPMENT



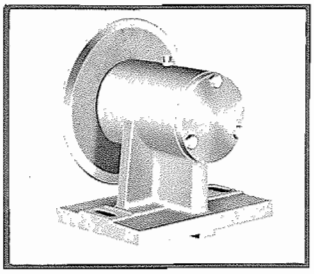
1. THIRD SLIDE — A third slide is available when deburring or chamfering operations are desired on the O.D. of both ends of the workpiece when both standard slides are in use for cutting. This slide can also be used for light plunge forming.



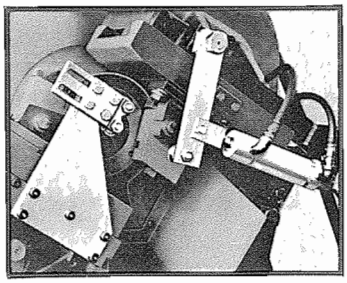
2. COMBINATION CUT-OFF TOOL HOLDER AND I.D. CHAMFERING ATTACHMENT—For deburring the I.D. of one end only, this attachment mounts on the front cross slide and is interchangeable with the standard tool holder bracket. The front cross slide can be used for cutting off. After the cut-off is completed the chamfering arm swings in to deburr or chamfer the I.D.. The rear cross slide can be used to cut-off, chamfer or plunge turn the O.D. and the third slide may be used when the front slide is equipped with this attachment.



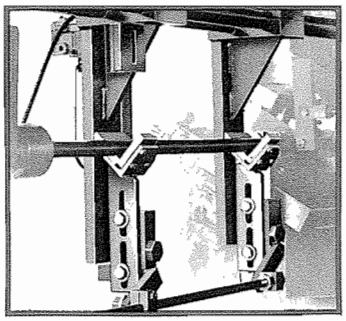
3. SWINGING CHAMFERING ARM — For chamfering or deburring the O.D. and I.D. of one end of a tube only, this replaces the rear slide. It can be ordered with the machine, instead of the standard rear slide, or for machines already in the field.



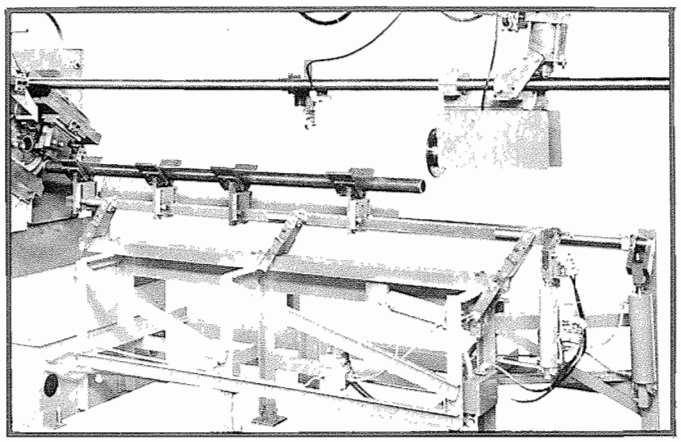
4. ROLLER CUTTER HOLDER — For higher production (up to 3/16" wall tubing) when square cut ends are not required, a roller cutter holder is used and accommodates a 7" roller cut-off wheel.



5. ROLLER STEADY REST — Cut-off lengths over 5" are supported by the roller steady rest when grooving or forming. This support minimizes the cut-off tip on solid stock. It is complete with holding cylinder.



6. STEADY REST AND EJECTOR — This optional attachment supports and ejects cut-off pieces over 2 feet and is available for all models of automatic machines.



7. SWING POSITION STEADY REST AND EJECTOR — "V"s support stock during cut-off and turning. When cut is completed, as cross slides are retracted, "V"s swing out from the spindle, and down so the part clears slides. "V"s then rotate, ejecting the cut part, which drops onto users material handling equipment. The steady rest can be equipped to separate remnant ends from cut-to-length parts when the machine is equipped with a bar feeder. Index time for the steady rest to swing out, down, rotate, eject and reposition is approximately one and one-half seconds. Lengths from 6 inches to several feet can be supported using this steady rest.

