"AMERICAN"
TOOL ROOM
LATHES

THE AMERICAN TOOL WORKS CO.
CINCINNATI, U.S.A.
LATHES — SHAPERS — RADIAL DRILLS

AMERICAN

Tool Room Lathes

DESIGNED AND BUILT EXPRESSLY FOR THE RAPID AND ECONOMICAL PRODUCTION OF TOOL ROOM WORK

THE AMERICAN TOOL WORKS CO.

CINCINNATI, U. S. A.

LATHES : SHAPERS : RADIAL DRILLS

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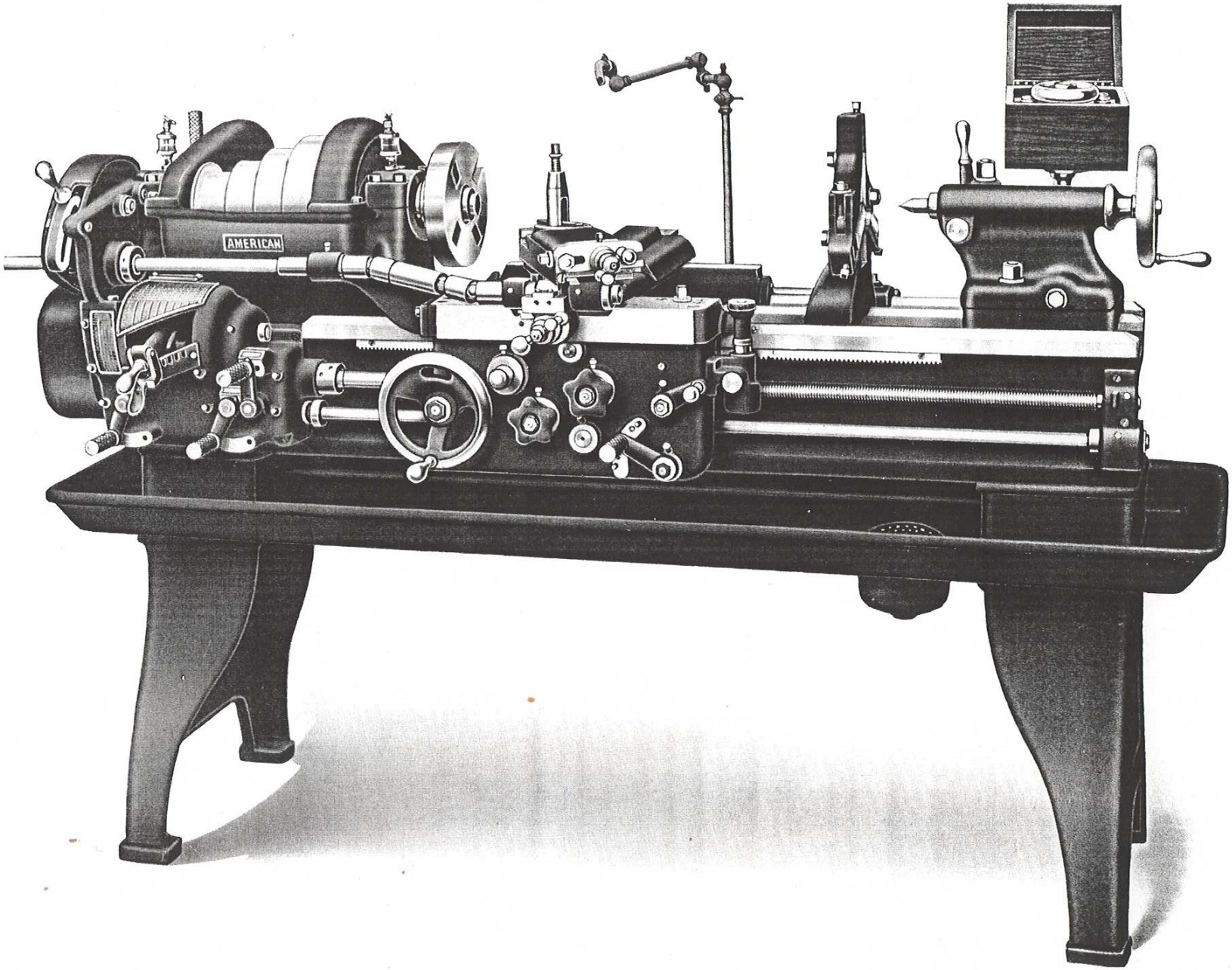


"American" complete 12-inch Tool Room Lathe

The "American" Tool Room Lathe

EXPERIENCED tool makers are practically unanimous in their contention that the ideal tool room lathe is the one which, first of all, meets all the requirements for extreme accuracy encountered in the most exacting tool room; next, is sufficiently sturdy and powerful to handle, without apparent stress or weakness, the most severe class of tool room work imposed upon the modern tool room, and yet, at the same time, is sensitive, convenient and easy to manipulate and control.

As a result of our sincere appreciation of the importance of these qualifications, the "American" Tool Room Lathe was developed, and in the following we call particular attention to the effort which has been made to embody and develop these important characteristics to the highest degree, in the new "American" Tool Room Lathe.

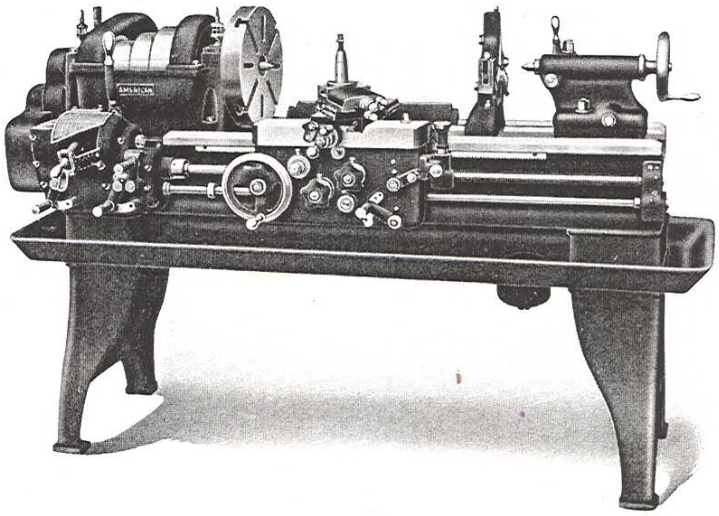
Accuracy

In our determination to secure the very highest degree of accuracy, every effort is made, not only to secure correct alignments, but to select the very best materials, to perfect our bearings and to guard against machining inaccuracies, by the use of a most thorough and complete equipment of jigs, special tools, Johansson and Pratt and Whitney gauges, Brown and Sharpe straight edges, Surface Plates, and the most accurate testing instruments.

Many purchasers are misled by the alignment guarantees of some lathe manufacturers. The alignments of a lathe are no indication of its quality or workmanship. To secure an accurate alignment of the headstock, tailstock and the carriage, is one of the simplest operations involved in lathe construction. The difficult and all-important thing is to build a lathe so it will retain its accurate alignments under hard service and over a period of years. The principal difference, therefore, between a second grade, low-priced lathe, and a high-grade, high-priced lathe, is not in the accuracy of alignments, but in the life of the alignments, and in the fitting and durability of the various units which compose the machine.

The first requisite in the production of a high-grade machine tool is an organization that understands the meaning of good work and, from experience, knows how to secure it. The next essential is an adequate equipment of jigs, templets, special tools, gauges, etc., without which high quality and duplicate work cannot be produced, and last, but not least, there must be an honest and sincere desire and determination on the part of the manufacturer to produce a high-grade machine.

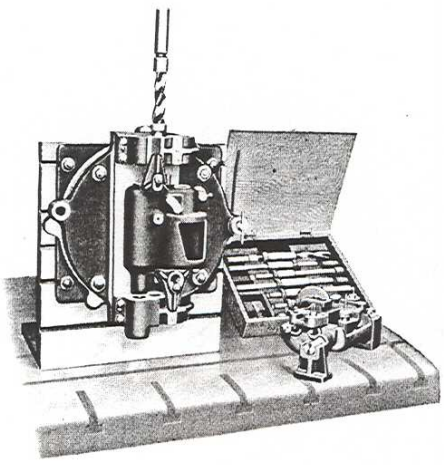
None of these requirements is wanting in The American Tool Works Company organization. Since its inception, the ambition of this company has been to build the very finest lathe,



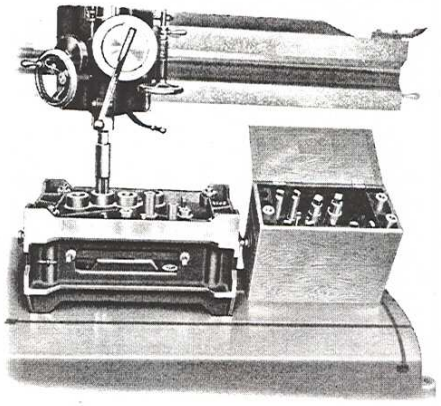
12-inch "American" Lathe with double back geared head

both for tool room and for manufacturing purposes, that men, money and materials could produce. Our organization extends over a period of forty odd years, has been developed with discretion and care, always with this purpose in view, until today we can say, with a feeling of absolute confidence, that no organization, in this or any other country, is better qualified, from the standpoint of sincerity of purpose, knowledge and experience, to build the very highest type and finest kind of Tool Room Lathe.

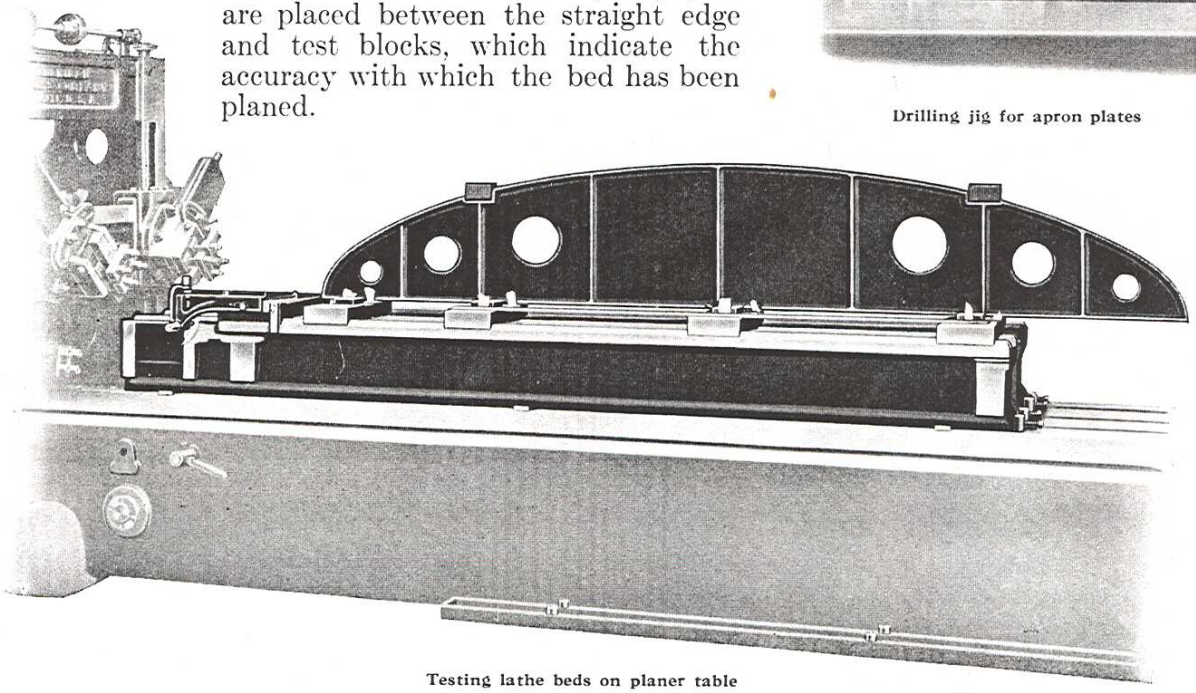
In the construction of "American" Tool Room Lathes, a very thorough and complete equipment of jigs and special tools insures accuracy in all machining operations, and absolute duplication and interchangeability of parts. Nor do we trust to jigs and fixtures alone for our assurance of accuracy. Every piece of work is carefully inspected before assembling in its respective unit, and each unit is, in turn, inspected and tested before its application to the lathe. For example, our lathe beds are tested for accuracy after the finishing cut has been taken, while they are still on the planer table. After the bed has been completely rough planed, the holding clamps are loosened, thus relieving the casting of all stresses, after which the finishing cut is taken. The bed is then tested for accuracy by means of four blocks, located at regular intervals on the carriage vees, which are used in connection with a Brown and Sharpe straight edge, placed on the test blocks. Tissue pull papers are placed between the straight edge and test blocks, which indicate the accuracy with which the bed has been planed.



