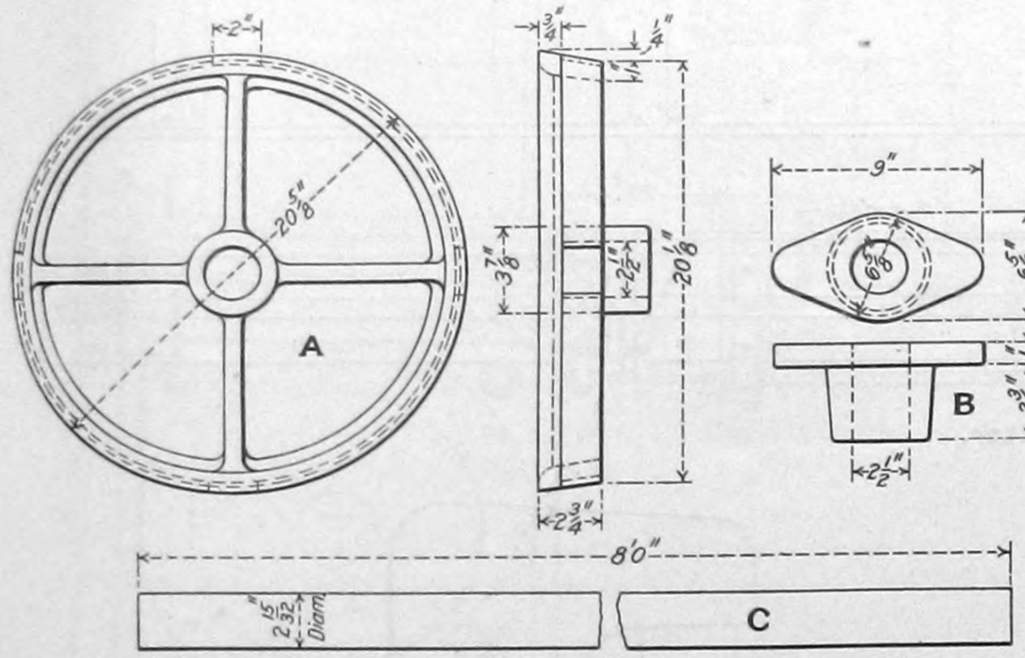
Shop Kinks.

FROM THE SCRANTON SHOPS OF THE DELAWARE, LACKAWANNA & WESTERN.

SPIDER AND GLANDS FOR SETTING GUIDES.

For many years and in many shops it has been the practice to set the guides of a locomotive by means of a string stretched along the axis of the cylinder and extending back to a point opposite one of the pedestals. It was held at either end by rather frail supports, which, if they happened to be struck, would throw the line out of center and might, if unnoticed, make a mess of the job. In order to obviate this difficulty and provide a solid point from which to take measurements this spider and gland is used. The spider, A, is

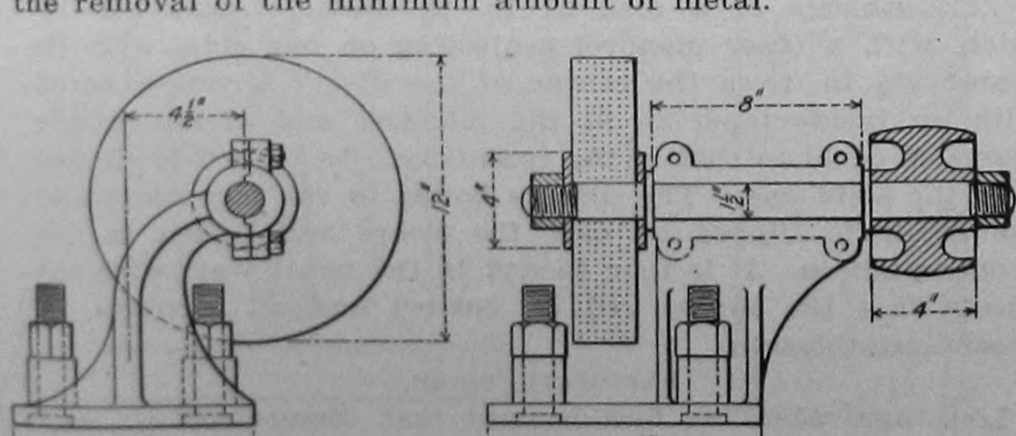


Spider and Gland for Setting Guides.

made of various diameters and has a tapered rim 2¾ in. wide that fits into the bore of the cylinder at the front, where it is held by nuts on the cylinder head studs. The taper of the rim causes the hole at the center to be drawn truly central with the bore. The gland, B, fits into the stuffing box at the back, so that its hole is also central with the cylinder. The bar, B, is then slipped into these two holes, which are in line with each other. As it is 8 ft. long and 2½ in. in diameter, it is long enough to reach to the end of the guides, and stiff enough to hold without bending, and thus furnishes a rigid point from which the guides can be set and lined.

GRINDER FOR TRUCK WHEEL LATHE.

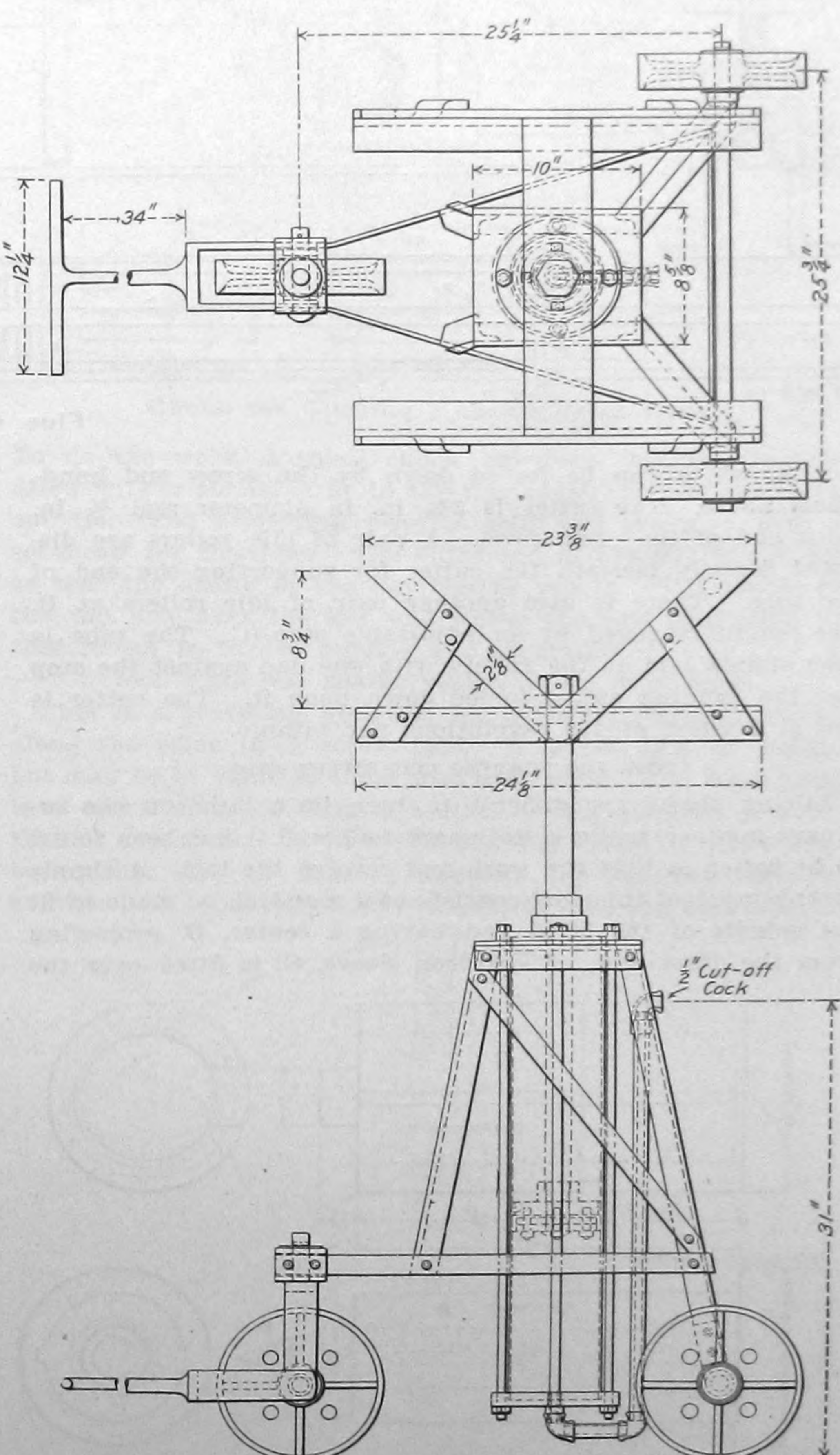
It frequently happens that the journals of an engine truck are worn slightly out of true and need such a small amount of metal removed that it can be done better by grinding than turning. To meet such cases a small base carrying an emery wheel is a handy tool. The one shown is bolted to the carriage and the wheel is driven from an overhead drum while the axle is revolved in the ordinary manner. In this way the journals can be quickly and accurately brought to true with the removal of the minimum amount of metal.



Grinder for Truck Wheel Lathe.

AIR HOIST FOR MAIN RESERVOIRS.

Blocking and holding main air reservoirs up against the running-boards or other parts of the engine is always troublesome and sometimes dangerous. In order to facilitate this work the portable air-jack illustrated in the accompanying engraving has been designed. It consists of a three-wheeled truck, whose wheels are 10 in. in diameter, with the front pair pivoted and guided in the usual manner by a tongue. The air cylinder is vertical and is formed of a piece of 5-in. pipe, with heads bolted on. It is steadied by a triangulated framing of angles, and has a piston rod 1½ in. in diameter,

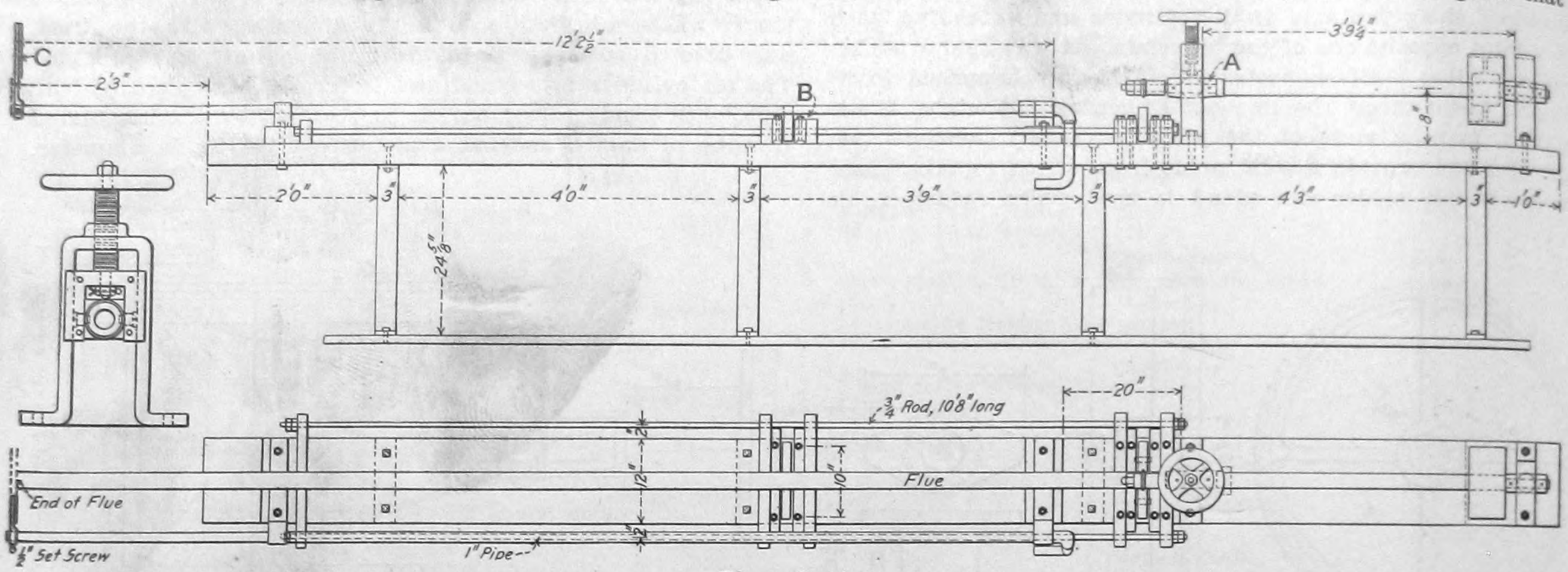


Portable Air Hoist for Main Reservoirs.

the upper end of which carries a cradle adapted to hold a reservoir. Its use is evident. It is hauled to place; the reservoir is put in the cradle; an air connection is made to the piping, and by the admission of compressed air beneath the piston the reservoir is lifted and held in place. In addition to its use for the purpose intended, the men have found it to be a handy tool for a great variety of lifting purposes.

FLUE CUTTER.

The flue cutter here illustrated does not differ essentially in design from a number of others used elsewhere, but is shown as a matter of record and suggestion to others who may wish to build one. The bed is formed of a piece of timber 3 in. by 12 in. by 16 ft. and is carried by eight legs made in pairs, with a good bracing spread of 3-in. by ⅝-in. iron. The shaft carrying the cutter has a total length of 5 ft. 1⅛ in. and is carried at the back end in a bearing hung in trunnions. Near the cutting end it is carried in a sliding

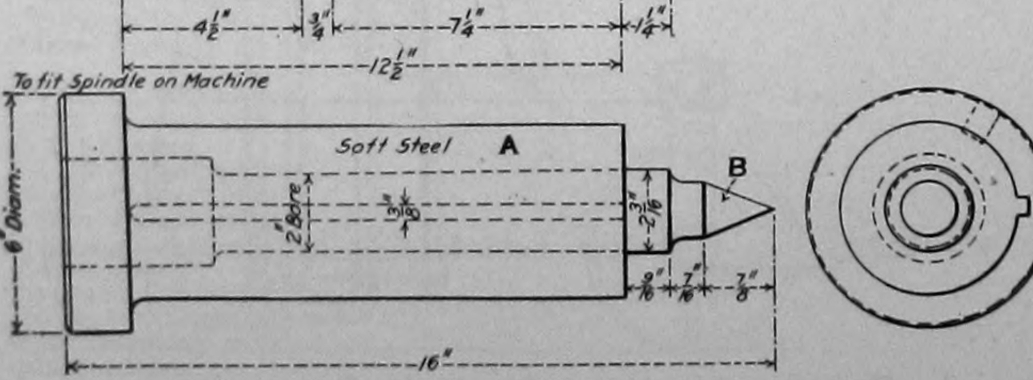


Flue Cutter.

box, A, which can be forced down by the screw and hand-wheel above. The cutter is 3⅜ in. in diameter and ⅜ in. thick and of the usual form. A pair of idle rollers are disposed directly beneath the cutter for supporting the end of the tube. There is also another pair of idle rollers at B. The length is gaged by an adjustable stop, C. The tube is then simply laid on the rollers with one end against the stop and the running cutter forced down upon it. The cutter is run at a speed of 430 revolutions per minute.

TOOL FOR TURNING LIFT SHAFT ENDS.

Lifting shafts are difficult to turn in a lathe in the ordinary manner, using a stationary tool, and it has been found to be better to hold the work and revolve the tool. A simple arrangement of this sort consists of a mandrel, A, made to fit the spindle of the lathe and having a center, B, projecting from the other end. A cast-iron sleeve, C, is fitted over the

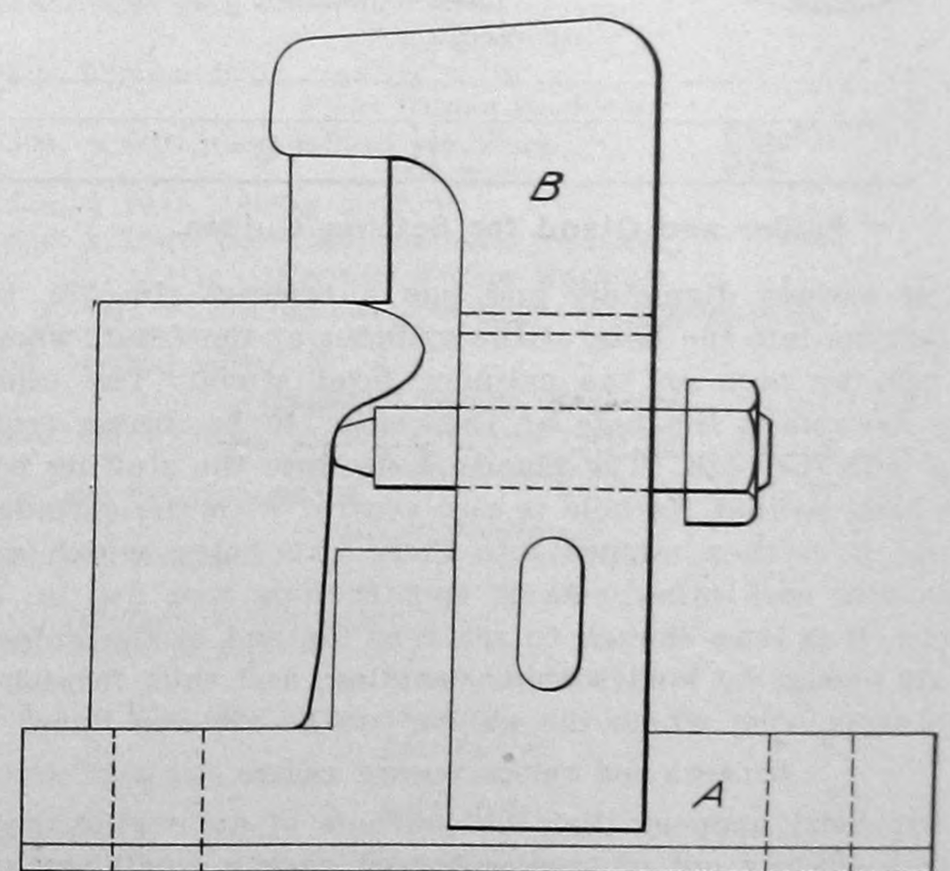


Tool for Turning Lifting Shaft Ends.

mandrel and prevented from turning by a spline. The face of this sleeve carries a turning tool. The lifting shaft is then supported on this false center, B, and that of the tail-stock, with the arms resting against the bed of the lathe. The lathe is started and carries the tool and sleeve with its spindle. These are then fed out over the work by a tool held in the tool-port in the ordinary way and pressing against the left side of the groove in the sleeve.