ALSO AVAILABLE

COOLANT SHUT-OFF VALVE — This valve shuts off the flow of coolant when stock is being fed forward. It is air operated and installed in the coolant line.

PRESSURE REGULATOR FOR COLLET CYLINDER — The regulator reduces gripping pressure of the collet when cutting light wall or very soft tubing, thus preventing distortion of the O.D.

SPECIAL COLLET HOLDER AND ADAPTER — With this special collet adapter, 3L collets may be used on Models 4L and 6L when cutting sizes under 3" O.D.

CIRCULAR FORM TOOL HOLDERS — Circular form tool holders or dovetail form tool holders are available for mounting on the rear slide for O.D. grooving and plunge turning.

ELECTRIC COUNTER — An automatic six-digit counter can be pre-set to control the exact number of pieces to be machined. This control stops production when the desired number of parts have been produced. A simple electric counter is also available which records the number of parts cut-off, but it is not equipped with automatic shut-off.

SPECIAL REAR CROSS SLIDES — Special cross slides can be furnished in place of the standard rear cross slide to feed a tool parallel to the spindle axis for turning the O.D. or boring the I.D. of one end only. Special slides are also available for plunge turning or grooving the I.D. of one end with form tools.

MODERN AUTOMATIC BAR FEEDERS

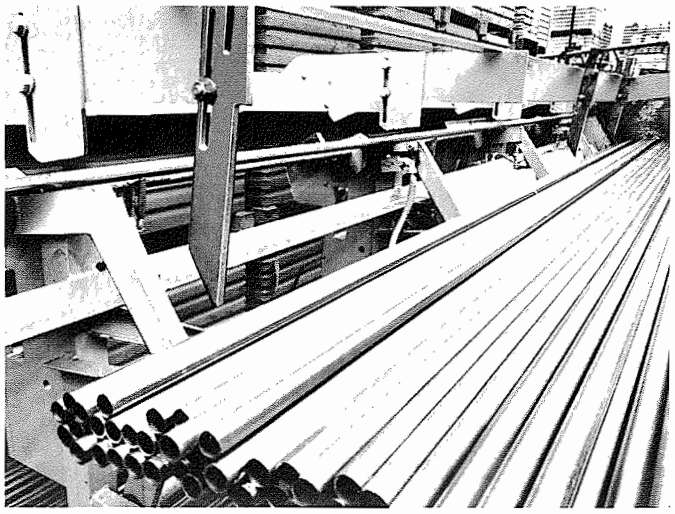
OPERATION AND CONSTRUCTION FEATURES

Modern Automatic Bar Feeders are designed for fully automatic loading of tubing, pipe and bar stock into Modern Automatic Cutting-Off Machines.

- **Feeders provide storage for stock being cut — up to five tons of 20 ft. lengths.**
- **Handle random length stock without positioning ends.**
- **Automatically load one bar at a time into the machine as needed.**
- **Automatically eject the remnant end of the previous bar.**
- **Trim the end of each new bar automatically.**
- **Adjust quickly for change of stock diameters.**

Various types of auxiliary equipment are available to meet specific production requirements.

With the addition of an automatic feeder, the entire machining operation from loading to cut-off becomes completely automatic, enabling an operator to run more than one machine.