Drilling jig for quick change gear boxes



Drilling jig for apron plates

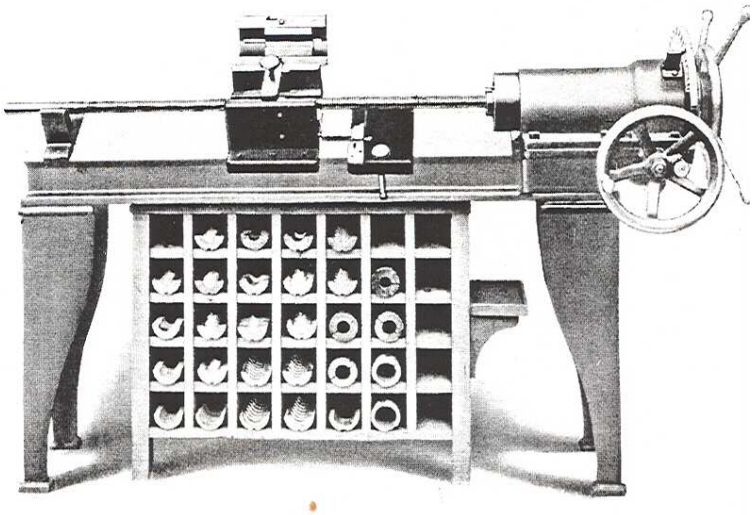


Testing lathe beds on planer table

The parallel or side alignment of the vees is tested by means of a long straight edge which bears against a shoulder on each of the testing blocks. Tissue test papers are then placed between contact points of the straight edge and shoulder, and must all be held with the same tension. If this test proves entirely satisfactory, the beds are removed from the planer and passed on to the erecting floor for assembling.

Precision Lead Screws

Every "American" Tool Room Lathe is regularly equipped, without extra charge, with a precision lead screw. These screws are made of special turned and ground lead screw stock, and are chased on lead screw lathes of our own design, which are used exclusively for this purpose. These special lead screw lathes are equipped with two lead screws, one for roughing and the other, a master screw, for finishing only.



Lead screw testing machine

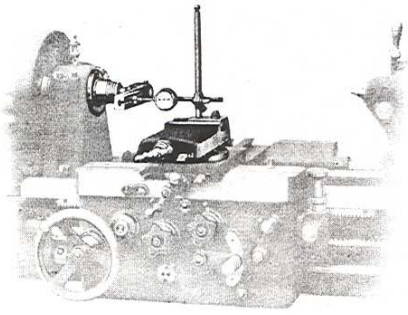
Our lead screws are first roughed out to within approximately .015 inch of the finished size and are then removed from the lathe and set up on end to season. After seasoning they are returned to the lead screw lathe and finished from the master screw, after which they are carefully tested for accuracy on a machine built especially for that purpose, which measures the pitch of the screw in .001 inches. Readings can be taken at each pitch, inch or multiple, by means of Johansson gauges, a master nut and 24″ diameter micrometer dial. Every lead screw is tested separately and individually in this machine, and, in addition, each screw, after it has been installed in the lathe, is again tested for the production of accurate threads, by means of a master thread gauge bar. Consequently, we have no hesitancy in guaranteeing the accuracy of our lead screws for the most exacting tool and gauge work.

As a further assurance of accuracy and long life all our gears are cut with special cutters and are tested for accuracy on a gear testing machine, having micrometer adjustment.

Bar for testing the accuracy of threads cut by "American" High Duty Lathes

Accurate Alignments

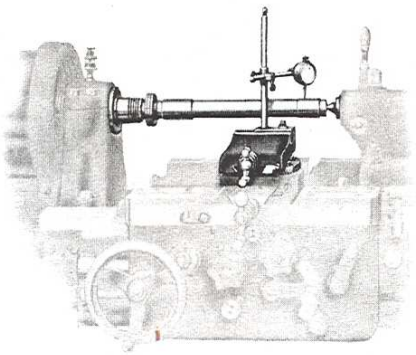
The accuracy of the work produced by a lathe naturally depends upon the accuracy of the lathe's alignments. As a consequence, the utmost care is exercised in securing alignments of the "American" Tool Room Lathe, and a series of micrometer tests is made to check these alignments. First, the bed is leveled perfectly, then the headstock is placed in position and the spindle aligned parallel with the bed. Next the tailstock is placed on the bed, and its spindle aligned with the headstock spindle, after which the alignment of the tailstock spindle, in and out of the barrel, is tested. After the headstock and tailstock have been properly aligned, the carriage ways are red leaded and fitted to the bed, while, at the same time, the cross side is squared up at right angles to the spindle. Now, as a final step in aligning, the large face plate is attached to the spindle and a finishing cut taken, after which it is tested with a straight edge and pull papers.



Testing cross slide alignment

After all the alignments have been made and tested, a careful test is made for ease of operation and control. For example, the action of the quick change gear tumbler is tested, the movement of the carriage along the bed is tried, the movement of the compound rest top and bottom slides, which, by the way, have previously been fitted to dove-tail masters, and then to the carriage cross slide and swivel, are tested carefully, and the tailstock spindle is tried for easy movement. In fact, a particular effort is made to fit our tool room lathes so as to secure a very easy and convenient control of the slides.

We call particular attention to this fact, because some tool makers, foremen and superintendents, have been led to believe that because the "American" Tool Room Lathe is more powerful and more rugged than the average tool room lathe, it is more difficult to operate. Such, however, is not the case, and we are willing to demonstrate and prove to any superintendent, right in his own plant, that we are entirely justified in our contention that the "American" Tool Room Lathe is everything that can be desired in the way of a high-grade productive, convenient and accurate lathe for tool room service.

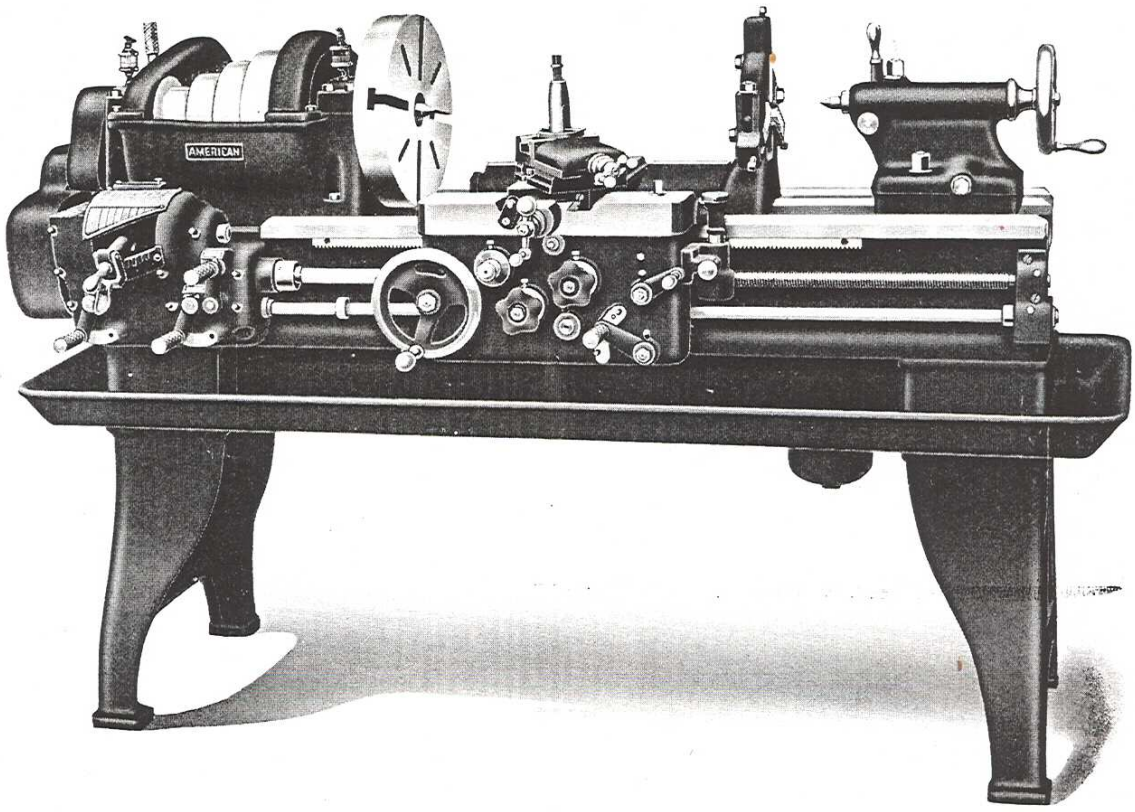


Testing headstock and tailstock alignments

The term "Tool Room Lathe" is generally understood to mean a lathe fully equipped with the various attachments, such as the taper, draw-in and relieving attachments, that are required to handle all classes of tool room work. This type of lathe is also usually furnished with a pan for retaining the lubricant which must be used when working on hard steel.

It is not always necessary, however, for a tool room lathe to have all of these attachments, and we are therefore prepared to furnish any one of them separately.

The "American" Tool Room Lathe is built in seven sizes, 12″, 14″, 16″, 18″, 20″, 24″ and 27″, and is regularly equipped with 4-step cone single back geared head up to and including the 18″ size and 3-step cone, double back geared head on the larger sizes; quick change gears, precision lead screw, feed rod and automatic feed stop, tailstock, large and small face plates, compound and steady rests, tool post, micrometer carriage stop, chasing dial and countershaft. In addition we can, at extra charge, equip our tool room lathe with 3-step cone friction double back geared head, 12-speed geared head with single pulley belt drive, 12-speed geared head, arranged for either gear, silent chain or belt connected constant speed motor drive or 4-speed geared head for gear connected adjustable speed motor drive. We can also furnish, at extra cost, the following special equipment: taper, draw-in, universal and plain relieving attachments, collets, special coarse or fine thread range, metric screws, oil pan, lubricant pump, follow rest, countershaft for geared head lathes, etc.

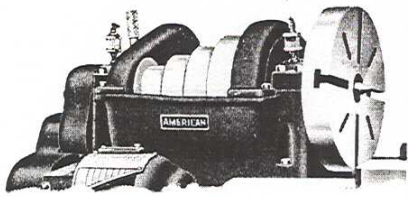


12-inch "American" Lathe with single back geared head

HEADSTOCKS

Single Back Geared Head

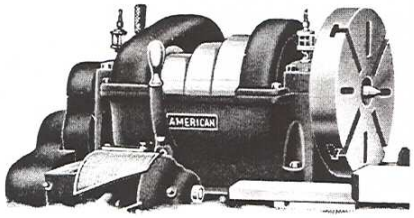
This type of head provides 8 spindle speeds, and is designed for a medium class of work. The cone steps are of large diameters and of wide face, thus insuring ample belt area. 4 direct spindle speeds are afforded, and 4 reduced speeds. As in other types of heads, all shafts are of high-grade steel, accurately ground and run in high quality phosphor bronze bearings having efficient oiling facilities. Sight-feed oilers are furnished on the spindle bearings.



4-step cone, single back geared head

Double Back Geared Head

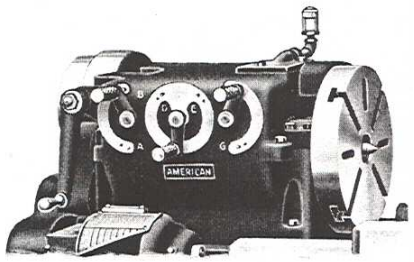
"American" 3-Step Cone Double Back Geared Heads, because of their large diameter and wide face cone pulleys and high belt velocity, are the most powerful double back geared heads built. They are all of the quick change, friction type, both the first and second back gear speeds being secured through a frictional connection between the back gear shaft and the gears. The advantage of this friction type of head lies in the fact that the change from one back gear range to the other can be made instantaneously, without stopping the lathe, and in the convenient control for starting and stopping through the speed control lever at the front. The frictions used in these heads are exceptionally large and powerful and are self-compensating for wear.