DRIVE FOR BORING MILL.

A sure-and-certain chuck and drive for tires in a boring mill is shown. The bases, A, of which there are four, are bolted to the face plate at proper distances from the center. The tire rests upon the lip, as shown, and then it is centered by the set-screws. The stirrup clamp, B, is then dropped over the base and a key driven home in the slot. This holds the work down so firmly and the turning effect is so great that



Drive for Boring Mill.

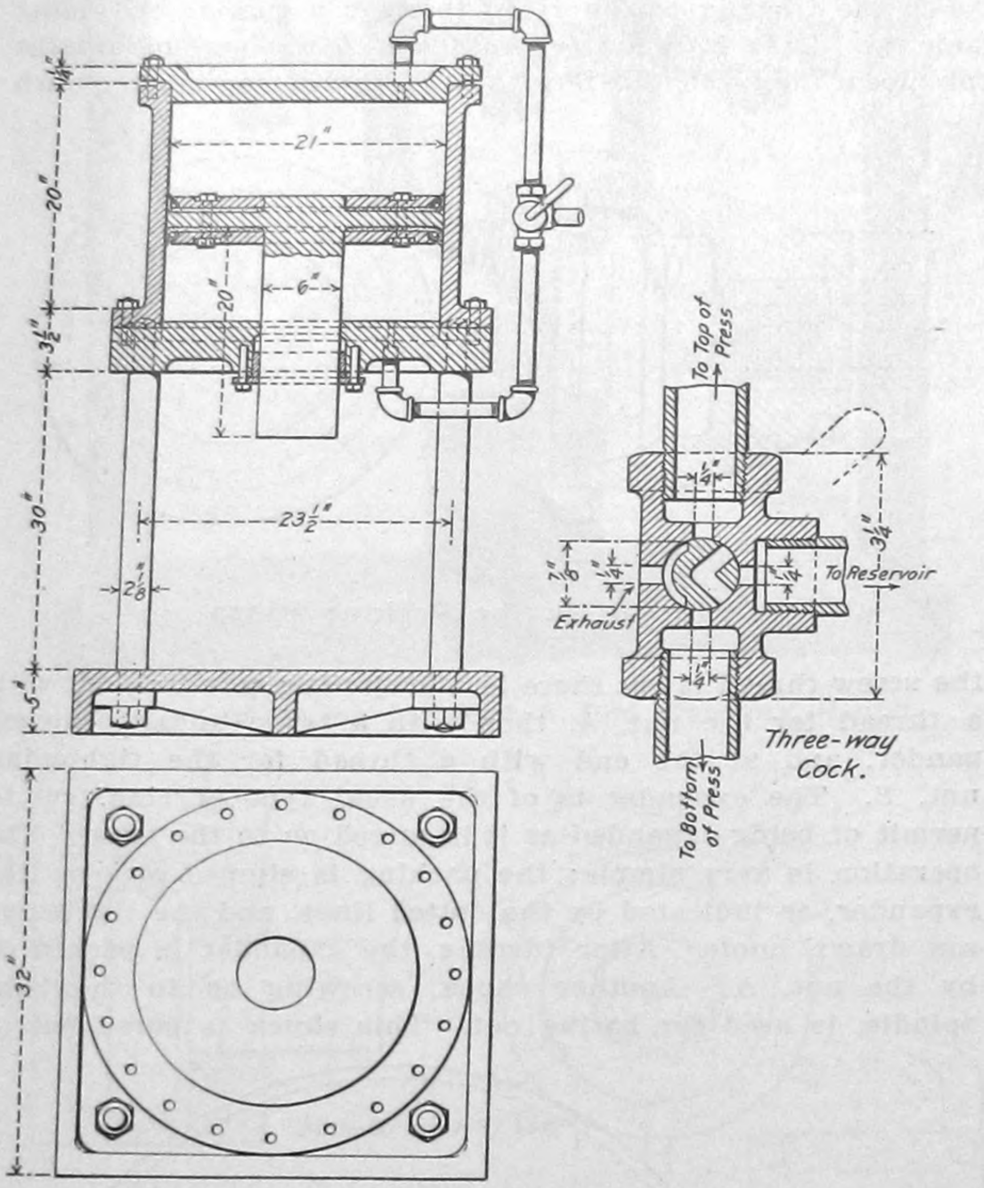
an exceedingly heavy cut can be taken (½ in. in one case). It is evident that it can be used either inside or outside the tires, so that it is available for both turning and boring.

MANDREL FOR TURNING ECCENTRICS.

This consists of a disk 21 in. in diameter and 2½ in. thick, with a taper mandrel projecting on one side, with its center 2½ in. from the center of the disk. A sleeve bored with an inside taper to fit the mandrel and of an outside diameter equal to that of the eccentric to be turned is slipped over the solid one. The disk is bolted to the face plate and the eccentric slipped on over the sleeve and bolted in the proper position. It is then turned in the usual way, with the surety that the throw will be correct and all surfaces in proper relationship.

PNEUMATIC PRESS.

Long ago, when we first learned that compressed air was adaptable to many uses, someone designed a pneumatic press with an inverted cylinder for pressing bushings in rods, brasses in driving boxes and doing similar work. At Scranton there is such a press. It has a cast-iron cylinder 21 in. in diameter in which there is a piston with double-cup leather packings, so that there is no leakage in either direction. The plunger is 6 in. in diameter and is given a stroke of 8 in.

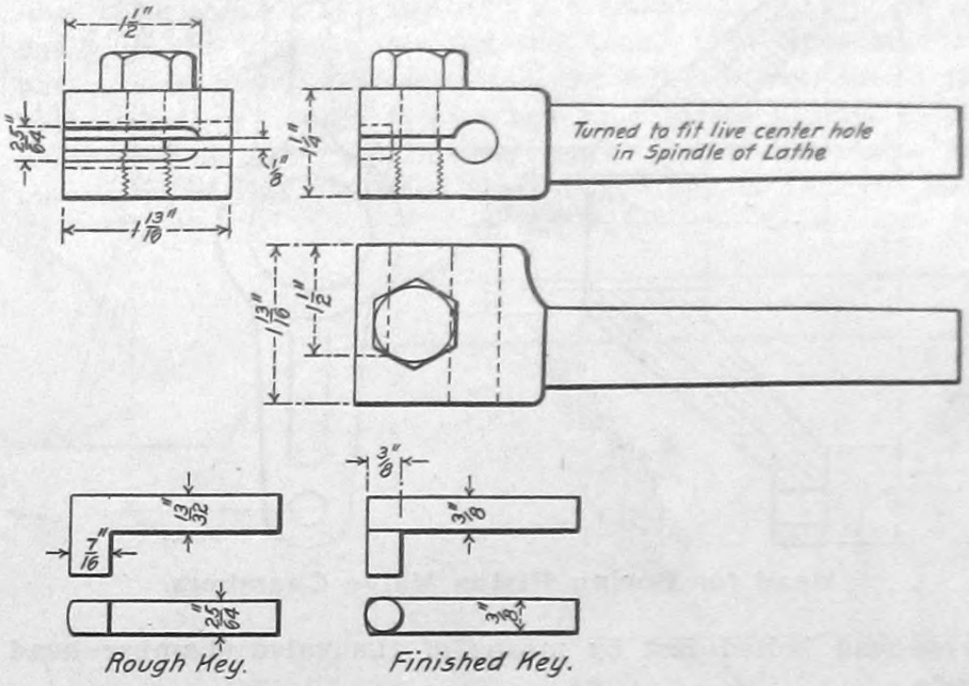


Pneumatic Press.

With 90 lbs. air pressure the press is capable of exerting a pressure of almost 4,000 lbs. The base is a stiff iron casting, tied to the cylinder by four 2⅛-in. columns, which are, however, turned down at the ends to 1⅝ in., thus forming a bearing shoulder of ¼ in. at each end. The three-way cock that is used can be made to exhaust from one end of the cylinder while admitting air to the other, or can blank all ports.

CHUCK FOR TURNING KNUCKLE-JOINT KEYS.

The knuckle-joint key for the side rods of mogul and consolidation locomotives has a teat ⅜ in. diameter and ½ in. long projecting from the side at one end. It is a troublesome thing to get at because of its small size and position.

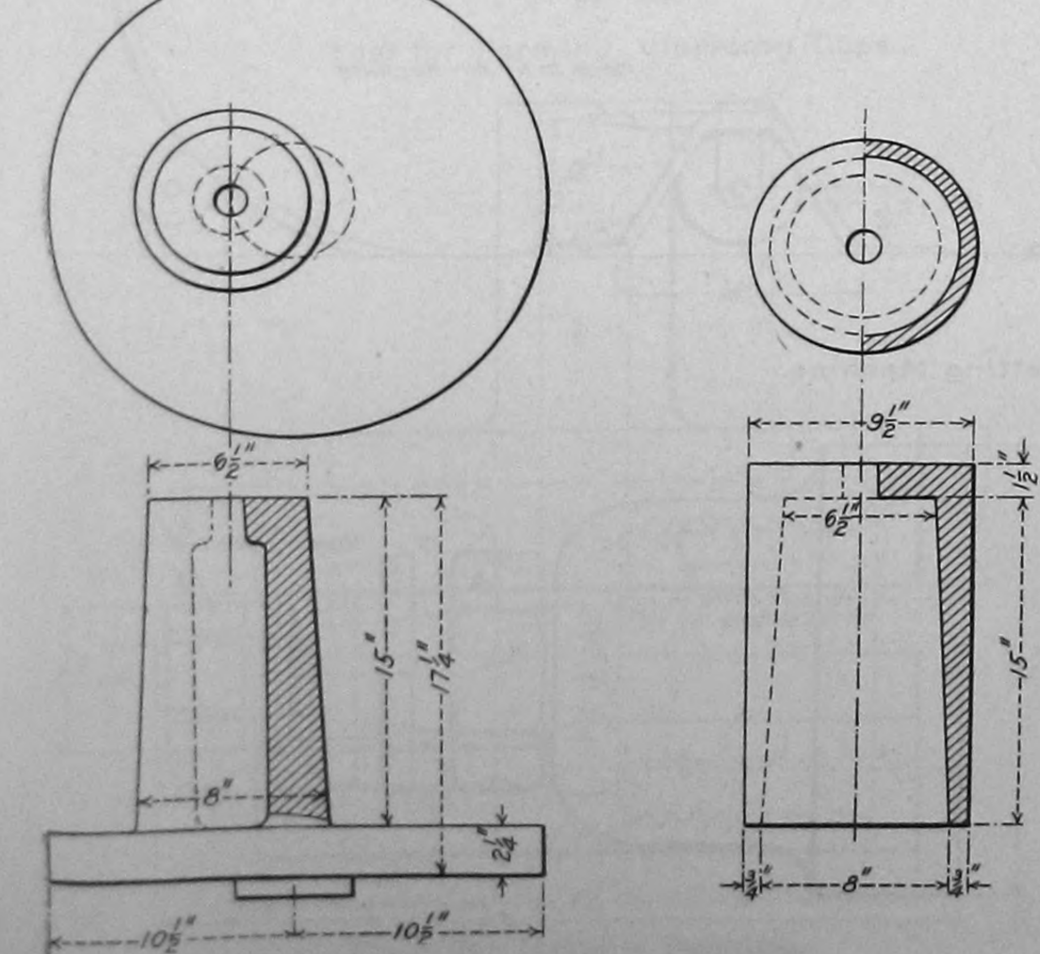


Chuck for Turning Knuckle Joint Keys.

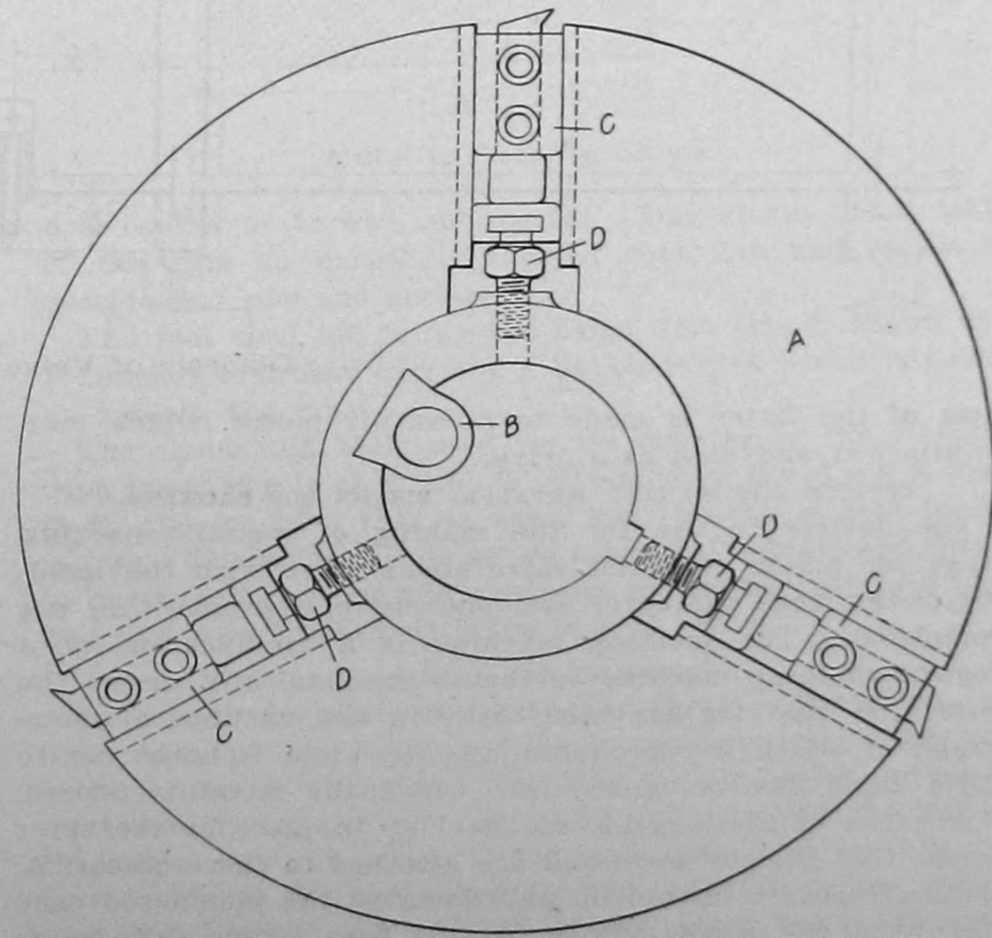
To do the work, a small chuck has been designed that is fitted with a shank to fit in the live center hole of the lathe spindle. The projecting head is split and provided with a set-screw for clamping. The outer end of the slot is cut out so that the shank of the key can be put in. Tightening of the top bolt fixes the key and leaves the teat projecting so that it can be turned quickly and accurately.

TOOL HEAD FOR BORING PISTON VALVE CHAMBERS.

This is a traveling head set on a boring bar and moved along the same by a screw feed. It is not new in design, but may be of value to those who have none. The head itself is of cast-iron in the form of a disk, A, of a diameter to meet that of the chest. It is bored and key-seated to fit a 3-in. boring bar and its spline. Opposite the key-seat there is another and broader one, dove-tailed, to take the feed nut, B.



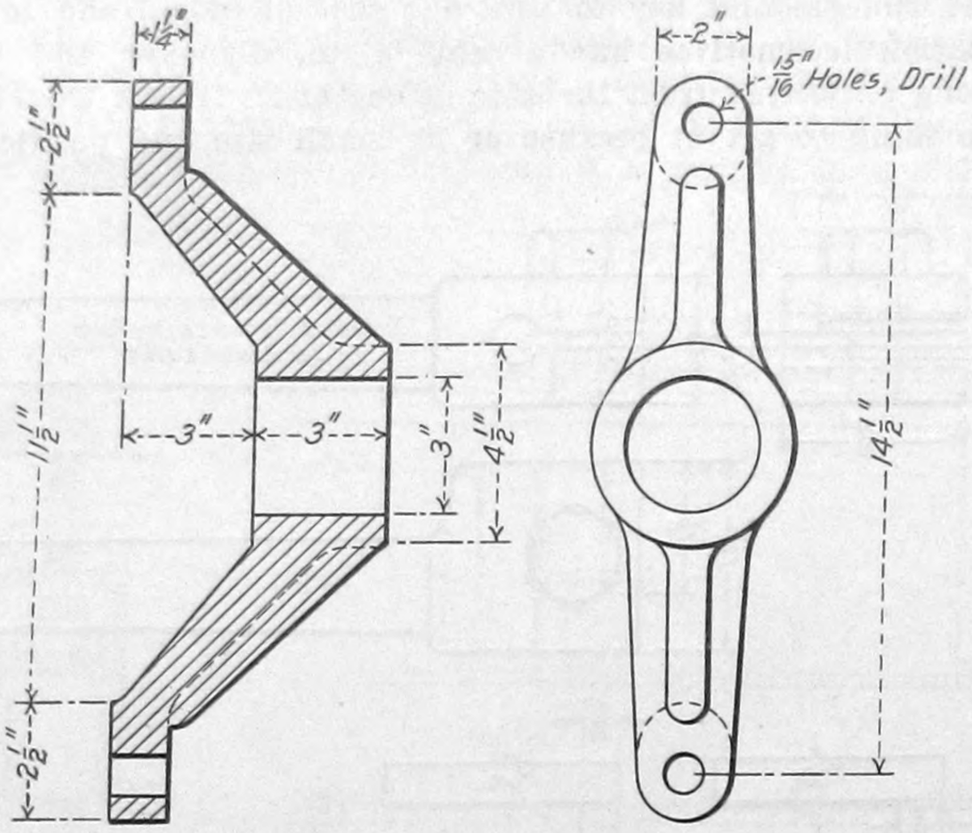
Mandrel for Turning Eccentrics.



Tool Head for Boring Piston Valves.

The tool-holders, C, are set in T slots cut in the face of the disk, and these are adjusted by the screws, D, that are threaded radially into the hub, and have a head that fits the tee of the tool-holder itself.

At the ends of the valve chambers the bar is held by a



Head for Boring Piston Valve Chambers.

guide-head bolted fast by means of the valve chamber head studs.

DIAGRAM OF VALVE-SETTING MACHINE.