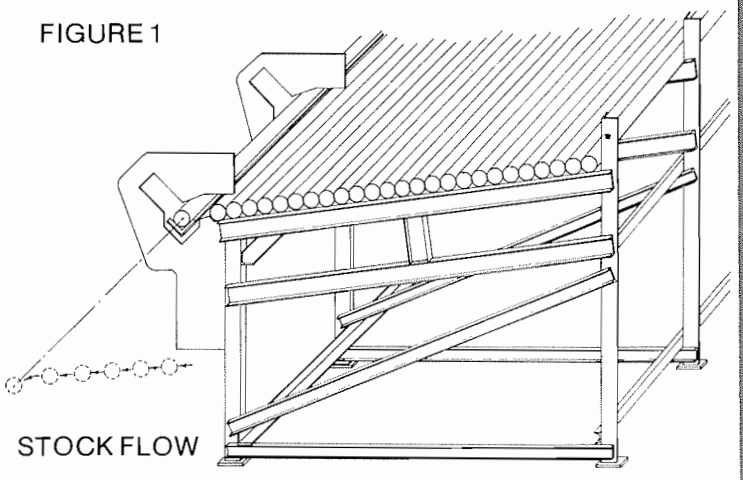
Modern Automatic Bar Feeders are available for all models of Modern Automatic Cut-Off Machines and handle any stock length from a minimum of six feet. Diameters over 3/8" on Models 2L and 3L and 1" on 4L, 6L and 8L may be handled as standard. With additional equipment, smaller diameters can be handled.

Stock is loaded into the feeder hopper, which will hold up to five tons of 20-foot lengths. The feeder automatically loads one bar at a time into the machine. Random lengths up to six feet in variance between the shortest and longest length can be handled without positioning the ends.

Automatic bar feeders are designed to eliminate all manual operations, i.e. loading stock in a feed trough, starting it between feed rolls and positioning ends for trim cuts.

Bar feeders are operated electrically and pneumatically. The pusher trolley is moved by a cable and drum which is rotated by a rack and gear attached to an air hydraulic cylinder. The speed of the pusher trolley is controlled by metering hydraulic oil through an adjustable needle valve and can be regulated for different stock sizes and conditions.

FIGURE 1

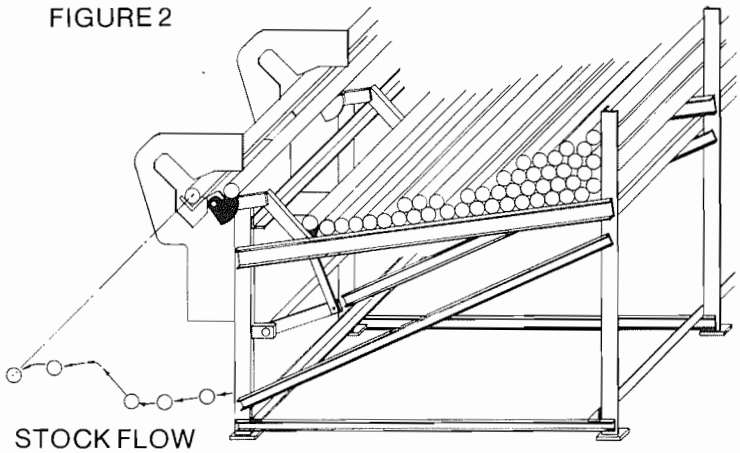


Cross section of Bar Feeder with inclined table

There are three types of stock storage available; an inclined table, a hopper, and a combination unit which can be used either as a table or hopper. The inclined table must be used for solid stock 5/8" diameter and smaller, and tubing 3/4" O.D. and smaller. Small diameter stock is so flexible it will jam if loaded several deep in a hopper. The inclined table may also be used for larger diameter stock when the number of bars that can be loaded on the table at one time is sufficient for a run. The table consists of channels on 4 foot centers having a 5° slope. Stock can be loaded on this table only one deep and rolls by gravity down the slope to the loading position where cams lift one bar at a time, as needed, into the feed trough. The table is 60" wide and the amount of stock it will hold depends on the diameter of the stock. (See stock flow illustration — Fig. 1).

A bundle of bars or tubing can be loaded in the hopper-type feeder several deep, allowing a larger number of bars to be loaded at one time. Elevating fingers raise the bars from the hopper to the loading position, which consists of supports that hold two or more bars, depending on the diameter of the stock. The stock is raised from the hopper only as needed, and when the loading position is full, limit switches stop the operation of the elevating fingers. Cams then load one bar at a time from the loading position into the feed trough as required.