3-step cone, double back geared head

Patented Geared Head

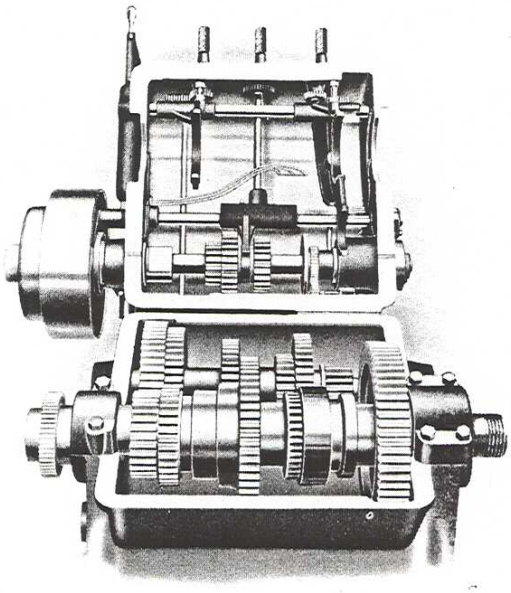
The new "American" automatically oiled geared head is the very latest development in geared head mechanisms. It provides 12 mechanical spindle speeds in geometrical progression and is an extremely powerful, yet very simple mechanism, consequently the maximum service with a minimum maintenance expense may be expected. All gears in the head are cut from heat treated alloy steel forgings, the clash gears being hardened. Only coarse pitch gears of large diameter and wide face are used, and only those required for the particular speed in use are in operation. The entire mechanism operates in a bath of oil, which in conjunction with the liberal proportions of the gears and shafts and the excellent materials employed, insures long and satisfactory service, with a minimum of wear.



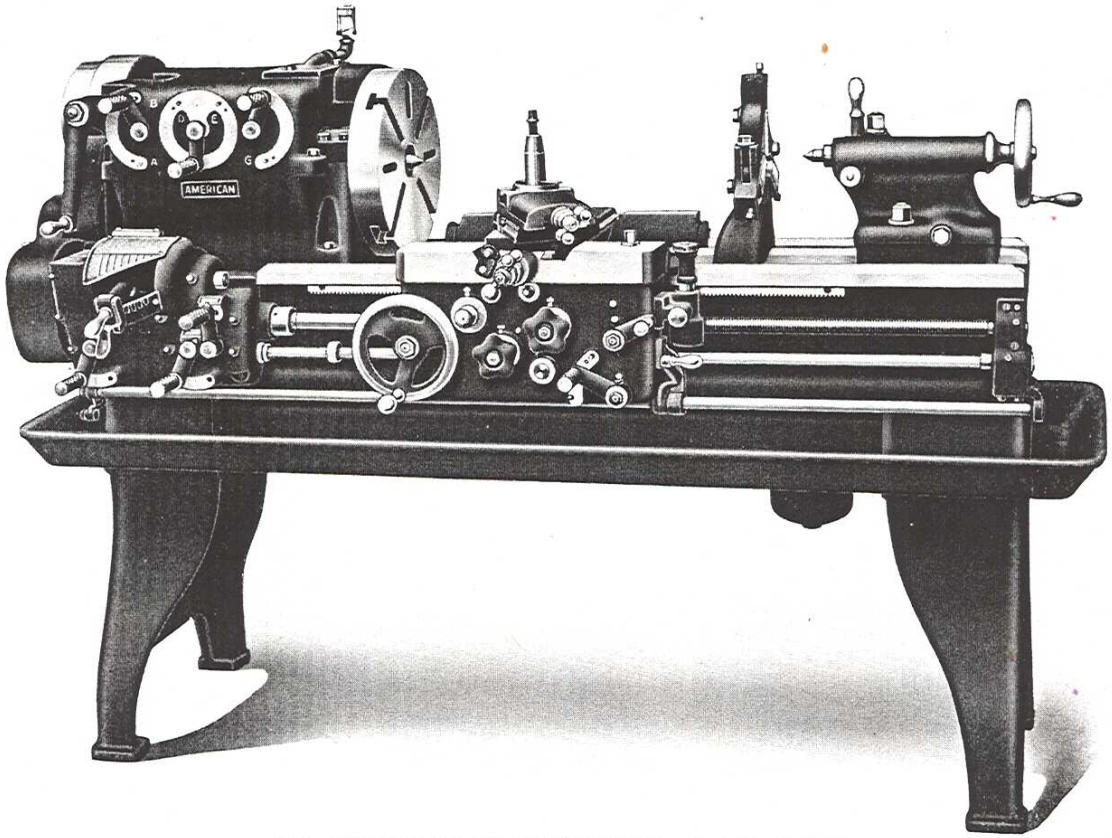
12-speed, automatically oiled geared head

Automatic Oiling System

The automatic oiling system employed is a new development and decided improvement in the lubrication of geared heads. By means of a geared pump accessibly located inside the head, the oil is pumped from a reservoir in the bottom of the head to a filtering and distributing tank in the head cover. After the filtration takes place the oil gravitates to the various head bearings through oil pipes leading from the filter reservoir. Since the oil pump supplies considerably more oil to the reservoir than the bearings will consume, the surplus overflows, and cascades over the gear teeth, thus keeping them constantly lubricated with clean oil. In order that any impairment of this circulating system may be immediately detected, gauge glasses are supplied, which indicate the oil levels, and show the circulation of the lubricant. This new head is under instant control through either of two levers, one located at the right side of the apron, the other at the left side of the head. These levers operate the powerful friction clutch incorporated in the initial driving unit accessibly located outside of the head. A very powerful external band brake operates in unison with the driving clutch, and is engaged when the clutch is released, and vice versa, consequently the spindle may be instantly stopped or allowed to drift when the driving clutch is released, and in addition may be securely locked in its stationary position by means of the brake, thus effectively guarding against the accidental starting of the spindle through possible drag of the clutch.



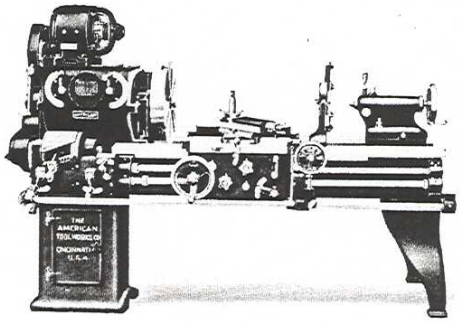
Interior of automatically oiled geared head



12-inch "American" Lathe with geared head arranged for belt drive

Simplified Head

Another valuable feature of this new head is that by the removal of one gear unit and its operating lever, it can be simplified so as to produce 4 speeds instead of 12, for the satisfactory use of an adjustable speed 2 to 1 or 3 to 1 motor, instead of a constant speed motor.



4-speed simplified geared head for adjustable speed motor drive

Motor Drives

The Self-Contained Motor Drive as shown by the lower illustration has been adopted by us as standard on all lathes from 12″ to 18″, inclusive. A constant speed A.C. or D.C. motor is mounted inside the cabinet leg, under the headstock, and connected by silent chain or belt to the initial driving unit of the headstock. Experiment and experience both have convinced us of the superior efficiency of the silent chain connection, but if customer insists, we are prepared to furnish a belt connection instead.

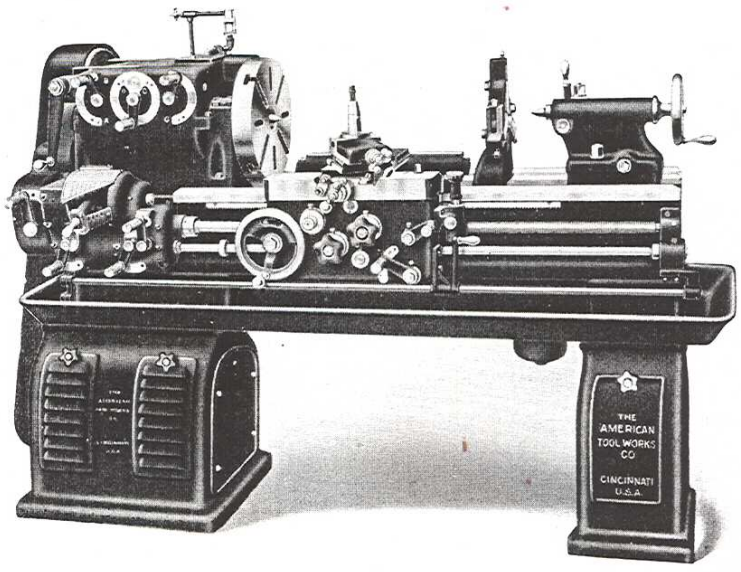
When the silent chain drive is used the motor should run 1800 R.P.M. When the belt connection is chosen the motor should not run over 1200 R.P.M. With the Self-Contained Motor Drive we recommend the use of an automatic control with push button station for starting and stopping the electrical equipment. When this control equipment is furnished the controller is mounted inside the cabinet leg under the tailstock, with the push button station conveniently located near the face plate. If a drum or any other type of control is used, it is located on the back of the tailstock cabinet leg.

The Self-Contained Motor Drive presents a neat and symmetrical appearance, and has practically all of the electrical equipment mounted inside the machine, with nothing on top of the headstock to obstruct the view or cut off the light.

When an adjustable speed motor is used for driving, and when customer for some reason prefers the externally mounted motor, we mount the motor on top of the headstock and connect it to the initial driving shaft in the head by three helical gears, similar to the illustration at the top of the page.

On all motor driven lathes larger than the 18″ size the motor is mounted on the headstock and connected to the initial driving shaft by a highly efficient, oil immersed, herringbone gear connecting unit.

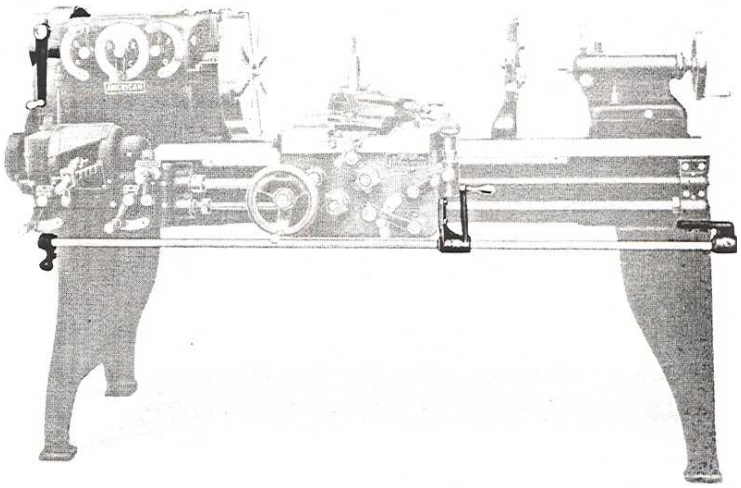
Mechanical apron control for starting and stopping the spindle of geared head lathes is part of the regular equipment.



Self-contained motor drive, silent chain connection

MECHANICAL APRON CONTROL

The mechanical apron control is a mechanical control by means of which the lathe spindle can be started and instantly stopped. It is regularly furnished with all geared head lathes, either belt or motor driven. The apron control handle is located at the right hand side of the apron and operates the friction clutch in the geared head driving member, as well as a powerful external brake. On motor driven lathes we can supply, at slight additional cost, an electrical apron control either in place of or in addition to the mechanical control, which, instead of start, stop and brake, provides start, stop and reverse, through the motor. When the electrical apron control is furnished the brake control from the apron is eliminated unless the electrical equipment includes an automatic control panel which provides a dynamic brake.