This shows an exceedingly simple arrangement for revolving the driving wheels during the process of valve setting. The line shaft is merely extended out on one side and is fitted with a worm gear, into which a worm meshes. The

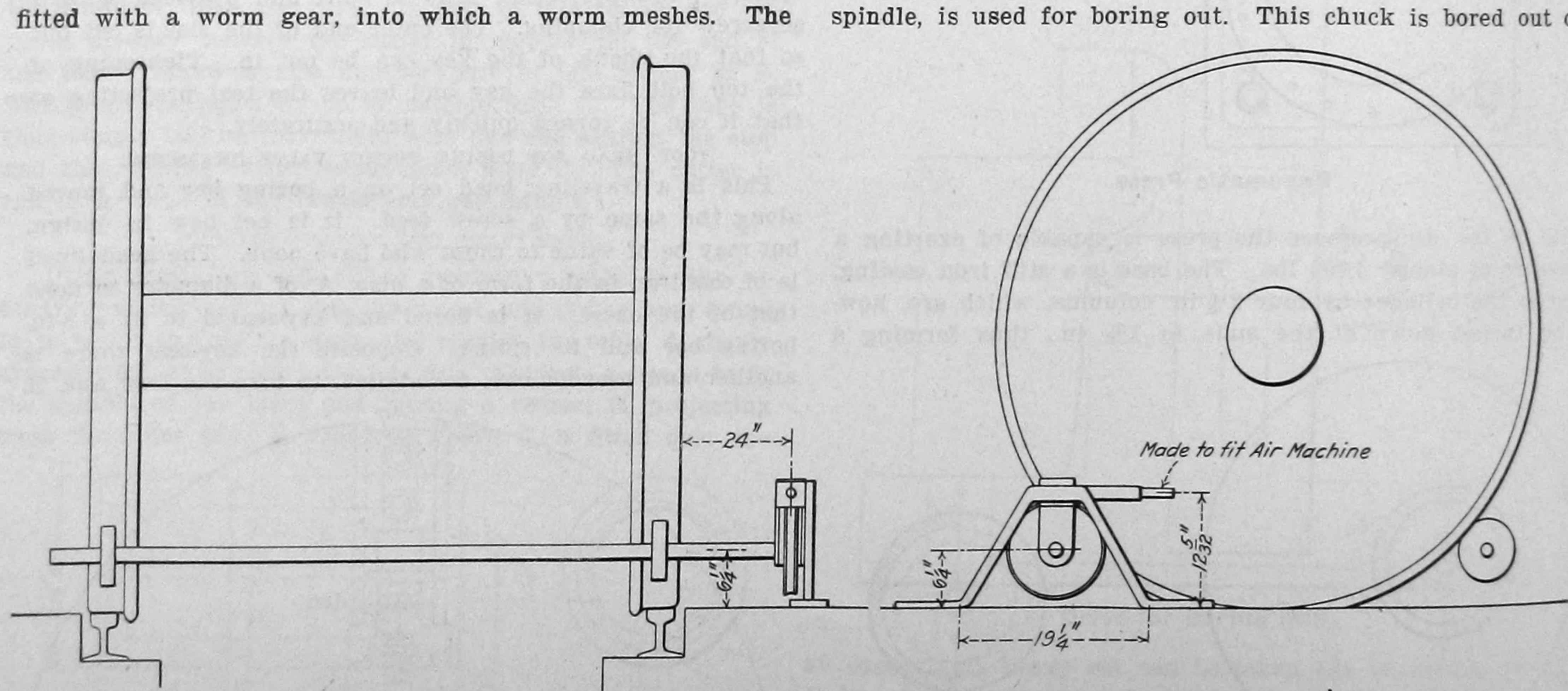


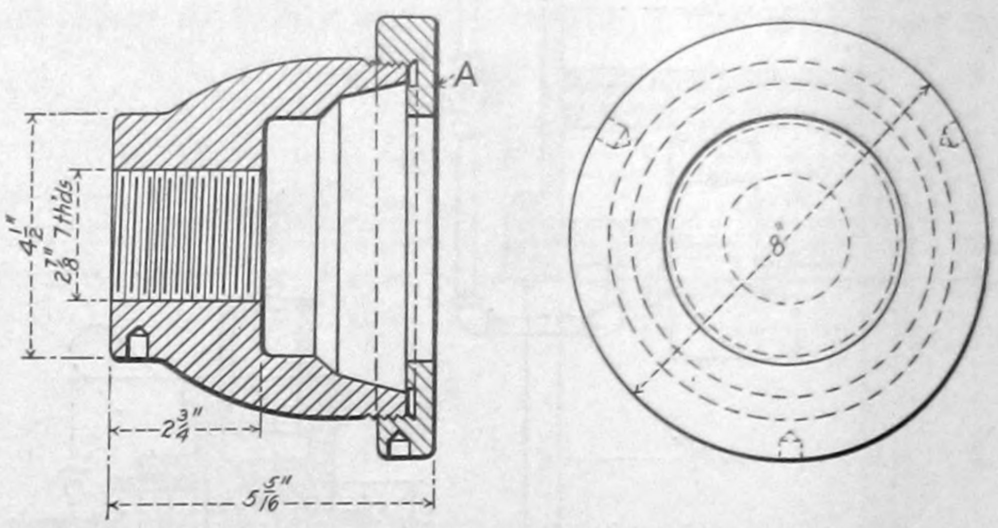
Diagram of Valve Setting Machine.

stem of the latter is made to fit an air motor, which may be attached and used as a driver.

DEVICES FOR MAKING METALLIC PISTON ROD PACKING.

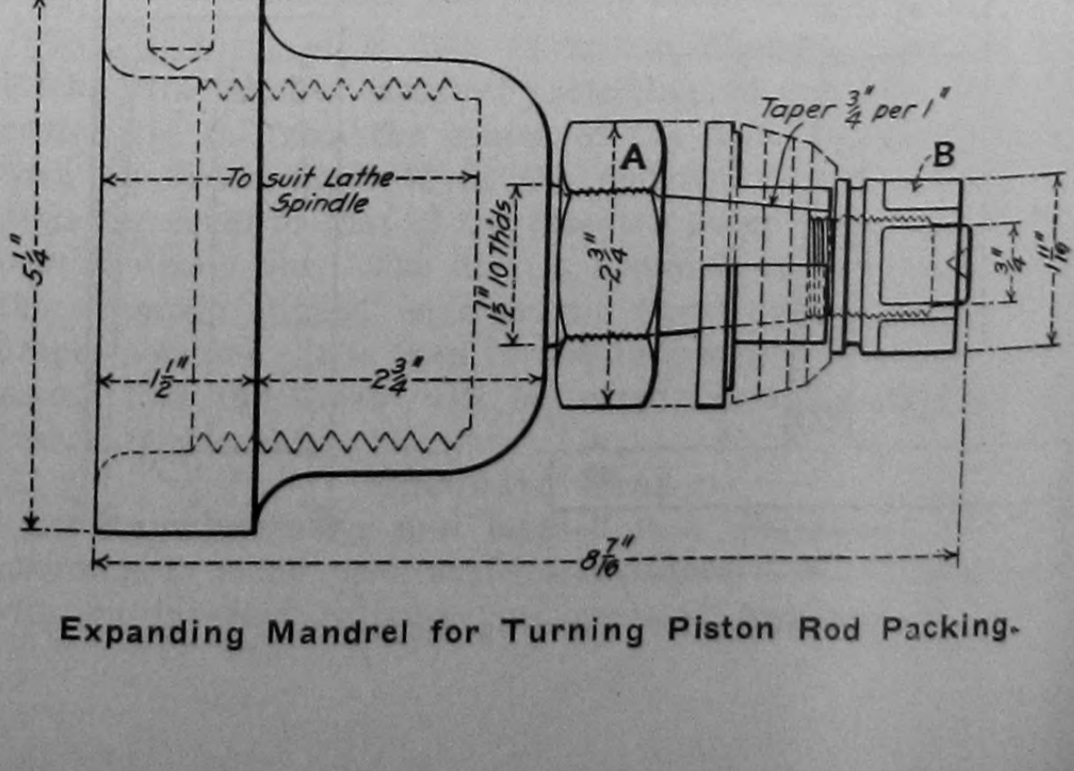
The devices in use for the making of metallic packing rings for piston rods and valve stems start with the molding of the rings and cover each successive step until they are completed. The molding machine is a modification of a regular molding machine in that it mechanically draws the core after the ring has been cast. In the machine, a photograph of which is reproduced, the top plate is bored out to form three dies or molds, into which the metal is poured. The cores of these molds are held up in place by the three stems that project down and are attached to the crossbar, A. This crossbar is moved up and down by the piston rod coming from the small cylinder at the base. This cylinder is about 3 in. in diameter, with a 3-in. stroke of piston. When air is admitted to the bottom of the cylinder the cores are held up in place and the mold is ready for pouring. After the rings have cooled air is admitted to the upper end of the cylinder, the cores are pulled down and the rings are readily removed.

For the turning of the rings there is a special expanding mandrel. This is made to screw on to the end of a lathe spindle in the place of a face plate. Beyond the hub in which

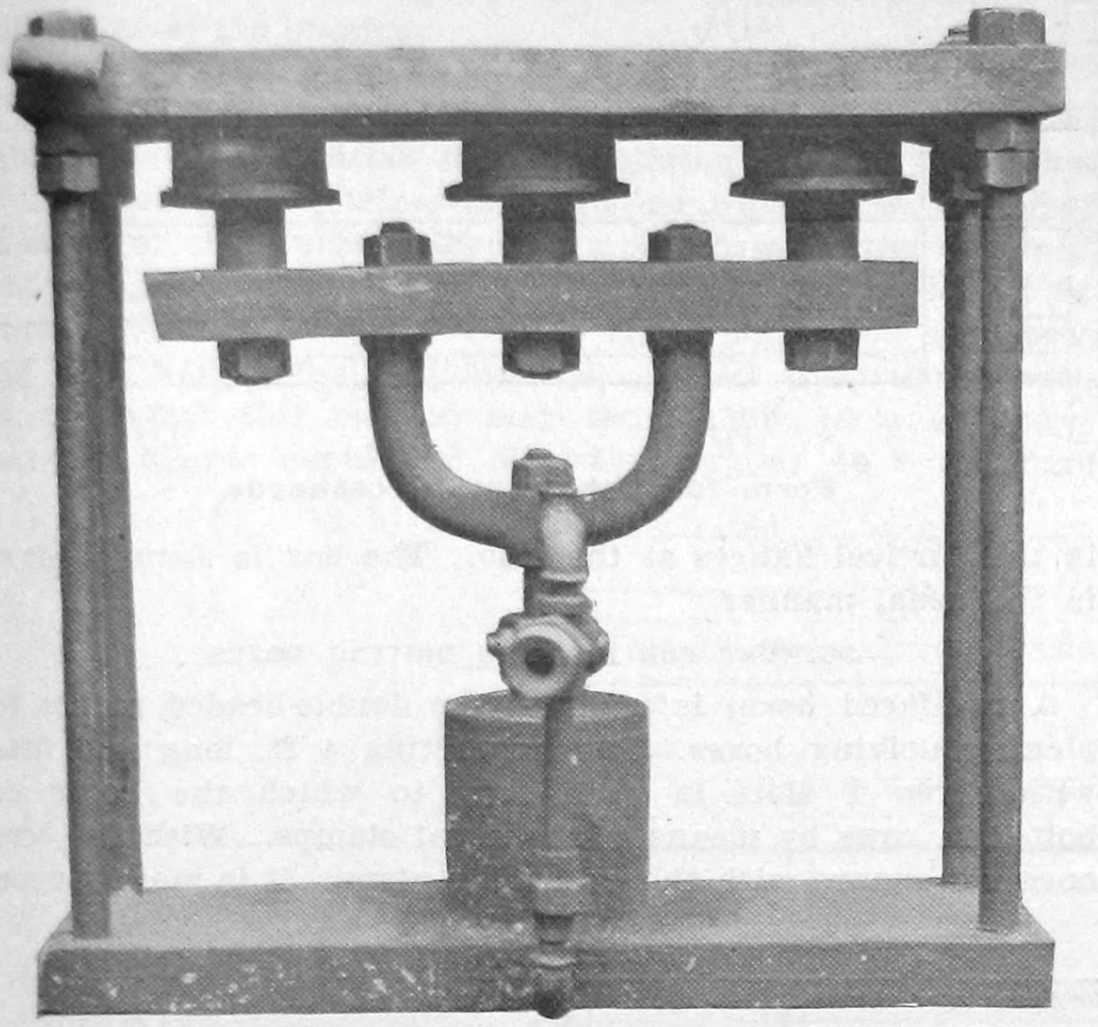


Chuck for Boring Packing Rings.

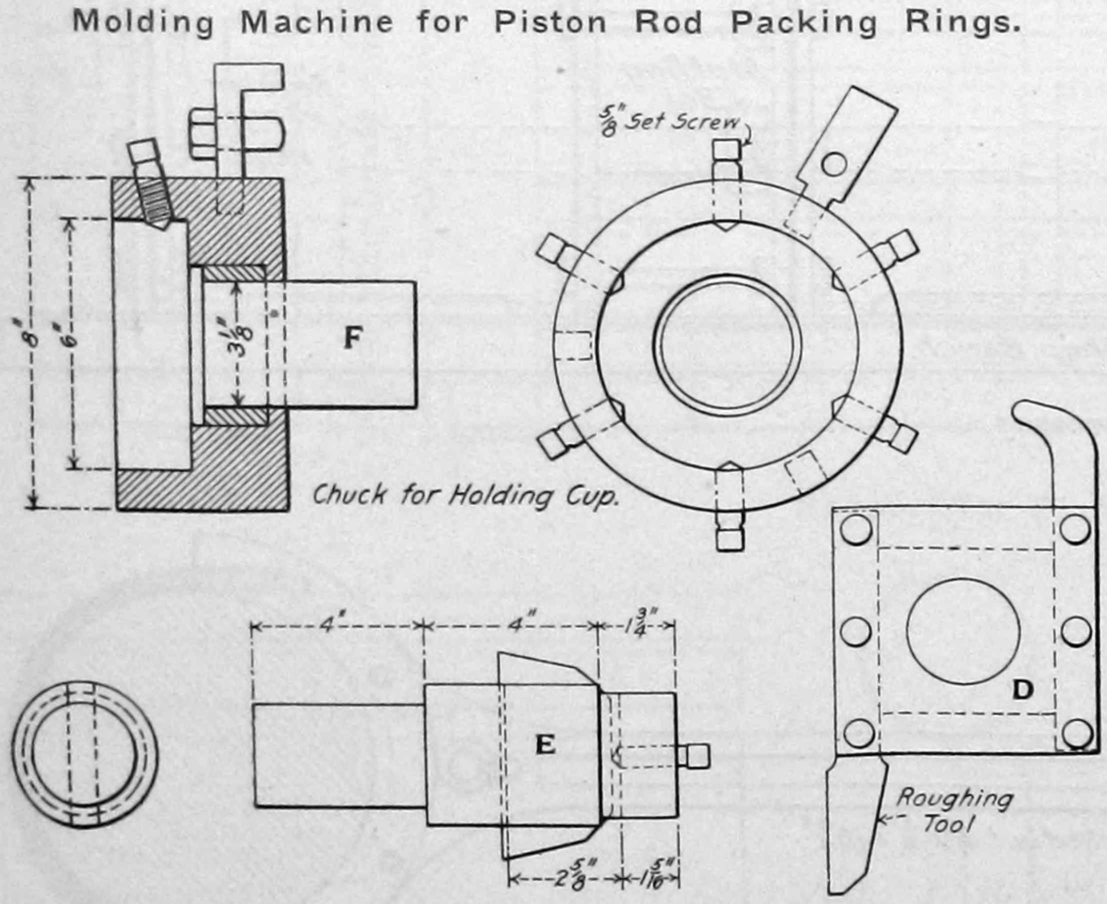
the screw thread is cut there is a projecting mandrel, cut with a thread for the nut, A, then with a taper to take the expander, and at the end with a thread for the tightening nut, B. The expander is of the usual type of ring, cut to permit of being expanded as it is forced on to the taper. The operation is very simple; the packing is slipped on over the expander, as indicated by the dotted lines, and the tightening nut drawn home. After turning, the expander is backed off by the nut, A. Another chuck, screwing on to the lathe spindle, is used for boring out. This chuck is bored out on



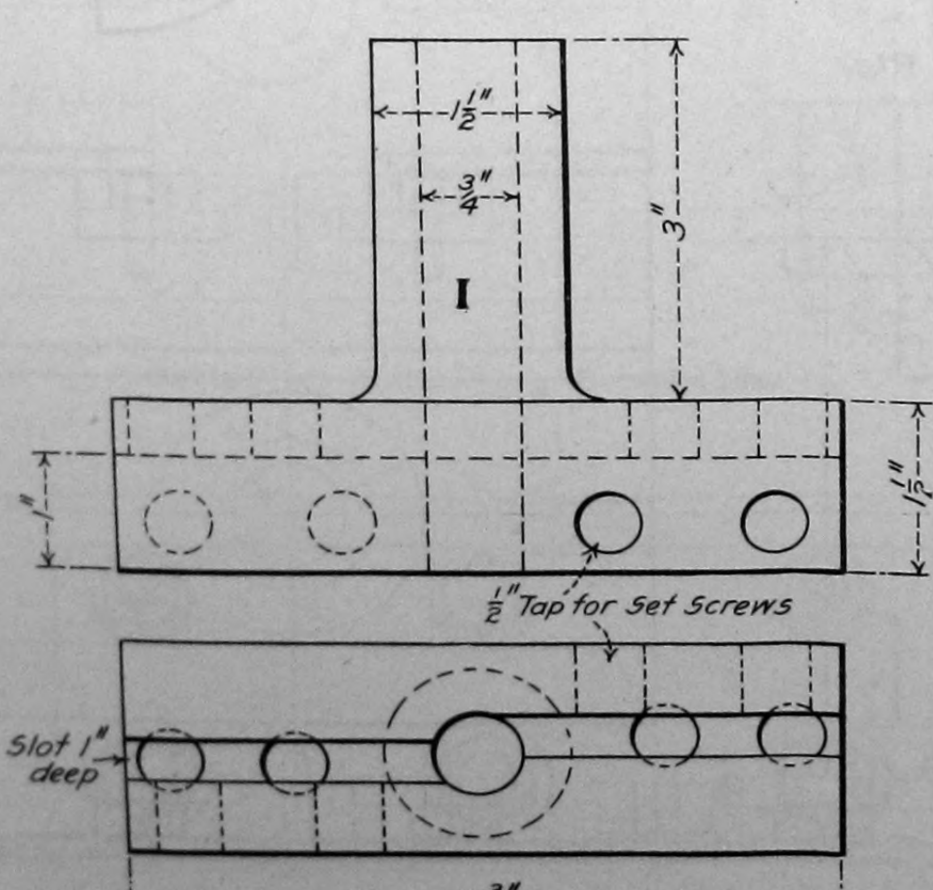
Expanding Mandrel for Turning Piston Rod Packing.