FIGURE 2

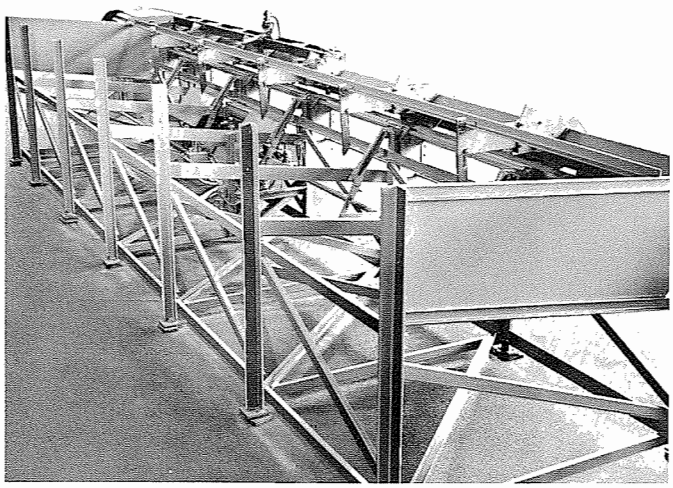


Cross section of Bar Feeder with hopper

The hopper will hold approximately eighty 2" diameter tubes. The number of bars of other diameter stock would vary depending on the diameter of the stock and the weight. The total weight that can be loaded in a hopper is 6,000 lbs. on a 12-foot feeder, and 10,000 lbs. on a 20-foot feeder. Since more stock can be loaded at one time, the hopper is recommended for most applications when stock diameters are 3/4" or larger. (See stock flow illustration - Fig. 2).

The combination inclined table and hopper style stock storage (not illustrated) is a standard hopper type bar feeder, furnished with extra channel supports which bolt across the hopper to form the inclined table. Thus, it can be used either as an inclined table with the channels in place or as a hopper with the channels removed. This type of bar feeder is recommended where the range of stock sizes to be cut includes small diameters that could not be run in the hopper, as well as larger diameters where the extra capacity and advantages of the hopper is desired.

Bar feeders for use with Models 2L and 3L Modern Automatic Cutting-Off Machines are equipped with a



feed trough consisting of a combination of roller supports and "V" troughs to handle both large and small diameter stock over the range of the machine.

Roller supports consist of sets of two turning rolls mounted at right angles to the stock forming a "V" on which the larger diameter stock rotates while being cut off. Each set also includes a "V" molded roll mounted lengthwise of the stock which supports the stock when it is loaded onto the supports and also lifts it off the turning rolls when it is being fed forward. These lifting rolls lower to clear the stock when it is rotating while being cut off. The sets of rollers are mounted on a T-rail at approximately four-foot centers.

For smaller diameter stock which is too light to rotate the turning rolls and which would deflect and whip between the roller supports, "V" troughs are mounted on the T-rail between the sets of roller supports. Thus the larger diameter stock is supported with a minimum amount of friction, both when turning and when being fed forward, while the smaller diameter stock is supported in the "V" troughs to give it the added support it needs over the full length of the stock. As roller supports and "V" troughs are mounted on the same T-rail, they adjust together for various stock diameters and do not require individual adjustments.

Bar feeders for models 4L, 6L and 8L are furnished with roller supports consisting of two turning rolls at right angles to the stock and a lifting roll parallel to the stock. These rolls operate the same as the support rolls on bar feeders for models 2L and 3L. These feeders are furnished with the roller supports only as standard equipment. If machines are to be used for feeding stock under 1" diameter, the bar feeder must be equipped with auxiliary "V" trough supports mounted between the roller supports. These larger machines are only occasionally used for stock diameters under 1", therefore auxiliary "V" supports are not included as standard equipment and must be ordered extra.

Roller supports and loading cams are adjustable for all stock diameters. Adjustments are made by a single hand lever located at the rear of the feeder. A graduated scale can be quickly set for the stock diameter being cut.

While Modern Automatic Bar Feeders may be furnished for any length stock, feeders to accommodate 12 or 20 foot lengths are considered standard. Operational efficiency, naturally, depends on the straightness of the stock. The bar feeders will perform efficiently on all stock within commercial straightness tolerances.