Details of mechanical apron control

Spindle Reverse from Apron

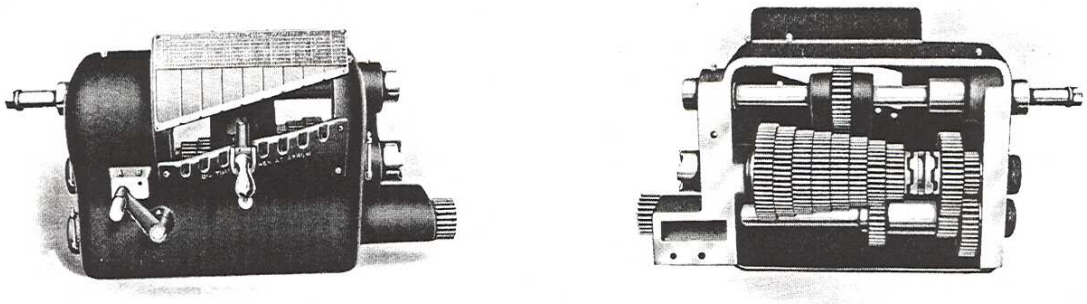
When a mechanical apron control is furnished, no means is provided for reversing the spindle from the apron position. If, however, customer desires a reverse, obtainable from the apron position, it can be secured, at extra cost, through a reversing mechanism incorporated in the initial driving unit. This new reversing mechanism also supplies a brake for stopping the spindle which operates at the neutral point between forward and reverse positions.

Quick Change Gear Mechanism

This is a very important feature of any lathe, both because of its primary function, that of providing the various threads and feeds required, and because it is an important link in the power transmission chain. Every standard thread ordinarily used is provided by the "American" quick change mechanism. It has an unusually wide range, yet is simple in design and easy to operate. Only 17 gears are used, all of which are steel and 10 of which are cone and tumbler gears cut with 20° cutters to produce a pointed tooth, which is easily and instantaneously meshed without fear of clashing. The tumbler lever is cast steel and bronze bushed, is located in its various positions by a notched plate, which prevents improper meshing, after which it is locked in position by a spring latch and locking pin, which eliminates vibration and wear between the cone and tumbler gears.

Separate Lead Screw and Feed Rod

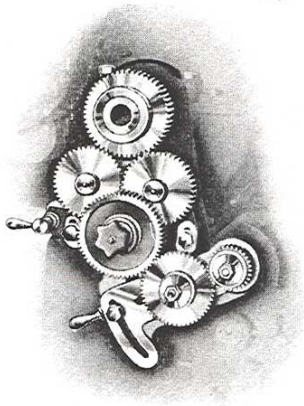
It should be carefully noted that a separate lead screw and feed rod are furnished on all "American" Lathes up to the 30″ size, and that these members are selective and independent of each other. The lead screw is preserved exclusively for threading, while the feed rod is used for all feeding operations. Thus, by relieving the lead screw of feeding operations, and using it exclusively for threading, it is only reasonable to assume that it will wear less, and retain its accuracy longer than if it were called upon to function on feeding operations as well as when thread chasing. Furthermore, the lead screw and feed rod are independent of one another. When one is in operation, the other is stationary, consequently on the "American" Lathe the lead screw bearings are in service only when the lead screw is being used, and therefore are of longer life and accuracy than on the average lathe, which does not have the independent lead screw and feed rod.



Quick change gear box, front and rear views

From the standpoint of power transmission it is interesting to compare the "American" quick change gear mechanism with competing designs. On the "American" no speeding up or compounding is required to secure the coarse leads and feeds. On heavy work the power transmission to the carriage is direct thru the cone and tumbler mechanism, consequently the frictional loss, which is coincident with speeding up and compounding, is strictly avoided. Therefore, it follows that on severe work, where lots of power is needed, our transmission is most effective and efficient and free from frictional waste.

An auxiliary quadrant in connection with the quick change mechanism permits the application of change gears for cutting special threads not regularly provided in the regular thread range, which makes the "American" Lathe practically unlimited in its range for threading operations.



Quadrant construction

Bearings

The life of any machine tool as an effective working unit can be no longer than that of its bearings. It is therefore of vital importance to protect the bearings as far as possible against wear and carelessness on the part of operator. No matter how unimportant a bearing may seem, if it sticks or cuts or wears badly, it must be renewed, and the lathe is bound to be out of commission while the repair is being made. To guard against these evils, every bearing in the lathe is supplied with a renewable bronze bushing which can be easily replaced in case of accident or wear. Furthermore, the important bushings are designed so as to form an annular oil container, which holds a liberal supply of oil and feeds it to the bearing thru a felt strip inserted in a slot cut in the bushing. This construction makes it unnecessary for the operator to renew the oil supply to the bearings as frequently as on other designs, and therefore lessens the possibility of bearings running dry. It also filters the oil and insures clean lubrication.

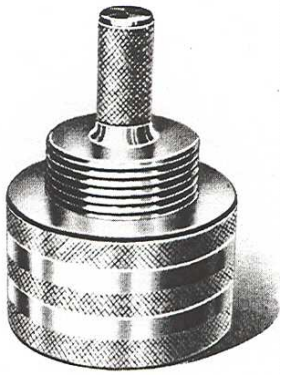
All bronze bushings are supplied with figure eight oil grooves to circulate the lubricant and retain it in the bearing. No shafts are grooved.

SPINDLE BEARINGS

The spindle bearings are of the cylindrical type, are long, and of large diameter, providing an unusually great area of bearing surface. The caps are carefully fitted to the headstock, and a metal to metal joint is made between the cap and cap seat. After the bronze bearings have been pressed and anchored in the boxes they are bored and hand-scraped to the ground spindle, obtaining thereby a metal to metal bearing between the cap and cap seat in the headstock, and a perfectly fitted cylindrical bearing on the spindle.

It is entirely safe to say that the great majority of experienced lathe operators decidedly prefer the cylindrical type of spindle bearing such as used on the "American" and other well-known makes of lathes. It is further significant that all of the recognized lathe builders, with only two or three exceptions, have adopted this type of bearing. Until quite recently there had been considerable discussion pro and con concerning the relative efficiency of the different types of spindle bearings, but good shop practice and experience have so conclusively proven the superiority of the cylindrical bearing that this question is now very seldom raised. But for those who are not entirely conversant with the numerous advantages of this type of bearing a few explanatory remarks may be of interest.

Lathe spindle



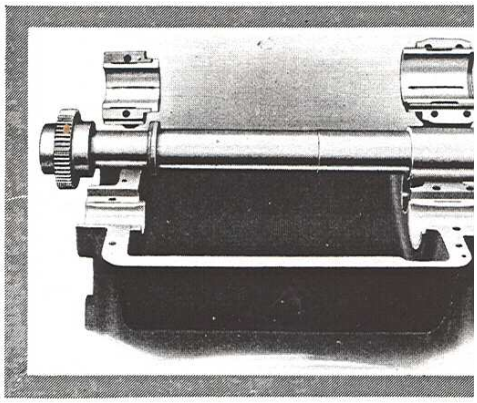
Hardened and lapped master for spir and face plates

It is of course a fact that all bearings, regardless of construction, are subject to wear, which must be compensated for in some way, or else the bearing becomes loose, and its effectiveness impaired. If the wear which takes place in the spindle bearings were uniform there would be little cause for discussion, as it could be easily taken up, but, unfortunately, the upward thrust of the cutting tool and the upward pull of the driving belt on cone driven lathes cause the front spindle bearing of the lathe to wear elliptically as a reaction of the upward thrust on the spindle. It is obvious, therefore, that to compensate for this uneven wear a cylindrical bearing with its top cap adjustment is absolutely necessary, while, on the other hand, it is just as plain that with any other type of bearing this wear could not be overcome.

Another decided advantage of the cylindrical spindle bearing is its ease and convenience of adjustment. Conditions frequently arise where lathes are operated at high speeds over long periods of time, under which conditions it is necessary to have some means of adjusting the spindle bearings to prevent overheating. Conversely, under heavy or intermittent operations on chucking jobs a very close fit must be made between the spindle and its bearing in order to secure accurately and smoothly finished work. Such adjustment is inconvenient and slow on any but the cylindrical type of bearing.

It is also a satisfaction to be able at any time to inspect the spindle bearings, and, if necessary, even to remove the entire spindle without difficulty. On other types of bearings inspection is impossible without first removing the spindle, which in itself is a very difficult, complicated and lengthy operation.

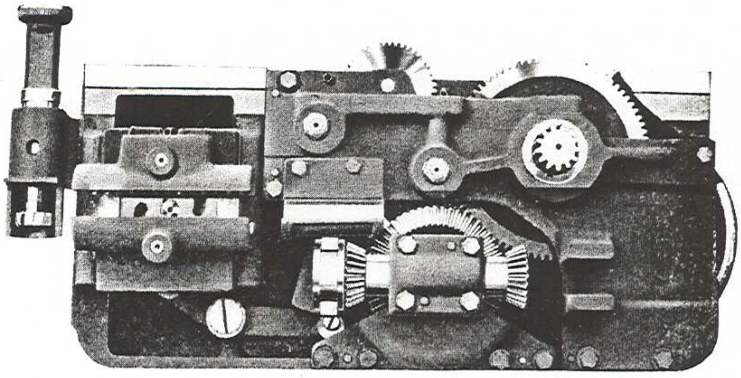
As a consequence of these many advantages the metal to metal cylindrical bearing is overwhelmingly approved by those who know and understand both types.



Spindle and spindle bearings

Bed—Our patented "Drop Vee" construction gives additional turning capacity over the nominal swing. Example, 14″ Lathe swings 16½″ over bed. This increase in capacity is secured without "raising," consequently provides a more substantial construction than other designs which are "raised" to secure a corresponding increase in turning capacity. The bearing surfaces of our beds are hardened by an improved chilling process, which produces a very close grained surface, considerably harder than the carriage bearings, and as a consequence what wear takes place is confined largely to the carriage bearings, where it will not affect the alignment.

The "Drop Vee" construction also permits greater depth to the carriage bridge and thus makes possible the unusually rigid carriage bridge of "American" Lathes.



Double plate apron

Apron—Is of the double plate, box construction, giving all studs a double support. All gears are steel. Rack pinion is withdrawable on all sizes and is of stub tooth type and hardened. Particular attention is directed to the fact that disc frictions are now being used in both the longitudinal and cross feed mechanisms operated by means of levers in place of star knobs. Greater convenience and more sensitive control is the result.

Tailstock—Has extension barrel, giving clearance to carriage bridge for short work. Except on the 12″ and 14″ lathes the tailstock is provided with four clamping bolts for binding it securely to the bed, the two rear bolts being carried to the top of the barrel for convenience in clamping. The tailstock barrel is solid, the spindle being clamped by a double plug binder which clamps without affecting the spindle alignment.

Compound Rest—Is extremely rigid. The swivel is rectangular in form and has greater bearing contact with bottom slide than is possible with the circular swivel used on many designs. On all sizes above the 16″ four bolts are provided for clamping the swivel in position. Full length taper gibs are used on both the compound rest top and bottom slides, and are located on the right hand side, where they are free from the tool thrust under normal working conditions.

In General—All studs, shafts and bushings are ground to gauge size and all holes are reamed to standard plug size. All flat surfaces are tested with B. & S. surface plates. Jigs are used wherever possible, consequently all detail parts are interchangeable and can be readily furnished and applied without undue fitting in case of breakage.

ATTACHMENTS

The "American" Tu-Way Taper Attachment

There are two distinct types of taper attachments on the market. They are known as the **yoke type** and the **telescopic screw type.** Each has its advantages and disadvantages, consequently it has been a question in the buyer's mind which type possessed the greater merit.

The new "American" Tu-Way Taper Attachment has completely eliminated the doubt by combining the advantages of both types, and eliminating the disadvantages.

The advantage of the yoke type of taper attachment rests in the rigid connection between the bottom slide of the tool rest and the sliding shoe on the swivel bar, thus eliminating the pull of the taper from the cross feed screw, and insuring for it longer life and greater accuracy. The disadvantage, on the other hand, is in the inability of the operator when cutting taper threads or boring taper holes to retain control of the cross feed screw for additional depths of cut.

On the telescopic screw type the condition is just the reverse. When chasing taper threads or boring taper holes the operator has complete control of the cross feed screw, but on all taper turning the entire pull of the taper is thru the cross feed screw, which naturally tends toward excessive wear, with its resultant back lash and inaccuracy.

The "American" Tu-Way Taper Attachment combines all the advantages of both types, and is so constructed that either combination can be used to cover the requirements; the yoke bar for heavy cuts or roughing and the telescopic screw for the finishing cuts, chasing, boring tapered holes, etc. The functions are selectively controlled by two clamp nuts, one to clamp the yoke to tool rest, and the other to hold the screw journal in a fixed position on the extended rear guide bracket; one being loose when the other is tight.