Molding Machine for Piston Rod Packing Rings.



Tool for Forming Vibrating Cups.

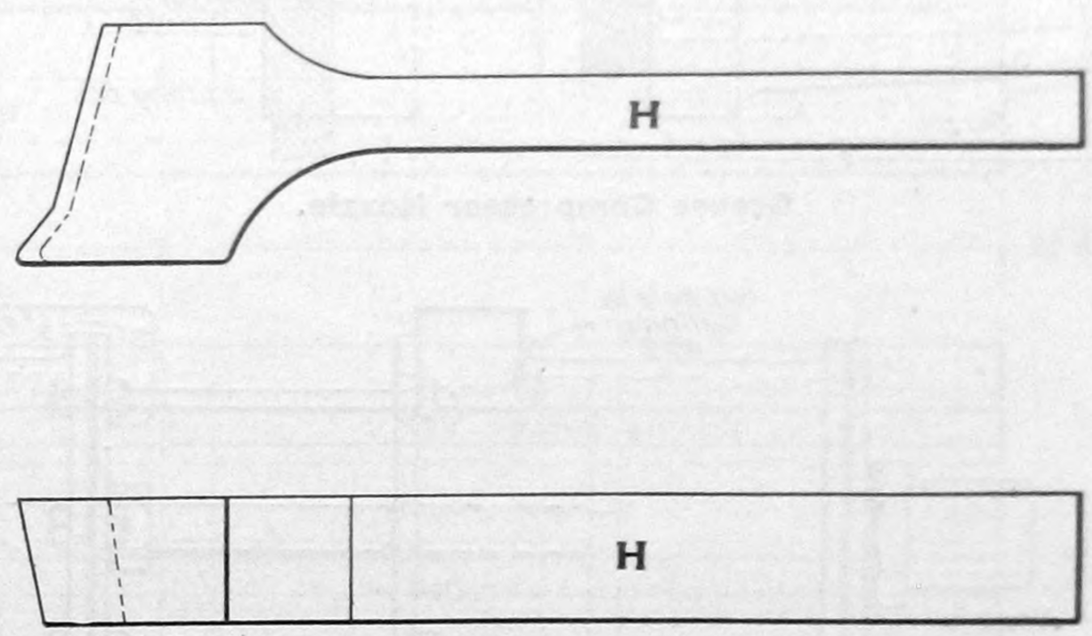


Facer for Metallic Packing.

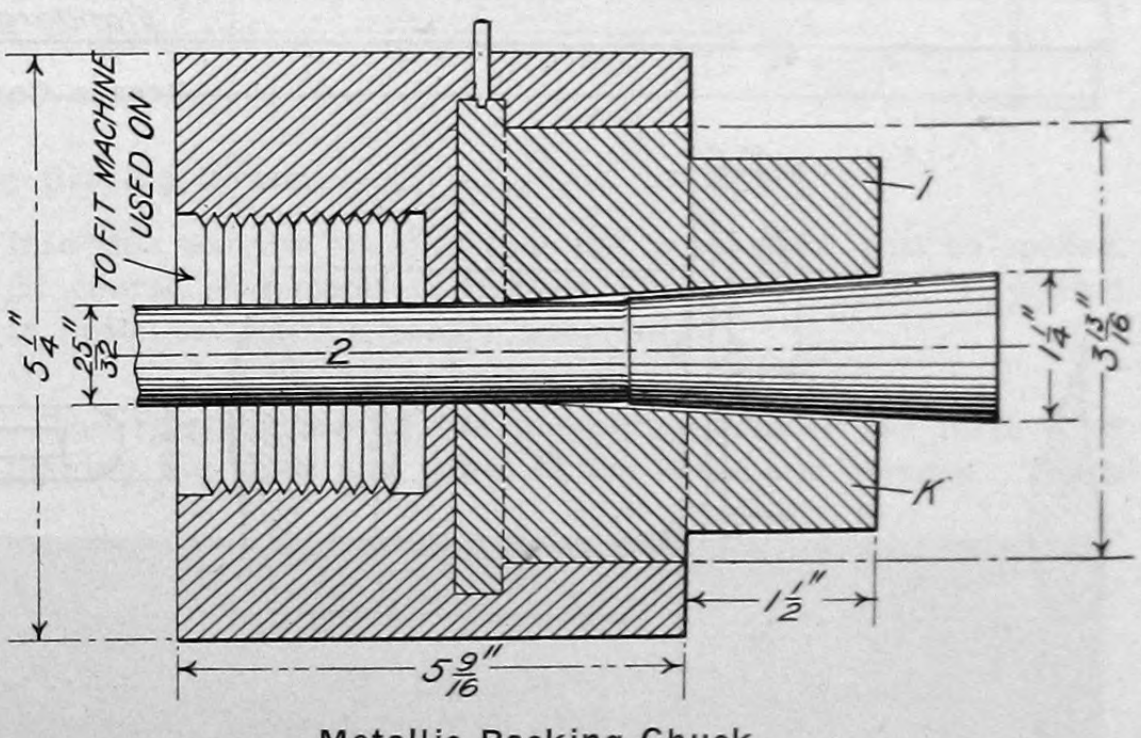
the face to receive the ring, which is held in place by the nut, A.

The tool used for forming the outside of the rings with these chucks is shown at H. It is held in the ordinary tool post and is simply fed down against the ring as it turns in the chuck.

Another form of chuck is that shown in K. It requires that a lathe shall be fitted to receive it, and this has been done, an old turret lathe being used for the purpose. The body of the chuck is screwed on to the spindle, which is hollow. The expanding rings (1) are set in this body and are cut with the flare away from the head. The taper mandrel has a long stem (2) extending through the spindle to the back, where a handle is attached that comes around to the front of the lathe within easy reach of the operator. The movement of this handle is limited by stops, so that the man-



Tool for Forming Metallic Packing.



Metallic Packing Chuck.

drel cannot be thrown out too far. This makes the chucking of the ring an exceedingly rapid operation and leaves the outside and one end accessible.

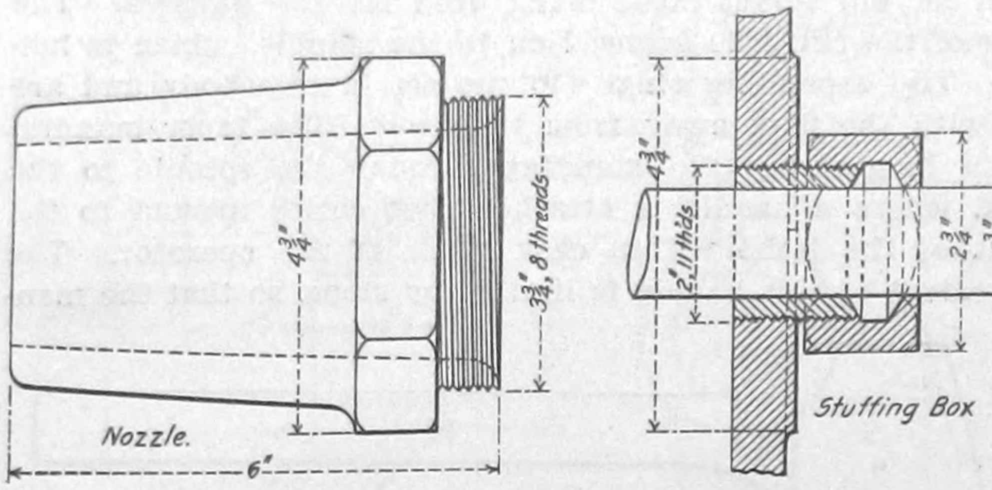
The tool used for facing the rings with this is shown at I. It consists of a head carrying a flat-blade tool which is pushed up against the ring.

The chuck and tools used for its forming of the vibrating cups are shown in D, E and F. The stem of the chuck is made to fit the machine that is used, and the cup is held by set-screws. The holder, D, is set on a vertical spindle and turned so as to bring either the roughing or boring tool into play. The inside is finished with the tool, E.

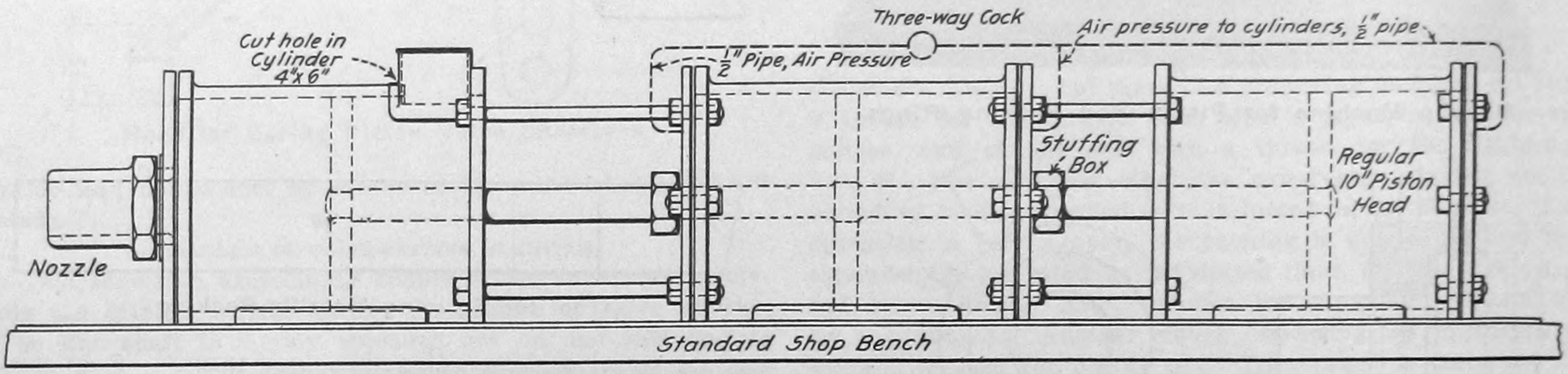
GREASE COMPRESSOR.

A home-made affair consisting of three cylinders in tandem, with pistons connected by a common rod. They are each 10 in. in diameter. Two are for air which serves to compress the grease and the third (the one on the end at the left) is for the grease. This has a hole 4 in. by 6 in. cut in the side at the inner end for the insertion of the grease, and at the other end a nozzle of the proper inside diameter is screwed. These nozzles are 1½ in., 2 in. and 2½ in. in diameter, respectively.

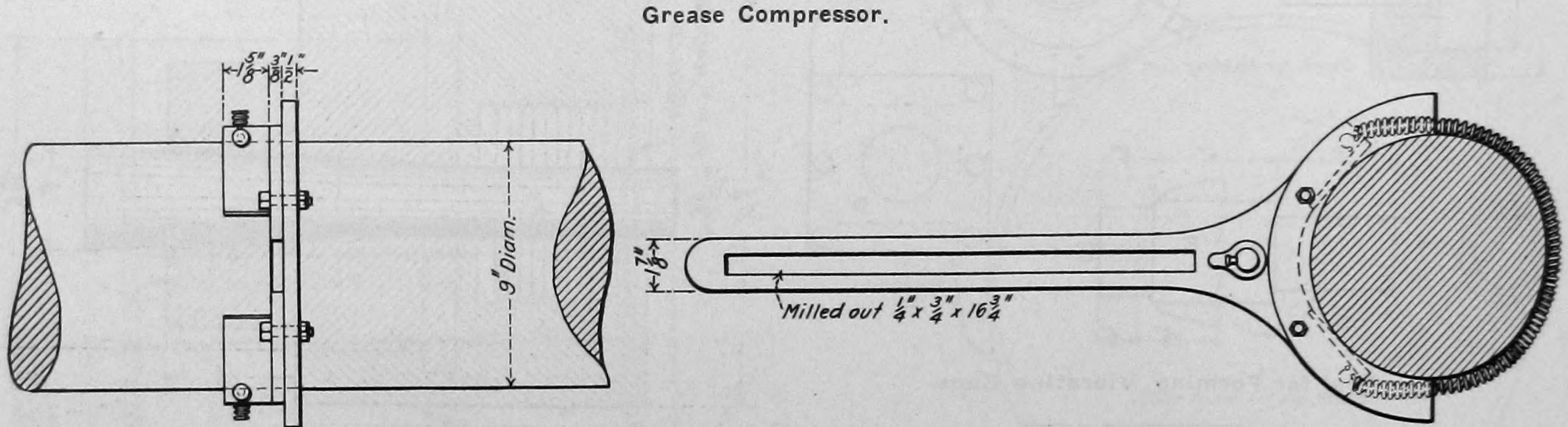
The three-way cock is located, as indicated, between the intakes at the two ends of the center cylinder. This makes it possible to admit an air pressure to the back end of the two air cylinders for compression, but when the compression has been completed and the pistons are to be drawn back, the air is exhausted from the two back ends and admitted to the front end of the center cylinder only, as this will give sufficient pressure for retraction.



Grease Compressor Nozzle.



Grease Compressor.



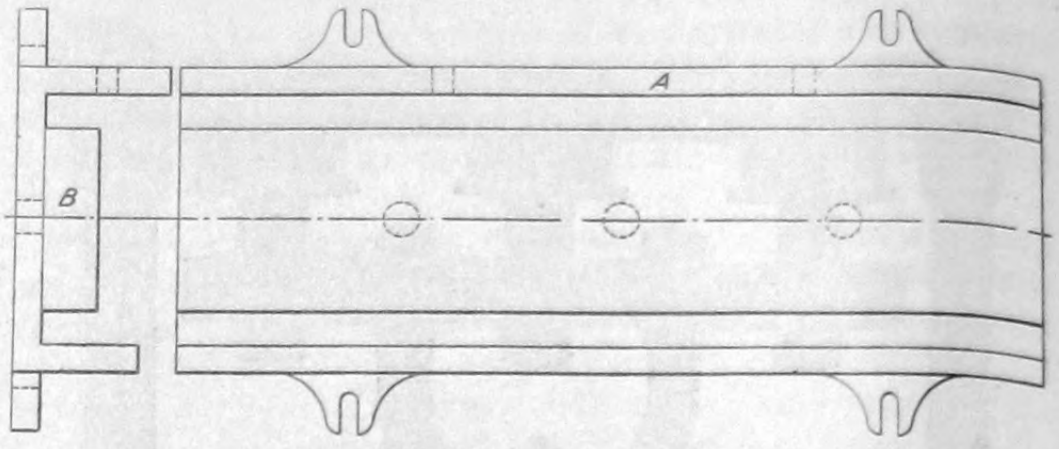
Eccentric Setting Rig.

ECCENTRIC-SETTING RIG.

Although the Stephenson link motion may be disappearing, there are still a goodly number at work, and it still remains to set the eccentrics accurately on the axle. The rig used at Scranton for this purpose consists of a half-circle, H, made to fit the axle, with a long arm attached for adjusting. It is held in place by a spring that spans the axle under tension. At 1 and 2 there are marks indicating the location of the radius leading to the front and back eccentrics, respectively. The slotted arm carries a pointer that can be adjusted to the center of the crankpin. When this has been properly set the location of the keyways for the eccentrics are scribed on the axle at 1 and 2 and the work is done.

CHUCK FOR BORING DRIVING BOXES.

The driving boxes are bored on a boring machine and are held in a simple cart chuck, with a short projecting teat that fits the center hole of the faceplate. The box rests upon the parallel pieces, H A, and is adjusted centrally by set-screws

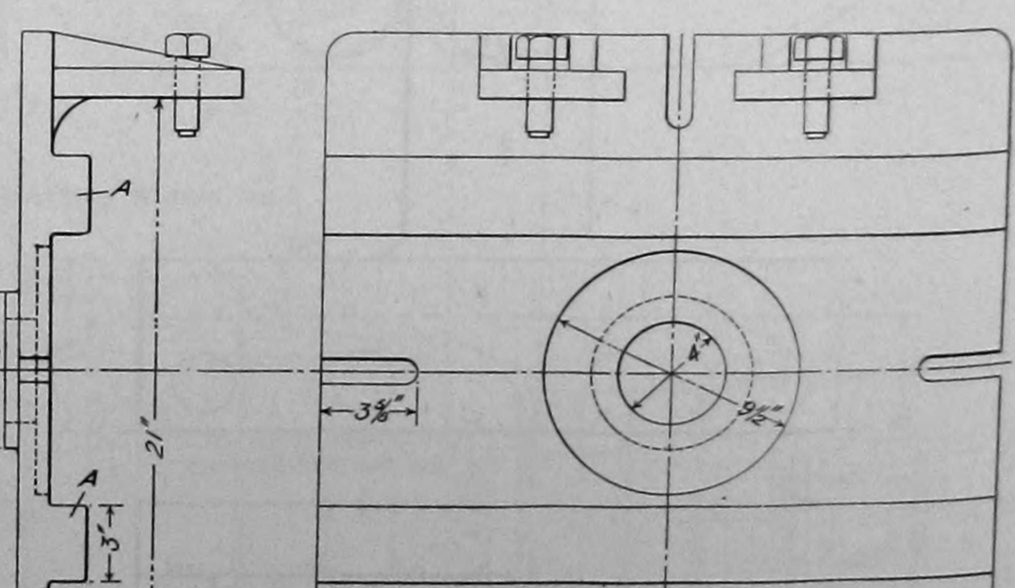


Form for Babbitting Crossheads.

in the vertical flanges at the side. The box is clamped down in the usual manner.

SUPPORT FOR PLANING DRIVING BOXES.