The improved attachment removes any interference between the swing of the work and the connections between tool rests and the sliding shoe, and greatly increases the swing capacity by placing the connections below the top of the carriage bridge, thus giving an unobstructed swing over the thin, flat dirt guard.

The "American" Tu-Way Taper Attachment is the very latest development in attachments of this kind, and has been designed to more thoroughly cover the requirements of rigidity, convenience and ease of manipulation demanded by modern production methods. It is a self-contained mechanism, carried as a unit on the rear of the carriage, and so proportioned as to resist the severest stresses, and at the same time excessive weight and bulkiness are strictly avoided. Its convenience of operation recommends it highly to the production departments, where the time element is an important factor, while its unusually high degree of accuracy commends it to the tool room, where accuracy is a prime essential.

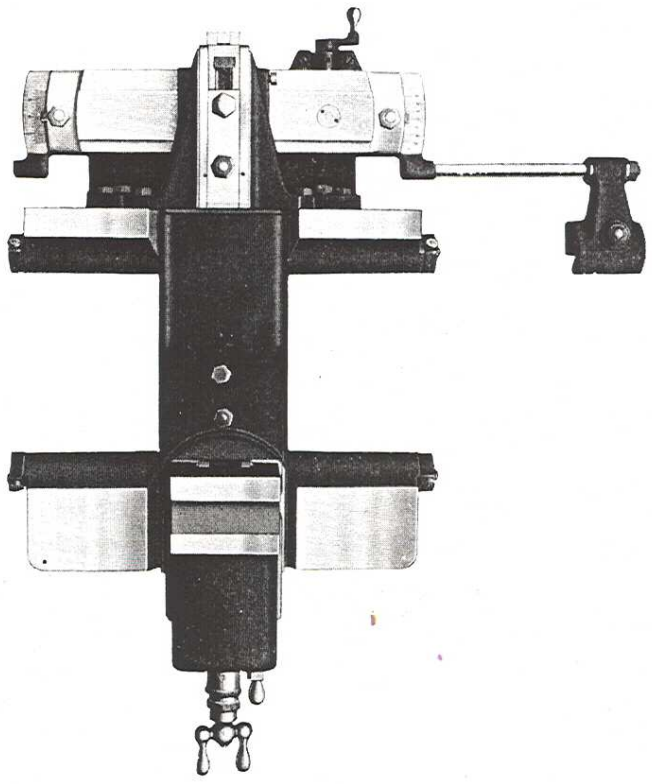
This mechanism can be quickly changed from taper to straight work, or vice versa, by simply loosening one nut and tightening another, while all other adjustments are proportionally simple.

Rigidity and smoothness of cut are insured by the use of the dovetail type of taper bar and sliding shoe with taper gib adjustment. This construction, combined with the stationary guide bracket above the shoe, prevents the lifting tendency under heavy cuts encountered where the square type taper bar and shoe are used.

The extended guide bracket not only provides a rigid support for the cross feed screw journal, but it also absorbs all angular thrusts without any cramping of the tool rest slide, thus permitting of very free movement and freedom from chatter.

The main taper attachment bracket is bolted and doweled to the rear wall of the carriage, where jigged holes provide for its installation when machine is shipped, or at a later date.

When the attachment is applied after the machine is shipped, a slight amount of fitting is necessary, for which full instructions are sent.



Improved "Tu-Way" Taper Attachment

Relieving Attachment

Before entering into a description of this attachment, attention must be called to the fact that it is built in two types—the Plain and the Universal, each one being designed for certain classes of work; consequently on ordering an attachment of this kind, it is imperative that the characteristics of each type be thoroughly understood, in order that the proper equipment may be secured for the work.

The Plain Relieving Attachment, as its name suggests, is a simple mechanism, designed for external and internal cylindrical work only. Owing to its limited field of action, the plain attachment can be constructed of fewer and larger elements, producing, in consequence, a much more rigid and durable mechanism than the universal type, which must cover in its operation practically the entire field of relieving, including external, end and internal work.

The Universal Relieving Attachment, on the other hand, is designed to perform a great variety of work, in fact, it must be ready when called upon to handle any kind of a relieving job. It is, therefore, of necessity a more complicated mechanism than the plain type, which is designed for one class of work only.

The "American" Universal Relieving Attachment, while it is exceptionally free from superfluous parts, nevertheless, owing to the wide field it must cover, has of necessity more sliding elements to wear, more adjustments to make, and less substantial parts to contend with than the plain attachment. It must, therefore, be expected that the Universal Attachment will demand care in handling, and more intelligent operation to secure results.

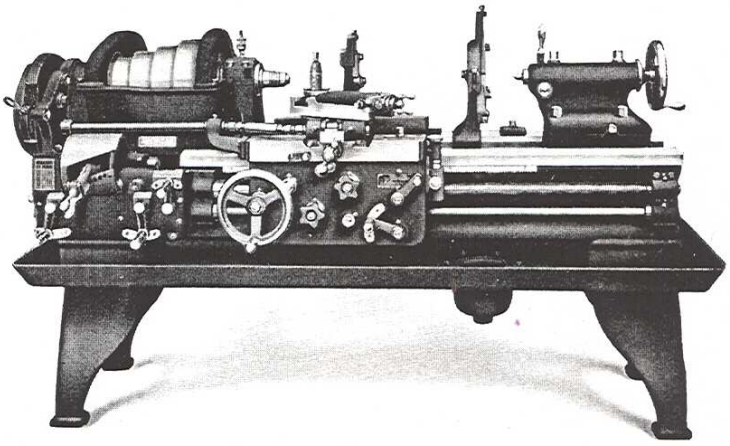
Let it be understood here that the Universal Attachment is not designed for manufacturing purposes, but is intended for the tool room which is called upon at various times to produce miscellaneous jobs of relieving work.

On the other hand, the Plain Attachment, owing to its less complicated design and sturdier construction, is considerably more of a manufacturing equipment. It is, therefore, a wise plan in some instances, where there is a great deal of cylindrical relieving to be done, and only an occasional job of end or angular work, to equip the tool room with both types of attachments, inasmuch as they are interchangeable. In this way the plain work which is to be done in quantities, can be accomplished by an attachment built especially for that particular work, while the occasional special job can be done on the Universal Attachment.

It is not difficult from the preceding statements to realize the importance of thoroughly considering the work before selecting the attachment. When only plain work is to be done, it is absolute folly to buy the Universal Attachment when a Plain Attachment can be had, which is designed especially and solely for that particular purpose. On the other hand, it must be remembered also, that the Plain Attachment will not accommodate anything but plain cylindrical work, consequently no angular or end work can be handled by it.

When relieving work such as hobs, taps, and cutters, the spindle speeds should be reduced to about half those regularly furnished.

In order to obtain this condition, on belt drives, the countershaft is fitted with an additional slow speed pulley, while on motor driven machines a two-speed motor is recommended for the most satisfactory operation of the attachment.



16-inch "American" complete tool room lathe

Universal Relieving Attachment

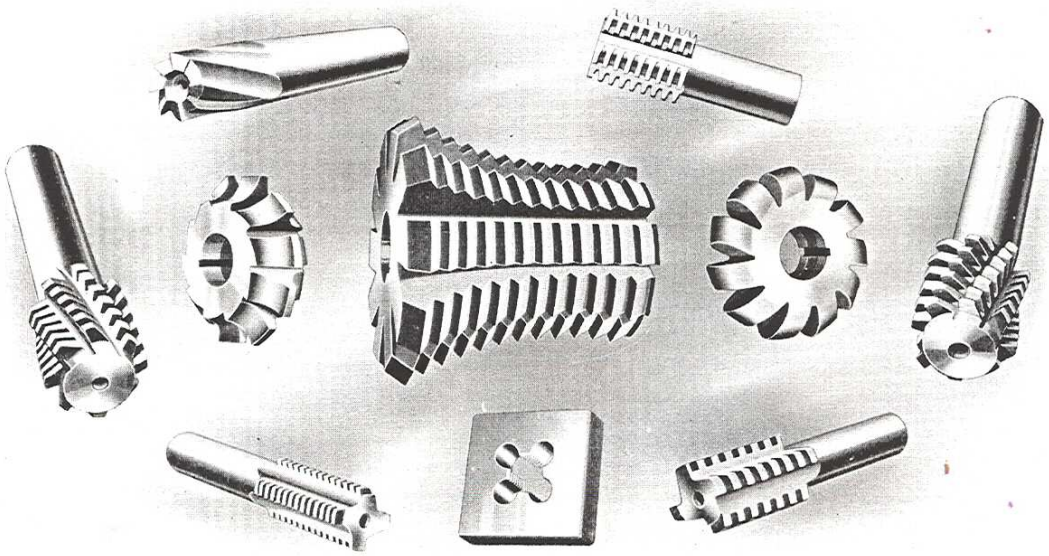
The function of the Universal Relieving Attachment is to relieve or back off the flutes of rotary cutters, taps, reamers, end mills, hollow mills, dies, etc. Heretofore, all of the relieving attachments on the market have been limited in their capacity for handling different classes of relieving work, and to the different types of lathes to which they could be applied, therefore were not universal in their action.

In order to successfully overcome these limitations, the new "American" Universal Relieving Attachment has been designed along original lines, with the result that this attachment is completely universal in its operation, as will be evident from the fact that end and internal relieving can be just as easily performed as straight relieving work, such as relieving cutters, taps, hobs, etc.

In addition, this new design has eliminated the many objectionable features common to other makes, such as numerous shafts, mitre gears, racks, etc., and as a result the new "American" Universal Relieving Attachment is very simple and efficient in its design, only a few parts being used to accommodate a very wide range of work and to provide an unusually direct drive.

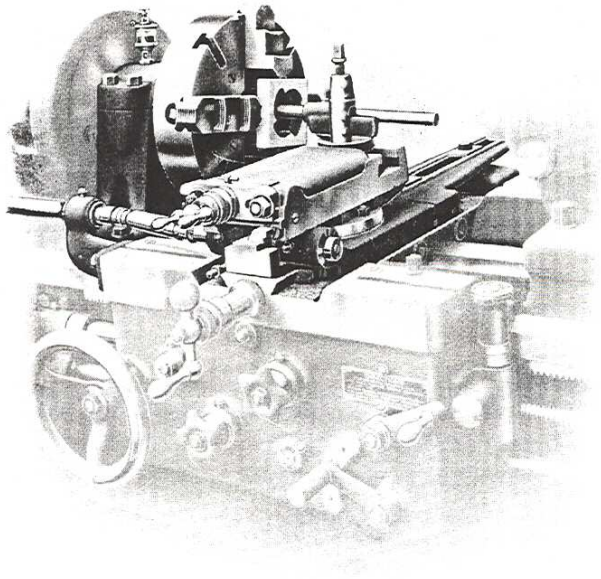
One of the important features of this new attachment is that it can be used with any type of "American" High Duty Lathe. In other words, the application of this relieving attachment is not limited to one type of lathe, as are many other similar attachments, but can be as easily applied to and operated in connection with a geared head or motor driven lathe, as it can with a cone head lathe.

The change gear mechanism is supported by a bracket located at the front of the headstock on top of the quick change gear box. The gear train has a small quadrant which carries the change gears, and which is used to disengage the drive when not required. Power is taken from a spur gear located on the end of the spindle and is transmitted thru the change gear mechanism to the driving shaft, which extends thru the supporting bracket on the quick change gear box and is journaled at the other end in a suitable bracket fastened to the left wing of the carriage. Between this bracket and the tool rest are located the universal or knuckle joints which permit cross movement to the tool slide.



Examples of work produced by the universal relieving attachment

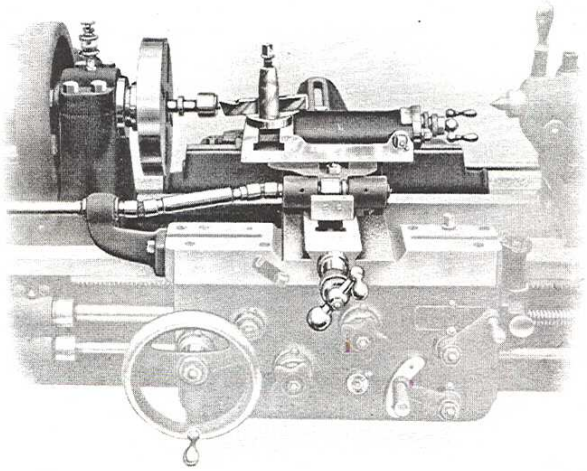
The driving shaft revolves constantly in one direction until the direction of the spindle rotation is reversed, at which time the driving shaft ceases to reciprocate the tool slide. This feature is of great value, for by means of it the tool slide will remain stationary when the direction of the carriage travel is reversed, while the half nuts are engaged. By means of this same feature the tool can be withdrawn from the work and run back for a new cut, as is the practice in tap and hob making, without any waste motion of the parts and with absolute safety to the work. This feature alone represents a very important advance in the development of the Relieving Attachment, and greatly increases the efficiency of this mechanism.



Internal relief

To obtain this condition a clutch connection is used between the cam and the driver which is operative in one direction only, therefore, when the cam is set for operating in one direction, the reversal of the driving shaft will cause the clutch, which is held in engagement by a spring, to be withdrawn from the cams, with the result that the cam will remain stationary and consequently will impart no motion to the tool slide.

In order to obtain the entire range shown on the index plate, three cams, of one, two and four lobes, are provided in addition to the change gears. These cams run in an oil bath, are carried on the cam shaft which is located directly in front of the tool slide, and can be very readily interchanged when desired. It will be noted by reference to the index plate, that the most commonly used reliefs are obtained by making the slightest changes. Probably the most important and valuable feature of this new attachment is that which permits the tool slide to be operated at every 30 degrees, thus providing twelve (12) operating positions within a circle. It is this feature that permits of relieving side cutters, end mills, and numerous jobs that heretofore could only be done by hand. On practically all other attachments that can accommodate this class of work, certain changes in and additions to the regular equipment are necessary to make them operative on internal and end relief work. On the "American" Relieving Attachment, however, aside from the simple adjusting of the tool slide to its proper position, there is absolutely no change or readjustment of the mechanism required.



End relief

Very convenient means are provided on this attachment for obtaining the various degrees of relief for either external or internal work. The adjustment takes place at the front of the tool slide thru a thumb screw, while a graduated scale indicates the depth of the relief as set.

As a further proof of the adaptability of this attachment, it can be applied and operated absolutely independently of the taper attachment. In other words, as far as the relieving attachment itself is concerned, a taper attachment is not required, except when taper work is to be handled.

A standard compound rest is furnished in addition to the special relieving rest, the use of which, for general turning purposes, we strongly recommend, for naturally the constant use of a precision tool for rough work will impair its accuracy, and unfit it for high-grade tool room work.

As the compound rest is readily interchangeable with the special tool slide of the relieving attachment, only a few moments are required to make the change.

When necessary to relieve taps or hobs having spiral flutes, the "American" Universal Relieving Attachment can be easily arranged to handle such work by the simple addition of extra gears.

The parts used in the construction of the "American" Universal Relieving Attachment are of the very best material for the service required. The cam yoke is forged. The cams, cam shoe and crank members are of tool steel, hardened and ground. The index bar in top slide is of forged steel, all the shafts and gears are well proportioned, and the entire mechanism is free from trappy construction.

One of the chief advantages of the "American" Relieving Attachment lies in the fact that any back lash in gears, cams, keyways or universal joints has no effect on the work, because the cam is located on the tool rest with a positive drive connection between the cam and the cutting tool. All gears are securely covered.

The "American" Universal Relieving Attachment can be applied to any "American" High Duty Lathe, below the 30″ size, after the machine has left our factory, the application requiring only a slight amount of work by the purchaser.

Relieving Attachments—Plain and Universal Models

Size of Lathes		12″	14″	16″	18″	20″	24″ G.P.	24″ H.P.	27″
Maximum work diameter		3″	5″	6⅛″	8″	9″	9″	12″	12″
Maximum Depth of Relief Obtainable	Univ'l	⅛″	⅛″	5/32″	3/16″	7/32″	7/32″	⅜″	⅜″
	Plain	. . . .	9/16″	9/16″	⅝″	⅝″	⅝″	¾″	¾″
Number of Cams Regularly supplied.	Univ'l	†3 fundamental cams, 1-2-4 lobes, with fixed drop only.							
	Plain	*3 Standard Cams, 1-2-4 lobes, ¼″ or ⅜″ drop, other drops special to order.							
Number of flutes in work		2 3 4 5 6 7 8 9 10							
		11 12 14 16 18 20 22 24							
Weights of attachments		150	175	190	225	250	250	300	300

†Depths of relief are adjustable, using a fixed cam drop.

*Depths of relief are fixed. Must use separate cam for each variation in depth of relief. On 12″, 14″ and 16″ lathes cams have ¼″ drop, on larger sizes cams have ⅜″ drop, unless otherwise ordered.

PLAIN RELIEVING ATTACHMENT

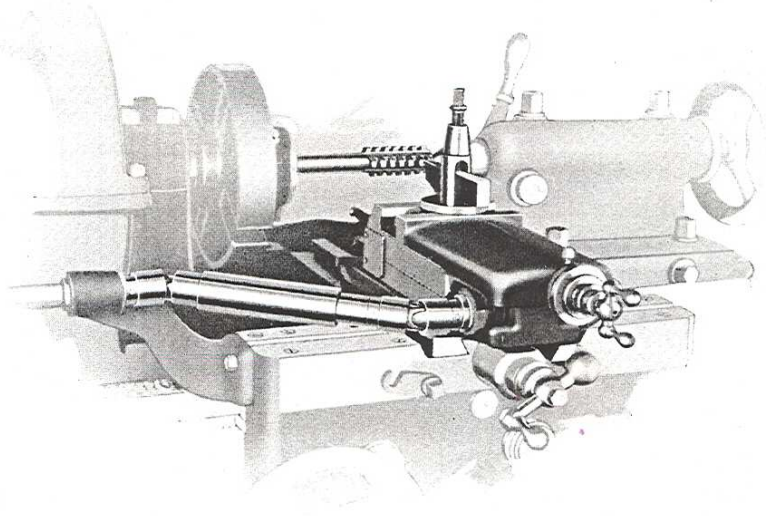
The purpose of the Plain Relieving Attachment is to relieve the flutes of cutters, reamers, hobs, taps and internal work as dies, etc., where the work requires neither side, angular or end relief.

To secure an attachment capable of handling this work economically and on a manufacturing basis, the "American" Plain Relieving Attachment was designed with much more liberal proportions and with greater rigidity than the average relieving attachment. It consists primarily of a top and bottom slide and an intermediate nut block controlled by a cam on the driving shaft. Backlash between the cam and tool has been absolutely eliminated, insuring an accurate reproduction of the cam contour, resulting in the producing of sharp edges on the work.

The cam operates against a hardened plate attached to the steel nut block mounted in a planed seat on the bottom slide, and is constructed so as to place the nut block and top slide screw in tension under the cutting stroke. The nut for the top slide screw is made of bronze and is attached to the top of the nut block, while the top slide screw connects the block with the top slide. At the inner end of the top slide is fastened a steel strap, to which is secured a tension spring bolt of sufficient dimensions to insure smooth operation and long service. One end of the tension spring bears against a lug on the bottom slide, while the other end bears against the head of the bolt.

Passing through the tension strap are two buffer rods which are attached to the nut block, their outer ends being supplied with large bushings which bear against raw-hide cushions inserted in the bottom slide. The rods have lock nuts on the outer ends to provide the proper adjustment for the buffer bushes to suit any change in cam lobe height or wear on the buffer pads. These buffer cushions absorb the shock and eliminate the noise.

Three cams are supplied with this attachment, which, together with the change gears, produce the entire range shown on the index plate. On this attachment the regular cam lobes are supplied with drops per table on page 20, and any desired rate of relief must be obtained by inserting another cam of the required drop. This is one of the principal points of difference between the plain and universal attachments, and on account of the elimination of the set-over yoke in top slide and the crank members, the results must be obtained through the cams. The tool steel cams having one, two and four lobes, are hardened and ground. The ends of the cam hubs are provided with single tooth clutches which permit the driving shaft to be reversed in direction when returning the carriage for new cut, without moving tool slide during the return interval. A clutch sleeve on the driving shaft engages the clutch tooth on one end of the cam. The cam clutches are cut right and left, and this permits of reversing the cam for internal work when spindle direction is reversed. The cam shaft can be easily removed for the changing of the cams.



Cylindrical relief

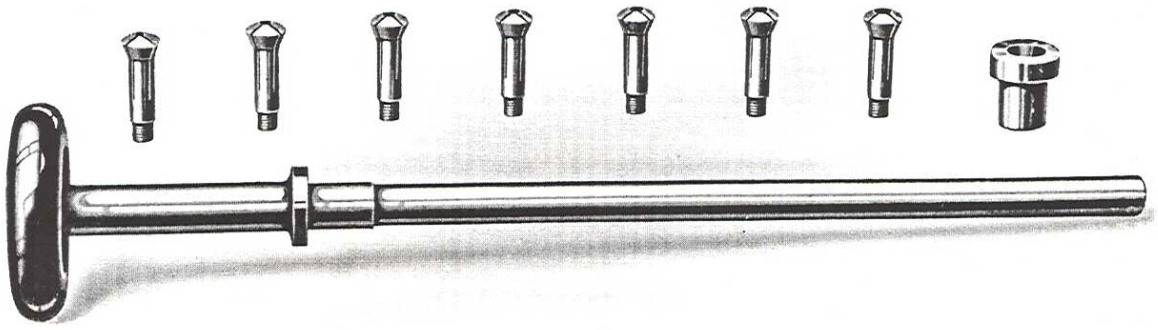
The change gear mechanism is supported by a bracket located at the front of the headstock on top of the quick change gear box. The gear train has a small quadrant which carries the change gears, and which is used to disengage the drive when not required. Power is taken from a spur gear located on the end of the spindle and is transmitted thru the change gear mechanism to the driving shaft, which extends thru the supporting bracket on the quick change gear box and is journaled at the other end in a suitable bracket fastened to the left wing of the carriage. Between this bracket and the tool rest are located the universal or knuckle joints, which permit cross movement to the tool slide.

This attachment can be used independently of, or in conjunction with the taper attachment, as the conditions may require.

The range of depths of relief possible on the plain attachment is as follows:

12″ . . . . . Not furnished.
14″ and 16″ Lathes . . . . . 0″ to $\frac{9}{16}$″ max. cam lobe drop
18″, 20″ and 24″ G. P. Lathes . . . . . 0″ to $\frac{5}{8}$″ max. cam lobe drop
24″ H. P. and 27″ Lathes . . . . . 0″ to $\frac{3}{4}$″ max. cam lobe drop

DRAW-IN ATTACHMENT



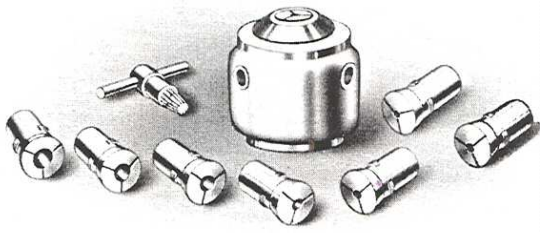
Draw-in attachment and collets

The Draw-in Attachment is a very simple mechanism, consisting of a long hollow steel bar, a hardened and ground steel taper bush and as many collets as are necessary for holding different diameters of work.

The hollow bar which extends thru the spindle has a wooden hand wheel at one end and is threaded internally at the other. The hardened and ground bush fits into the spindle nose and the collets are placed in this bush, the threaded end extending thru and being engaged by the thread chased on the inside of the bar. The stock which is to be turned, is passed thru the bar from the head end of the lathe, and is gripped in the collet or chuck. The turning of the hand wheel, in one direction or the other, causes the collet to either engage or disengage the work. Collets can be furnished for holding stock from the smallest fraction of an inch up to $\frac{7}{8}$″ diameter on the 12″, 14″ and 16″ sizes, and up to 1″ diameter on the 18″, 20″, 24″ and 27″ sizes.