A two-faced beam is used on the double-headed planer for planing driving boxes. It is a casting 4 ft. long and fitted with three T slots in each face, to which the boxes are bolted in rows by means of the usual clamps. With the beam once set square with the cut of the planer, it is merely neces-



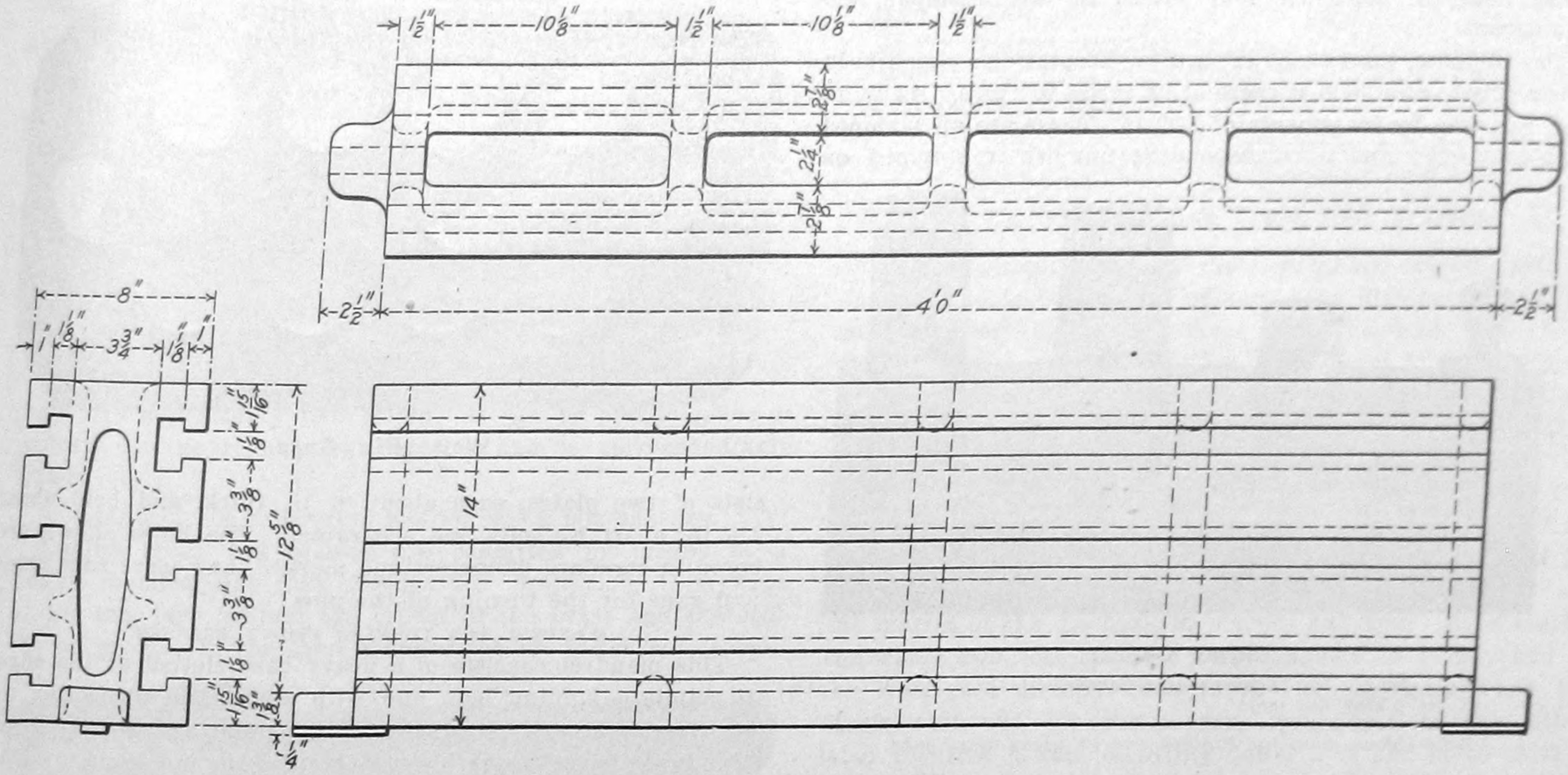
Chuck for Boring Driving Boxes.

sary to bolt the boxes against the face to insure truth in the alinement of the planing.

ARRANGEMENTS FOR BABBITTING CROSSHEADS.

In accordance with what is now common practice, the crossheads are babbitted for their sliding shoes to a finished fit and without requiring any machine work to be put upon them. For this purpose there is a cast base in the center of which a plug is set that is made to enter the piston-rod fit. This holds the flanges vertical. Then after the crosshead has been heated the U-clamps, H, are set over the flanges. In order that this method may be efficient, it is necessary that the flanges should be planed accurately to a standard height, so that the distance between faces of the wearing surfaces may be exact. The U-clamp has a filler strip, B, doweled on the inside, the thickness of which is such that, if subtracted from the height of the flange on each side, it will leave the faces the proper distance apart.

In using this arrangement, one side is babbitted at a time and two ladles are used in the pouring, so that the metal runs down the sides and fills in at the bottom. This is done because if an attempt were made to pour in at the bottom and let the metal spread from there to the sides it would chill and be defective. The thickness of the babbitt liner is from ⅛ in. to ¼ in., and the men become so skillful in the pouring

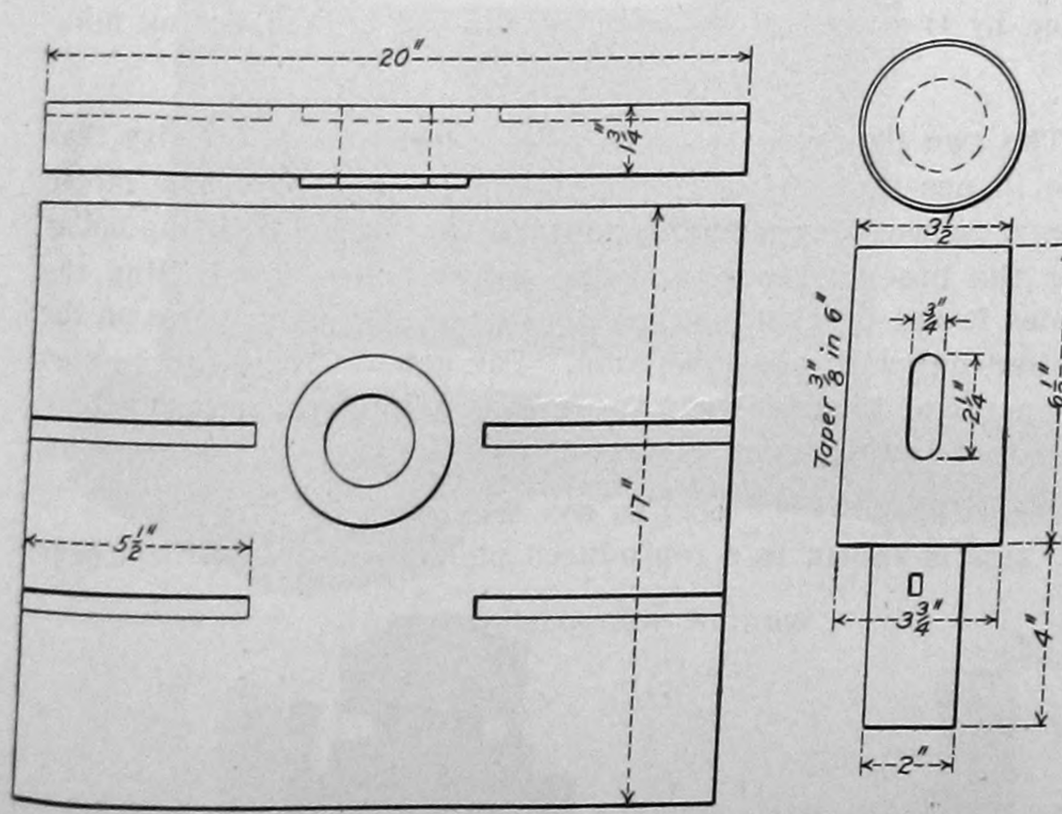


Support for Planing Driving Boxes.

into this narrow opening that not a spoonful will be spilled. Of course, the metal is tinned before the babbitt is poured in order to secure a proper adherence.

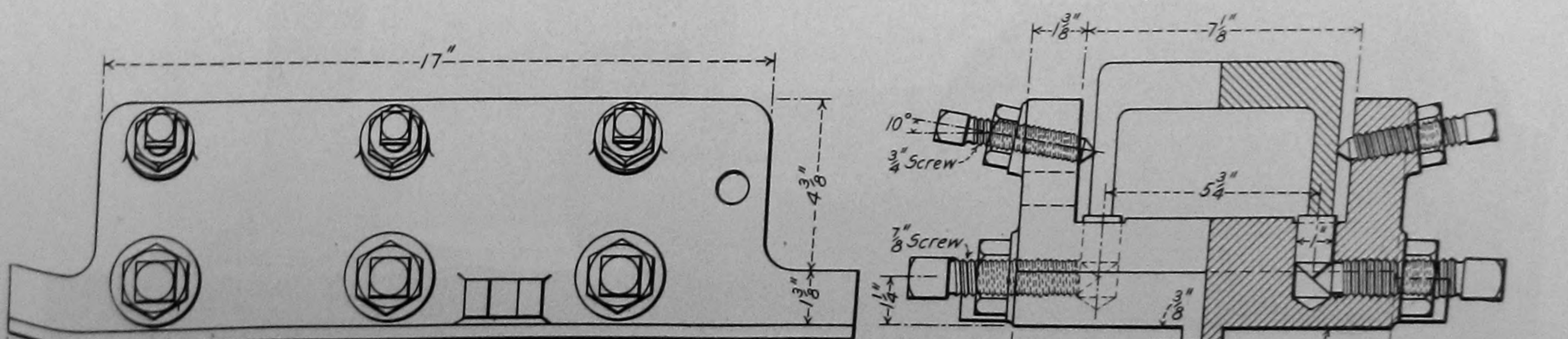
PLANING DRIVING SHOES AND WEDGES.

The reproduction of the photograph shows the method of planing the sides and edges of the shoes and wedges. There



Device for Babbitting Crossheads.

Method of Planing Driving Box Shoes.



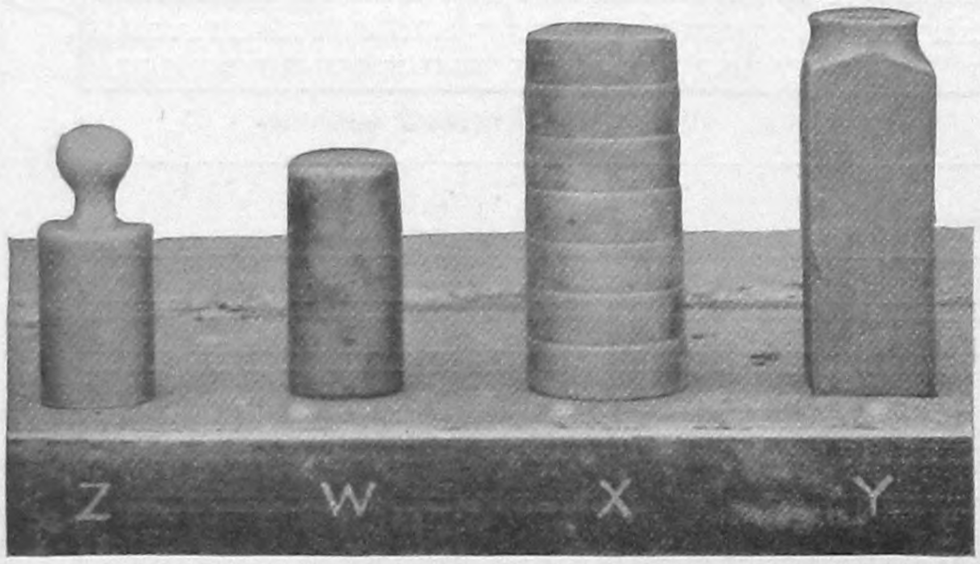
Chuck for Planing Shoes and Wedges.

is a long casting bolted to the planer, over the edges of which the shoe and wedge castings are straddled and held. The rubbing faces are finished in a chuck, a section and elevation of which is shown in the line engraving. The flanges rest on dowel pins that have a conical end and which can be forced up by a set-screw entering from the side and having a similar end. This adjustment made, the casting is held down and in place by the downwardly projecting set-screws, which have sharp points that grip the piece and hold in the usual manner.

MINOR GAGES.

Among the minor gages in use in the shop upon which much depends, there are four shown in the accompanying photograph.

One of these, marked X, is used for keeping the piston rods accurately to size. On it there are a series of rings, 7 in number, carrying by increments of 1-32 in. These are all stamped and numbered and a corresponding number is stamped on



Minor Gages.

W = *center for turning valve yokes.*
X = *piston rod gage.*
Y = *block gage for standard bolts.*
Z = *block gage for tapered end of valve stem yoke.*

the rod. Then when a rod is turned it is brought to one of these diameters and stamped, and from this mark the packing rings are selected and issued.

A second, marked Y, is a block bored out to the proper taper to take standard bolts and to which they are all fitted.

A third, marked Z, is a gage similarly bored, with a taper hole, to which the tapered end of the valve yoke is fitted.

The fourth, marked W, is more of a shop tool or kink. It is quite common for valve yokes to be so abused in their removal from the valve rod sockets that the centers are either destroyed, or, at least, so mutilated, that they cannot be used. This block, W, is bored to fit over the tapered end of the yoke, and at its end it carries a good center that can be used in the lathe when it becomes necessary to turn the stem.

ECCENTRIC MANDREL.

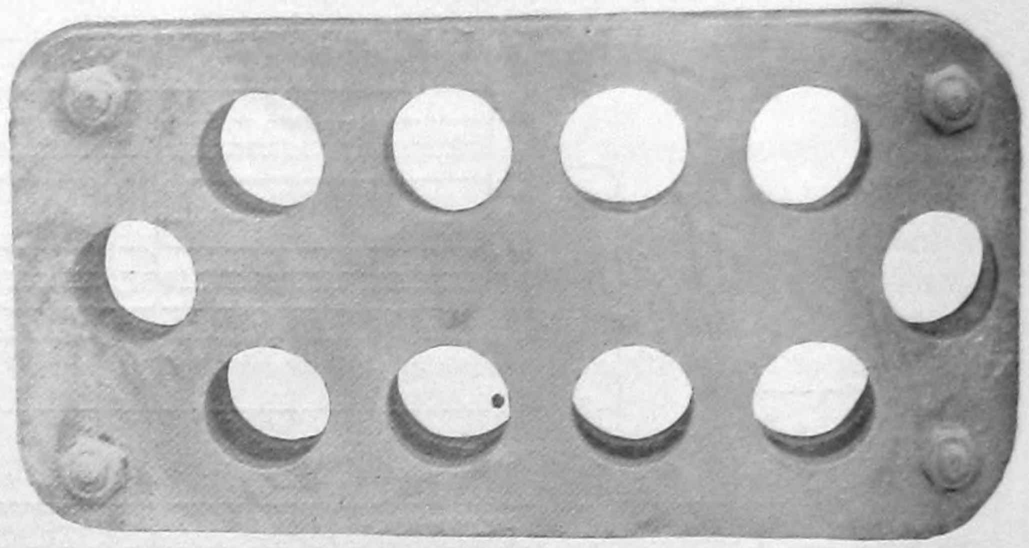
This tool, marked M on the accompanying photograph, is merely a heavy mandrel with a key set in it and of sufficient length to take four eccentrics at once. At the ends there are crank arms that have centers cut in them, so that the proper throw can be given the eccentrics being turned.

CROSSHEAD MANDREL.

On the same photograph, with the eccentric mandrel lying in front of it, marked N, there is a handy mandrel that is used for turning the brass on the crossheads about the piston fit. There is a taper sleeve near one end, with the larger diameter towards that end, which is to enter the piston fit. The mandrel is, therefore, put in through the crosshead, which is held in place by the nut in the end (see photograph).

GAGE FOR WRIST PINS.

Similar in principle, but differing greatly in size from the piston rod gage, is the gage for wrist pins. This is shown in the accompanying reproduction of a photograph. It con-



Wrist Pin Gage.

sists of two plates, each about ¾ in. thick, and held about 2½ in. apart by bolts and separators. The holes shown are bored to standard diameters and marked, and serve as a guide and gage for the turning of the pins.

MANDREL FOR TURNING CROWN BRASSES.

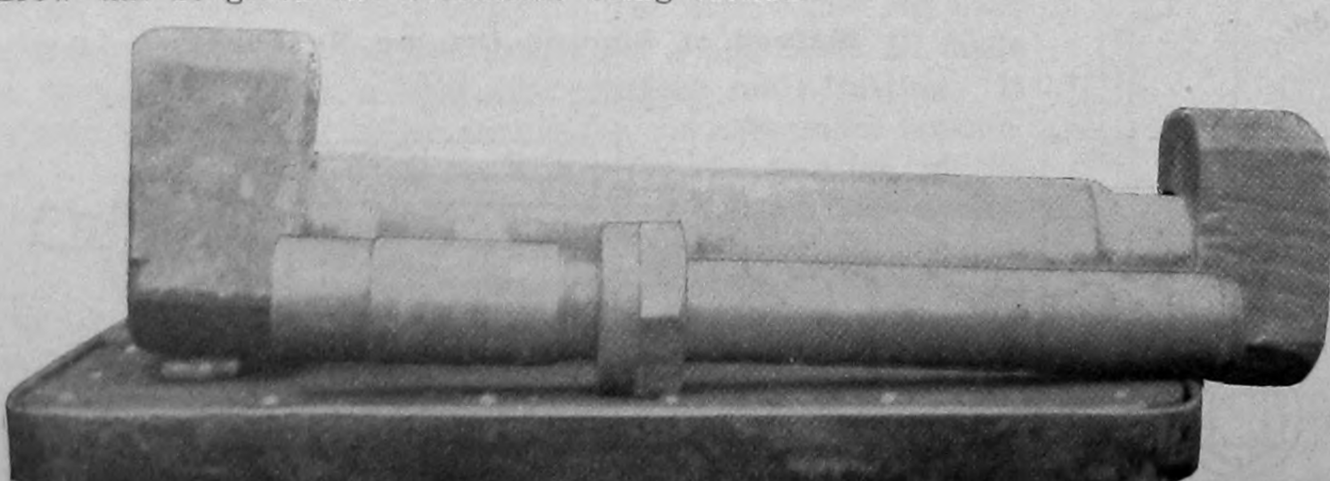
This mandrel consists of a heavy base slotted at the edges to admit a holding bolt, and with a mandrel projecting upwardly, to the end of which a sliding collar and nut are fitted. The brass is set on the lower collar and the upper one dropped down and adjusted with the set-screws and then tightened in place by the nut. It is intended for use on the boring mill.

JIGS FOR SETTING AIR PUMPS.