Improved Nose-Type Collet Chuck

This attachment is a self-contained unit, secured to the spindle nose, and arranged to hold a series of collets with a maximum capacity equal to the diameter of the spindle hole.

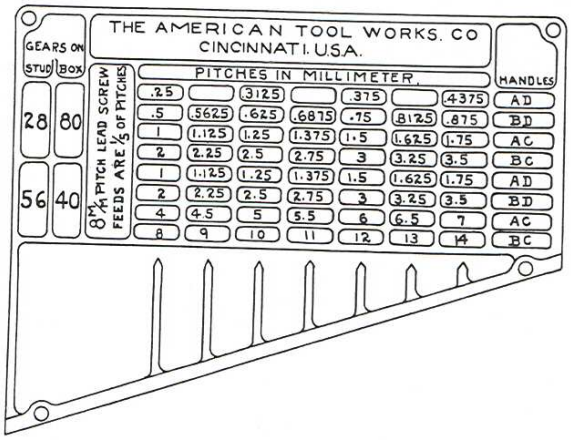


The collets are opened and closed by a T-shaped key with a pinion on its lower end, which engages a combined bevel gear and scroll inside of the body, which moves the collet endwise when it revolves.

The particular advantage of this chuck is that it eliminates the necessity for reaching over to the left end of spindle to open and close the collet. Another advantage is that practically the full capacity of spindle hole can be obtained thru the collets.

Special Coarse and Fine Threads

If a range of coarser or finer threads than regularly provided is desired, we can at very slight additional cost furnish a pair of compounding gears to replace the standard idler gear, which will provide both a coarser and finer range of threads. The application of these wide range gears requires only a moment's time, which again demonstrates the unparalleled convenience, simplicity and range of our quick change gear mechanism.



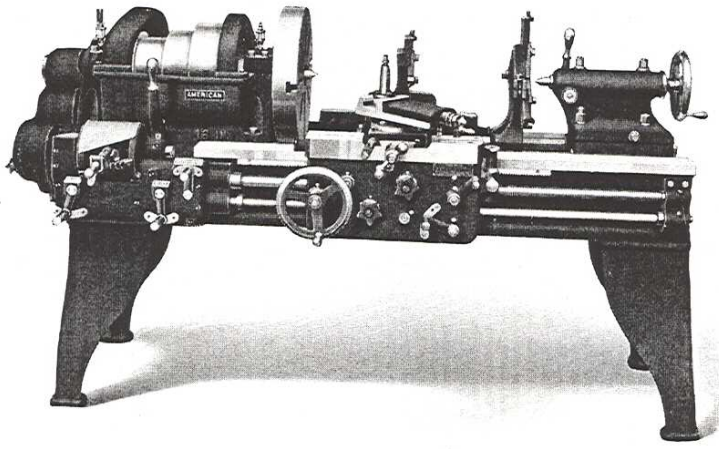
Metric index plate

Metric Lathes

"American" Lathes can be furnished in all sizes as complete metric lathes. This type of lathe is equipped with metric pitch lead screw and special gearing to cut standard metric pitches. It is also equipped with metric cross feed and compound rest screws, metric carriage micrometer stop and with metric graduations on micrometer dials and tailstock spindle.

Except for these changes, "American" metric lathes are identical to our standard lathes, all dimensions being exactly the same on both types.

When desired, English or Whitworth transposing gears can be furnished to convert the metric thread and feed range to the English or Whitworth standard.



16-inch "American" metric lathe with double back geared head

"Converted" Metric Pitches

Because of the metric standards employed by some concerns in this country, and the almost universal use of the metric system abroad, means has been provided for quickly, easily and inexpensively converting the quick change threading and feeding mechanism from the standard English to the Metric System.

METRIC PITCHES				
GEAR ON STUD	FEED BOX LEVERS			
	A-D	B-D	A-C	B-C
	M / M	M / M	M / M	M / M
40	.5	1.0	2.0	4.0
45	.5625	1.125	2.25	4.5
50	.625	1.25	2.5	5.0
55	.6875	1.375	2.75	5.5
60	.75	1.5	3.0	6.0
65	.8125	1.625	3.25	6.5
70	.875	1.75	3.5	7.0
75	.9375	1.875	3.75	7.5
80	1.0	2.0	4.0	8.0
85	1.0625	2.125	4.25	8.5
90	1.125	2.25	4.5	9.0
95	1.1875	2.375	4.75	9.5
100	1.25	2.5	5.0	10.0
PLACE 127 TOOTH GEAR ON GEAR BOX LOCK TUMBLER IN LOWEST HOLE.				
THE AMERICAN TOOL WORKS CO. CINCINNATI, O., U.S.A. 2411				

Index plate for "converted" metric pitches

The method of conversion from the English to the metric range is very simple; in fact, the operation of this mechanism is so extremely simple that it is practically impossible to make a mistake in securing the desired pitch. There is absolutely no change made in the regular design of the lathe nor is there any complicated mechanism to apply, in order to secure the desired result. The only work incident to making the conversion is the replacing of the original gear on the stud, the intermediate gear and the driving gear on the quick change box with the proper transposing gears that are furnished to produce the required range of pitches.

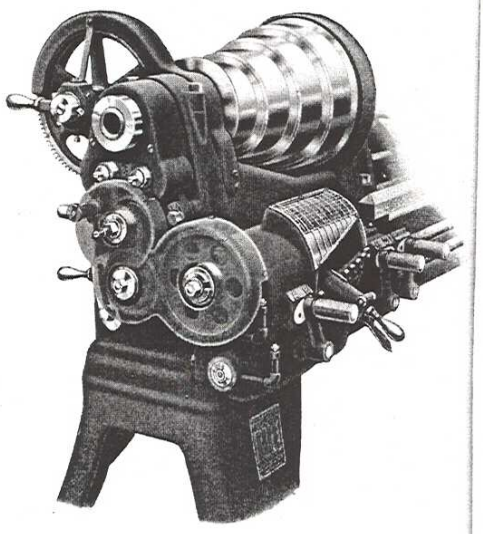
After the three transposing gears have been applied to produce one metric pitch, all the other pitches shown on the index plate and enumerated on the following page can be secured by simply interchanging the gear on the stud with the particular gear shown by the index plate to be necessary for the desired pitch, and then setting the two compounding levers located at the left and right of the tumbler lever to the positions as indicated on the index plate.

After once applying the 127-tooth transposing gear to the box it is not removed until it again becomes necessary to cut English or Whitworth threads, when the original gear is replaced.

All gear combinations incident to obtaining the entire range of metric pitches are calculated with the tumbler lever in the first position as it is shown in the accompanying illustration. Therefore, when cutting metric threads the position of this lever must not be changed.

In order that the screw cutting mechanism may be properly set for cutting both metric and English threads, two index plates, one showing the combinations for metric and one for English pitches, are furnished with each lathe arranged for metric conversion.

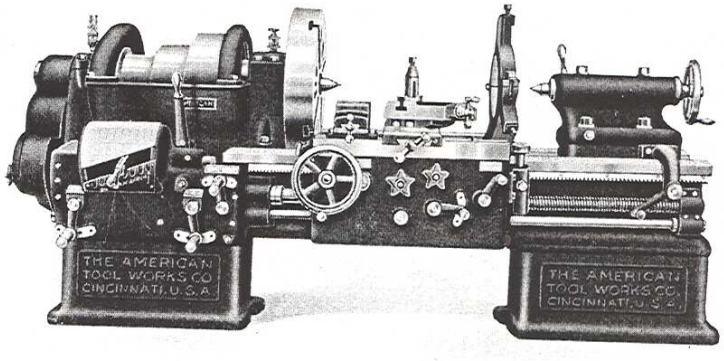
Special threads and pitches not included with the regular range can be obtained by the use of additional compounding gears. However, those regularly provided are considered sufficient for ordinary use.



Metric transposing gears in place

Standard Range of "Converted" Metric Pitches

12-inch	14-inch	16-inch	18-inch	20-inch	24-inch G. P.	24-inch H. P.	27-inch
.5	.5	.5	.5	.5	.5	1.00	1.00
.5625	.5625	.5625	.5625	.5625	.5625	1.125	1.125
.625	.625	.625	.625	.625	.625	1.25	1.25
.6875	.6875	.6875	.6875	.6875	.6875	1.375	1.375
.75	.75	.75	.75	.75	.75	1.5	1.5
.8125	.8125	.8125	.8125	.8125	.8125	1.625	1.625
.875	.875	.875	.875	.875	.875	1.75	1.75
.9375	.9375	.9375	.9375	.9375	.9375	1.875	1.875
1.00	1.00	1.00	1.00	1.00	1.00	2.00	2.00
1.0625	1.0625	1.0625	1.0625	1.0625	1.0625	2.25	2.25
1.125	1.125	1.125	1.125	1.125	1.125	2.5	2.5
1.25	1.25	1.25	1.1875	1.1875	1.1875	2.75	2.75
1.375	1.375	1.375	1.25	1.25	1.25	3.00	3.00
1.5	1.5	1.5	1.375	1.375	1.375	3.25	3.25
1.625	1.625	1.625	1.5	1.5	1.5	3.5	3.5
1.75	1.75	1.75	1.625	1.625	1.625	3.75	3.75
1.875	1.875	1.875	1.75	1.75	1.75	4.00	4.00
2.00	2.00	2.00	1.875	1.875	1.875	4.5	4.5
2.125	2.125	2.125	2.00	2.00	2.00	5.00	5.00
2.25	2.25	2.25	2.125	2.125	2.125	5.5	5.5
2.50	2.5	2.5	2.25	2.25	2.25	6.00	6.00
2.75	2.75	2.75	2.375	2.375	2.375	6.5	6.5
3.00	3.00	3.00	2.5	2.5	2.5	7.00	7.00
3.25	3.25	3.25	2.75	2.75	2.75	7.5	7.5
3.50	3.5	3.5	3.00	3.00	3.00	8.00	8.00
3.75	3.75	3.75	3.25	3.25	3.25	9.00	9.00
4.00	4.00	4.00	3.5	3.5	3.5	10.00	10.00
4.25	4.25	4.25	3.75	3.75	3.75	11.00	11.00
4.50	4.5	4.5	4.00	4.00	4.00	12.00	12.00
5.00	5.00	5.00	4.25	4.25	4.25	13.00	13.00
5.5	5.5	5.5	4.5	4.5	4.5	14.00	14.00
6.00	6.00	6.00	4.75	4.75	4.75	15.00	15.00
6.5	6.5	6.5	5.00	5.00	5.00	.....	.....
7.00	7.00	7.00	5.5	5.5	5.5	.....	.....
7.5	7.5	7.5	6.00	6.00	6.00	.....	.....
8.00	8.00	8.00	6.5	6.5	6.5	.....	.....
8.5	8.5	8.50	7.00	7.00	7.00	.....	.....
9.00	9.00	9.00	7.5	7.5	7.5	.....	.....
.....	.....	.....	8.00	8.00	8.00	.....	.....
.....	.....	.....	8.5	8.5	8.5	.....	.....
.....	.....	.....	9.00	9.00	9.00	.....	.....
.....	.....	.....	9.5	9.5	9.5	.....	.....
.....	.....	.....	10.00	10.00	10.00	.....	.....



24-inch "American" lathe with double back geared head

OIL PAN

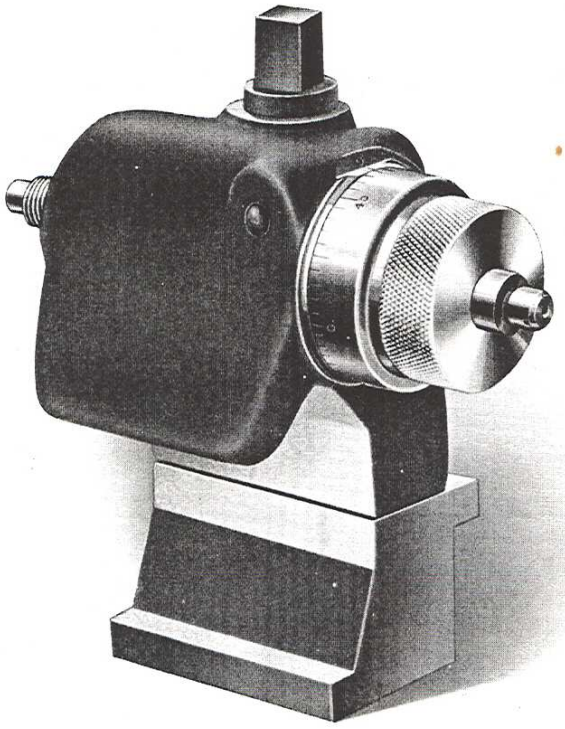
There is very little to be said in connection with the oil pan, aside from the fact that it is made from cast-iron on short beds and sheet iron on long beds, its purpose being to catch the waste lubricant and thus prevent it from running onto the floor and being wasted.

MICROMETER CARRIAGE STOP

The micrometer carriage stop regularly furnished on the "American" Tool Room Lathe is provided for accurately locating the carriage or tool with relation to the work. It is a positive stop, which is used in connection with the hand feed only, and must not be used in combination with the power feed.

This mechanism consists of a body casting carrying an adjusting screw with knurled knob, and a micrometer collar graduated for fine adjustments of the screw. A combination clamp permits the stop to be used on either front or rear Vee of bed, the clamp being reversed to fit the bed shape, while a binder screw secures the stop in place.

The stop screw can be used at either end, which permits of placing the stop at any point on front or rear Vee, and at either end of carriage wings.



Micrometer carriage stop

SIZE	12″	14″	16″	18″
Actual swing over bed	14½″	16½″	18½″	20½″
Swing over Carriage Bridge	8½″	11½″	12¼″	13¼″
Swing over Taper Attachment Yoke	7¾″	10½″	11¼″	12¼″
Length of bed, base length	5′	6′	6′	6′
Takes between centers, tailstock flush with end of bed	2′ 4″	3′ 1½″	2′ 7″	2′ 3″
*Front Spindle Bearing—diameter and length	2⅜″ x 3¾″	2¾″ x 4″	3″ x 5″	3¼″ x 5½″
*Rear Spindle Bearing—diameter and length	1 13/16″ x 2¾″	2 1/16″ x 3″	2 1/16″ x 3 15/16″	2⅜″ x 3¾″
Spindle Hole diameter	1 13/64″	1 13/64″	1 13/64″	1 9/16″
Centers Morse Taper No.	3	3	4	4
Cone Pulley, width of step, Single Back Geared Head	2¼″	2⅝″	3⅛″	3½″
Cone Pulley, width of step, Double Back Geared Head	2½″	3⅛″	3 11/16″	4⅛″
Driving Pulley width, All Geared Head	2¾″	3¼″	4¼″	5¼″
Cone Pulley Diameters, Single Back Geared Head	9,–7⅜,–5¾,–4⅛,	10½,–8¾,–7,–5¼″	13,–10.8,–8.6,–6.4″	14½,–12,–9½,–7″
Cone Pulley Diameters, Double Back Geared Head	5⅞,–7 7/16,–9″	7 1/16,–8 25/32,–10½″	8⅝,–10 13/16,–13″	9 9/16,–12 1/32,–14½″
Driving Pulley Diameter, All Geared Head	10″	10″	10″	12″
Back Gear Ratio, Single Back Geared Head	1 to 8.5	1 to 10	1 to 10.5	1 to 12
Back Gear Ratios, Double Back Geared Head	1 to 3.54 & 1 to 12.7	1 to 3.29 & 1 to 11	1 to 3.44 & 1 to 11.73	1 to 3.47 & 1 to 12.08
Maximum Gear Ratio, All Geared Head	28.3 to 1	37.1 to 1	37 to 1	43.7 to 1
Speed of Drive Pulley, All Geared Head	340	370	370	350
Lead Screw diameter and threads per inch	1⅛″,–6 thr.	1¼″,–4 thr.	1⅜″,–4 thr.	1⅝″,–2 thr.
Range of threads per inch	2 to 112	2 to 112	2 to 112	1 to 56
Range of feeds per inch	8 to 448	8 to 448	8 to 448	8 to 448
Number of thread and feed changes	48	48	48	48
Tailstock Spindle diameter	1⅝″	1 13/16″	2″	2 3/16″
Tailstock Spindle movement	5″	5¾″	7½″	8¼″
Steady Rest Capacity	3″	3½″	6″	7″
Compound Rest top slide movement	3⅝″	4¼″	5¼″	6¼″
Large Face Plate diameter	12½″	15″	17″	19″
Size of Friction Pulleys, Single Back Geared Head	10″ x 3¼″	10″ x 3¼″	12″ x 4¼″	12″ x 4¼″
Size of Friction Pulleys, Double Back Geared Head	10″ x 3¼″	12″ x 3¼″	12″ x 4¼″	12″ x 4¼″
Size of Friction Pulleys, All Geared Head	12″ x 3¼″	12″ x 4¼″	12″ x 4¼″	12″ x 5¼″
Countershaft speeds, forward and reverse, S. B. G. Head	200 and 260	200 and 247	187 and 232	168 and 211
Countershaft speeds, forward and reverse, D. B. G. Head	265 and 330	268 and 327	252 and 321	232 and 286
Countershaft speeds, forward and reverse, All Geared Head	290 and 340	310 and 370	310 and 350	350 and 380
Standard Tool Size	½″ x ¾″	½″ x 1″	⅝″ x 1¼″	¾″ x 1½″
Taper Attachment Capacity	3″ per ft., 12″ long	3″ per ft., 16″ long	3″ per ft., 16″ long	4″ per ft., 23″ long
Maximum size collet	⅞″	⅞″	⅞″	1″
Crated weight base length bed, Single Back Geared Head	1600 lbs.	2350 lbs.	2800 lbs.	3700 lbs.
Additional weight, Double Back Geared Head	30 lbs.	50 lbs.	50 lbs.	55 lbs.
Additional weight, All Geared Head	220 lbs.	275 lbs.	350 lbs.	575 lbs.
Additional weight, each 2′ of bed	150 lbs.	200 lbs.	250 lbs.	300 lbs.
Additional weight of oil pan (base length)	225	165	170	200
Additional weight of each extra 2′ of oil pan	120	40	40	40
Boxed weight base length bed, Single Back Geared Head	1725 lbs.	2525 lbs.	3050 lbs.	4900 lbs.
Boxed weight base length bed, Double Back Geared Head	1830 lbs.	2575 lbs.	3100 lbs.	4055 lbs.
Boxed weight base length bed, All Geared Head	2020 lbs.	2850 lbs.	3250 lbs.	4575 lbs.
Cubic feet boxed, base length bed, S. B. G. Head	50	60	70	80
Cubic feet boxed, base length bed, D. B. G. Head	50	60	70	80
Cubic feet boxed, base length bed, All Geared Head	52	63	73	85
Cubic feet, each additional 2′ of bed	13	15	18	20

*Dimensions are for cone heads only. For geared head spindle bearing dimensions, see page 28.

SIZE	20″	24″ G. P.	24″ H. P.	27″
Actual swing over bed	22½″	24½″	27½″	30½″
Swing over Carriage Bridge	14⅝″	17½″	19″	23″
Swing over Taper Attachment Yoke	13½″	16¼″	17¾″	21½″
Length of bed, base length	8′	8′	10′	10′
Takes between centers, tailstock flush with end of bed	3′ 10″	3′ 10″	5′ 0″	5′ 0″
*Front Spindle Bearing—diameter and length	3¾″ x 6⅛″	3¾″ x 6⅛″	4⅜″ x 7⅜″	4⅜″ x 7⅜″
*Rear Spindle Bearing—diameter and length	2¾″ x 4 9/16″	2¾″ x 4 9/16″	3 5/16″ x 5¼″	3 5/16″ x 5¼″
Spindle Hole diameter	1¾″	1¾″	2⅛″	2⅛″
Centers Morse Taper No.	4	4	5	5
Cone Pulley, width of step, Double Back Geared Head	4⅝″	4⅝″	5⅜″	5⅜″
Driving Pulley width, All Geared Head, 12-speed	5¾″	5¾″	6½″	6½″
Cone Pulley Diameters, Double Back Geared Head	16,–13¼,–10½″	16,–13¼,–10½″	19⅞,–16⅜,–12⅞″	19⅞,–16⅜,–12⅞″
Driving Pulley Diameter, All Geared Head, 12-speed	14″	14″	16″	16″
Back Gear Ratios, Double Back Geared Head	3.5 to 1 & 12.55 to 1	3.5 to 1 & 12.55 to 1	3.69 to 1 & 13.65 to 1	3.69 to 1 & 13.65 to 1
Maximum Gear Ratio, All Geared Head, 12-speed	42.5 to 1	42.5 to 1	41.4 to 1	41.4 to 1
Speed of Drive Pulley, All Geared Head, 12-speed	340	340	280	280
Lead Screw diameter and threads per inch	1¾″ dia., 2 thr.	1¾″ dia., 2 thr.	2″ dia., 2 thr.	2″ dia., 2 thr.
Range of threads per inch	1 to 56	1 to 56	½ to 28	½ to 28
Range of feeds per inch	8 to 448	8 to 448	5 to 280	5 to 280
Number of thread and feed changes	48	48	48	48
Tailstock Spindle diameter	2 11/16″	2 11/16″	3 3/16″	3 3/16″
Tailstock Spindle movement	9½″	9½″	11″	11″
Steady Rest Capacity	7½″	7½″	9″	9″
Compound Rest top slide movement	7¼″	7¼″	8½″	8½″
Large Face Plate diameter	21″	21″	25¼″	27¼″
Size of Friction Pulleys, Double Back Geared Head	14″ x 4¼″	14″ x 4¼″	16″ x 5½″	16″ x 5½″
Size of Friction Pulleys, All Geared Head	16″ x 6½″	16″ x 6½″	16″ x 6½″	16″ x 6½″
Countershaft speeds, forward and reverse, D. B. G Head	220 and 272	220 and 272	200 and 249	200 and 249
Countershaft speeds, forward and reverse, All Geared Head	300 and 330	300 and 330	280 and 335	280 and 335
Standard Tool Size	¾″ x 1½″	¾″ x 1½″	⅞″ x 1¾″	⅞″ x 1¾″
Taper Attachment Capacity	4″ per ft., 23″ long	4″ per ft., 23″ long	4″ per ft., 28″ long	4″ per ft., 28″ long
Maximum size collet	1″	1″	1″	1″
Crated weight, base length bed, Double Back Geared Head	5250 lbs.	5400 lbs.	8300 lbs.	8500 lbs.
Additional weight, All Geared Head	725 lbs.	775 lbs.	900 lbs.	950 lbs.
Additional weight, each 2′ of bed	375 lbs.	375 lbs.	600 lbs.	600 lbs.
Additional weight of oil pan (base length)	175	175	470	470
Additional weight of each extra 2′ of oil pan	45	45	50	50
Boxed weight, base length bed, Double Back Geared Head	6000 lbs.	6150 lbs.	9200 lbs.	9500 lbs.
Boxed weight, base length bed, All Geared Head	6725 lbs.	6925 lbs.	10000 lbs.	10350 lbs.
Cubic feet boxed, base length bed, D. B. G. Head	126	126	180	189
Cubic feet boxed, base length bed, All Geared Head	130	130	183	192
Cubic feet, each additional 2′ of bed	11	11	14	14

12-SPEED GEARED HEAD SPINDLE DIMENSIONS.

	12″	14″	16″	18″	20″	24″ G. P.	24″	27″
Diameter and Length Front Bearing	2⅜ x 3¾	2¾ x 3⅞	3¼ x 5	3¾ x 5½	4⅜ x 6½	4⅜ x 6½	5¼ x 7 7/16	5¼ x 7 7/16
Diameter and Length Rear Bearing	1 13/16 x 2¾	2 1/16 x 3	2⅜ x 3 15/16	2¾ x 3¾	3⅛ x 4 9/16	3⅛ x 4 9/16	3⅝ x 5⅜	3⅝ x 5⅜
Diameter and Length Spindle Nose	2 7/16 x 2⅛	2 7/16 x 2⅛	2 13/16 x 2⅛	3 1/16 x 2 9/16	3 11/16 x 2¾	3 11/16 x 2¾	4 x 3⅜	4 x 3⅜

*Dimensions shown in main chart are for cone heads only.