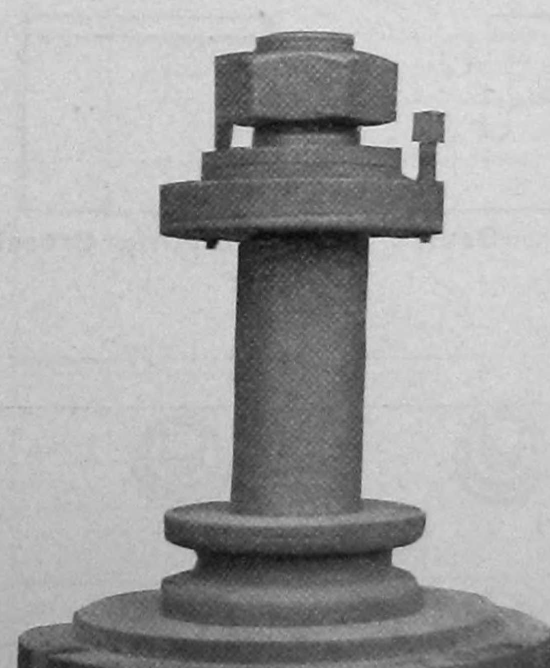
The two photographs on next page show a set of jigs that are in use for setting air pumps on locomotives. The larger jig, A, is used for marking and drilling the holes in the boiler for the bracket studs, and the smaller ones for drilling the holes in the bracket, so that it will not only fit in place on the boiler, but will take the pump. The general form can be seen from the photograph, but the dimensions and proportions will depend, of course, upon the boiler and the location of the pump.

ROCKER BOX MANDREL.

This is shown in a reproduced photograph on the next page,



Upper Piece—Mandrel for Turning Four Eccentrics.
Lower Piece—Crosshead Mandrel for Turning Bars.

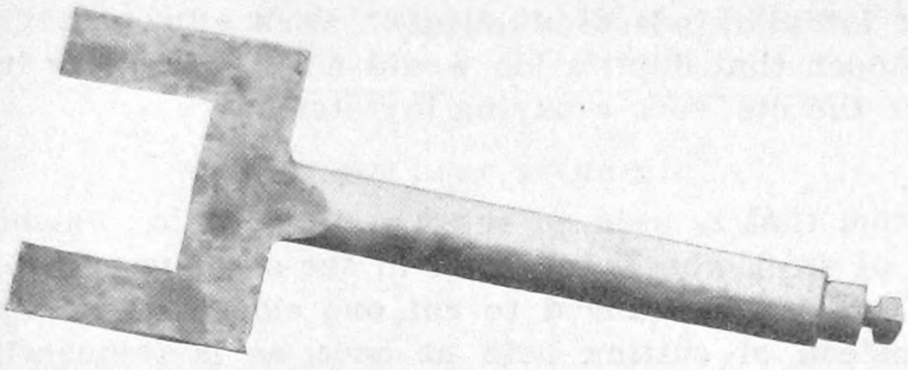


Mandrel for Turning Crown Brasses.

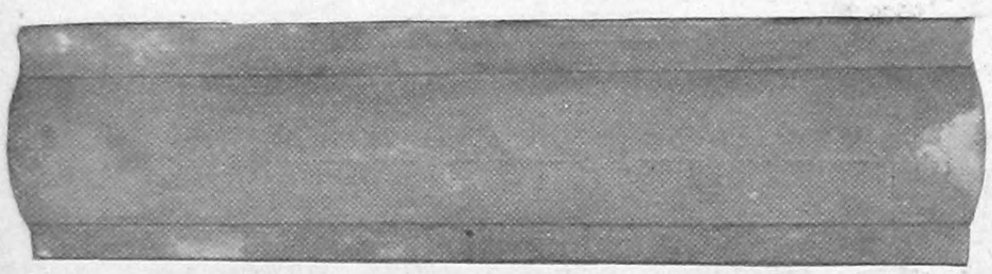
and is merely a hollow half-round mandrel used in the babbitting of rocker boxes.

BORING MILL BAR.

This is a boring bar that is used for light work in the boring mill, and can be held in the ordinary tool post. The two forks are of rectangular section and slip under and are



Boring Mill Mandrel.



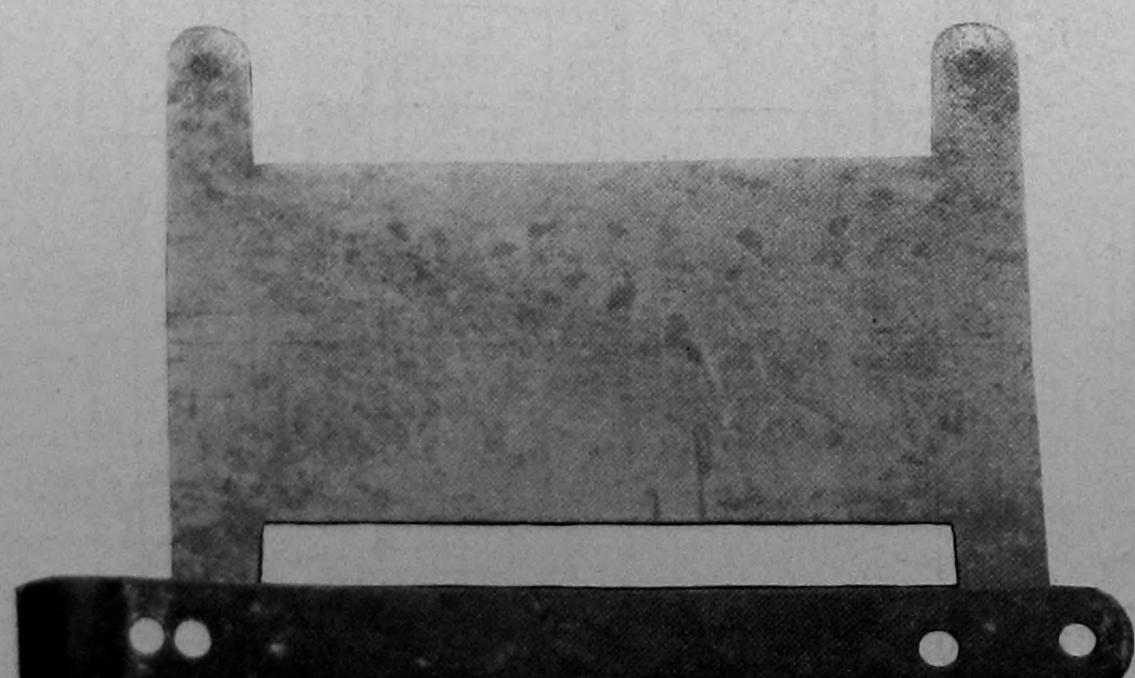
Mandrel for Babbitting Rocker Boxes.

held by the ordinary tool clamp. It can be put in place as quickly as the regular cutting tool and is correspondingly handy.

MANDREL FOR BABBITTING ENGING TRUCK BOX BRASSES.

Engine truck box brasses are babbitted by means of a hollow mandrel like that shown. The projection, 1 in. wide at the top, lays against the crown of the brass and protects the oil grove. In the same manner the lip at the side comes against the side of the brass and leaves the open space between, into which the babbitt is poured.

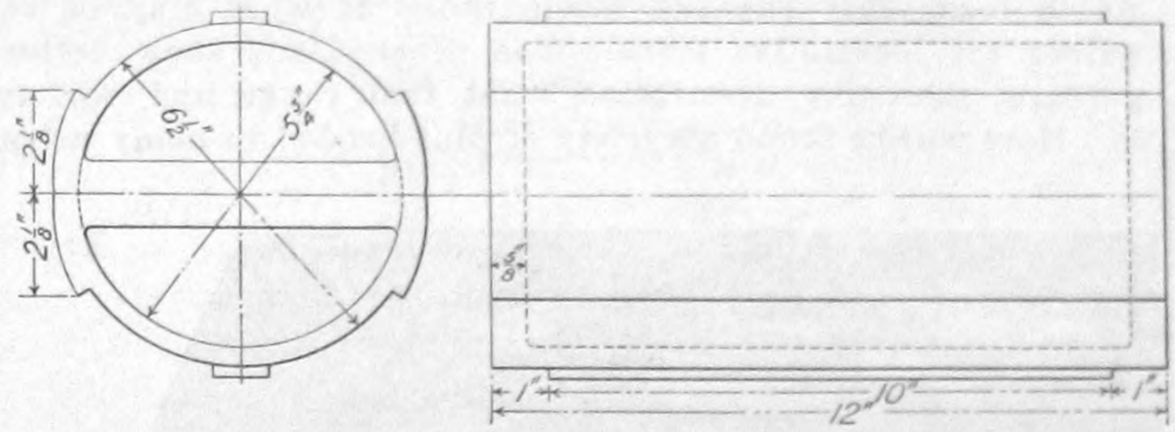
Jig for Setting Air Pumps.



Jig for Setting Air Pumps.

HAMMER FORGINGS.

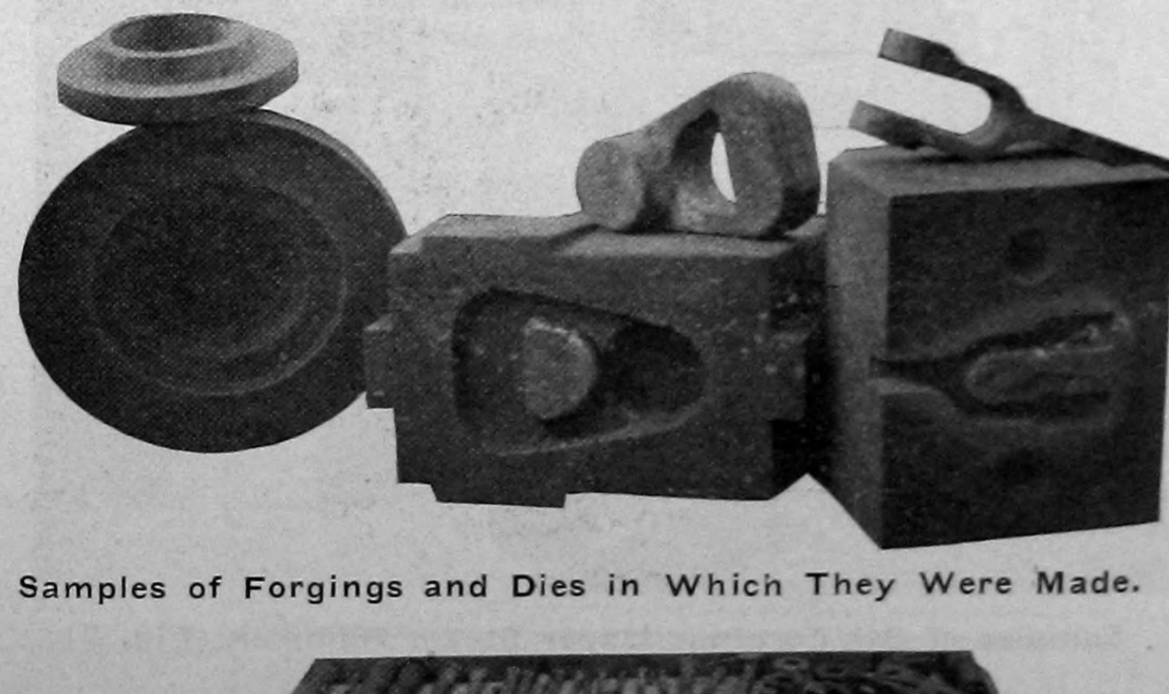
The 3,500-lb. steam hammer in the blacksmith shop is made to do a wide variety of work by the foreman, T. F. Buckley, that it was not designed to perform. This is along the line of making die forgings of intricate shapes and designs, such as are usually turned out of the drop press. In a reproduction



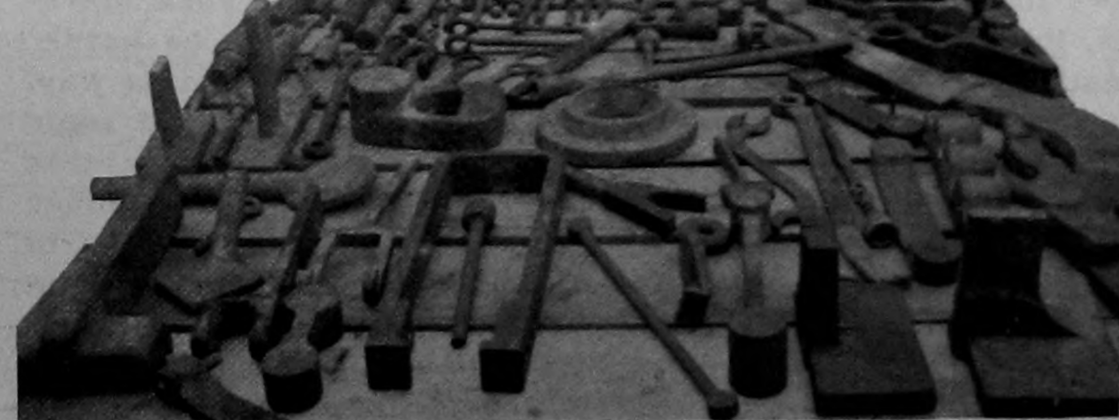
Jig for Babbitting Truck Axle Brasses.

of a photograph three of these dies are shown, with the forgings made from them on top. The dies are of cast iron and are used just as they come from the sand, with the exception of the planing required to fit them to the anvil and the hammer head. In short, there is no die-cutting whatever either in the metal or in the pattern. The method of making the dies is to first make a wooden model of the piece to be forged. This is used as a pattern for the formation of a plaster-of-paris matrix, which is attached to the face of the standard pattern body. It is from this combination that the sand mold is made, the only care being that the face and the matrix of the die shall be smooth and true. As a molder can make two sets of these dies complete in a day, and as the iron goes directly back to the cupola again when the die is worn out, the cost is very low, since the only other labor required is that of fitting dowel pins and holes so that the two parts will come together truly, and to planing, to fit the hammer head and anvil, of the two parts, respectively.

In casting the ordinary run of iron as it comes from the cupola for the regular machinery, castings of the road are used. Hence the iron cost is only that of melting and the



Samples of Forgings and Dies in Which They Were Made.

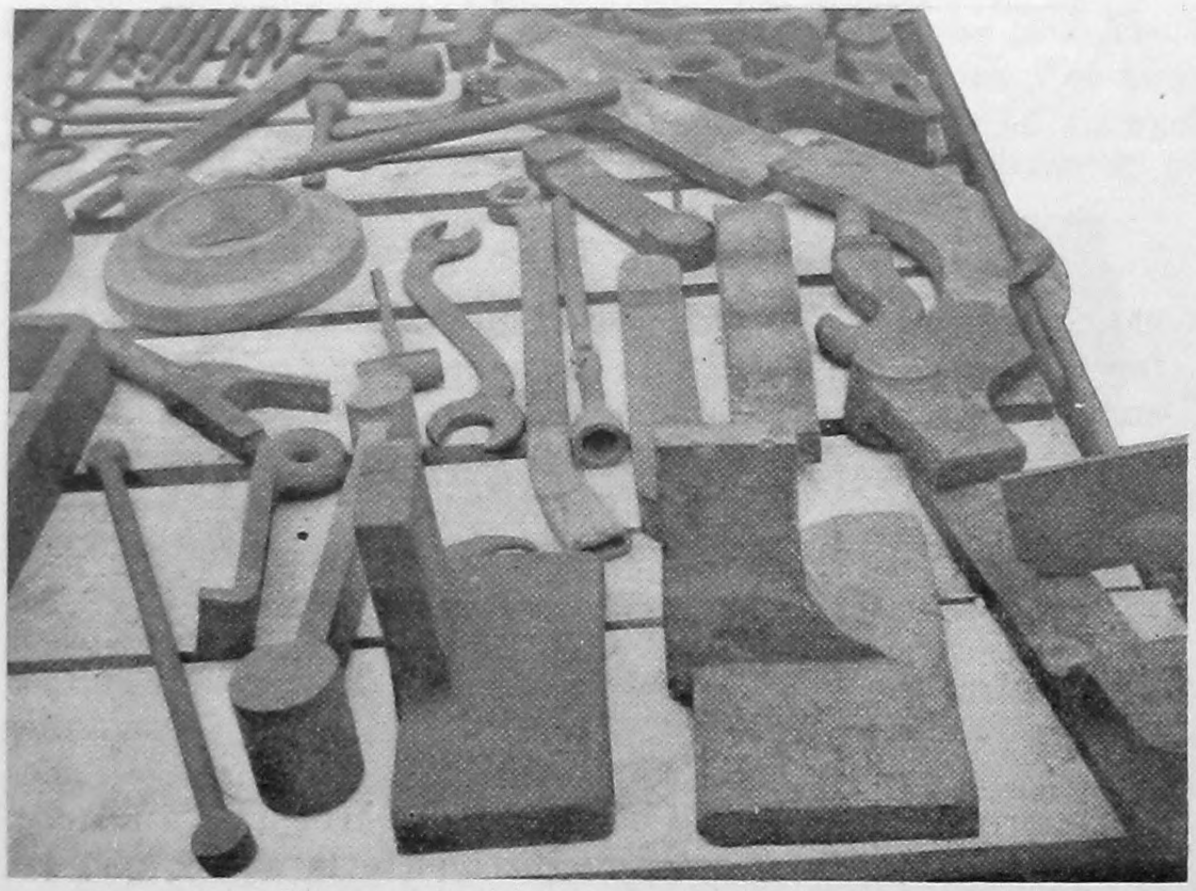


Samples of Die Forgings Under Hammer (Fig. 3).

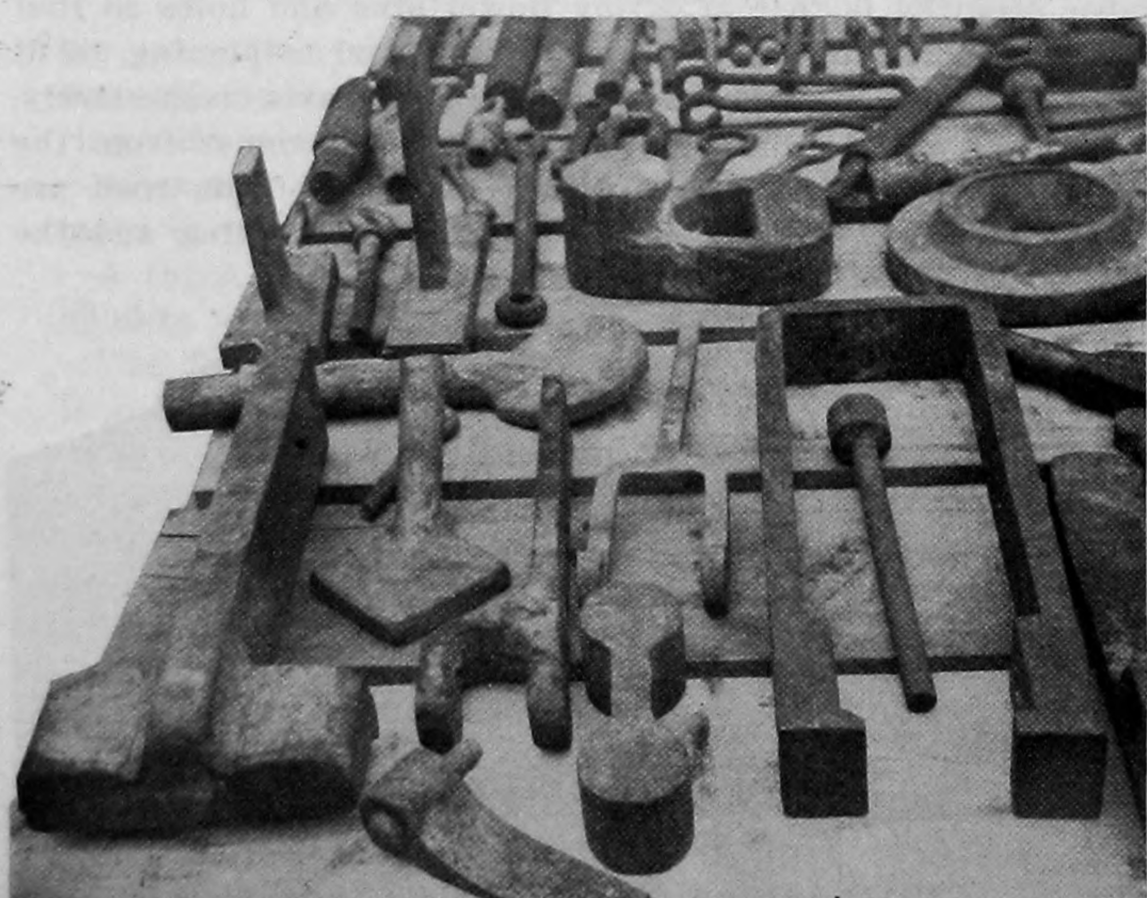
waste of the planer chips, as the die goes back to the foundry as first-class machinery scrap.

In the use of the dies, the operation does not differ essentially from that of making drop forgings. The metal is heated to a welding temperature and is laid dripping on the dies. The head then strikes good heavy blows until the two faces are together and the work is done.

The average life of such dies runs from 80 to 100 pieces. As to form, they run the whole range of what may be required for locomotive work. The illustrations show better, perhaps, than any description what that range and variety is. Here will be found a variety of pins headed in many ways,



Samples of Die Forgings Under Steam Hammer (Fig. 1).

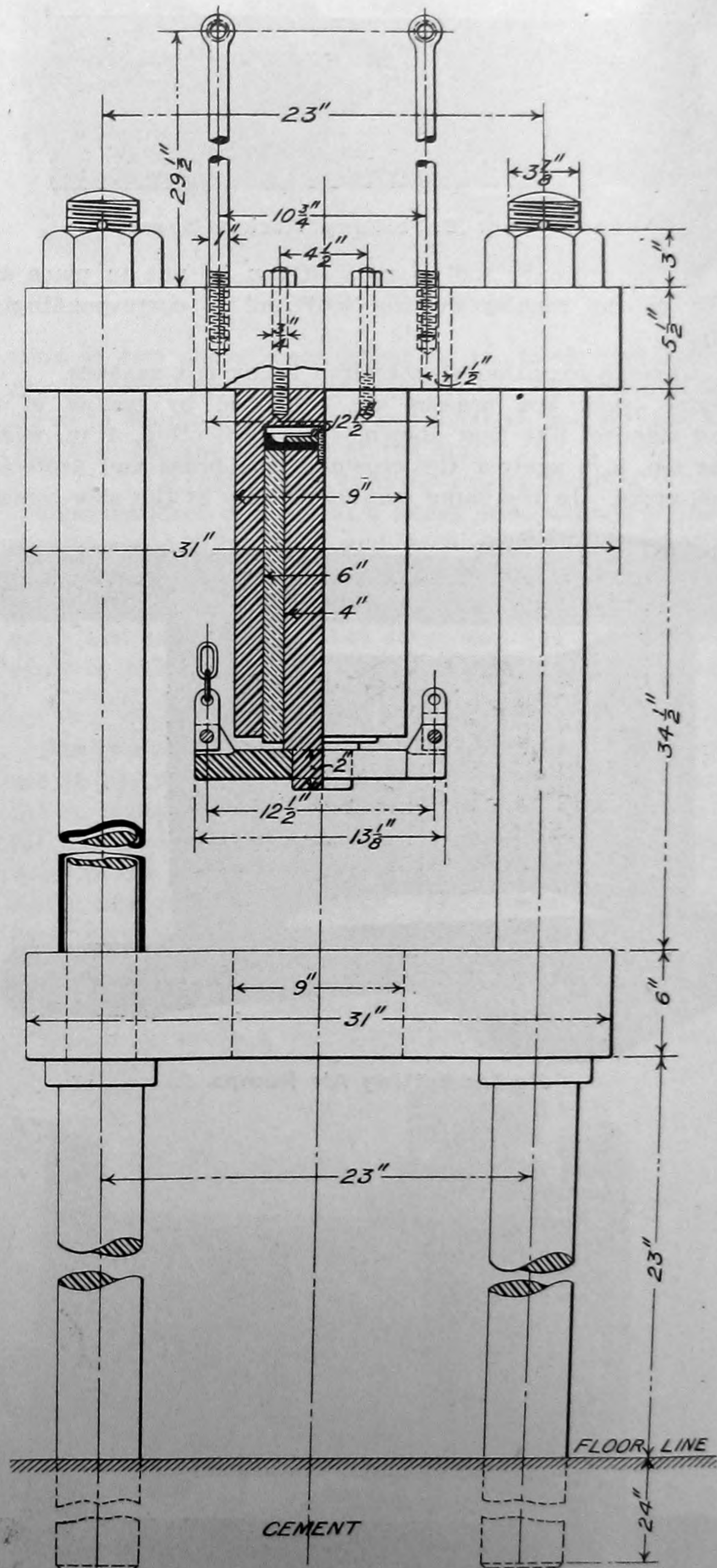


Samples of Die Forgings Under Steam Hammer (Fig. 2).

jaws for transmission rods, coupler yokes, guide yoke brackets, fire hose and hooks. So that there seems to be hardly anything of too complicated a form to be made in this way, and it is evident that even for the small quantity of some of these forgings that are used, economy realized by this method of making in comparison with the regular hammer and anvil work is very great. Add to this the fact that parts are made in what is practically exact duplicates, with the minimum of allowances for machine finishing, and that saving is still further enhanced. This, it will be borne in mind, is just the contrary to what is done in regular forge work, under the modern regime of rapid and heavy machine work, where it is cheaper to cut away and waste the metal than it is to pay for close forging. But when, as in this case, it is as cheap to forge close as it is to forge with big finishing allowances, we have three economies rolled together: that of rapid blacksmith work; that of close forging, with the decrease of waste metal, and of saving of labor in the machine shop, all of which go far to recommend this method of die forging for all kinds of duplicated work. In fact, it might even happen that duplication would not be necessary in order to make the die work a paying investment.

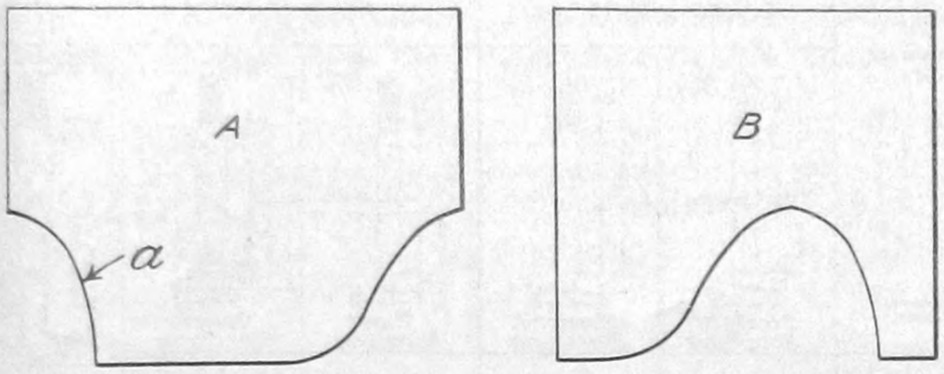
FINISHING TOOL FOR TIRES.

The tool that is used on the wheel lathes for finishing the flanges of steel wheels is shown in the accompanying engraving at A. It is arranged to cut one side of the flange at a time instead of cutting both at once, as is frequently done with a tool shaped as at B. The cutting edge, *a*, dresses



Hydraulic Press, for Pressing Locomotive Rod Bushings in or Out of Rods.

the working side of the flange and at the same time the flat surface of the tool finishes the tread. The tool is then drawn back and the cut made at the back. It is claimed that this will be done in less time than will be required with the tool shown at B, which cuts both sides at once, because of the heavier cut that can be taken, and, in addition to this, the tool is much more easily kept in condition, because when it



Tire Finishing Tool.

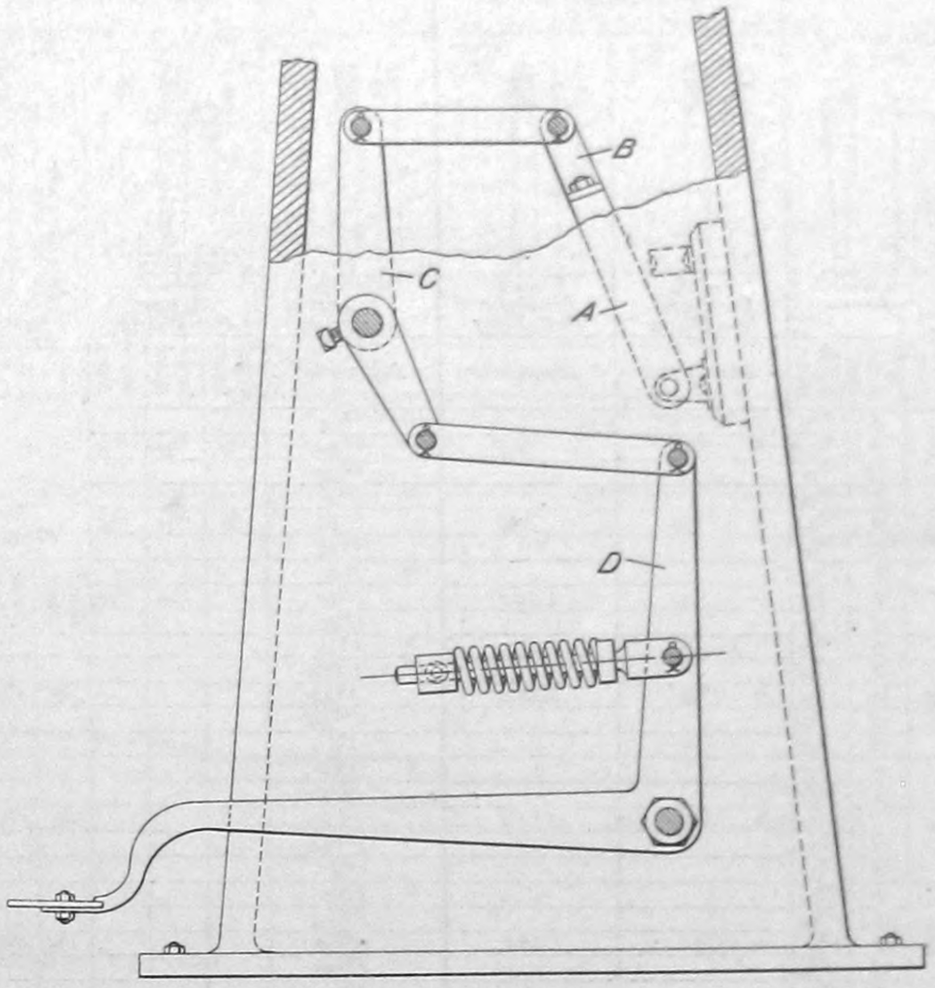
wears or becomes dull it can be sharpened without cutting back so as to build up the flange recess, as is necessary with B.

HYDRAULIC PRESS FOR ROD BUSHINGS.

This press is arranged in the same general manner as that of the pneumatic press for box brasses and miscellaneous work. The table stands on four substantial legs that are embedded in a concrete base and which extend up to and through the upper plate, which is held in position by 3⅞-in. nuts. The cylinder is inverted and is bolted to the lower face of the upper plate. It is 6 in. in diameter and is fitted with a bushed plunger. The lower end of the plunger sets into a hole, against the sides of which a shoulder has a bearing in a crosshead to which lifting chains are attached. These chains pass over T cheaves in set on the uprights at the top and carry retracting weights at their ends. These serve to draw the plunger up after it has done its work and the pressure has been removed.

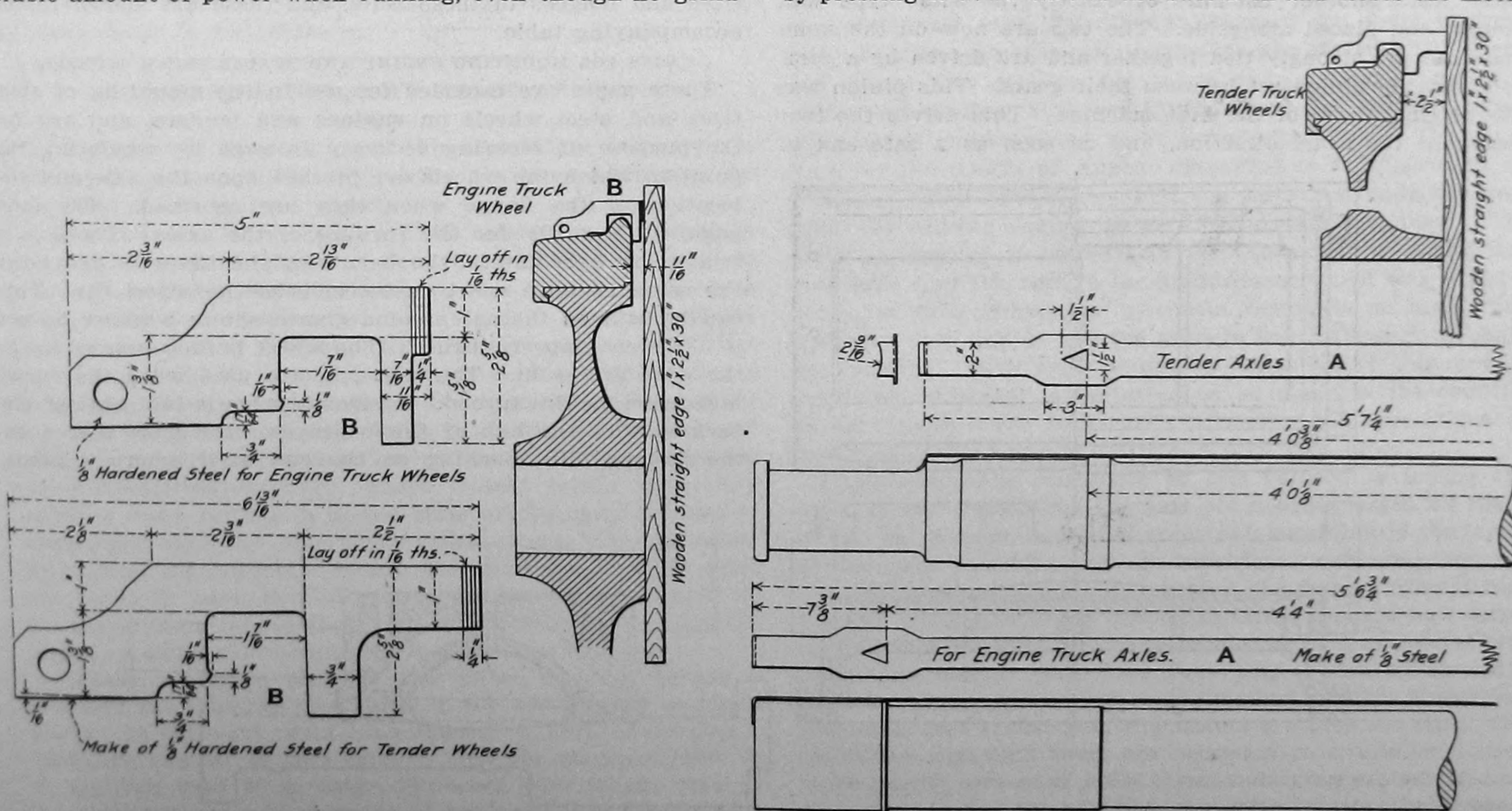
EMERY WHEEL SWITCH.

It is well known that an emery wheel requires a considerable amount of power when running, even though no grinding is being done. It is also unfortunately true that the men who use the wheel are very careless about shutting off the power when they are through using it. In order to save this waste of power a treadle device for throwing the switch is used. The original switch, A, has an extension, B, bolted on, and this, through the two connections and the lever, C, is connected with the upper arm of the lever, D. This lever



Emery Wheel Switch.

is pivoted at its lower extremity on a fixed shaft and has a bell-crank extension, at the end of which there is a treadle. Midway up this a lever, A, there is a helical spring which bears against a stop on the machine. When the machine is to be used the operator puts his foot on the treadle and by pressing it down throws the switch in and closes the motor



Gages for Mounting Engine and Tender Truck Wheels.

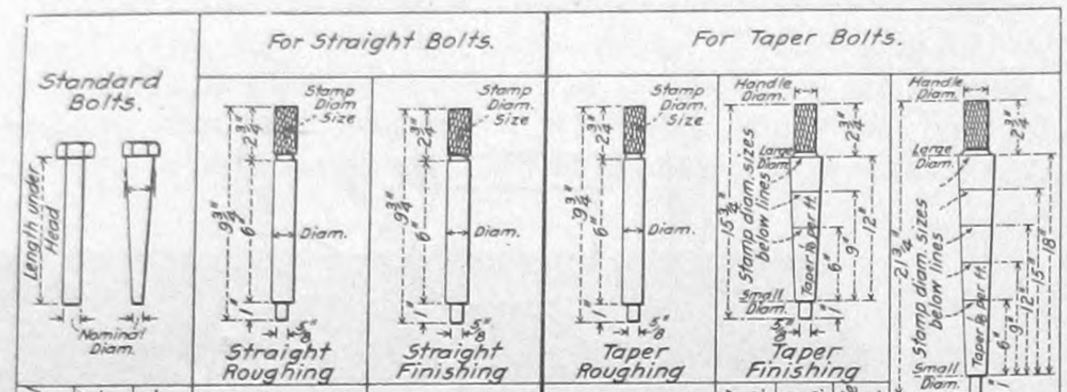
circuit. He holds his foot on the treadle while he is at work, and when he lifts it to go away the spring throws out the switch and the wheel stops.

FLUE WELDER.

There is a novel arrangement in the flue shop for welding and swaging flues. The shop was originally possessed of a single flue-welder of the usual roller type. This served to weld the flues. In order to have it do the swaging at the same heat, another machine of exactly the same type was bought and placed alongside. The two are now on the same base and are strongly tied together and are driven by a common driving pinion set between their gears. This pinion was the original drive of the first machine. This drives the two heads in the same direction, and as soon as a safe end is welded on it is pushed into the swager and finished. This, in combination with the oil furnace, enables the work to be turned out with great rapidity.

STANDARD TAPER BOLTS.

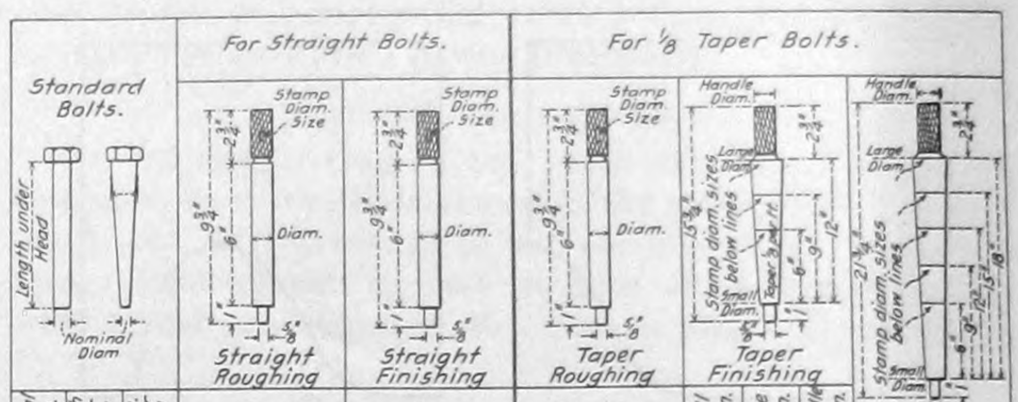
There are two standards of taper bolts in use on locomotives. For the cylinder and frame bolts a taper of 1-16 in. to the foot is used, and for the rods a taper of 1/8 in. to the foot.



Nominal Diam.	Length Under Head	Diam. Under Head	For Straight Bolts. Straight Roughing Diameter	Straight Finishing Diameter	For Taper Bolts. Taper Roughing Diameter	Taper Finishing Small Diam.	Large Diam.	Handle Diam.	Taper Finishing Small Diam.	Large Diam.	Handle Diam.
3/4	6	25/32			⦶ 13/16						
	9	51/64	⦶ 13/16	.755	53/64	3/4	13/16	11/16			
	12	13/16			27/32						
7/8	6	29/32			⦶ 15/16						
	9	59/64	⦶ 15/16	.880	61/64	7/8	15/16	13/16			
	12	15/16			31/32						
1	6	1 1/32			⊖ 1 1/16						
	9	1 3/64	⊖ 1 1/16	1.005	1 5/64	1	1 1/16	15/16			
	12	1 1/16			1 3/32						
1 1/8	6	1 5/32			⊖ 1 3/16						
	9	1 11/64			1 13/64						
	12	1 3/16	⊖ 1 3/16	1.130	1 7/32				1 1/8	1 7/32	1 3/32
	15	1 13/64			1 15/64						
	18	1 7/32			1 1/4						
1 1/4	6	1 9/32			⊕ 1 5/16						
	9	1 19/64			1 21/64						
	12	1 5/16	⊕ 1 5/16	1.255	1 11/32				1 1/4	1 11/32	1 7/32
	15	1 21/64			1 23/64						
	18	1 11/32			1 3/8						
1 3/8	6	1 13/32			⊘ 1 7/16						
	9	1 27/64			1 29/64						
	12	1 7/16	⊘ 1 7/8	1.380	1 15/32				1 3/8	1 15/32	1 11/32
	15	1 29/64			1 31/64						
	18	1 15/32			1 1/2						
1 1/2	6	1 17/32			⊘ 1 9/16						
	9	1 35/64			1 37/64						
	12	1 9/16	⊘ 1 9/16	1.505	1 19/32				1 1/2	1 19/32	1 15/32
	15	1 37/64			1 39/64						
	18	1 19/32			1 5/8						

⦶⦶⊖⊖⊕⊘⊘ Duplicate sizes, one only wanted per set

Plug Gages for Bolt Turning Machine (Fig. 1).



Nominal Diam.	Length Under Head	Diam. Under Head	For Straight Bolts. Straight Roughing Diameter	Straight Finishing Diameter	For 1/8 Taper Bolts. Taper Roughing Diameter	Taper Finishing Small Diam.	Large Diam.	Handle Diam.	Taper Finishing Small Diam.	Large Diam.	Handle Diam.
3/4	6	13/16			27/32						
	9	27/32	13/16	.755	7/8	3/4	7/8	11/16			
	12	7/8			29/32						
7/8	6	15/16			31/32						
	9	31/32	15/16	.880	1	7/8	1	13/16			
	12	1			1 1/32						
1	6	1 1/16			1 3/32						
	9	1 3/32	1 1/16	1.005	1 1/8	1	1 1/8	15/16			
	12	1 1/8			1 5/32						
1 1/8	6	1 3/16			1 7/32						
	9	1 7/32			1 1/4						
	12	1 1/4	1 3/16	1.130	1 9/32				1 1/8	1 5/16	1 3/32
	15	1 9/32			⊕ 1 5/16						
	18	1 5/16			● 1 11/32						
1 1/4	6	1 5/16			⦶ 1 11/32						
	9	1 11/32			1 3/8						
	12	1 3/8	⊕ 1 5/16	1.255	1 13/32				1 1/4	1 7/16	1 7/32
	15	1 13/32			⊘ 1 7/16						
	18	1 7/16			⊖ 1 15/32						
1 3/8	6	1 7/16			⊖ 1 15/32						
	9	1 15/32			1 1/2						
	12	1 1/2	⊘ 1 7/16	1.380	1 17/32				1 3/8	1 9/16	1 11/32
	15	1 17/32			⊘ 1 9/16						
	18	1 9/16			⊘ 1 19/32						
1 1/2	6	1 9/16			● 1 19/32						
	9	1 19/32			1 5/8						
	12	1 5/8	● 1 9/16	1.505	1 21/32				1 1/2	1 11/16	1 15/32
	15	1 21/32			1 11/16						
	18	1 11/16			1 23/32						

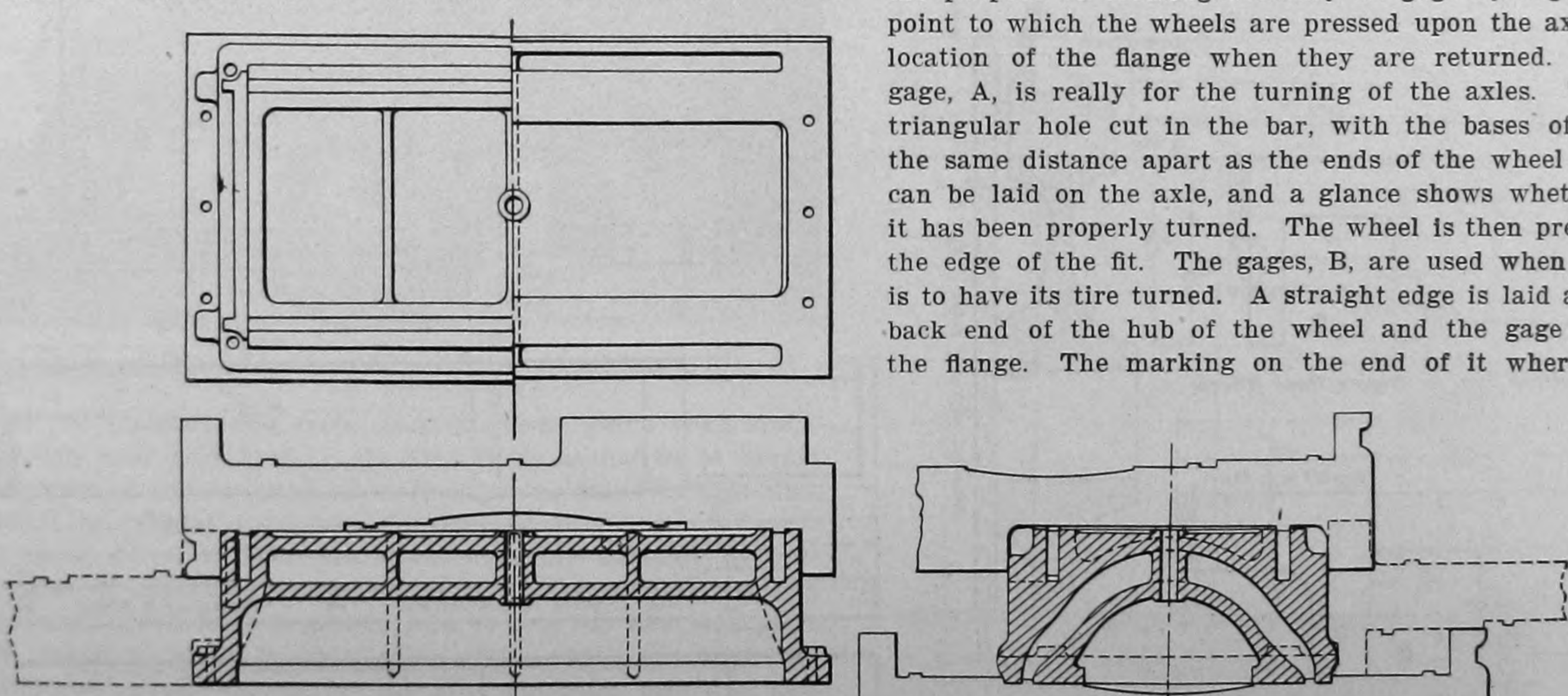
○○○○○○ Duplicate sizes, one only wanted per set

Plug Gages for Bolt Turning Machine (Fig. 2).

Regular schedules have been adopted for the making of all sizes and lengths of these bolts, and these are shown in the accompanying table.

GAGES FOR MOUNTING ENGINE AND TENDER TRUCK WHEELS.

These gages are intended for use in the mounting of steel tires and steel wheels on engines and tenders, and are for the purpose of securing accuracy in gage by regulating the point to which the wheels are pressed upon the axle and the location of the flange when they are returned. The long gage, A, is really for the turning of the axles. There is a triangular hole cut in the bar, with the bases of the holes the same distance apart as the ends of the wheel fits. This can be laid on the axle, and a glance shows whether or not it has been properly turned. The wheel is then pressed on to the edge of the fit. The gages, B, are used when the wheel is to have its tire turned. A straight edge is laid against the back end of the hub of the wheel and the gage placed on the flange. The marking on the end of it where it abuts

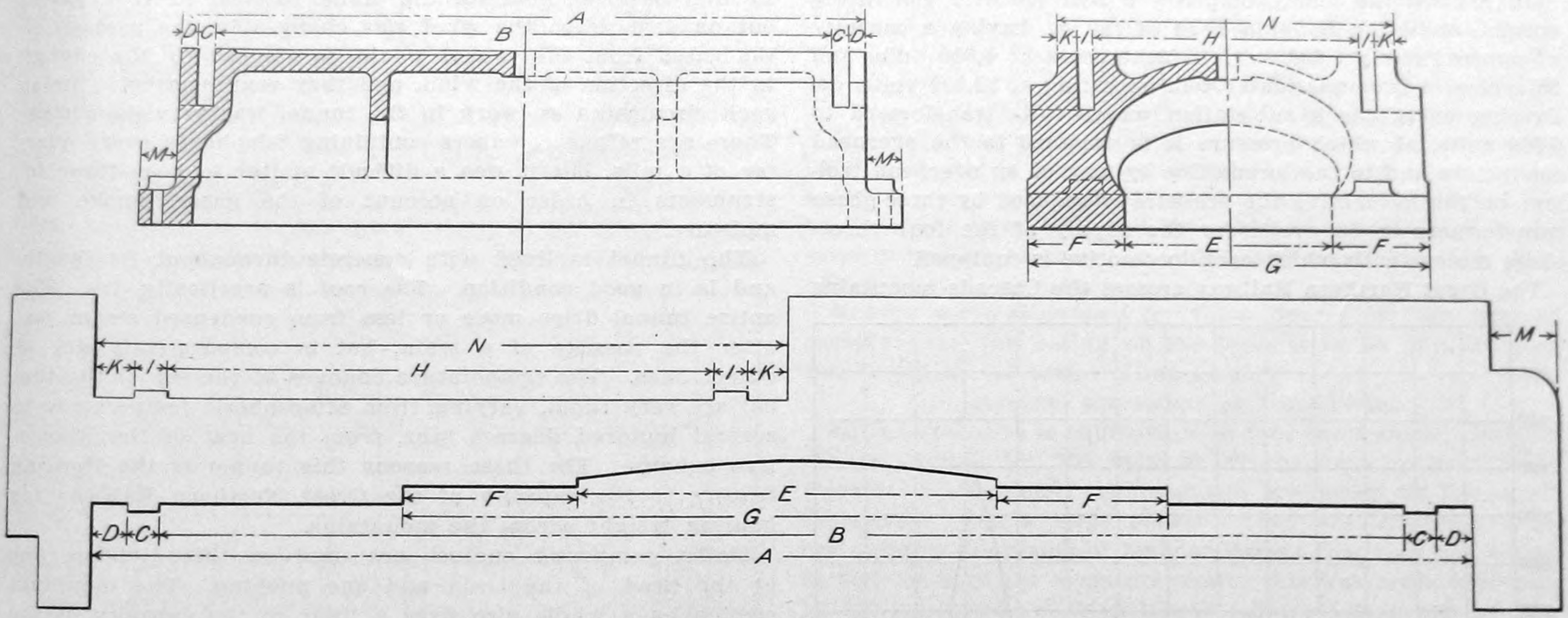


Gages for Inspecting Slide Valves.

against the straight edge will show whether the flange has been properly located or not. With these it is possible to put the wheels on the axles with the minimum of variation from the truly correct position.

GAGES FOR FINISHING AND INSPECTING SLIDE VALVES.

For each size of slide valve in use there is a gage that contains on its edge all of the essential measurements of the valve for which it is intended. Two examples of these gages are shown. In one case the application of the gage to the valve is shown, and in the other the gage is shown on a larger scale, and the measurements on it are indicated by letters corresponding to those on the valve itself. From this it will be seen that the length, width and location, with its width of the groove for the packing ring in the back; the width and the exhaust opening in the face and the width of the flange at the end are given. Where there is a flange at the side, this is also put on the gage. These gages are made of steel about ⅛ in. thick.



Gages for Inspecting Slide Valves.

AMERICAN RAILWAY ASSOCIATION.

A report of the fall meeting of this association was given in our last issue, page 1030. Following are some additional details from the committee reports:

Committee on Maintenance.—This committee presented a two-page history of what has been done during the past 15 years to establish standard dimensions for box cars. This was prepared by J. J. Turner, who was long at the head of the committee on that subject. Mr. Turner presents statistics showing that in Western classification territory the increase in the use of very large cars has been stimulated by a scale of minimum carload rates for bulky goods which does not place sufficient penalty on the large car; while in Official and Southern classification territory, where freight tariffs have been adjusted more rationally to the sizes of the cars, the use of unstandard cars has been much more successfully restricted. By making the minimum weight too small the roads in western territory have not only given undue encouragement to the use of large cars in their own territory, but have been the means of doing the same thing in Eistern territories.

Figures are given showing the better progress toward a standard car that has been made in the eastern and southern states. In the eight years from January 1, 1901, to January 1, 1909, the number of cars smaller than the standard—that is to say, less than 36 ft. long—decreased from 84 per cent. of the total box car equipment to 42 per cent., and the decrease was about the same in all territories. In the same eight years the number of cars 36 ft. long increased from 10 per cent. of the total box car equipment to 39 per cent., but the increase was much smaller in the Western classification territory than in the eastern and southern states. The figures showing the number of cars over 36 ft. long show, however, in eight years an increase in Western territory from 6.3 per cent. of the total box car equipment to 25.7 per cent., while in Official and Southern territory the increase was only from 5.5 per cent. to 12.9 per cent.

Committee on Electrical Working.—This committee has considered the effect of electrical working of railways on automatic signaling systems, and says that it would seem advisable that in new automatic signal work alternating currents should be employed for the track circuits, and this not only on roads which contemplate the adoption of electric traction, but also where electric traction is or may be employed on roads nearby.

Relations Between Railways.—The committee on this subject gives in its report a copy of the working agreement of the Cincinnati Joint Interchange Bureau, and some information about the American Railway Clearing House. The Clearing House (for settling car interchange balances) now has offices in both New York and Chicago, and the list of members includes 68 railways and three private car lines. The clearings for the month of August amounted to $1,600,000, an increase of about $200,000 over March last. Accounts are kept with 464 railway companies and 370 private car lines. The total assessment to subscribers for the month of September was $180, and the cost to the subscribers, which was about 2 cents for each mileage or per diem report, is no more than formerly they had to pay for postage and stationery in mailing reports. With over 50 reports consolidated into one at this office, a benefit is conferred on all roads in the country, as they have fewer settlements to make. All corrections of errors are settled by the companies with each other.

Explosives.—The committee on this subject, reviewing the work of the Bureau for the past six months, urges all roads to join the Bureau, declaring even that, according to the terms of the rules prescribed by the Interstate Commerce Commission, roads which are not members of the Bureau are not conforming to the law. Ten steamship companies are now members of the Bureau and 32 manufacturers of explosives are associate members. Excessive placarding of cars, which was a considerable annoyance, has been done away with. Answering criticisms that "inflammable" placards are used too much, the committee says that these are necessary to enable employees to keep such cars away from those containing explosives, and to warn men not to enter the cars with lanterns or torches. At the same time it must not be thought that the card justifies failure to enter a car to extinguish a fire.